

Blue Gold Program 2013–2021 Final Report: Lessons Learnt

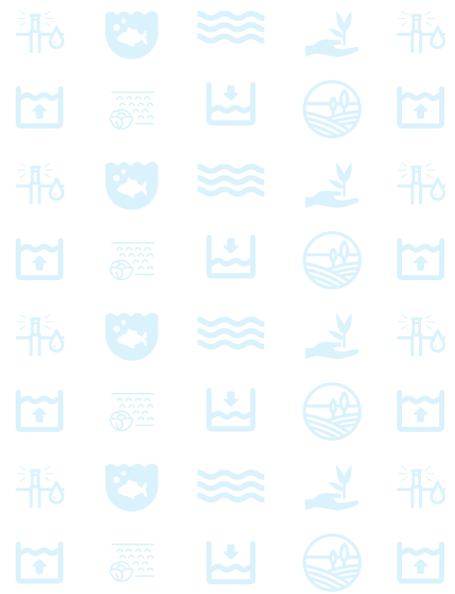


Kingdom of the Netherlands



Blue Gold Program 2013-2021

Final Report: Lessons Learnt



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Blue Gold Program Photo Archives

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The expanded and interactive version of this lessons learnt report can be found at: www.bluegoldwiki.com

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The work presented in Blue Gold report has been funded by the Governments of the Netherlands and Bangladesh. The Blue Gold report has been prepared by the technical assistance team grant-funded by the Ministry of Foreign Trade and Development Cooperation of the Government of the Netherlands, represented locally by the Embassy of the Kingdom of the Netherlands in Dhaka. The technical assistance team was led by Euroconsult Mott MacDonald.

Note to readers:

Glossary and acronyms are available through the wiki site only. To restrict the size of this report, we have decided not to include them in the printed report.



Kingdom of the Netherlands





Introduction

This print version of the Final Report of the Blue Gold Program has been extracted from a wiki version of Blue Gold's Lessons Learnt Report, which documents the experiences of the technical assistance (TA) team working in the development project implemented by the Bangladesh Water Development Board (BWDB) and the Department of Agricultural Extension (DAE) over an eight+ year period from March 2013 to December 2021. Blue Gold has rehabilitated and improved the main water infrastructure in 22 coastal polders in south-west Bangladesh and empowered Water Management Groups (WMGs) and Water Management Associations (WMAs) to be the drivers of economic development in the polders using the improved water infrastructure. Blue Gold has assisted the water management organisations with arrangements and procedures for water management, and advice on how to optimise profitability through the adoption of modern crop technologies, crop selection, and the collective purchase of inputs and sales of produce. Blue Gold's differentiated approach ensured that benefits reached not only households with access to land but also the many landless households, as well as men and women farmers.

This report is intended to complement the BWDB and DAE project completion reports (PCRs), by recording lessons learnt for use in the design and implementation of future interventions in the coastal zone. It aims to review and analyse approaches and methodologies used in the delivery of Blue Gold, how and why they evolved over the lifetime of Blue Gold with reasons for the adaptations and adjustments that were introduced and an explanation for the timing of the intervention.

The wiki version of this report can be accessed by typing www.bluegoldwiki.com into your browser.

This wiki version has a range of features that are not reproducible in the print version. In particular, this wiki provides digital versions of documents prepared by the project team, by other organisations who received financing through the Innovation Fund and the many valuable references (policy documents, legislation etc) that have provided direction to Blue Gold. The documents have been organised in categories (see wiki "*File Library*") to aid searches. Although the wiki report is in English, many documents were prepared in Bangla for use in training of Blue Gold communities and are also available in the File Library.

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Executive summary

Lessons learnt from the coastal zone: a call for action

Summary

Program duration

2013 to 2021

Program area in Bangladesh

22 polders in the districts of Patuakhali, Khulna, Satkhira and Barguna

Objective

To reduce poverty and to increase household income through appropriately targeted interventions for 185,000 households in the coastal districts of Patuakhali, Khulna, Satkhira, and Barguna; by helping local communities to mitigate impacts of climate change and to develop their local economy through diversified farming practices based on information on input costs and market prices, supported by participatory management of local water resources.

Partners

Implementation

Bangladesh Water Development Board (BWDB)

Department of Agricultural Extension (DAE)

in association with

Department of Livestock Services (DLS)

Department of Fisheries (DoF)

Donor

Government of the Netherlands (GoN)

Government of Bangladesh (GoB)

Consultants

Euroconsult Mott MacDonald

in association with

Femconsult, Socioconsult and BETS Consulting

1 A Call for Action

This is the executive summary of the Lessons Learnt Report of the Blue Gold Program (BGP), which is written with the aim of assisting its intended readership of policy makers, planners and practitioners to use practical lessons gained from Blue Gold in modifying policies, plans, procedures, and the design of programs, and projects that support water management in the coastal zone. This executive summary is intended to present summary recommendations from Blue Gold's eight year practical experience with 800,000 farmers in 22 polders as a "call for action" by investment platforms like the government's Delta Plan.

2 Why is it important to heed lessons of the Blue Gold Program?

Bangladesh's impressive economic development has brought the country's imminent identification as a middle-income country as a realistic goal. One precondition for development is that adequate water security sustains lives and livelihoods. This means that adequate protection from the destructive force of water must be in place and that the productive potential of water for the greater good of society is harnessed at the same time. The better a society functions, the higher the level of water security must be. One can see this relation between economic development and water security already: Dhaka City – being the country's main economic hub – is protected against severe floods, whereas lower levels of protection are provided to the country's agricultural rural areas. The next phase of development in these areas must therefore protect investments in economic and social infrastructure from flood-damage, secure communities from the consequences of climate change and also enable the control and regulation of water levels, volumes and qualities to allow high value production of both fisheries and crops.

In particular in south and south-west Bangladesh, the investments by government in transport infrastructure – Padma Bridge, Payra deep-sea port and associated road and rail infrastructure – will provide new opportunities that:

- Increase the demand for agricultural products in local markets as towns and cities expand, due to the increase of employment opportunities
- Reduce transport costs for agricultural products to existing markets, increase the speed of delivery of goods to markets, and reduce losses caused by damage to vulnerable fresh products during transport
- Open up new markets for agricultural products in India and internationally.
- The new opportunities for the south and south-west are far-reaching and could stimulate important changes in agriculture.

Blue Gold Program – a unique cooperation

The relation between water management and agricultural production is obvious, yet BGP is the first investment project that is implemented jointly by the concerned departments, i.e. Bangladesh Water Development Board and Department of Agricultural Extension. Transformation of the smallholder agriculture towards high value products is a driver for better utilisation of the water management potential within areas served by embankments, canals, and sluices.

The cost of inaction

The prevalence of a vicious cycle of 'build – neglect – rebuild' draws the viability of the Government's strategy to intensify water sector investment into question. To enhance sustainability of investments, water governance must be improved. Blue Gold's lessons on Participatory Water Management could contribute to improving water governance

Bangladesh has adopted the Delta Plan 2100 which provides an investment plan with a long-term perspective for the development of water infrastructure. Whilst infrastructure for water security is being well-addressed, it is the procedures for managing, operating and maintaining water resources infrastructure to sustain continued and inclusive economic growth which crucially needs attention.

This Lessons Learnt Report (LLR) aims to contribute towards answering the question ‘How should water resources and infrastructure be managed in the coastal polders to enable inclusive development?’ This executive summary summarises Blue Gold’s practical experiences and presents suggestions for use by water sector planners in devising policies which result in better governance of water resources.

3 Management of water resources and infrastructure in the context of the experience of Blue Gold

Using the experience of a single project – in this case the Blue Gold Program – to modify water governance in Bangladesh is not unlike a mouse attempting to move an elephant. The Blue Gold Program is a relatively small and short-lived set of interventions, which can easily be ignored when set against the long history and scope of water resources governance. We must therefore first argue, why the lessons are relevant:

- Lessons from BGP do not stand on their own:**
 Investments in water resources management are often made through projects using donor funds. Blue Gold builds on the experiences of many previous projects in the coastal zones. These water sector projects adhered to government policies on Participatory Water Management¹ and attempted to establish organisations through which infrastructure is locally managed and maintained. BGP, like all related projects, has achieved some successes in doing so but – like all other projects – has also been severely constrained by existing policies and a lack of appropriate governance procedures.
- Lessons from BGP apply across the coastal zone:**
 Having worked in 22 of Bangladesh’s 139 coastal polders, and having done so in four distinct physical and environmental settings (Khulna, Satkhira, Patuakhali and Barguna) means that at least some of the experiences can be extrapolated across the coastal zone, subject to the following conditions: (i) BGP’s focus has been on rural areas and does not provide lessons on water management for urban areas within the polders; (ii) within the 117 coastal polders not addressed by BGP, there may be some polders where physical constraints render improved water management impossible (e.g. due to sedimentation of the river network adjacent to a particular polder) or where farmland has been converted for commercial

Blue Gold Program

The Blue Gold Program (2013-2021) promotes Participatory Water Management in 22 polders in the southwestern coastal belt by:



Improving water management by community mobilization and infrastructure development



Increasing and diversifying agricultural production



Increasing income and employment through market-led agriculture



Reducing poverty and improving food security



Using a pro-poor, inclusive approach, and enhancing innovations, targeting men and women, to include all polder inhabitants and also to enhance development outcomes

¹ Reference is made inter alia to: Government of Bangladesh, Ministry of Water Resources, National Water Policy, January 1999; Government of the People’s Republic of Bangladesh, Ministry of Water Resources, Guidelines for Participatory Water Management, Dhaka, 2000; and: Government of the People’s Republic of Bangladesh, Participatory Water Management Rules, 2014, Circular 20 Magh 1420 Bangla Year/2 February 2014 AD, published in Bangladesh Gazette, Additional Issue, February 11, 2014

and/or residential uses, in which case the lessons of Blue Gold would not be transferable.

- **Lessons from BGP relate to national policies:** The first Government policies on Participatory Water Management were framed around 2000. At that time, these policies were novel and constituted a break with a tradition of top-down water resources management. More recently, the Water Act (2013)², was promulgated. This Act, with its Rules and procedures, builds on the spirit of the 1999 National Water Policy by defining structures for devolving central authority to regional and local levels. Implementation of this framework aimed to bridge the gaps between planners and policy makers, local government institutions, the private sector and local, regional and national water stakeholders. Given that local water users would be linked to regional and national water management coordination structures, it is very timely to use the hindsight of 20-years of experience in applying Participatory Water Management (of which BGP covers some eight years), for better overall water governance; especially also in the light of the investments proposed in the Delta Plan 2100.
- **Lessons from BGP expand on the organisational model for local water resource management:** The national policies and regulations for Participatory Water Management describe an organisational structure for local water management. Based on its experience, BGP suggests various improvements to the organisation of the local Water Management Organisations (WMOs). At the same time, the sustainability of local water management remains affected by a very weak linkage to (and support from) local government and national structures for water management decision-making.
- **Lessons from BGP show the significance of Participatory Water Management for local economic development and poverty reduction:** The policy for Participatory Water Management – and especially its subsequent transposition in a legal and regulatory framework – emphasises the need for a systematic approach towards participation of stakeholders ensure operation and routine maintenance of infrastructure. The underlying concept was that the government through project investments would plan for and provide the infrastructure and that subsequently the water users would take care of management. The experience of Blue Gold in Participatory Water Management is that water users, when involved in devising and implementing plans to use opportunities for better local economic development, become motivated to engage in maintenance, operation and even construction of small-scale water resources infrastructure to secure the economic benefits. Harnessing water management for local economic development also requires that: (i) a greater connection is made between agricultural commercialisation and water management; (ii) that local government institutions are systematically and substantially engaged with the specialised departments, such as BWDB, DAE, DoF and DLS, to develop participatory water resource management from the very onset of an intervention ; and (iii) agricultural extension takes into account the practical experience of aligning commercial production with water management, with due consideration for the economic potential of crops and fisheries as well as the trade-off between them.

Intentions for periodic review

A quote from the National Water Policy:
“The National Water Policy will be reviewed periodically and revised as necessary.”

A quote from the Guidelines for Participatory Water Management: *“In consideration of the changing environment and growing experience, the guidelines will have to be updated regularly.”*

In other words, Blue Gold’s experience shows a way forward for enhanced and inclusive economic development through water resources management in both agriculture and aquaculture in the coastal zone, and suggests directions for more effective management of local water resources and infrastructure.

2 Government of Bangladesh, Bangladesh Water Act 2013, Act 14 of 2013; Government of Bangladesh, Water Rules 2018, Bangladesh Gazette, August 2018

4 What, then, are the key lessons from BGP?

The principal lesson of BGP is that Participatory Water Management constitutes a strong driver for inclusive local economic development, which can encourage and enable local stakeholders to maintain, operate and to develop small-scale water management infrastructure within their catchment area. This is further underpinned by eight key lessons³:

- **Security from embankment breaches and flooding of farmland is a pre-requisite to investment in new high-value, high-investment crops:** Presently, the fear of flood damage to their land and property discourages farmers from choosing high investment crops. Their understandable aversion to risk, results in conservative crop choices and a lack of planning to optimise the sequencing of planting and harvesting dates of the annual cropping cycle on a specific parcel of land. Better planning helps to avoid periods of expected heavy rainfall during the early germination stages of a crop, or periods of cyclonic winds close to harvest time. Security from breaches and flooding removes an overwhelming threat and stimulates farmers to include more commercial, high-value options into their production cycle. It also safeguards other economic interests and sectors, such as trade and commerce.
- **Participatory Water Management starts with consultation in decision-making:** Developing investment plans centrally, with little to no local consultation, leads to unnecessary friction during implementation and to a lack of commitment or ownership from local government and other local stakeholders; as well as a poor level of community care for new infrastructure. In preference, local economic development priorities and any findings from local consultations should be incorporated into central investment plans.
- **Activation should precede organisation:** When pursuing the development of Water Management Groups as an organisational structure for Participatory Water Management, it is more effective to focus first on activating men and women of the community to improve their agricultural production by improved water management, rather than insisting on the full development of the WMGs right from the start. Agricultural extension, integrating crop production and water management into their messages, plays an important role here. Once people see the benefit of improved water management and the value of cooperation, they are more motivated to develop the organisational structure required for WMGs, needing less technical advice and support.
- **Water management should be driven by a vision for local economic development:** The orientation towards action in the previous lesson can be embedded in a local economic development vision. Such a vision helps to build commitment from all local actors around local economic priorities; helps secure the necessary support from departments and local governments; and enlists private and non-government sector support.
- **Local governments are a logical and indispensable partner in aligning water resources investment to an agenda for local economic development:** The front door for local economic development – and thereby also for investment projects in water infrastructure – is the local government. They are a first stop for consultation, a partner to use in activating their communities, a support in the development of an organisational structure for water resources management at catchment or sub-catchment level, often act as successful mediators in disputes, and provide a safeguard for remedial action if plans need to be changed. If water management organisations are viewed by local government as a local platform to reach out to other community-based organisations, they will recognise the WMO's role and be encouraged to sustain them.
- **Agricultural transformation and commercialisation are key elements for local economic development:** In the context of most, if not all, rural regions of the coastal zone of Bangladesh, agriculture and fisheries are the driver for economic development and any vision for economic development will largely relate to these sectors. Important partners for the commercialisation of agriculture are the private sector and local government line departments. A further alignment of water

³ Thematic brochures and case studies accessible through the Lessons Learnt Report wiki site provide more explanations and illustrations for these eight lessons.

Improving productivity of land in coastal Bangladesh – BGP outcomes

| Water management problems before BGP | Improvements brought about by Participatory Water Management |
|--|--|
|  <p>Waterlogging during the aman season in Patuakhali and Satkhira</p> |  <p>Improved drainage system</p> |
|  <p>Scarcity of the water for irrigation in rabi season in Patuakhali, Khulna, Satkhira and Barguna</p> |  <p>Increased supply of water for irrigation</p> |
|  <p>Salinity problems in some areas of Khulna, Patuakhali, Satkhira and Barguna</p> |  <p>Salinity no longer a significant problem</p> |
|  <p>Large-scale shrimp farming, resulting in an unobstructed drainage system in Satkhira</p> |  <p>While water management problems still exist, they are now less severe</p> |

Changes in cropping patterns: profitability of land and investment return

Net farm incomes have almost doubled since the start of BGP due to:

- More land being utilised and less left fallow, and higher yields
- Significant move from LV to HYV paddy for aman and aus, and from HYV to hybrid for boro
- Expansion of high value crops (vegetables and watermelons) in Khulna
- A large expansion of mung bean in Patuakhali
- Significant increase of seasonal fish ghers in Khulna and Satkhira

The overall annual increase in net farm income can cover total BGP expenditures in two years.

Changes in land tenure

- A little less than half of all land is now farmed by the owner
- Reduction in sharecropping in all seasons
- Significant increase in other lease arrangements (mainly annual cash rentals)

Farm employment: changing roles of women (feminisation of agriculture)

- With an increased area of crops, 40% labour requirement has increased compared to pre-project and 57% of all labour is now being hired.
- Much male labour has been absorbed in the non-farm sector, so more women now being hired.
- Women are now hired for almost all farm operations in Khulna and Satkhira, and still mostly hired for non-rice crops in Patuakhali.
- Women are almost always paid less than men (in many cases only 50% to 65% of the men's wages, but in some locations the differential has narrowed and has risen from around 60% to 80% of men's wages)
- Increased participation in the workforce has also increased the overall workload of women, but overall, women consider themselves better off – with additional own income, leading to greater say in household decision-making.

resources management and production support can trigger the next growth spurt for agricultural productivity and profitability. As shown in Blue Gold areas, this can include pro-poor growth through increased demand for agricultural labour combined with intensified homestead production by resource-poor households;

- **Participatory Water Management revolves around activating a partnership of water users, private sector, departments and local government:**

Organisations that work in isolation from the wider civil society are neither effective nor sustainable. Local water management organisations must be part of an active partnership for better management of the local water system, that constitutes concerned technical departments, such as BWDB, DAE, BADC and

LGED; that works in synergy with the local government; and that seeks to develop reciprocal relations with the private sector;

- **Joint actions by a network of stakeholders result in more inclusive and more sustainable development outcomes:**

When representatives of all different stakeholders and socio-economic groups are involved in making choices for local economic development - such as those related to water management and agricultural production - the resulting actions are more likely to benefit all. Jointly prepared actions, which are widely supported within the community, tend to bring more social equity and a better use of natural resources.

Women's stronger voice

Across all 511 water management groups in the 22 polders supported by BGP, women form 43% of the general membership and 34% of the executive committee members, the latter against a quota of 30%. Women's participation in key roles (president, secretary, treasurer) has gone up from 5 to 9%.

Of the 93 WMO executive committee members who won a seat in the 2016 Union Parishad elections, 25 were female.

From 'experience gained' to 'lessons learnt' to 'learning applied'

The process from gaining experience to drawing lessons to applying lessons is not a simple process. The Blue Gold Program cannot just document its experiences and then leave it to sector agencies and time for these lessons to be adopted. Just copying Blue Gold's lessons learnt is often not possible: (i) the sector's policy makers have to consider a wider set of arguments applying to situations which are very different from those of Blue Gold areas; and (ii) just the analysis of BGP lessons – however well prepared and considered – does not provide a course of action but requires further consideration about the implications, pilot testing a number of options and a careful roll-out.

The documentation of lessons learnt can raise questions and provide relevant experiences and thereby form a source of inspiration, but not enough to enable sector reform. Therefore, this Executive Summary calls upon policy makers to lead the way towards a modernisation of water governance, using BGP's and other experiences and insights.

In view of this call for action, it is very promising that, parallel to the preparation of this report, the Bangladesh Delta Plan has launched a policy-level review of water governance, for which Participatory Water Management is an important building block. A National Conference on Participatory Water Management is to be held in 2021 before closure of the Blue Gold Program, when recommendations will be made by an independent panel of senior national experts in the fields of rural development, agriculture, water resource management, local government and economy. This group of eminent experts has reviewed the BGP experience, and other experiences, to make a head start in answering how water resources and infrastructure can be managed better in future: more effective, more efficient, more sustainable and geared towards not leaving anyone behind.

Governance questions arising from BGP's experience



Participatory Water Management (infrastructural, institutional and agricultural development) must be initiated and supported. But where is the institutional capacity to do so at a nationwide scale?



Water Management Groups and Associations flourish when working closely with Local Government Institutions and line agencies. How can this partnership be extended to the whole country?



Water Management Groups and Associations develop small-scale infrastructure but also are stakeholders in main infrastructure. How can the planning of small- and large-scale infrastructure be optimised to complement each other?



New legislation establishes local and regional water resource committees. How can such bodies enhance the synergy between national, regional and local interest?

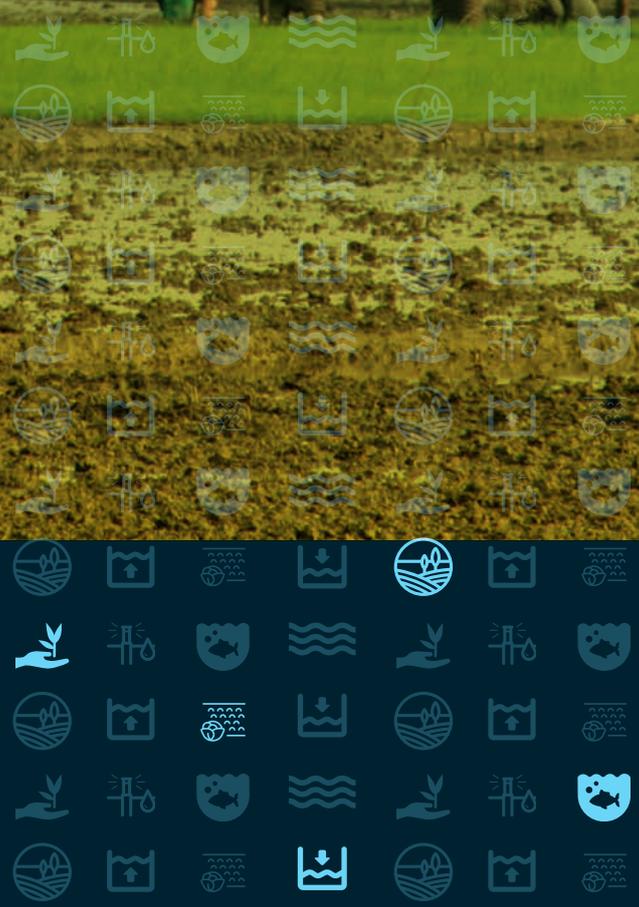
Resilience in the face of disaster

The year 2020 brought two major disasters that could negate some of the achievements of the preceding period of development support through Blue Gold: the Covid-19 pandemic, which continues to be a threat; and Cyclone Amphan, which hit several polders on May 20 and 21.

The Covid-19 measures stopped almost all transport. Shops and markets closed; and many migrant workers returned home. Farm gate prices fell and vegetables rotted due to lack of buyers. Fish prices dropped as there was no export. The supply of inputs was negatively affected. Construction work slowed down as skilled labour returned home. On top of this, Cyclone Amphan damaged or breached embankments, destroyed crops, made fish ponds overflow, and flooded homesteads.

Due to this double disaster, many households saw their incomes dwindle, impacting their food intake. This especially affected already marginal households. The incidence of domestic violence and early marriage increased.

But communities in the project area also showed resilience: Several WMGs – often hand-in-hand with Union Parishads – helped raise awareness about Covid-19 and issued warnings for the upcoming cyclone. They helped mobilise labour to repair damaged embankments, thereby minimising losses. Their closer association with government officials enabled farmers and communities to obtain support. Households that had diversified and improved their homestead production appear to be more self-reliant.



Section A Background and Context

Section A

Background and context

Summary

This section provides background and context for lessons learnt during the Blue Gold Program by providing a description of the project, its ambitions, resources, and underpinning concepts. It will also detail ‘the setting’ (institutions, social and physical context, previous experiences, the enabling environment of policies, laws and regulations) in which the project was implemented, as well as describe how the **Participatory Water Management** approach defined at the project’s start evolved during the seven-year implementation period.

BGP postulates that ‘**water management for development**’- the combining of water infrastructure and locally-led initiatives for better water management with a transformative approach to smallholder agriculture- provides a robust pathway to development.

The purpose of this final report is to present this pathway and the many lessons that help to describe it. Blue Gold Program lessons serve as input for the definition of future water sector investments in Bangladesh’s coastal zone, and as a contribution to policy choices on Bangladesh’s water sector governance. Both investment decisions and policy choices take place under the aegis of the Delta Plan 2100.

A.1 The project: the Blue Gold Program

The Blue Gold Program is funded by the governments of Bangladesh and the Netherlands and aims to reduce poverty for 185,000 households in the coastal districts of Patuakhali, Khulna, Satkhira, and part of Barguna. Blue Gold helps local communities stabilise their environments, and pursue sustainable socio-economic development through participatory water management and diversified farming practices with an increased orientation on markets. It aims to reduce poverty and enhance food security by strengthening the institutional framework, water resources infrastructure and through agricultural transformation.

Blue Gold Program

The Blue Gold Program (2013-2021) promotes Participatory Water Management in 22 polders in the southwestern coastal belt by:



Improving water management by community mobilization and infrastructure development



Increasing and diversifying agricultural production



Increasing income and employment through market-led agriculture



Reducing poverty and improving food security

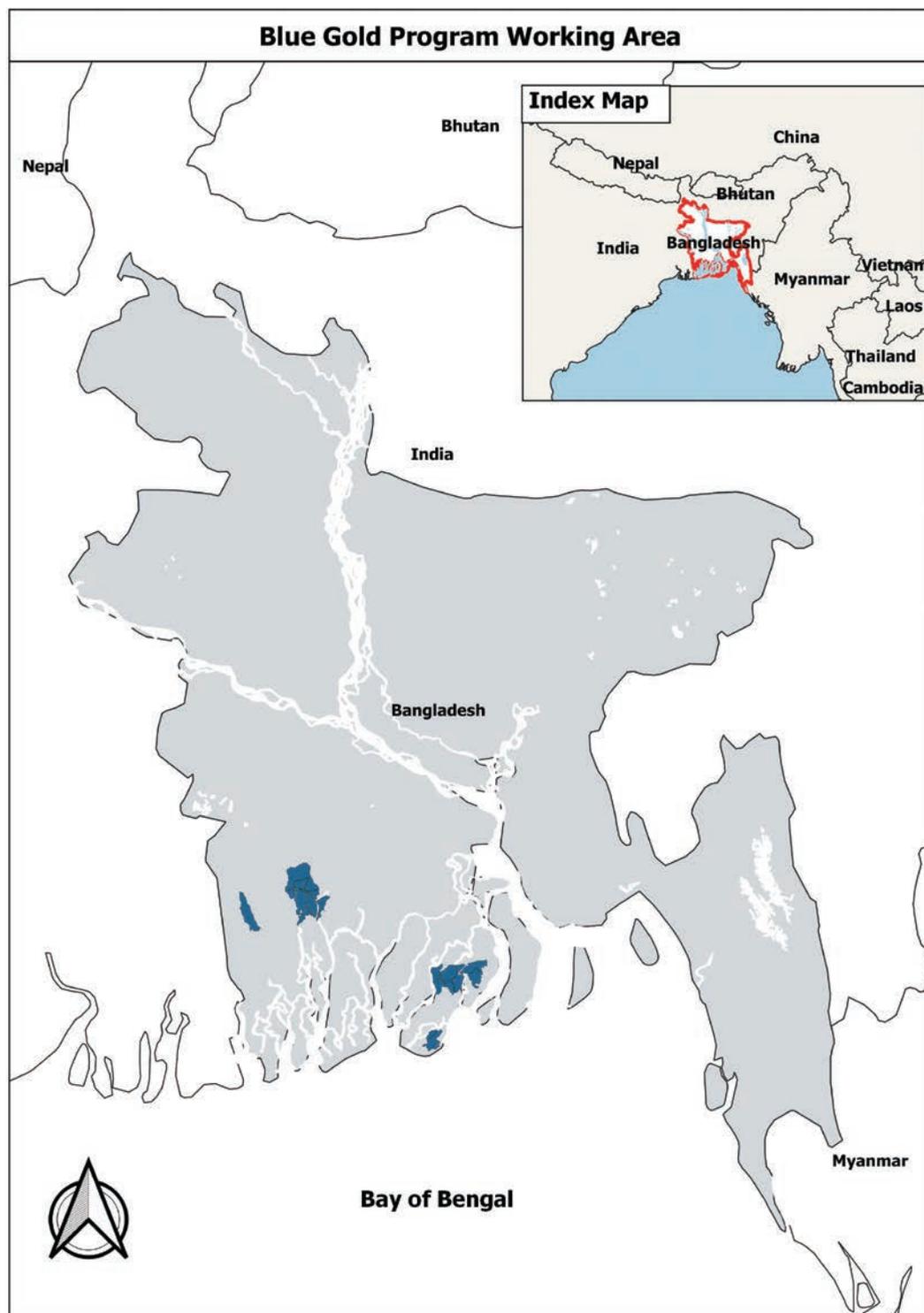


Using a pro-poor, inclusive approach, and enhancing innovations, targeting men and women, to include all polder inhabitants and also to enhance development outcomes

A.2 Setting: the coastal zone

Over 1 million hectares of agricultural lands were enclosed in polders in the 1960s and 1970s to provide protection from tidal flooding and saline water intrusion. Now, these polders are home to about 8 million people. Yet, despite the enormous investment in embankments and associated infrastructure, some 38% of rural households in the polders live below the national poverty line. The polders are subjected to flooding during the rainy season, drought and salinity during the dry season, as well as cyclones. As a result, productivity is low. These problems will be exacerbated by climate change and sea-level rise over time.

Figure A.1: Blue Gold Program working area



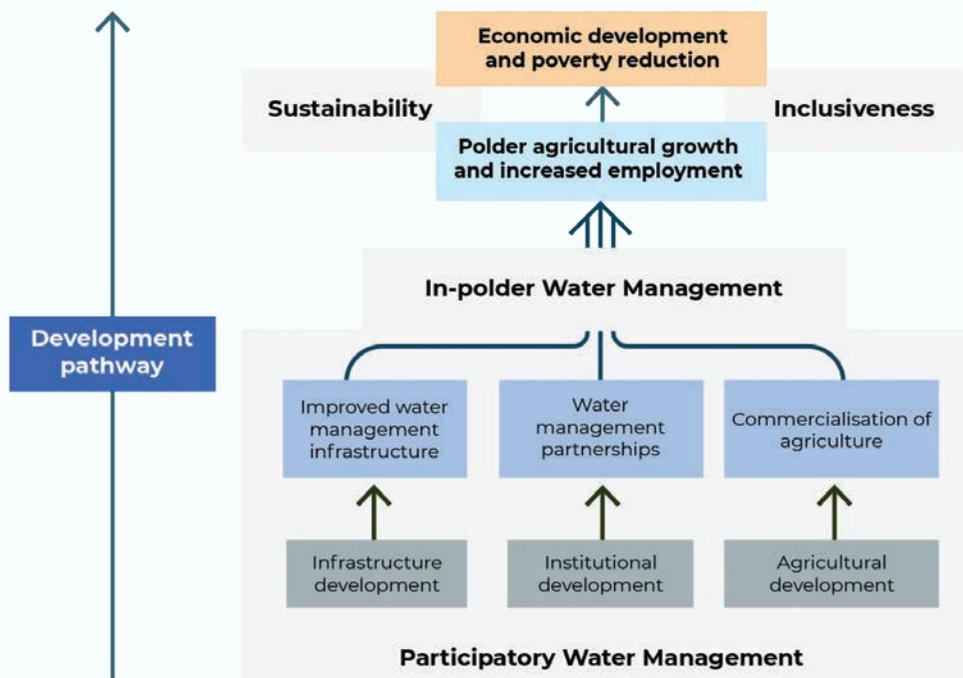
A.3 Participatory Water Management

The Blue Gold Program functions within the country policy and legal framework for Participatory Water Management (PWM). This framework, of which the basic principles were laid down some 20 years back, structures the involvement of communities in water management through a nested structure of Water Management Groups and Water Management Associations, which are to be formally given responsibility for routine maintenance and operation of water infrastructure.

A.4 Water management for development

Through its implementation period, BGP sought to bring the benefits of water management to all corners of the polders. Increased agricultural returns through better in-polder water management provide a reason for polder inhabitants to assume operation and maintenance responsibilities and to contribute to their cost.

Figure A.2: Blue Gold Program's Theory of Change



To promote in-polder water management, BGP intervenes in three realms:

- Infrastructure development: complementing rehabilitation works on embankments, sluices and main drainage channels with small-scale works within the polders' internal water systems;
- Institutional development: strengthening recently established water management organisations by the development of their networks and partnerships with local governments, departments and the private sector;
- Agricultural development: Aiming to bring the benefits of commercial agriculture through the dissemination of knowledge on field crop production, support to diversified homestead production and support to market linkages.

A.5 Purpose of this report and the 'lessons learnt' wiki

This report records lessons learnt for use in the design and implementation of future interventions in the coastal zone. The wiki version of this report can be accessed by typing www.bluegoldwiki.com into your browser.

The purpose of this report and the wiki is to pass on this knowledge and experience to the planners and policymakers working towards the realisation of the Delta Plan, and to those responsible for the design and implementation of future projects in the coastal zone.

The way forward

The Blue Gold Program and other PWM projects apply the existing legal, regulatory and institutional framework. Given the proven potential of participatory water management for enhancing development, the time has come to reassess the enabling framework for PWM. The experience of BGP suggests rethinking the following:



Participatory Water Management (infrastructural, institutional and agricultural development) must be initiated and supported. But where is the institutional capacity to do so at a nationwide scale?



Water Management Groups and Associations flourish when working closely with Local Government Institutions and line agencies. How can this partnership be extended to the whole country?



Water Management Groups and Associations develop small-scale infrastructure but also are stakeholders in main infrastructure. How can the planning of small- and large-scale infrastructure be optimised to complement each other?



New legislation establishes local and regional water resource committees. How can such bodies enhance the synergy between national, regional and local interest?



01 Overview, purpose and structure of report

1.1 Overview

1.1.1. The Coastal Zone

Bangladesh, the largest river delta in the world, depends for its economic growth largely on integrated and sustainable water resources management. The three major river systems of the country mark its physiography and life of its people. Its waters - its 'blue gold' - have fundamentally shaped Bangladesh culture. Efficient management of this immense natural resource remains a continuing challenge and offers at the same time tremendous opportunities. Starting from the 1960s, low lying tracts of land in the south-western coastal zone were enclosed by earthen embankments to create polders which protect coastal communities from tidal floods and surges. There are now 139 coastal polders enclosed by embankments of an overall length of nearly 6,000 km.

About 38% of the population in the coastal regions of Bangladesh live below the poverty line and face high vulnerabilities in terms of insecurity of food, income, water and health. However, there are ample opportunities to harness the resources of the coastal areas that can lift the population from poverty, create a sustainable environment and provide security and quality of life to present and future generations.

In addition to suffering from the effects of tidal floods and surges, the people in the coastal polders are vulnerable to the intrusion of saline water, shortage of fresh water in the dry season and the impact of extreme events such as cyclones. In the south-western coastal zone, river siltation hinders drainage and causes prolonged waterlogging in the polder after monsoon rains, which can persist for extended periods of up to six months. This in turn results in loss of crops and income, reduced food security and explains in part the higher than average poverty levels in the coastal belt. Climate change will only increase the threats posed to coastal livelihoods.

1.1.2. Blue Gold Program

To address the situation of the coastal zone, the Governments of Bangladesh and The Netherlands agreed to improve the quality of life for communities in south-western Bangladesh. The 22 polders selected for interventions through Blue Gold are located in the districts of Patuakhali, Khulna, Satkhira and Barguna, have a resident population of around 800,000 and cover a gross area of 115,000 ha (refer to Figure 1.1). Specific objectives of the Blue Gold Program are to:

1. Reduce the threat to polder communities and their land from floods from river and sea, and from saline intrusion;
2. Optimise the use and management of water resources for agricultural production, thereby increasing economic development for the polder communities, with a special focus on creating income opportunities for the poor and landless;
3. Encourage the adoption of modern agricultural technologies and strengthen linkages with the private sector;
4. Empower communities through water management organisations to lead natural resources-based development (agriculture, fisheries and livestock) with the support of public and private sector partners; and
5. Strengthen the institutional framework for sustained water resources development and related development services.

A number of government agencies implement the program:

*The **Bangladesh Water Development Board (BWDB)** is the lead agency, responsible inter alia for protecting the communities from flooding and surges by ensuring the integrity of the embankments and associated structures, and for forming and registering water management organisations (WMOs).*

*The **Department of Agricultural Extension (DAE)** works alongside farmers to encourage the selection and cultivation of crops and varieties that are well-suited to the coastal environment and which, as part of an interlinked annual cropping system, form the basis for profitable business.*

*In addition, the **Department of Livestock Services (DLS)** and **Department of Fisheries (DoF)** provide specialist advice for the development of training modules to farmer field schools, and contribute to other project interventions.*

***Local government institutions (LGIs)**, especially Union Parishads (UPs), are partners in polder development planning, coordination and maintenance.*

The total project investment amounts to € 75.3 million, allocated as follows (Table 1.1):

Table 1.1: Project budget by financier

| Contribution | Amount |
|---------------------------------|--------------|
| Government of Bangladesh | |
| BWDB | € 13,513,713 |
| DAE | € 535,015 |
| Total | € 14,048,728 |

| Contribution | Amount |
|--|---------------------|
| Government of Netherlands (grant) | |
| Administered by BWDB | € 27,320,000 |
| Administered by DAE | € 1,495,000 |
| Technical Assistance | €32,425,663 |
| Total | € 61,240,663 |
| Grand Total | € 75,289,391 |

The Blue Gold Program was implemented from 2013 to 2021. Project implementation activities were planned to be completed by end-June 2021, whilst administrative closure of the project continued for the six-month period from July to end-December 2021. During this period of administrative closure, final payment certificates for civil engineering construction contracts and other service contracts were processed, recommendations for reimbursement by EKN were prepared, and contributions to the BWDB project completion report were made.

1.2 Water management for development

For the inhabitants of the 22 polders selected for support by the Blue Gold Program, water is the most significant natural resource. This resource would be the ‘blue gold’ of their local economy, if its destructive force were sufficiently controlled and if its productive potential were adequately harnessed. To fulfil these conditions, a ‘water management for development’ approach is adopted in which water safety is improved by repair and rehabilitation of main polder-level water management infrastructure, and water productivity and profitability are enhanced by optimising the synergy between agriculture, market opportunity and in-polder water management.

The Blue Gold Program is established to help enhance local development through improved water safety and enhanced water profitability - summarised in the strapline ‘water management for development’.

In 2018, in the face of long-term uncertainties and risks brought on by global climate change, the Government of Bangladesh adopted a long-term perspective on the management of its water resources. With a view to achieving a safe, climate-resilient and prosperous delta, the ‘Bangladesh Delta Plan 2100’ sets out a strategy and achieving investment plan for the water sector.

The experience of the Blue Gold Program contains lessons on how to apply a ‘water management for development’-approach. While BGP’s setting is specific (i.e. 22 predominantly rural polders in the coastal zone), some of its lessons may be generic for the coastal zone; while others might even be relevant for the country as a whole.

1.3 Purpose of the Report

Now that the investment portfolio of the Bangladesh Delta Plan 2100 is gradually taking shape, there is a window of opportunity to inform future investment strategies and plans for the coastal zone with lessons that can be drawn from the Blue Gold Program.

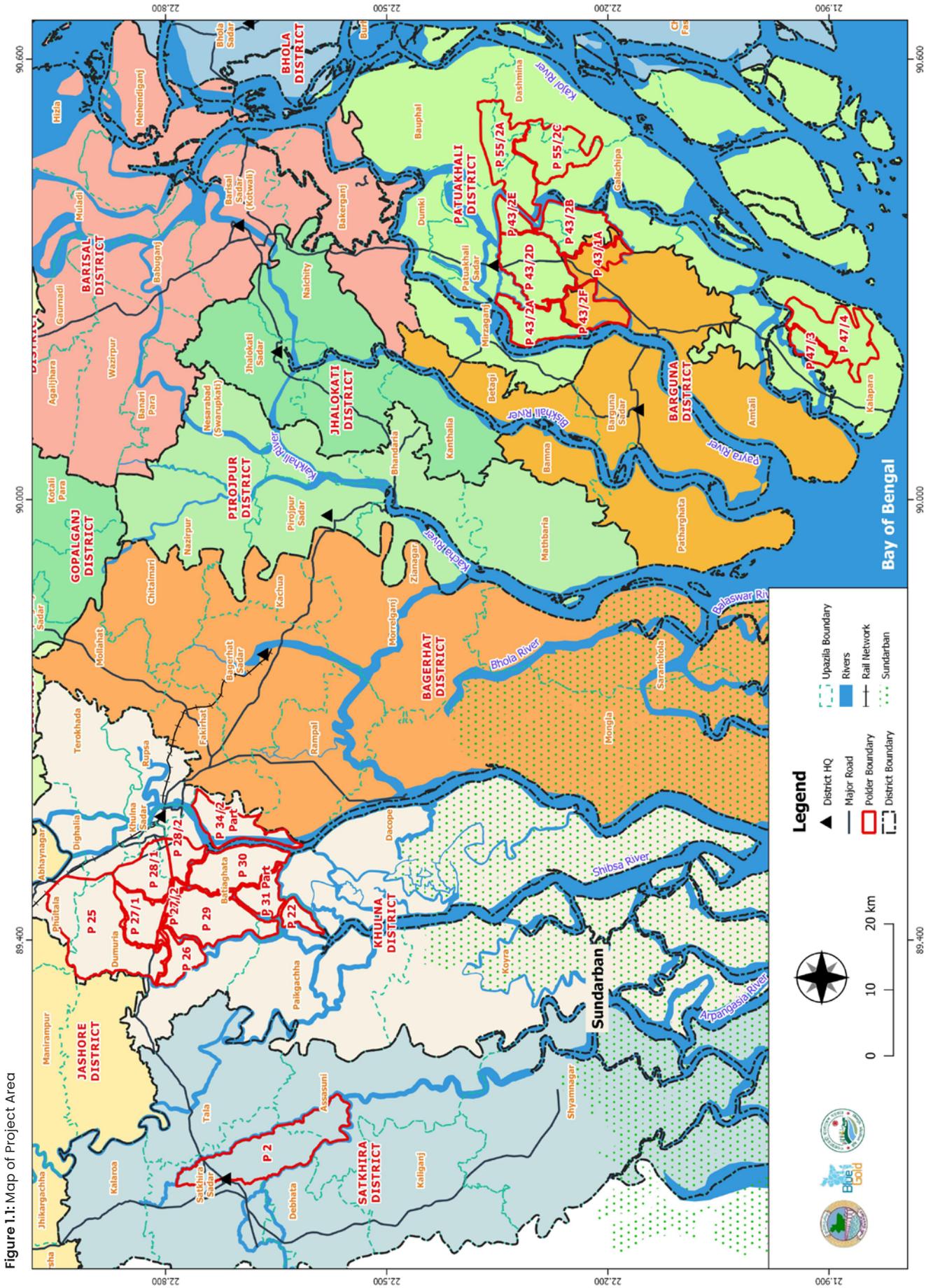


Figure 1.1: Map of Project Area

At the end of a project implementation cycle, the governments of Bangladesh and the Netherlands require documentation of the scope of project investments, and their impact and outcomes. In the case of the Blue Gold Program, a number of reports are planned. BWDB and DAE will prepare Project Completion Reports to account for the funds provided through their respective Development Project Proformas (DPPs), and these are then complemented by a “lessons learnt” report prepared by the technical assistance (TA) team. The separate purposes for these two types of reports are described below.

1.3.1. Project Completion Reports (PCRs)

On completion of a development project, all implementing agencies that receive public funds are obliged to prepare and submit a formal Project Completion Report (PCR) to the Implementation Monitoring and Evaluation Division (IMED) of the Ministry of Planning. For the Blue Gold Program, both BWDB and DAE received funding in accordance with separate Development Project Proformas (DPPs) approved by the Planning Commission.

The format for an IMED PCR is strictly controlled to ensure coverage of standard items, including: a description of the project, the status of implementation at the time of reporting, the project’s financial and physical scope, its achievements, an analysis of benefits, evidence of monitoring and internal and external audits, and a descriptive report.

1.3.2. Lessons Learnt Report

This report has been prepared to complement the BWDB and DAE PCRs, with the aim of recording lessons learnt for use in the design and implementation of future interventions in the coastal zone. The aim of this report is to review and analyse approaches and methodologies used in the delivery of Blue Gold, how and why they evolved over the lifetime of Blue Gold with reasons for the adaptations and adjustments that were introduced and an explanation for the timing of the intervention.

One of the main aims of this report then is to pass on this knowledge and experience to the planners and policy makers working towards the realisation of the Delta Plan, and to those responsible for the design and implementation of future projects in the coastal zone.

The lessons learnt report was written before the end of the project while resources within the technical assistance (TA) team were available. DAE’s involvement as a stakeholder partner finished at end-December 2020, whilst BWDB’s involvement continued to end-December 2021. During 2021, a reduced TA team with a limited analytical capacity was largely focused on assisting with quality control and payment certification for construction contracts, and with capacity building of water management organisations focusing mainly on the new polders.

1.4 Structure of this report

This report is laid out in eight sections (Sections A to H), as described in Table 1.2.

Table 1.2: Report Structure and Content

| Section | Summary content |
|----------------------------------|---|
| A Background and context | Background and context; Institutional setting; social physical and environmental context; project design; previous interventions; project definition |
| B Development Outcomes | Overview of monitoring and evaluation work; outcomes at household and community level |
| C Water Infrastructure | Overall objectives of structural interventions; investments; preparatory works; construction and quality control; reimbursement |
| D Participatory Water Management | Consultation; capacity building of water management organisations; women's participation; in-polder water management; partnerships; from concept to implementation; and way forward |
| E Agricultural Development | Commercialisation of agriculture based on improved water resource management, to drive economic development in the polders |
| F Responsible Development | Reaching marginalised groups: women, landless households and extremely poor |
| G Project Management | Project management arrangements; technical assistance; organisational development; training; horizontal learning; communications; monitoring and evaluation; project database; environmental impact assessments |
| H Innovation Fund | Objectives, evolution of procedures, types of projects and implementers, contracting modalities, lessons learnt, management arrangements, achievements, conclusions |



02 Institutional setting

This chapter presents the organisations that gave direction and shape to the Blue Gold Program. It presents the development partners that own the program, the implementation agencies and key implementation partners, as well as other public and private sector agencies that played an important role in program implementation.

2.1 Executive Authorities

The Administrative Arrangement and the Contribution Arrangement - which formed the legal basis for establishing the Blue Gold Program – were signed on 20th February 2013 and 4th December 2013 respectively, between the Minister of Foreign Trade and Development Cooperation of the Netherlands, represented by the Ambassador of the Kingdom of the Netherlands in Dhaka on the one hand; and the Economic Relations Division of the Ministry of Finance of the People's Republic of Bangladesh, on the other.

The original agreements covered a period of six years (i.e. up to 19th February 2019) but this was extended to 31st December 2020 through an amendment signed on 29th December 2016^[1], and to 31st December 2021 through an amendment signed on 21st October 2020^[2]. The agreements stipulate inter alia that Bangladesh's Ministry of Water Resources and the Embassy of the Kingdom of The Netherlands were 'Executive Authorities'.^[3]

2.1.1. Ministry of Water Resources^[4]

The Ministry of Water Resources is mandated to develop and manage all water resources of the country. It formulates policies, plans, strategies, guidelines, instructions, acts, rules and regulations relating to the development and management of water resources; and it governs a number of professional organisations within the water sector.

According to the National Water Policy, 1999 the Ministry is responsible for the formulation of a framework for institutional reforms to guide all water sector related activities. Inter alia, the Ministry prepared the Guidelines for Participatory Water Management (GPWM) which is followed by stakeholders

at all levels, and which was – as discussed later – a highly important strategic document for BGP.

MoWR's policy role also includes:

- Macro-planning exercises. The Water Resources Planning Organization (WARPO) of the Ministry has prepared the National Water Policy, the Coastal Zone Policy, National Water Resources Database (NWRD), National Water Management Plan (NWMP) and Integrated Coastal Resources Database (ICRD). Recently, WARPO led the preparation of the 2013 Water Act, its underlying Water Rules (2018) and the subsequent guidelines for integrated water resources management (2019) for District, Upazila and Union levels.
- Knowledge development and coordination.
 - The River Research Institute (RRI) undertakes physical and mathematical modelling of the river system and supports the Joint Rivers Commission to act as the secretariat for the Ministry with respect to shared management of transboundary rivers;
 - The Institute of Water Modelling (IWM) provides public services in the field of physical and mathematical water modelling, whereas
 - The Center for Environmental and Geographic Information Services (CEGIS) provides services in the field of integrated environmental analysis using geographical information systems, remote sensing, and other forms of ICT-based information management.
 - International cooperation, liaison with international organisations, processing matters relating to treaties and agreements with other countries and world bodies in the field of water development and management.

In addition to its role in policy development, strategic planning and coordination, MoWR is also described as a development ministry. It prepares, implements and monitors water sector development projects that are funded by GoB solely or jointly with international partners; processes the approval of such projects by the Planning Commission as well as the release of necessary funds through the Annual Development Plan; and oversees the administration of such projects.

MoWR-implemented development projects relate to flood control and drainage (FCD); flood control, drainage and irrigation (FCDI); riverbank erosion control; delta development and land reclamation; and provide irrigation, drainage, flood protection, bank erosion protection, land reclamation facilities by constructing barrages, regulators, sluices, canals, cross-dams, embankments and sea-dykes along the banks of the rivers and the coast. The Bangladesh Water Development Board (BWDB) is the principal implementing agency of the Ministry for such projects; with the Bangladesh Haor and Wetland Development Board (BHWDB) playing a similar role for the development of haors and wetlands.

The Blue Gold Program was governed by the policy framework of the Ministry, and specifically by its Guidelines for Participatory Water Management (GPWM). It applied these guidelines through a development investment to selected polder areas in the South-West of Bangladesh, through the Bangladesh Water Development Board.

The Blue Gold Program, however, transcended disciplinary boundaries and complemented the investment in better water management conditions with support to agricultural development.

2.1.2. Embassy of the Kingdom of The Netherlands^[5]

The Netherlands established a diplomatic mission in Bangladesh shortly after the country's independence. The Embassy of the Kingdom of The Netherlands (EKN) had an initial strong focus on supporting the development of the new nation, but over the years assumed a growing focus on stimulating a sustainable trade relationship between both countries.

The Netherlands' development cooperation with Bangladesh aims to improve living conditions of the poor, particularly in three areas: water, sexual and reproductive health and rights (SRHR), and food security. Another priority is labour conditions in the Ready-Made Garments (RMG) sector. Activities align with national policy and development plans. EKN pursues partnerships, and complements technical assistance with investment funds from international financial institutions (IFI).

The overall aim of the EKN water program is to contribute to a healthy living environment for and the wellbeing of the population, as well as economic growth. Particular focus is on the poor and vulnerable, who are likely to be affected by more extreme rainfall, higher sea water levels, increasing industrial pollution and further urbanisation.

At the time of formulating the Blue Gold Program, the EKN focused its support to south-west Bangladesh, reflecting inter alia the need to address the high regional incidence of poverty and the after-effects of recent cyclones. After 2014 – prompted by climate change – the focus of the EKN water program shifted to water sector resilience and governance. A flagship investment was made in the development of the Bangladesh Delta Plan 2100 (BDP), while BGP's focus on decentralised governance of local water systems remained well-aligned to the overall program objectives and focus.

EKN's strategy for supporting food security builds on its synergy with improved water resource management and infrastructure for agricultural production; but it adds important focus on fisheries and aquaculture development, livestock development and nutrition. Moreover, the strategy seeks to help small producers develop profitable linkages with input and output markets, through active involvement of the private sector, facilitation of market access and value chain development.

The synergy between the water and agriculture program of EKN, the focus of the former on resilience and governance and the focus of the latter on a broad definition of agriculture with attention to market integration is strongly reflected in the design of BGP, and it followed logically that EKN welcomed both MoWR and MoA as development partners for BGP.

2.1.3. Ministry of Agriculture^[6]

The Administrative Arrangement for BGP indicated that a proportion of the funds made available for the Project were to be administered by the Department of Agricultural Extension (DAE), which comes under the Ministry of Agriculture (MoA). Although MoA is not identified in the Administrative arrangement as an Executive Authority, it has played an influential role in policy-level decisions concerning BGP alongside the two Executive Authorities, MoWR and EKN.

The Ministry of Agriculture (MoA) comprises seven wings with responsibilities of policy formulation, planning, monitoring and administration as shown below. Sixteen agencies operate under this ministry which are responsible for implementation of the different projects and plans of MOA. MoA's mandate includes:

- Develop policies, plans, regulations, and acts for sustainable agricultural development and for self-sufficiency in food;
- Provide support in developing new agricultural technologies to boost agricultural production and coordinate with local and international trade agencies for marketing;
- Monitor implementation of agricultural policies, plans, projects, programs and regulations;
- Monitor distribution of agricultural inputs and subsidies and marketing of the agricultural products in local and international markets;
- Update the capacity of professionals and other stakeholder with respect to recent global agricultural developments;

- Provide administrative and policy support to MoA agencies for planning and implementation of development programs/projects and coordinate with donors and development partners for funding and technical assistance.

The Department of Agricultural Extension (DAE) is the main agency of the Ministry for implementing projects aimed at optimising agricultural production. DAE is strictly concerned with field crops, as services in the fields of livestock and fisheries resort under the Ministry of Fisheries and Livestock.

2.2 Implementing Agencies

The Administrative Agreement for the Blue Gold Program set out the arrangements for project implementation, through the Bangladesh Water Development Board and the Department of Agricultural Extension. Resources were also allocated via the technical assistance contract to the Department of Fisheries (DoF) and the Department of Livestock Services (DLS), both of which come under the Ministry of Fisheries and Livestock, and initially to the Department of Cooperatives (DoC), under the Ministry of Local Government, Rural Development and Cooperatives.

2.2.1. Bangladesh Water Development Board

The Bangladesh Water Development Board (BWDB) started operations in 1959 as the water wing of the erstwhile East Pakistan Water and Power Development Authority (EPWAPDA) and was established as BWDB in 1972 after independence, when the former EPWAPDA was split into two organisations: BWDB dealing with water and PDB dealing with power.). BWDB has a long history with the implementation of major water resources projects. It is responsible for preparing and implementing development projects related to flood control, drainage and irrigation, including riverbank protection, coastal development and land reclamation. The National Water Policy specifies that this mandate is for development projects benefitting 1,000 ha or more.

BWDB is an autonomous organisation mandated to undertake activities for the whole of Bangladesh or any part thereof for development and efficient management of water resources. It exercises the right of the government to control the flow of water in all rivers, channels and underground aquifers. To this end, it develops standards and guidelines for the operation and maintenance of all water management structures; it signs contracts for procurement of works, goods and services in connection with project implementation; it can – with prior government approval – levy and collect service charges for operation and maintenance and cost recovery of FCDI projects; and execute water related projects on behalf of any public agency with full technical, administrative and financial control of the project.^[7]

BWDB was responsible as lead executing agency for the overall implementation of the Blue Gold Program from planning to approval of completed works and for establishing arrangements for operation and maintenance. A Program Coordinating Director (PCD) was appointed by BWDB as its representative for the daily operations of the Blue Gold Program. The Director DP-III was appointed as PCD. For the execution of the activities related to the water resources infrastructure in the polders, Blue Gold worked with the Zonal Offices of the Chief Engineers in the Southern and South-Western Zones, and the associated O&M Circles and Divisional offices. Within BWDB Headquarters in Dhaka (initially in Motijheel, and from April 2020 in Pani Bhaban, Green Road), Blue Gold also worked with the Chief Engineer (Civil) Design, the Office of Chief Water Management (OCWM), Chief Staff Development and Training, Chief Engineer Mechanical Equipment (ME) and the Chief Engineer O&M. BWDB management was responsible for ensuring effective cooperation between DP-III and the BWDB offices mentioned.^[8]

The Chief Engineer for the South-Western Zone is based in Khulna. He is supported by two Superintending Engineers: Khulna O&M Circle (with 5 BGP Polders) and Jessore O&M Circle (with 7

BGP polders). Two Executive Engineers, who report to the Superintending Engineer for Khulna O&M Circle, are responsible for the following Divisions (and Blue Gold polders): Satkhira O&M Division-2 (P2) and Khulna O&M Division-2 (P22, P30, P31-part and P34/2-part). One Executive Engineer, who reports to the Superintending Engineer for Jessore O&M Circle, is responsible for Khulna O&M Division-1 (P25, P26, P27/1, P27/2, P28/1, P28/2 and P29).

The Chief Engineer for the Southern Zone is based in Barisal. He is supported by a Superintending Engineer for Patuakhali Water Development (WD) Circle based in Patuakhali, who is responsible for 10 BGP polders. A Superintending Engineer for Barisal Circle also reports to the Chief Engineer of Southern Zone, but there are no BGP polders in his jurisdiction. Three Executive Engineers, who report to the Superintending Engineer for Patuakhali WD Circle, are responsible for the following Divisions (and Blue Gold polders): Barguna O&M (P43/1A and P43/2F); Patuakhali O&M (P43/2A, P43/2B, P43/2D, P43/2E, P 55/2A and P 55/2C); and Patuakhali WD, Kalalapara (P47/3 and P47/4). These jurisdictions are summarised in the table (Table 2.1), while Figure 2.1 provides a map, which overlays the Blue Gold polders on the boundaries of the six BWDB divisions, three circles and two zones that are responsible for implementing Blue Gold.

Table 2.1: BWDB Jurisdiction by Division, Circle and Zone for BGP Polders

| Polder / District | BWDB Zone | BWDB Circle | BWDB Division | Gross Area (ha) | Embankment |
|-------------------|----------------|------------------|----------------------------|-----------------|--------------|
| P2 | SW | Khulna O&M | Satkhira O&M-2 | 12,600 | 64 |
| Satkhira | SW | | | 12,600 | 64 |
| P22 | SW | Khulna O&M | Khulna O&M-2 | 1,630 | 20.0 |
| P26 | SW | Jessore O&M | Khulna O&M-1 | 2,696 | 29.0 |
| P29 | SW | Jessore O&M | Khulna O&M-1 | 8,218 | 49.0 |
| P30 | SW | Khulna O&M | Khulna O&M-2 | 6,396 | 40.0 |
| P31-Part | SW | Khulna O&M | Khulna O&M-2 | 4,848 | 26.7 |
| P25 | SW | Jessore O&M | Khulna O&M-1 | 17,400 | 61.0 |
| P27/1 | SW | Jessore O&M | Khulna O&M-1 | 3,765 | 30.0 |
| P27/2 | SW | Jessore O&M | Khulna O&M-1 | 495 | 15.3 |
| P28/1 | SW | Jessore O&M | Khulna O&M-1 | 5,600 | 32.2 |
| P28/2 | SW | Jessore O&M | Khulna O&M-1 | 2,590 | 30.0 |
| P34/2 part | SW | Khulna O&M | Khulna O&M-2 | 4,900 (5,633) | 52.0 |
| Khulna | SW | | | 58,538 | 385.2 |
| P43/1A | S | Patuakhali WD | Barguna O&M | 2,675 | 27.1 |
| P43/2A | S | Patuakhali WD | Patuakhali O&M | 5,182 | 39.0 |
| P43/2B | S | Patuakhali WD | Patuakhali O&M | 5,460 | 39.8 |
| P43/2D | S | Patuakhali WD | Patuakhali O&M | 6,500 | 42.4 |
| P43/2E | S | Patuakhali WD | Patuakhali O&M | 1,650 | 20.0 |
| P43/2F | S | Patuakhali WD | Barguna O&M | 4,453 | 33.0 |
| P55/2A | S | Patuakhali WD | Patuakhali O&M | 7,166 | 45.0 |
| P55/2C | S | Patuakhali WD | Patuakhali O&M | 6,275 (7,120) | 47.5 |
| P47/3 | S | Patuakhali WD | Patuakhali WD, Kalapara | 2,025 | 19.7 |
| P47/4 | S | Patuakhali WD | Patuakhali WD, Kalapara | 6,600 | 59.0 |
| Patuakhali | S | | | 47,986 | 372.5 |
| TOTAL | 2 Zones | 3 Circles | 6 Divisions | 119,124 | 821.7 |

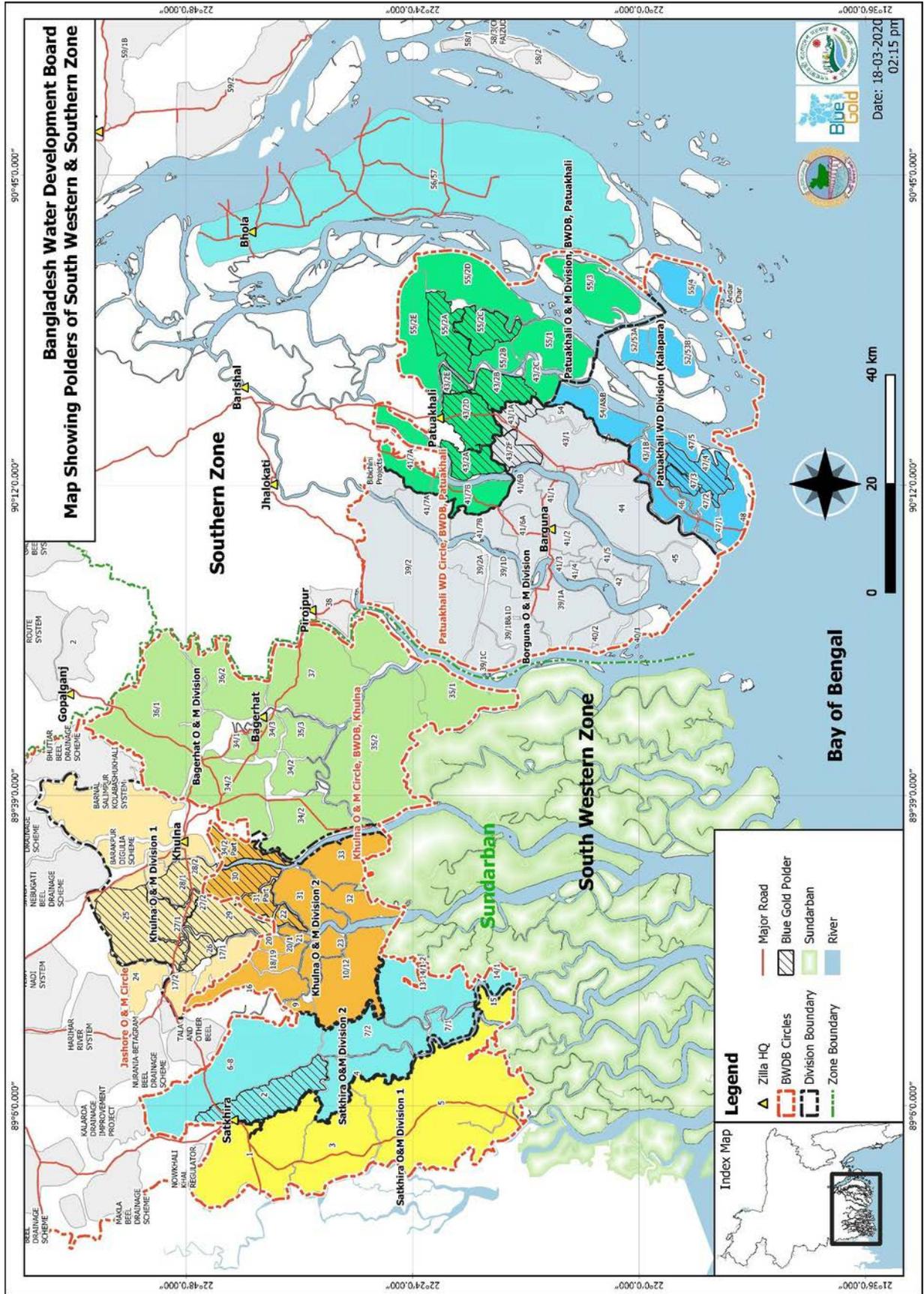


Figure 2.1: BWDB administrative areas and BGP polder location

The administrative boundaries for the BWDB differ from the boundaries adhered to by regional and local governments (Division, District, Upazila, Union) and the BWDB is not decentralised at any of the regional or local levels of administration.

Although not explicit in the BGP Program Document, the BWDB Office of the Chief Water Management (OCWM) played a role in BGP with respect to community participation. OCWM is responsible for the following: preparing and periodically updating of the Participatory Water Management Rules that apply to BWDB; supervising community mobilisation in BWDB projects that include establishment of participatory water management; directing the process of establishment of Water Management Organisations; and – from 2014 onwards – for registering WMOs. OCWM is, however, severely constrained in human and financial resources and was unable to mobilise polder-level staff for organisational development through its own resources. In BGP, polder-level staff are mobilised through the TA team.

2.2.2. Department of Agricultural Extension

The present Agriculture Extension Department (DAE) was formed in 1982. From 1990 onwards it adopted the concept of group-based extension services. The 1996 New Agriculture Extension Policy (NAEP) further consolidated the Agriculture Extension Service. DAE's mission is to provide efficient and effective needs-based extension services to all categories of farmers, to enable them to optimise their use of resources, in order to promote sustainable agricultural and socio-economic development.^[9]

DAE is decentralised up to Union-level. Through this decentralised structure, DAE provides crop-based extension services, along with services with respect to inputs and plant protection, through Farmer Field Schools (FFSs). The usual point of contact between farmers and DAE is at field level, through Sub-Assistant Agricultural Officers (SAAOs). Although farmers also come into contact with DAE through mass media, the success of extension services is largely dependent on the quality of the personal contact between SAAOs and farmers.

Within BGP, DAE implemented intensified crop-based extension in the thirteen Upazilas which cover the 22 BGP polders, or parts thereof (see Table 2.2 below). DAE was the primary government counterpart agency responsible for supervising the food security activities of BGP. A senior officer was designated as a dedicated national project director based in DAE's head office in Khamar Bari, Dhaka.

2.2.3. Implementation Partners

The Program Document identified the Departments of Cooperatives (DoC), Fisheries (DoF) and Livestock Services (DLS) also as implementing agencies. Since no separate DPP was established for the three departments, financial assistance was provided through EKN's Technical Assistance (TA) funds.

The **Department of Cooperatives (DoC)** comes under the administrative control of the Ministry of Local Government, Rural Development and Cooperatives (MoLGRDC) and is responsible for the registration of, support to and auditing of cooperatives. DoC is established at the District and Upazila levels. Through assistance from LGED's ADB-supported Small-Scale Participatory Water Resources Management Project, DoC established a Water Cell to monitor the performance of Water Management Cooperative Associations. The design of Blue Gold anticipated that DoC's assistance would be continued throughout the life of BGP. However, the 2014 Participatory Water Management Rules (PWMR) introduced registration of WMOs directly under BWDB and DoC's intended role has since become obsolete. The key role of auditing of the WMOs, which would be outsourced through DoC, had been transferred to the BWDB Audit Department. Given the change introduced by the new rules, the memorandum of understanding proposed to be signed between BWDB and DoC, therefore became superfluous.

The **Department of Fisheries (DoF)** and the **Department of Livestock Services (DLS)** both come under the administrative control of the Ministry of Fisheries and Livestock. Both DoF and DLS supported BGP through their officers at District and Upazila level. They have been involved in the activity planning in the polders and as advisors to the TA-consultant on the creation of farmer field schools (FFSs) for fish and livestock. The involvement of DoF and DLS was governed by memoranda of understanding (MoU) between respective DoF and DLS and the BWDB; with resources reserved in the TA budget. The MoUs designate focal points to coordinate fisheries and livestock activities in Blue Gold.

2.3 Other public sector organisations

Water management by its very nature transcends disciplinary boundaries as well as the borderlines between departments and agencies. In the course of BGP implementation relations were established with Local Government Institutions and with additional technical departments.

2.3.1. Local Government Institutions

The support of the Union Parishad and the Upazila Parishad proved to be essential for the successful implementation of BGP.

The Union is the lowest level of Government and is governed by a board (Parishad) comprised of elected male and female members representing the nine wards that comprise a Union, headed by an elected chairperson. The UP chairperson is mandated through the Participatory Water Management Rules to advise the Water Management Organisations. At the same time, the WMOs – being community-based organisations – are an important partner for the coordination mechanisms established within each Union: Ward sobha (public meeting), standing committees and Union Development Coordination Committee (UDDC). WMOs are also a natural stakeholder in the Union’s mandated activities in the field of disaster preparedness and emergency response.

Unions can play an important role towards water management by encouraging WMO formation; by assisting in planning works on embankments, khals and sluices; and by enhancing synergy between water sector development efforts in their areas. A number of departments, including DAE, are decentralised to the Union level and have staff posted in each Union.

The Upazila (‘sub-District’) is the next tier of local government. It is governed by a board (parishad) comprised of the Union chairpersons, headed by an elected Upazila chairperson and assisted by a government-assigned Upazila Nirbahi Officer (UNO or Upazila Executive Officer). The chair and the UNO have a co-signing responsibility. DoF and DLS have staff at the Upazila. The BWDB is not represented at Upazila (or Union) level.

While most issues in project implementation are, as far as local government is concerned, primarily addressed by the Unions, the Upazila is an important entity in those cases where the issue has to be addressed by higher authorities.

For most organisations other than BWDB, locations are described in terms of mouza, village, Union, and Upazilas rather than by polder number. The maps below provide overlays of the Blue Gold polders on maps of Upazilas and Unions. Table 2.2 summarises the polder locations in administrative terms.

Table 2.2: Polder locations by Division, District, Upazila and Union

| Polder | Division | District | Upazila | Unions |
|---------------|----------|------------|------------------------------|---|
| P22 | Khulna | Khulna | Paikgacha | Deluti |
| P26 | Khulna | Khulna | Dumuria | Shovna |
| P29 | Khulna | Khulna | Dumuria, Batiaghata | Dumuria (Dumuria, Sahas, Bhandar Para, Sarappur); Batiaghata (Surkhali) |
| P30 | Khulna | Khulna | Batiaghata | Batiaghata, Gangarampur, Surkhali |
| P31-part | Khulna | Khulna | Batiaghata | Surkhali |
| P34/2 | Khulna | Khulna | Batiaghata | Amirpur, Bhanderkote, Baliadanga |
| P25 | Khulna | Khulna | Dumuria, Fultala, Dighlia | Dumuria (Kharnia, Rudaghara, Dhamalia, Raghunathpur, Rangpur) Fultala (Jamira, Damodar, Atra Gilatola) Dighalia (Jugipul, Arongghata) Dighalia (Jugipul, Arongghata) |
| P27/1 | Khulna | Khulna | Dumuria | Raghunathpur, Dumuria, Gutudia |
| P27/2 | Khulna | Khulna | Dumuria | Gutudia, Dumuria, Kharnia |
| P28/1 | Khulna | Khulna | Dumuria, Batiaghata | Dumuria (Gutudia), Batiaghata (Jalma) |
| P28/2 | Khulna | Khulna | Batiaghata | |
| P2 and P2-Ext | Khulna | Satkhira | Satkhira Sadar, Assasuni | Satkhira Sadar (Balli, Jhaudanga, Labsa, Brahmarajpur, Dhulihar, Fingri) Assasuni (Kulla, Budhhata) |
| P43/2A | Barisal | Patuakhali | Patuakhali Sadar | Chhota Bighai, Bara Bighai |

| Polder | Division | District | Upazila | Unions |
|-------------------|--------------------|-------------------------|--|---|
| P43/2D | Barisal | Patuakhali | Patuakhali Sadar | Marichbunia, Madarbunia, Kalikapur, Jainkati, Auliapur |
| P43/2E | Barisal | Patuakhali | Patuakhali Sadar | Jainkati |
| P55/2A | Barisal | Patuakhali | Patuakhali Sadar, Bauphal, Dashmina, Galachipa | Patuakhali Sadar (Kamalapur), Bauphal (Adabaria, Noawmala); Dashmina (Alipur); Galachipa (Bakulbaria, Kalagachia, Chiknikandi) |
| P55/2C | Barisal | Patuakhali | Dashmina, Galachipa | Dashmina (Alipur) Galachipa; (Bakulbaria, Kalagachia, Chiknikandi) |
| P47/3 | Barisal | Patuakhali | Kalapara | Mithaganj |
| P47/4 | Barisal | Patuakhali | Kalapara | Mithaganj, Baliatali, Khaprabanga, Dhularsar |
| 43/2B | Barisal | Patuakhali & Barguna | Galachipa, Patuakhali Sadar, Amtali | Galachipa (Amkhola) Patuakhali Sadar (Auliapur) Amtali (Atharagashia); |
| 43/1A | Barisal | Barguna | Amtali | Kukua, Atharagashia |
| P43/2F | Barisal | Barguna | Amtali | Gulisakhali |
| 22 polders | 2 divisions | 4 Districts | 13 Upazilas | 56 Unions |

2.3.2. Technical Departments

In the course of project implementation coordination took place with a wider group of technical departments; while in some cases these also played a supportive role for specific activities using their own resources. Among the key technical departments were the Local Government Engineering Department (LGED), Department of Public Health Engineering (DPHE) and the Bangladesh Agricultural Development Corporation (BADC).

2.4 Private Sector

Given BGP's emphasis on commercialisation of agriculture, the Private Sector is considered part and parcel of the institutional setting of BGP. The scope of the private sector involvement in creating forward and backward market linkages for farmers in the BGP project area was largely determined by the characteristics of the coastal region. The coastal region can be termed as a frontier area where market channels of the large private sector organisations are either non-existent or weak and where the commerce that exists is largely driven by local retailers. The market for agricultural inputs (seed, pesticide, fertiliser, etc.) is limited, irregular, non-repetitive and discrete, whereas a multitude of small buyers comprise the output market. Given this background, BGP interacted largely with local small and medium – and sometimes even micro – enterprises. The BGP interventions for commercial agriculture engaged the following partners:

- Small producer groups, which were usually formed for a specific crop; they work together on the purchase of inputs and, less frequently, on the joint sale of produce. Resource farmers – trained by the Project – help producer groups organise collective actions such as input supply or bulk sale of products;
- Local input retailers were trained to enhance their business management capacities and to be well informed by and linked with national private companies to enhance supply of quality inputs. This category includes local collectors (farias or arothdars) who were linked to producer groups; women buying and selling vegetables and eggs; female collectors of eggs to enable selling of produce; and a rice mill who could sustain itself thanks to the enhanced production by HYVs;
- National lead enterprises in agricultural input supply (LalTeer, Metal, AR Malik, ACI, Syngenta etc.) were informed through their top management of the market potential and situation in the project area, thereby paving the path for regional support and cooperation from private sector organizations to establish demonstration plots of improved and suitable product and technology at producer group level involving Resource Farmers (farmer leaders) and WMGs;
- There was a limited potential for sourcing local production to international enterprises, but a varietal shift in Mung bean enabled the supply of high-quality produce to a Japanese importer (Euglena), while Natural Agro could export black sesame after supporting farmers in the project area in their cultivation.

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03 Social, Physical and Environmental Context

To provide background and context to the design of the Blue Gold Program, the following information is provided in this chapter:

Environmental context: using four groupings (ie Khulna, Satkhira, Patuakhali north and Patuakhali south) for the 22 Blue Gold polders, an analysis is provided of the hydrological, biological, bio-ecological, agricultural and environmental characteristics.

Social context: provides information on project demographics, educational status, type of construction and facilities at household level, relative poverty levels and the outreach target population for poverty-focused activities (such as homestead FFSs).

Physical context: purpose of polder infrastructure (safety and water management), vulnerability to threats, and a summary of for each polder of the dates of construction, investments by earlier projects, location, the responsible BWDB Division and Upazila administration, and characteristics of the infrastructure - length of embankment, numbers of structures and length of primary drainage channels or khals.

3.1 Environmental context

The coastal zone has a complex agroecology, with low-lying lands between huge tidal rivers.

Waterlogging is a problem in large parts of the coastal zone, but especially in the southwest (Satkhira, Jessore, Khulna and Bagerhat). This is caused by the reduction of dry season flow resulting from water abstractions at Farakka barrage on the Ganges just upstream from the border with India. This has contributed to increased salinity and greater sedimentation in the tidal rivers that drain the polders. The construction of polders during the 1960s and 1970s reduced the tidal prism of the rivers by preventing flooding across the tidal plain and contributed to accelerated river siltation. Because of the reduced drainage capacity caused by siltation, these tidal rivers are unable to drain adjacent lands and polders, and this causes the waterlogging. More information on the decision to form coastal polders, together with

a review of the water resources projects in the coastal zone - both historical and current is provided in *Chapter 4*.

The physical and environmental context for all twenty-two Blue Gold polders is provided below, using four groupings (ie Khulna, Satkhira, Patuakhali north and Patuakhali south), and including an analysis of the hydrological, biological, bio-ecological, agricultural and environmental characteristics. The data and information are mostly obtained from Polder Development Plans (PDPs), Environmental Impact Assessments (EIAs) and the Bangladesh Delta Plan 2100 Baseline Study Report on Coastal and Polder Issues.

3.1.1. Khulna

South-West hydrological region with Ganges Tidal Flood Plain (AEZ-13) zone, Sibsa and Pashur river at the south are the main distributaries are connected with Bay of Bengal

Blue Gold includes eleven polders¹ within the Upazilas of Dumuria, Batiaghata, Fultola and Dhighulia, all in Khulna District. The polders are located in the South-West hydrological region of Bangladesh, with BWDB's responsibilities discharged by Khulna-1 and Khulna-2 O&M Divisions from Khulna.² It is surrounded by a network of tidal rivers: Bhairab, Rupsha and Kazibacha river to the east; Teligati, upper Vodra and Gangrail rivers to the west; Hari, Sree Hari and upper Bhairab rivers to the north, and Pashur and Sibsa rivers to the south.

The rivers and drainage channels around these eleven polders are fed by tidal flows through Sibsa and Pashur rivers. During the monsoon months, when the sluice gates are opened, freshwater flow takes place both in and out of the polder. The polder situated most southern, P22, is in a straight-line distance of 75 km from the shores of the Bay of Bengal. The distance from buffer radius of the Sundarbans mangrove forest (under Nolian range) ranges from about 28 km for P34/2-part to about 49 km for P25. Due to the distance from the Sundarbans and the nature of rehabilitation works, there are no negative influences on the Sundarbans Ecological Critical Area resulting from Blue Gold interventions.

The area encompasses two bio-ecological zones, namely the Ganges Floodplain (which comprises of a smooth landscape of ridges, basins and old channels) and the Saline Tidal Floodplain (which has a low ridge and basin relief, crossed by innumerable tidal rivers and creeks). The greater part of the area in this grouping lies in the Saline Tidal Floodplain, which is characterised by smooth relief and large areas of saline land of varying degrees of salinity.

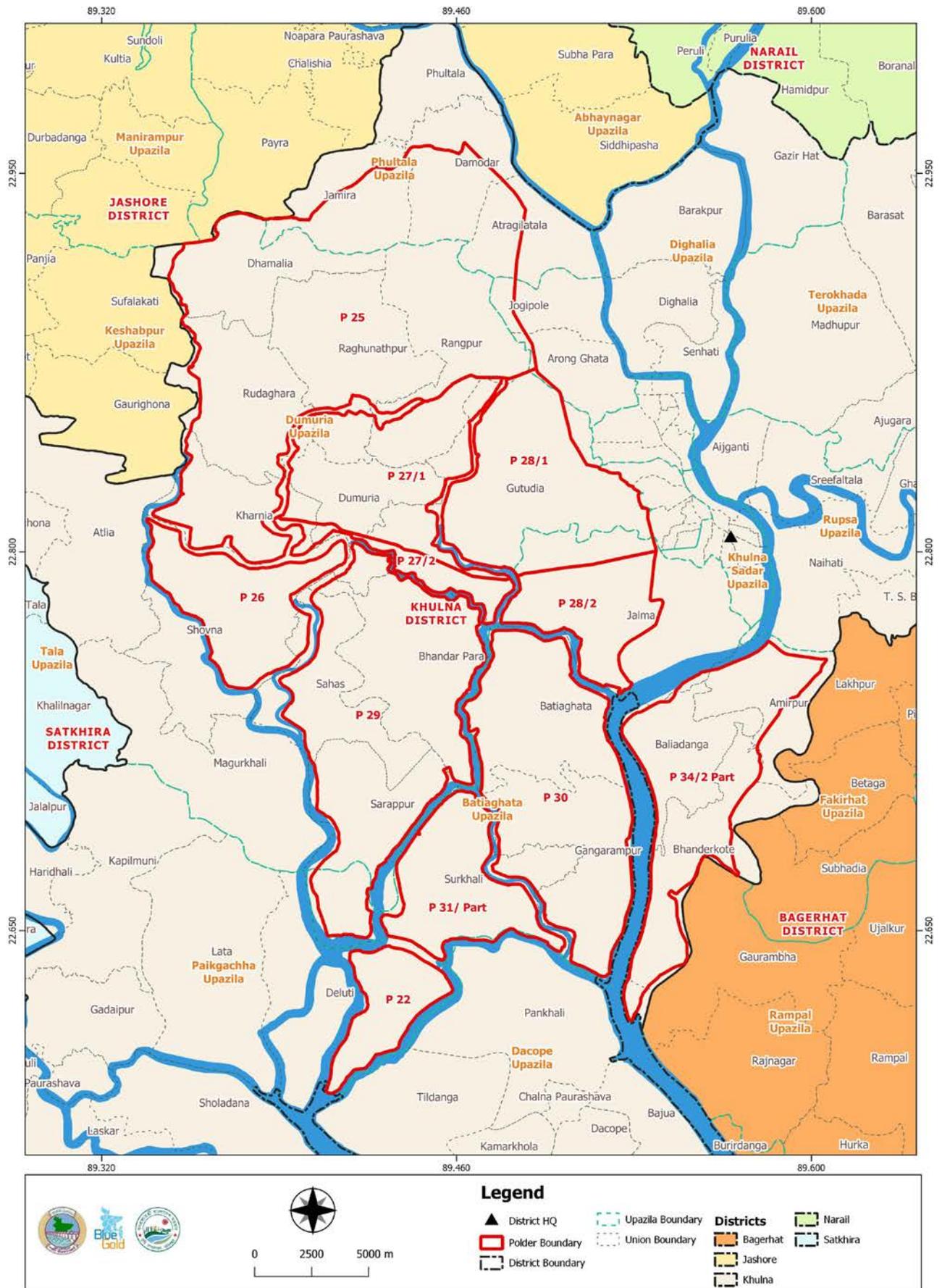
The eleven polders have a gross area of 60,200 ha of which 49,400 ha is used for agricultural purposes, 10,800 ha for fisheries (with white fish ghers of 9,500 ha and shrimp ghers of 1,300 ha). The highland in the polders under Dumuria Upazila is around 16% which are mostly used for homestead vegetable, the medium high land is around 44% which is mostly used for rice, vegetable and seasonal white fish farming in monsoon and the low land which is around 40% area is mostly used for fish with one rice crop in the dry months. Around 13% of the area under Dumuria Upazila is prone to salinity. In Batiaghata Upazila, the highland area of around 8% of the agricultural area is mainly used for homestead vegetables, with the medium high land of around 75% used for rice, vegetables and seasonal white fish farming in monsoon, and the low land of around 15% used for fish with one rice crop in the dry months. Around 38% of Batiaghata Upazila is prone to salinity.

The internal road communication facilities are good. In the polders, there are 55% pucca, 20% herringbone (brick-made) and 25% kacha (earthen) roads. The business communications and market facilities are good within the District and for access to Upazila headquarters. The demand for vegetables

1 Polder 22, 30, 31 Part, 34/2 Part, 29, 25, 26, 27/1, 27/2, 28/1 and 28/2.

2 O&M Division 1 with polder 25, 26, 27/1, 27/2, 28/1, 28/2 and 29; O&M Division 2 with polder 22, 30, 31 Part and 34/2 Part

Figure 3.1: Map of Khulna



in Khulna and adjacent cities is served by Dumuria and Batiaghta Upazilas. The condition of the embankments is reasonable but there are a number of reaches which are especially prone to erosion: in Chandghar and Baroaria (P29); Korla, Bujbunia and Shealidanga (P34/2-part); Barobhuiyan (P31-part); Kismotfultola, Kathamari, Boronpara and Hogalbungia (P30); Kalinagar, Darunmollik, Durgapur, Bigordana and Telikhali (P22); Khornia bazar to Mery Bricks reach (P25); Zialtola (P26) and Kachubunia (P28/2).

The issues that affect the sustainability of agricultural production and fisheries – and thereby the livelihoods of local inhabitants – include:

- **Salinity intrusion**, especially in the dry period. Such salinity intrusion causes severe scarcity of drinking water sources in particular in Char Charia, Dighalia, Ratankhali, Jaliakhali, Akra, Chandgarh and Sundar Mahal.
- **Drainage congestion**. Around 40% of the khals inside the polder suffer from severe drainage congestion, mainly caused by: (i) silting of khals which are connected to outfall rivers; (ii) illegal use of the khals for fisheries either on lease through the local administration or relying on local influence; and (iii) congestion of khals by water hyacinth
- **Sediment congestion**. During tidal flood flows (i.e. tidal phase during which the tidal current is flowing inland), sediment is deposited in the outfall rivers resulting in congestion and a reduced drainage capacity. This mostly occurs during the dry months when the inflow from rivers is negligible.
- **Congestion of water hyacinth**. Most of the internal khals, field channels, low current rivers are congested by water hyacinth.
- **Conversion of agricultural land into settlements** is occurring in peri-urban areas around Khulna city, such as P25, P28/1 and P28/2.

3.1.2. Satkhira

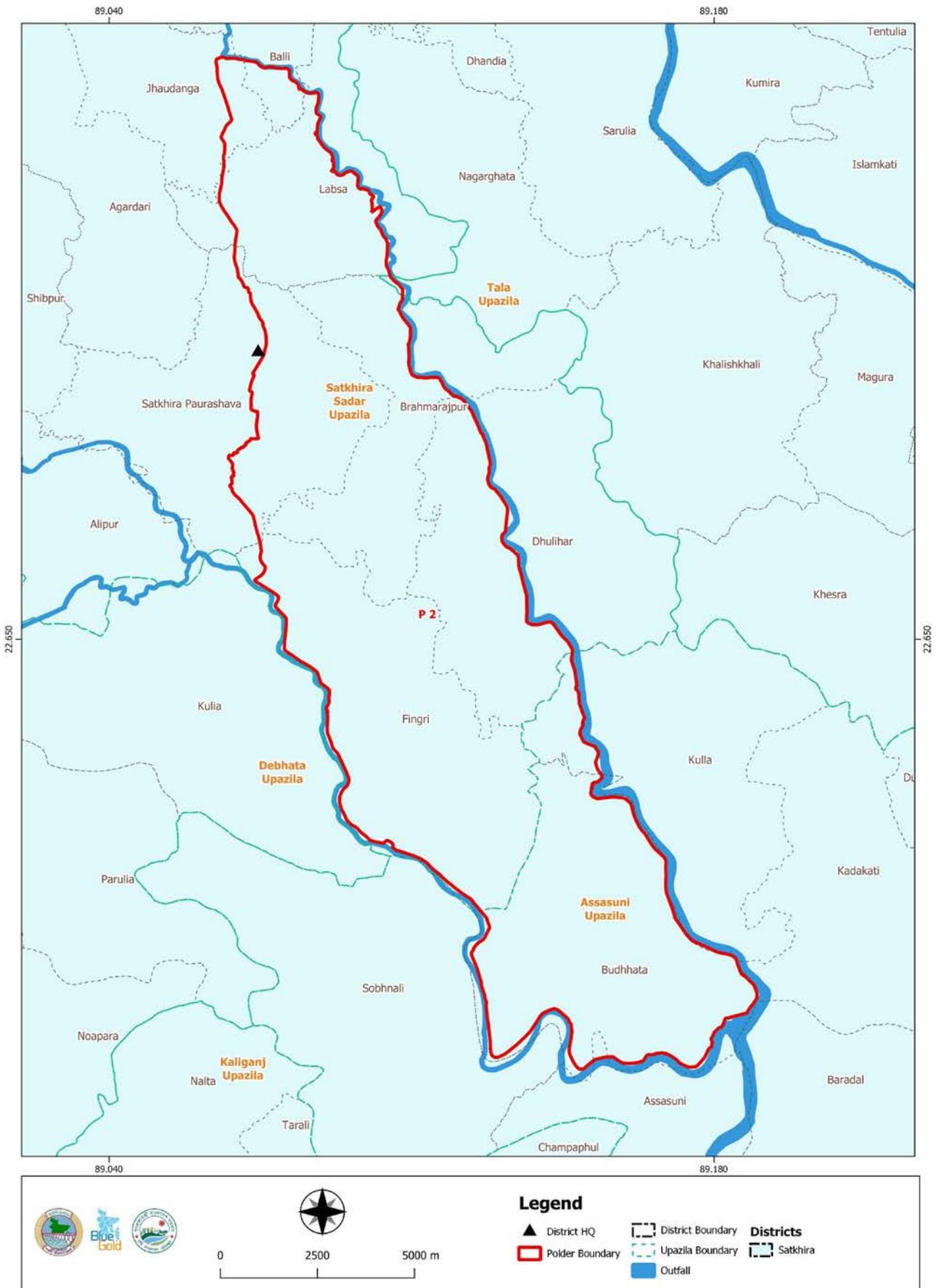
South-West hydrological region with High Ganges River Floodplain (AEZ-11) and Ganges Tidal Flood Plain (AEZ-13) zone, Kholpetua and Kanksiali river at the south are the main distributaries are connected with the Bay of Bengal

Blue Gold targeted one polder in Satkhira District, Polder 2 (P2), which is surrounded by the Betna River on the east and Morichap River on the south-west. The upstream reaches of Betna River are silted, with the result that there is no water flow in the dry season. The Morichap River is now fully silted with almost no drainage capacity, and is being used for rice-gher cultivation. The drainage system has been declining since Farakha barrage was commissioned in 1974 but particularly severe effects have been felt by P2 communities in the last 10 to 15 years when the Betna and Morichap river have been significantly silted. Satkhira khal is poorly connected with outfall Morichap river. Therefore some water drains out in Kolikata khal and Tiket khal from Morichap river and finally fall in the Ichamoti river.

P2 is around 85 km away from the Bay of Bengal and is affected by tidal influences. The polder is of an elongated north-south orientation. The south-east corner of the polder is located within 12 km of the buffer area of the Sundarbans. The polder is situated in the south-west hydrological regions of the country with BWDB responsibilities being discharged by Satkhira-2 O&M Division, in Satkhira. The area is represented by two agro-ecological zones (AEZs): High Ganges River Floodplain (AEZ-11) and Ganges Tidal Flood Plain (AEZ-13). During high tide, water flows from the Bay of Bengal to the Kabodak river system, which feeds in turn the peripheral Betna and Morichap rivers.

P2 has a gross area of 12,600 ha land, with 11,000 ha used for agricultural, 1,600 ha for fisheries (400 ha for white fish gher and 1,200 ha for shrimp gher). The highland which is around 10% area, is mostly used for rice and vegetable, the medium land which is around 50% area is mostly used for rice and seasonal white fish farming in monsoon and the low land which is around 40% area is mostly used for fish with one rice crop in the dry months. About 10% area is saline prone, which is likely to expand northward due to the effect of climate change if no adequate mitigation measures are taken.

Figure 3.2: Map of Satkhira



The internal road communication facilities are good. In the polder there are 60 km pacca road, 25 km herringbone bound (brick made) and 20 km kaacha (earth made) road. The business communication and market facilities are good with the District and Upazila headquarters. The existing condition of the embankment is good with the exception of one erosion vulnerable spot at Chapra area.

The embankment at the north-eastern part has been turned into a rural herringbone road which now allows heavy vehicular movements during all seasons. A huge number of brickfield have been established at north-eastern part (at Benarpota, Machkhola, Shalley and Beradangi village area) along the bank of Betna river which required movement of trucks and heavy vehicle for carrying bricks and materials which previously caused damage to the embankment.

The issues that affect the sustainability of agricultural production and fisheries – and thereby the livelihoods of local inhabitants – are the following: -

- **Drainage congestion.** During monsoon and post-monsoon, most of the khals running through the polder area cannot cope with the increased rainfall occurrences, leading to moderate to severe drainage congestion in about 60% of the polder area. The siltation of the Betna and Morichap river is the main reason for such drainage congestion. Water logging at the north and middle and brackish water shrimp farming at the south are causing a problem of unemployment in the area, since labor requirements are reduced as a consequence of a reduction in crop cultivation. This causes migration of local labor to the nearby Khulna and Jashore District.
- **Sediment congestion.** During the high tide the sediment comes through the outfall rivers with the tidal water and congests the connected canals/river side of the gates. This mainly takes place during the dry months when the upstream flow is low. The sediment congestion contributes to morphological changes (i.e. formation of new lands, river course shifting) and may thus be affect the peripheral rivers and be the cause of other anthropogenic development (i.e. conversion into shrimp farming, settlement etc.)

3.1.3. Patuakhali North (Patuakhali and Barguna)

South-Central hydrological region at Ganges Tidal Flood Plain (AEZ-13) zone, Rabnabad and Patua river at the south are main distributaries are connected with Bay of Bengal.

Blue Gold includes eight polders within the Upazilas of Patuakhali Sadar, Galachipa, Dashmina and Bauphal under Patuakhali District³ and Amtoli under Barguna District.⁴ The polders are located in the South hydrological zone of the country, with BWDB's responsibilities discharged by the Patuakhali O&M Division, Patuakhali and Barguna O&M Division, Barguna. These polders are surrounded by various tidal rivers: Tetulia river to the east; Pyra river to the west; Lohalia river to the north, and Galachipa and Patua rivers to the south.

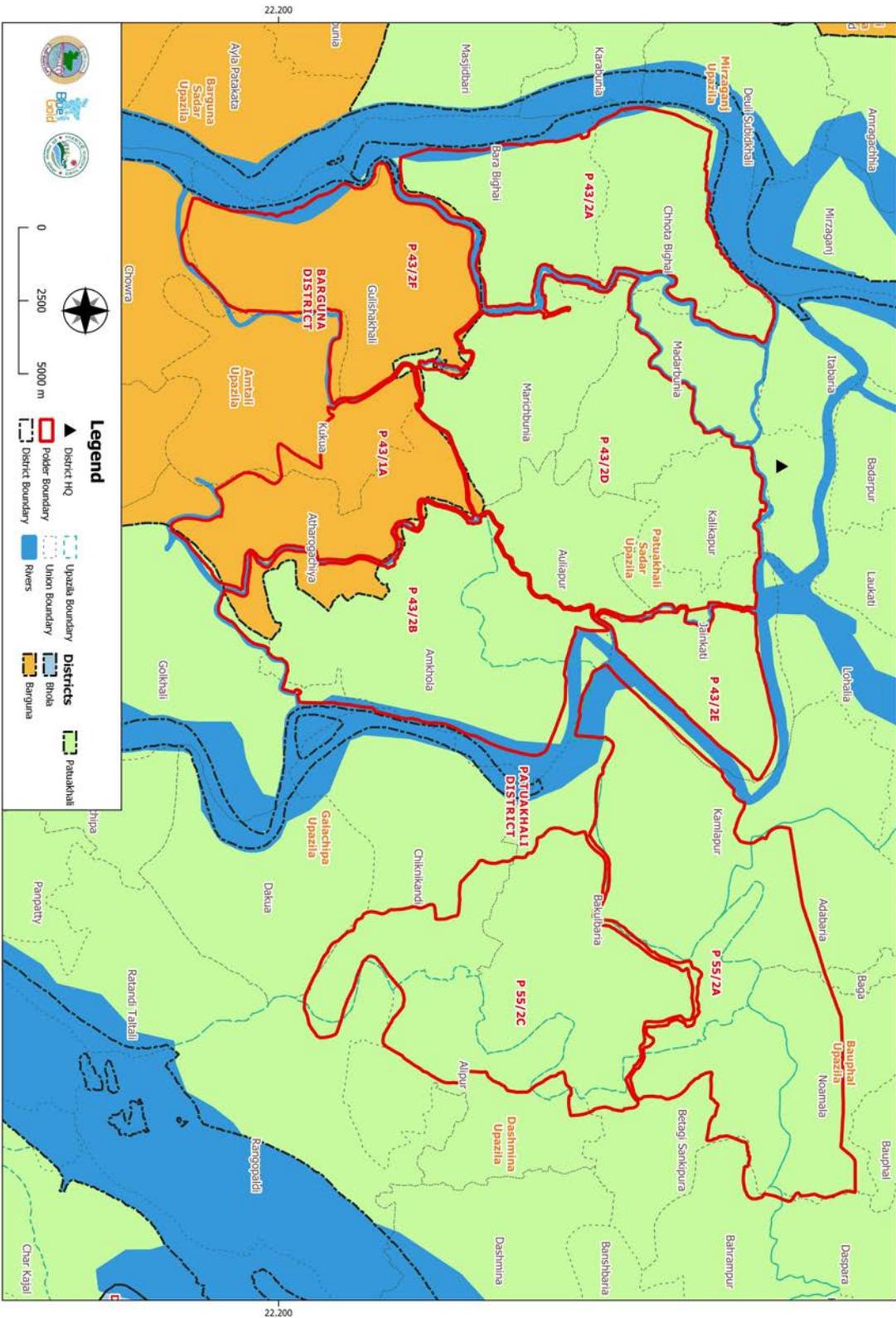
This region occupies an extensive area of Ganges tidal floodplain (AEZ-13) with the greater part of the region influenced by upstream flows from the Meghna system. Deep, rapidly permeable sandy loams and sandy clay loam soils are dominant in the region. The aerial distance from the coast of the Bay of Bengal ranges from 45 km (from P43/2E) to 30 km (P43/2F). All the peripheral rivers and drainage channels around these eight polders are tidal with inflow from the Bay of Bengal entering the peripheral rivers including Galachipa, Lohalia, Pyra and Tetulia rivers through the Rabnabad and Patua rivers.

The eight polders have a gross area of 40,400 ha, of which agricultural land is approximately 33,000 ha. Among the cultivable land single, double and triple cropping is practiced at a scale of 22%, 66% and 12% respectively. The highland in the polders is about 15% while the medium high land is around 75% and low land is 10%. 88% of the populations are engaged in the agriculture sector including farming,

3 Polder 43/2A, 43/2B, 43/2D, 43/2E, 55/2A and 55/2C

4 Polder 43/1A and 43/2F

Figure 3.3: Map of Patuakhali North



agricultural labour, fishing, day labour etc. About 5% of the population is engaged in the salaried service sector, including employees in government and the private sector. The industrial sector employs only 7% of the population implying that industrialization is still underdeveloped. Farmers are mainly owner-operators, preferring to cultivate their own land rather than using sharecropping arrangements.

Salinity levels in these eight polders are low. No surface water salinity exists in the area in monsoon and post monsoon seasons, even though very minor surface water salinity is found along the peripheral rivers i.e. the Payra and the Gulishakhali during dry season. The reason for this low salinity level is the freshwater discharge from the upstream Meghna River system towards the rivers of the South Central hydrological region. The soils of the polder area become very slightly saline in the dry season (Jan-May). According to the DAE, the soil and water salinity gradually increases with dryness from January and reached maximum level in the month of March-April and then decreases due to the onset of the monsoon rainfall.

Rain-fed agriculture is practised during the kharif-I and kharif-II seasons for Lt. Aus, HYV Aman, and Lt. Aman crops; whereas surface water irrigation is provided to around 95% area of watermelon and groundnut crops during Rabi season. Irrigation is not required in some areas for groundnut since only areas of high soil moisture are used, and for watermelon which is grown by the sides of rivers or khals. Water is also required for other rabi season crops (sunflower, sesame, khesari etc.) but no supplementary irrigation is needed for these crops as sufficient soil moisture is available during the season.

The greatest part of the internal road network is kacha (earth made). During monsoon, it is difficult to communicate through the earthen roads inside the polder due to heavy mud formation. The business communication and market facilities is not very good with the District and Upazila headquarters.

The issues that affect sustainability of agricultural production and fisheries – and thereby the livelihoods of local inhabitants – include:

1. **Lack of irrigation facilities** which results in large areas remaining fallow from March to June. About 5 to 10% of agricultural land has been brought under irrigation, apart from P55/2A and P55/2C where irrigation covers 8 to 12% of agricultural land. Some 728 Low Lift Pumps (LLPs) are used for surface water irrigation across the eight polders.⁵
2. **River bank erosion and tidal flooding** include erosion hotspots near Angulkata, Gulishakhali, Dalachara and Naiapara in P43/2F; Balaikati & Sonakhali in P43/2B; Bhajna, Matibhanga, Banshtala, Kazirhat bazar and Kewabunia in P43/2A; Morichbunia in P43/2D and Modhupura, Sutabaria, Ronuabazar and Alipura sluice area in P55/2C.
3. **Congestion of water hyacinth and duck weed.** Due to siltation, many khals only function for part of the year, and become blocked with duck weed and water-hyacinth. Water-hyacinth prevents sun light to penetrate through the water which hampers photosynthesis of other aquatic vegetation. The decomposition of water-hyacinth reduces the water quality and has a negative impact on the fisheries and other aquatic life.

3.1.4. Patuakhali South (Kalapara)

South-Central hydrological region at Ganges Tidal Flood Plain (AEZ-13) zone, Rabnabad and Patua river at the south are main distributaries are connected with Bay of Bengal

Two polders⁶ in Kalapara Upazila in Patuakhali District are included in the Blue Gold Program. The polders are located in the South region, with BWDB's responsibilities discharged by the Patuakhali Water Development Division based in Kalapara. It is surrounded by Patua and Rabnabad rivers to the east;

5 In Polder 43/2A there are 115 LLPs, 43/2B-130 LLPs, 43/2D-110 LLPs, 43/2E-60 LLPs, 55/2A-95 LLPs, 55/2C-78 LLPs, 43/1A-75 LLPs and 43/2F-65 LLPs

6 Polder 47/3 and 47/4

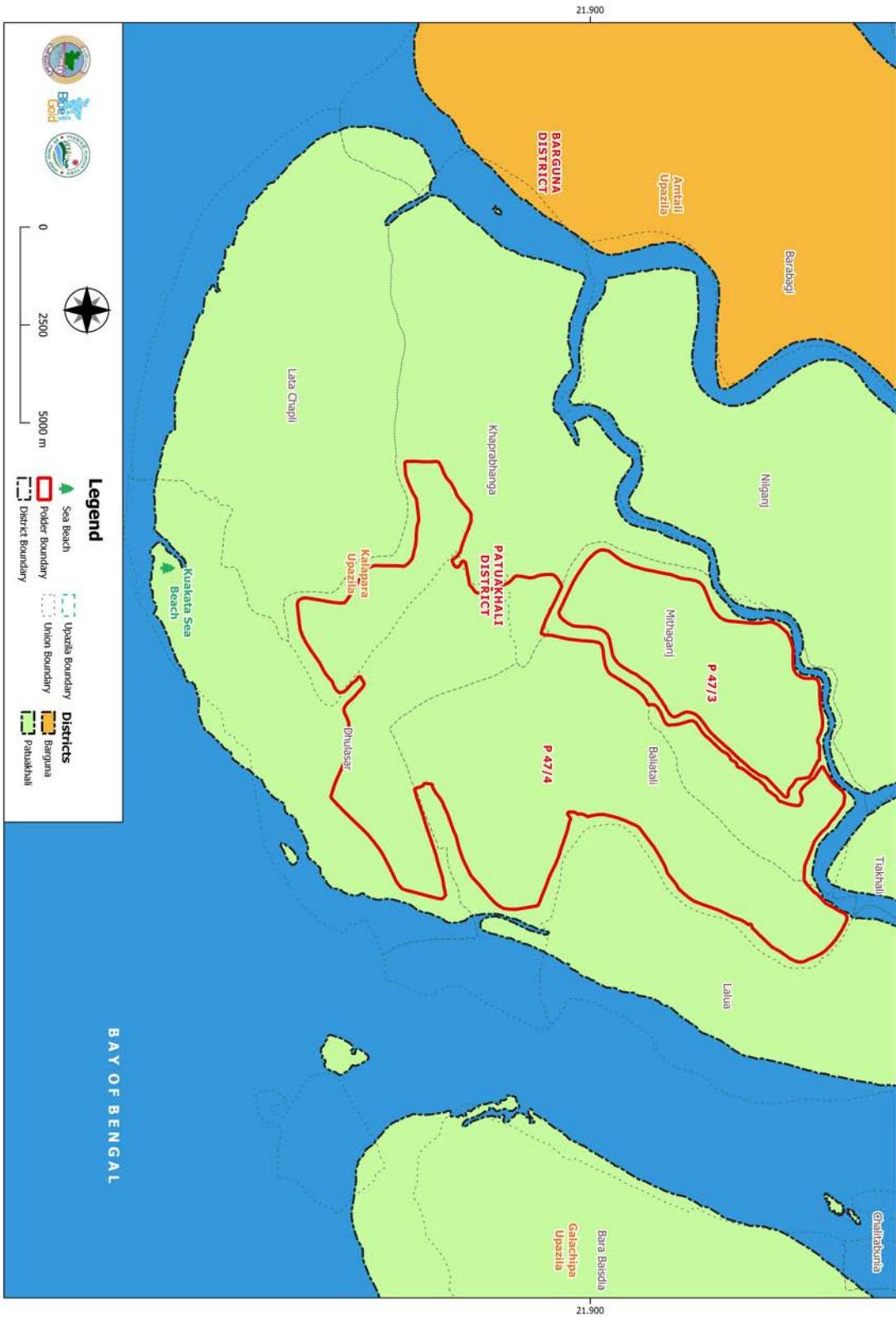


Figure 3.4: Map of Patuakhali south

Andharmanik river to the west; Hauder Bharani river to the north, and connected to the Bay of Bengal at the south through Rabnabad river. Andharmanik river to the west; Hauder Bharani river to the north, and connected to the Bay of Bengal at the south through Rabnabad river. Andharmanik river to the west; Hauder Bharani river to the north, and connected to the Bay of Bengal at the south through Rabnabad river.

This region occupies an extensive area of the Ganges tidal floodplain (AEZ-13) with the largest part of this region of smooth relief with extensive saline areas. Deep, rapidly permeable sandy loams and sandy clay loams are dominant in this region. The aerial distance from the coast of the Bay of Bengal ranges between 3 km (from Mithaganj Union of Polder 47/3) and 2 km (from Dhularsar Union of Polder 47/4). The peripheral and internal rivers and canals are subject to the diurnal tidal cycles. During high tide, water flows from the Bay of Bengal comes in to the peripheral rivers through the Rabnabad and Patua river.

P47/3 and P47/4 are to some extent saline prone areas. There are two erosion affected areas at P47/3, one is located from Tegachia Bazar to Joy Bangla Bazar in the bank of Hauder Bharani khal/river and another one is near Dakshin Charpara bridge and five erosion prone zones at P47/4 which are Banglabazar (near Mithaganj), Katakhal (near Monoshatali village), Paschim Dhularsar School Ghat, Char Dhularsar and Char Baliatali.

The polders are about 8,600 ha in size, of which 7,000 ha (82%) is agricultural land. In both polders, the irrigation facilities are poor, in P47/3 approximately 3% and in P47/4 approximate 2% of the land is irrigated, especially for the cultivation boro rice and vegetables in rabi season. Surface water (reserved canal and pond water) is generally used for irrigation. Around 80-90% of the population depend on deep tube-wells as a source of drinking water and the remaining 10% depend on pond water, *kup* (protected dug well) water etc.

The internal road communication facilities are poor. Internal polder roads consist of about 37 km of bituminous roads, 12 km of brick-soled roads and 80 km of earthen roads. The poor business communications and market facilities result in additional costs for farmers to deliver and sell their rice and vegetables to Upazila or District level markets. However, for fish such as *Hilsha* the business communication is good because of a *Hilsha* landing centre in Kalapara, and - after packaging - *Hilsha* can be readily transported to outside markets.

The issues that affect sustainability of agricultural production and fisheries – and therefore, the livelihoods of local inhabitants – are:

- **Drainage congestion**, which is the major problem in P47/3 and P47/4. It is most severe from mid-July to mid-November because of siltation and man-made causes, including artificial blockages made to serve fisheries interests in the rivers and khals and damage to regulators at the outfall of khals. In these polders the Tulatola beel, Choto Baliatoli, Pokhiyapara beel, Boga Khalir beel and Charbaliatoli beel under Baliatali Union; Baultali and Tarikatar beel under Dhularsar Union; Tegachhiar beel under Mithaganj Union and Kortaliar beel under Dalbuganj Union are particularly prone to drainage congestion.
- **Lack of irrigation facilities.** Irrigation facilities are poor with very small areas in both P47/3 and P47/4 being served by irrigation facilities.

3.2 Social context

This section describes the social context of the livelihood of coastal Bangladesh. To explore the social contexts and poverty situation of coastal communities, the data of three Districts and its Upazilas under Blue Gold Program areas are included from Bangladesh Bureau of Statistics, 2010-11 (BBS). Besides this, polder level data is included from the Baseline survey-phase I, 2017. It is noteworthy that limited data on polders versus national units. First section of this chapter includes some social indicators like demographic

features, educational status, household structure and other facilities of the households (electricity, sanitation and electricity) of three Districts, Upazilas and polders. The next section the chapter includes the poverty data of the three Districts, and Upazilas, land-based household categories in polder level and their income from different sources. At the end this section tried to draw a link between land ownership and incidence of poverty and targeting households for BGP interventions.

3.2.1. Demographic features

In term of area and population, Khulna District has the highest number among the three Districts of BGP area and the areas and population of different Upazilas of these three Districts vary significantly. Population densities in Khulna (528/km²) and Satkhira (520/km²) are similar, but lower in Patuakhali District (477/km²). The population density varies significantly among the different Upazilas within the same District. The highest population density is considered as most vulnerable. The population density is more than double in the Upazilas which are near to zila center like Phultala Upazila (1,476/km²) of Khulna District and Sadar Upazila of Satkhira (1,156/km²) compared to Paikgacha Upazila (603/ km²) of Khulna District and Asasuni Upazila (717/ km²) of Satkhira District. Population growth rate varies among the Districts and Upazila. Some Upazilas have negative growth rate due to migration related to climate change and rapid urbanization. The national average family size is 4.4, this size is not significantly varying among the Districts and Upazila with the highest (4.6) in Patuakhali Sadar and the lowest 4.1 in Paikgacha, Kalapara and Satkhira Sadar.

Table 3.1: Demographic features of Khulna District and its Upazilas

| Demographic features (BBS 2011) | Khulna District | Upazilas under Khulna District within BGP areas | | | |
|-----------------------------------|-----------------|---|---------|-----------|----------|
| | | Batiaghata | Dumuria | Paikgacha | Phultala |
| Area (sq. km) | 4,394 | 248 | 454 | 411 | 57 |
| Population | 2,318,527 | 171,691 | 305,675 | 247,983 | 83,881 |
| Density per sq. km. | 528 | 691 | 673 | 603 | 1,416 |
| Annual population growth rate (%) | (-)0.25 | 1.99 | 0.87 | (-)0.1* | 0.85 |
| Households (no) | 547,347 | 40,779 | 71,909 | 59,873 | 19,555 |
| Average HH size (no) | 4.2 | 4.2 | 4.2 | 4.1 | 4.3 |

* Negative growth rate of population due to migration of population to other places

Table 3.2: Demographic features of Patuakhali District and its Upazilas

| Demographic features (BBS 2011) | Patuakhali District | Patuakhali District and Upazilas within BGP areas | | | | | Barguna Amtali |
|-----------------------------------|---------------------|---|----------|----------|----------|------------------|----------------|
| | | Bauphal | Dashmina | Galchipa | Kalapara | Patuakhali Sadar | |
| Area (sq. km) | 3,221 | 487 | 352 | 1,268 | 492 | 362 | 721 |
| Population | 1,535,854 | 304,284 | 123,388 | 361,518 | 237,831 | 316,462 | 270,802 |
| Density per sq. km. | 477 | 625 | 351 | 285 | 484 | 873 | 720.8 |
| Annual population growth rate (%) | 0.49 | (-)0.02 | 0.52 | 1.05 | 1.62 | (-)0.19 | 0.41 |
| Households (no) | 346,462 | 67,833 | 28,490 | 80,054 | 57,525 | 68,813 | 63,212 |
| Average HH size (persons) | 4.4 | 4.5 | 4.3 | 4.5 | 4.1 | 4.6 | 4.3 |

Table 3.3: Demographic features of Patuakhali District and its Upazilas

| Demographic features (BBS 2011) | Satkhira District | Upazilas under Satkhira District within BGP areas | |
|-------------------------------------|-------------------|---|----------------|
| | | Assasuni | Satkhira Sadar |
| Area (sq. km) | 3,817 | 374 | 398 |
| Population | 1,985,959 | 268,754 | 460,892 |
| Density per sq. km. | 520 | 717 | 1,156 |
| Households (no) | 469,890 | 62,037 | 109,105 |
| Average HH size (no) | 4.2 | 4.3 | 4.1 |
| Population growth rate (annual) (%) | 0.62 | 0.74 | 1.15 |

Table 3.4 provides information for each polder including:

- Previous project interventions: IPSWAM, KJDRP or WMIP
- Location by District, BWBD Division and Upazila
- Gross and cultivable area (ha)
- Numbers of households per polder and per WMG. with estimates of the population based on the average household size provided by the Bangladesh Bureau of Statistics (BBS)

Table 3.4: Information on Blue Gold Polders⁷

| Sl. No. | Polder | Previous History | District | BWDB Division | Upazila | Gross Area (hectare) | Cultivable Area (hectare) | No. of households of local stakeholders | No. of households enrolled in WMGs | People per Polder | Members enrolled in WMGs | No. of WMAs | No. of WMGs | HHs per WMG | Hs per WMA | People per WMG | People per WMA | |
|---------------|-----------|------------------|----------|---------------|--------------------------|----------------------|---------------------------|---|------------------------------------|-------------------|--------------------------|-------------|-------------|-------------|--------------|----------------|----------------|--|
| Khulna | | | | | | | | | | | | | | | | | | |
| 1 | 22 | IPSWAM | Khulna | Khulna O&M-2 | Paikgachha | 1,630 | 1,417 | 2,145 | 1,684 | 9,052 | 2,132 | 1 | 12 | 179 | 2,145 | 754 | 9,052 | |
| 2 | 26 | none | Khulna | Khulna O&M-1 | Dumuria | 2,696 | 2,100 | 3,962 | 3,051 | 16,720 | 5,072 | 1 | 15 | 264 | 3,962 | 1,115 | 16,720 | |
| 3 | 29 | IPSWAM | Khulna | Khulna O&M-1 | Dumuria, Batiaghata | 8,218 | 6,570 | 12,232 | 7,476 | 51,619 | 7,896 | 2 | 56 | 218 | 6,116 | 922 | 25,810 | |
| 4 | 30 | IPSWAM | Khulna | Khulna O&M-2 | Batiaghata | 6,396 | 4,048 | 8,187 | 4,875 | 34,549 | 5,385 | 1 | 40 | 205 | 8,187 | 864 | 34,549 | |
| 5 | 31 Part | none | Khulna | Khulna O&M-2 | Batiaghata | 4,848 | 4,048 | 4,196 | 3,224 | 17,707 | 4,584 | 1 | 12 | 350 | 4,196 | 1,476 | 17,707 | |
| 6 | 25 | KJDRP | Khulna | Khulna O&M-1 | Dumuria, Fultala | 17,400 | 14,379 | 30,323 | 17,759 | 127,963 | 18,292 | 2 | 61 | 497 | 15,162 | 2,098 | 63,982 | |
| 7 | 27/1 | KJDRP | Khulna | Khulna O&M-1 | Dumuria | 3,765 | 3,000 | 5,292 | 3,102 | 22,332 | 3,221 | 1 | 15 | 353 | 7,181 | 1,489 | 30,304 | |
| 8 | 27/2 | KJDRP | Khulna | Khulna O&M-1 | Dumuria | 495 | 400 | 1,889 | 1,142 | 7,972 | 1,236 | | 6 | 315 | | 1,329 | | |
| 9 | 28/1 | KJDRP | Khulna | Khulna O&M-1 | Dumuria, Batiaghata | 5,600 | 4,500 | 2,393 | 1,419 | 10,098 | 1,431 | 1 | 12 | 199 | 5,382 | 842 | 22,712 | |
| 10 | 28/2 | KJDRP | Khulna | Khulna O&M-1 | Batiaghata | 2,590 | 2,000 | 2,989 | 1,766 | 12,614 | 1,817 | | 12 | 249 | | 1,051 | | |
| 11 | 34/2 part | none | Khulna | Khulna O&M-2 | Batiaghata | 4,900 | 4,030 | 9,617 | 6,334 | 40,584 | 7,724 | 1 | 20 | 481 | 9,617 | 2,029 | 40,584 | |
| | | | | | Sub-Total: Khulna | 58,538 | 46,492 | 83,225 | 51,832 | 351,210 | 58,790 | 11 | 261 | 319 | 7,566 | 1,346 | 31,928 | |

⁷ Average household size in Khulna & Satkhira is 4.22 and in Patuakhali is 4.41 (based on Population Census 2011).

| Sl. No. | Polder | Previous History | District | BWDB Division | Upazila | Gross Area (hectare) | Cultivable Area (hectare) | No. of households of local stakeholders | No. of households enrolled in WMGs | People per Polder | Members enrolled in WMGs | No. of WMAs | No. of WMGs | HHs per WMG | Hs per WMA | People per WMG | People per WMA | |
|-------------------|--------------|------------------|----------------------|----------------|--|----------------------|---------------------------|---|------------------------------------|-------------------|--------------------------|-------------|-------------|-------------|--------------|----------------|----------------|---------------|
| Patuakhali | | | | | | | | | | | | | | | | | | |
| 12 | 43/1A | IPSWAM | Barguna | Barguna O&M | Amrtali | 2,675 | 2,200 | 5,129 | 3,571 | 21,131 | 3,936 | 2 | 14 | 366 | 2,565 | 1,616 | 4.41 | 4.12 |
| 13 | 43/2A | IPSWAM | Patuakhali | Patuakhali O&M | Patuakhali Sadar, Amrtali | 5,182 | 3,887 | 8,434 | 5,700 | 37,194 | 7,465 | 2 | 22 | 383 | 4,217 | 1,691 | | 18,597 |
| 14 | 43/2B | IPSWAM | Barguna & Patuakhali | Patuakhali O&M | Galachipa, Patuakhali Sadar, Amrtali | 5,460 | 4,000 | 8,885 | 5,817 | 39,183 | 7,210 | 3 | 28 | 317 | 2,962 | 1,399 | | 13,061 |
| 5 | 43/2D | IPSWAM | Patuakhali | Patuakhali O&M | Patuakhali Sadar, Galachipa | 6,500 | 4,875 | 9,988 | 6,472 | 44,047 | 7,364 | 5 | 28 | 357 | 1,998 | 1,573 | | 8,809 |
| 16 | 43/2E | IPSWAM | Patuakhali | Patuakhali O&M | Patuakhali Sadar | 1,650 | 1,300 | 2,317 | 1,761 | 10,218 | 1,962 | 2 | 12 | 193 | 1,159 | 851 | | 5,109 |
| 17 | 43/2F | IPSWAM | Barguna | Barguna O&M | Amrtali | 4,453 | 3,500 | 6,639 | 4,602 | 27,353 | 6,459 | 3 | 27 | 246 | 2,213 | 1,084 | | 9,759 |
| 18 | 55/2A | WMIP | Patuakhali | Patuakhali O&M | Patuakhali Sadar, Bauphal, Dashmina, Galachipa | 7,166 | 5,000 | 13,966 | 7,838 | 61,590 | 7,838 | 1 | 14 | 998 | 13,966 | 4,399 | | 61,590 |
| 19 | 55/2C | none | Patuakhali | Patuakhali O&M | Dashmina, Galachipa | 6,275 | 5,020 | 10,173 | 6,468 | 44,863 | 7,600 | 2 | 16 | 636 | 5,087 | 2,804 | | 22,431 |
| 20 | 47/3 | none | Patuakhali | Kalapara | Kalapara | 2,025 | 1,660 | 2,313 | 1,668 | 10,200 | 2,326 | 1 | 7 | 330 | 2,313 | 1,457 | | 10,200 |
| 21 | 47/4 | none | Patuakhali | Kalapara | Kalapara | 6,600 | 5,600 | 7,453 | 5,105 | 32,868 | 6,847 | 1 | 18 | 414 | 7,453 | 1,826 | | 32,868 |
| | | | | | Sub-Total: Patuakhali | 47,986 | 37,042 | 75,297 | 49,002 | 328,647 | 59,007 | 22 | 186 | 405 | 3,423 | 1,767 | | 14,939 |
| Satkhira | | | | | | | | | | | | | | | | | | |
| 22 | 2 and 2 ext* | none | Satkhira | Satkhira O&M-2 | Satkhira Sadar and Assasuni | 11,290 | 10,122 | 25,077 | | 105,825 | | 3 | 58 | 432 | 9,272 | 1,825 | | 39,129 |
| | | 2 extensiom | Satkhira | Satkhira O&M-2 | satkhira Sadar | 1,310 | 1,174 | 2,740 | | 11,563 | | 6 | 457 | 1,927 | | | | |
| | | | | | Sub-Total: Satkhira | 12,600 | 11,296 | 27,817 | 17,761 | 117,388 | 19,122 | 3 | 64 | 435 | 9,272 | 1834 | | 39,129 |
| Total | | | | | | 119,124 | 94,830 | 186,339 | 118,595 | 797,244 | 136,919 | 36 | 511 | 365 | 5,176 | 1,560 | | 22,146 |

The table below (*Table 3.5*) presents averages for the polders, WMAs and WMGs whose details are provided in *Table 3.1*. Whilst averages are a useful indicator, it is also helpful to appreciate the ranges between upper and lower limits of the data set -which are provided in the table in brackets beneath the average figure.

Table 3.5: Average areas and numbers of households and populations per polder, per WMA and per WMG

| | Area (ha) | No HHs | Population | No. of WMAs | No. of WMGs |
|----------------------------|-------------------------------------|-------------------------------|---------------------------------|-------------|-------------|
| Average polder (22 no.) | 5,415 (range 1,630 to 17,400) | 8,470 (2,145 to 30,323) | 36,238 (9,052 to 127,963) | 1.6 | 23 |
| Average WMA (36 no.) | 3,309 (1,485 to 8,700) | 5,176 (1,159 to 15,162) | 22,146 (9,052 to 63,982) | | 14 |
| Average WMG (511 no.) | 233 (83 to 512) | 365 (179 to 998) | 1,560 (754 to 4,399) | | |

BWDB's preference was to have one WMA per polder, and therefore one O&M Agreement per polder between the WMA and BWDB's Executive Engineer - except for the very large polders (such as P25 and P29). For historical reasons, more WMAs per polder were formed in Patuakhali at an early stage in the project, and despite attempts by BWDB in 2019/20 to consolidate these WMAs, this is still the case (22 WMAs for 10 polders). This in contrast with Khulna where each polder has only one WMA (11 WMAs for 11 polders – admittedly through the merger of P27/1 and P27/2 and P28/1 with P28/2).

The potential influence of WMAs and WMGs to act collectively in Union or Upazila elections, or in the purchase of agricultural inputs or sale of agricultural products is evident from the table: a WMA represents nearly 5,200 households and a WMG represents 365 households.

2017 Baseline data shows that average family size is higher in Khulna and Patuakhali zone compared to the national average. This data also reveals that there is a significant difference in the average size of household among the different types of holding households. The average number of male and female members within the households is very similar while all the polders have a slightly higher average number of male members. The average number of children is around 1. The data shows as well-being improve from the landless to the large farmer, household sizes become significantly larger from 4 to 6. Overall, 3.6% households are headed by the female with highest in Patuakhali 4.3. Female-headed households are more prevalent (6.6%) in the landless household category while none of the large farm households is the female headed household. Female headed households are one example of relatively poorer households (they are over-represented in LCS groups). However, the incidence of households with a male head who is unable to work (due to disability, chronic illness, etc) or migrated to other places for work seems quite substantial. Informal interviews find that husbands of many women of the poor group in the rural areas work and reside outside their villages at least for a certain period within a year.

Table 3.6: Average areas and numbers of households and populations per polder, per WMA and per WMG

| Polder | Average HH size | Average male members | Average female members | Children (up to 12 yrs) | Female headed HH (HH %) |
|------------------------|-----------------|----------------------|------------------------|-------------------------|-------------------------|
| 25 | 4.6 | 2.4 | 2.2 | 0.9 | 2.1 |
| 31 Part | 4.4 | 2.2 | 2.2 | 1.1 | 6.5 |
| 28/1 | 4.4 | 2.2 | 2.2 | 0.7 | 2.9 |
| 34/2 part | 4.7 | 2.4 | 2.2 | 1.1 | 4.9 |
| 55/2A | 5.1 | 2.6 | 2.5 | 1.1 | 4.7 |
| 47/4 | 4.6 | 2.4 | 2.3 | 1.1 | 3.8 |
| 2 & 2 Ext. | 4.3 | 2.2 | 2.1 | 0.8 | 3.3 |
| Khulna zone | 4.6 | 2.4 | 2.2 | 0.9 | 3.5 |
| Patuakhali zone | 4.3 | 2.2 | 2.1 | 0.8 | 3.3 |
| Satkhira zone | 4.9 | 2.5 | 2.4 | 1.1 | 4.3 |
| Total (N=3,651) | 4.6 | 2.4 | 2.2 | 0.9 | 3.6 |

3.2.2. Educational status

BBS 2011 shows that more than 50% population are literate. However, females are significantly behind than their counterpart in three Districts and in all the Upazila. Although country has achieved positive improvement in education but still illiteracy is the one of the main problems of coastal areas as well as the country. School attendance among 7-24 years people is highest in Khulna District with 58% people. So, around 40% school going age people are not enrolled in school. Female are also less enrolled than male in these age group. To reduce the gender gap in education, some initiatives has been taken by the government and various NGO's but still a long way to go.

Table 3.7: Educational status in Khulna

| Educational status (BBS 2011) | Khulna District | Upazilas under Khulna District within BGP areas | | | |
|--|-----------------|---|---------|-----------|----------|
| | | Batiaghata | Dumuria | Paikgacha | Phultala |
| Literacy Rate (7 years & above) (%) | | | | | |
| Both sex | 60.1 | 54.9 | 52.6 | 52.8 | 58.0 |
| Male | 64.3 | 59.0 | 57.4 | 58.6 | 62.8 |
| Female | 55.9 | 50.7 | 47.7 | 47.1 | 55.3 |
| School attendance (5 to 24 years)(%) | | | | | |
| Both sex | 58.1 | 54.2 | 58.1 | 55.3 | 48.3 |
| Male | 61.4 | 58.3 | 62.9 | 59.0 | 50.6 |
| Female | 54.8 | 50.1 | 53.4 | 51.8 | 45.8 |

Table 3.8: Educational status in Patuakhali

| Educational status (BBS 2011) | Patuakhali District | Upazilas under Khulna District within BGP areas | | | | | Barguna |
|--|---------------------|---|---------|-----------|----------|------------------|---------|
| | | Batiaghata | Dumuria | Paikgacha | Phultala | Patuakhali Sadar | Amtali |
| Literacy Rate (7 years & above) (%) | | | | | | | |
| Both Sex | 54.1 | 57.1 | 48.7 | 45.4 | 52.0 | 59.5 | 45.9 |
| Male | 56.2 | 59.5 | 52.6 | 47.2 | 52.6 | 62.7 | 54.9 |
| Female | 52.0 | 55.1 | 45.1 | 43.7 | 51.5 | 56.5 | 50.8 |
| School attendance (5 to 24 years)(%) | | | | | | | |
| Both Sex | 56.8 | 60.1 | 54.0 | 50.6 | 51.7 | 60.0 | 39.3 |
| Male | 59.8 | 63.5 | 57.8 | 52.7 | 53.5 | 64.9 | 42.4 |
| Female | 53.8 | 57.0 | 50.3 | 48.5 | 49.8 | 56.1 | 36.2 |

Table 3.9: Educational status in Satkhira

| Educational status (BBS 2011) | Satkhira District | Upazilas under Satkhira District within BGP areas | |
|--|-------------------|---|----------------|
| | | Assasuni | Satkhira Sadar |
| Literacy Rate (7 years & above) (%) | | | |
| Both sex | 52.1 | 49.8 | 56.5 |
| Male | 56.1 | 54.9 | 59.8 |
| Female | 48.2 | 44.8 | 53.2 |
| School attendance (5 to 24 years)(%) | | | |
| Both sex | 56.1 | 56.3 | 56.5 |
| Male | 59.6 | 59.8 | 60.0 |
| Female | 52.8 | 53.0 | 53.0 |

The educational status of the household heads in polder level shows that there is considerable variation in the level of education of the HH heads across the polders. In the polder areas, the rate of no schooling (Illiterate and can sign only) of the household heads is highest in the polder 31 Part. Overall, 9.2% are illiterate and 28% of the household heads completed primary level education. In total 21.5% household heads have a secondary level education while only 6.5% completed SSC level. However, proportions of the household heads having completion of HSC or graduate and above level are quite low (3.9% and 3.7% respectively). Across polders, the proportion of school-age children who do not go to school is lowest in polder 25 (2.6 %) that is the closest polder near to Khulna city and highest in polder 47/4 (9.8 %) in Patuakhali. Overall, a considerable percentage of the school enrolment of children is visible across the zone and all types of households. The trend does not vary significantly among different types of households. The percentage of sending children to school increases rapidly due to the initiatives of government and NGOs.

Table 3.10: Level (%) of education of HH head the school enrolment in different polders

| Level of education (Baseline 2017) | Upazilas under Khulna District within BGP areas | | | | | | | |
|------------------------------------|---|---------|------|-----------|-------|------|------------|-------|
| | 25 | 31 Part | 28/1 | 34/2 part | 55/2A | 47/4 | 2 & 2 ext. | Total |
| Illiterate | 8.9 | 12.4 | 10.5 | 10.5 | 7.9 | 5.7 | 11.6 | 9.2 |
| Can sign only | 21.5 | 32.5 | 25.0 | 25.0 | 24.0 | 28.3 | 26.7 | 25.1 |
| Primary | 25.8 | 24.3 | 27.9 | 27.9 | 33.7 | 34.6 | 26.7 | 28.1 |
| Secondary | 24.6 | 21.3 | 21.2 | 21.2 | 21.0 | 18.4 | 20.7 | 21.5 |
| SSC | 7.9 | 4.7 | 5.4 | 5.4 | 6.6 | 4.9 | 5.5 | 6.5 |
| HSC | 4.4 | 2.4 | 4.9 | 4.9 | 3.6 | 3.2 | 3.0 | 3.9 |
| Graduate and above | 4.2 | 2.4 | 3.1 | 3.1 | 2.7 | 3.2 | 3.3 | 3.7 |
| Others | 2.7 | 0.0 | 2.0 | 2.0 | 0.5 | 1.7 | 2.5 | 2.0 |
| Total | 100 | 100 | 100 | 100 | 100 | 100 | 100 | 100 |
| School enrollment (6-12yrs) | 97.4 | 90.8 | 92.6 | 92.6 | 94.0 | 90.2 | 95.6 | 93.8 |

3.2.3. Household structure and other facilities

BBS 2011 shows that around 58% household structure are kutcha or jhupri in Khulna and Satkhira while it is significantly high (around 92%) in Patuakhali. household structure significantly varies within the Upazilas. Though a considerable household have access to safe drinking water, still around 15% households in Khulna and Satkhira do not have access to safe drinking water. This problem in Khulna and Satkhira is mainly related to the problem of high salinity level and arsenic contamination in ground water. Around 22% and 29% households in Khulna and Patuakhali do not have access to sanitary latrine. It is significantly high in Satkhira with around 42% households. A significant percentage of households in Khulna (64.3%) has access to electricity while it is less than half (31%) in Patuakhali and 41% in Satkhira.

Table 3.11: Household structure and other HH facilities of Khulna

| Household structure and other facilities (BBS 2011) | Khulna District | Upazilas under Khulna District within BGP areas | | | |
|--|-----------------|---|---------|-----------|----------|
| | | Batiaghata | Dumuria | Paikgacha | Phultala |
| HH Structure (% of HH) | | | | | |
| pucca house | 18.3 | 6.2 | 11.1 | 12.4 | 17.9 |
| semi-pucca house | 23.0 | 11.9 | 20.0 | 18.1 | 42.9 |
| kutcha house | 56.6 | 79.3 | 67.6 | 68.5 | 37.4 |
| Jhupri | 2 | 2.6 | 1.3 | 1.0 | 1.8 |
| Source of drinking water (tube-well & tab) (% of HH) | 85.7 | 96.5 | 100.0 | 64.0 | 98.3 |
| Sanitation (% of HH) | | | | | |
| Sanitary latrine | 78.0 | 87.4 | 81.8 | 57.6 | 78.9 |
| Non-sanitary latrine | 18.4 | 9.7 | 13.6 | 37.7 | 19.9 |
| no toilet facilities | 3.6 | 2.9 | 4.6 | 4.7 | 1.2 |
| Access to electricity (% of HH) | 64.1 | 39.9 | 69.8 | 43.1 | 82.4% |

Table 3.12: Household structure and other HH facilities of Patuakhali

| Household structure and other facilities (BBS 2011) | Patuakhali District | Upazilas under Khulna District within BGP areas | | | | | Barguna |
|--|---------------------|---|---------|-----------|----------|------------------|---------|
| | | Batiaghata | Dumuria | Paikgacha | Phultala | Patuakhali Sadar | Amtali |
| HH Structure (% of HH) | | | | | | | |
| pucca house | 2.6 | 2.2 | 1.1 | 1.1 | 1.6 | 5.5 | 1.2 |
| semi-pucca house | 5.7 | 5.7 | 2.8 | 3.7 | 3.3 | 9.3 | 4 |
| kutchu house | 86.6 | 91.3 | 93.7 | 83.6 | 85.2 | 83.9 | 87.4 |
| jhupri | 5 | 0.8 | 2.4 | 11.6 | 9.9 | 1.3 | 7.4 |
| Source of drinking water (tube-well & tab) (% of HH) | 97.4 | 97.5 | 94.2 | 97.3 | 99.0 | 98.1 | 98.1 |
| Sanitation (HH %) | | | | | | | |
| Sanitary latrine | 71.4 | 70 | 76.1 | 62.4 | 70.9 | 76.7 | 66.9 |
| Non-sanitary latrine | 25.3 | 36.2 | 21.2 | 29.9 | 24.9 | 21.9 | 28.7 |
| no toilet facilities | 3.4 | 1.5 | 2.7 | 7.7 | 4.2 | 1.4 | 4.4 |
| Access to electricity (HH %) | 31.8 | 36.2 | 14.1 | 22.9 | 31.6 | 40.4 | 21.6 |

Table 3.13: Household structure and other HH facilities of Satkhira

| Household structure and other facilities (BBS 2011) | Satkhira District | Upazilas under Satkhira District within BGP areas | |
|---|-------------------|---|----------------|
| | | Assasuni | Satkhira Sadar |
| HH Structure (% of HH) | | | |
| pucca house | 14.3 | 11.1 | 18.0 |
| semi-pucca house | 28.5 | 14.3 | 42.1 |
| kutchu house | 55.8 | 73.9 | 38.3 |
| jhupri | 1.4 | 0.7 | 1.7 |
| Source of drinking water (tube-well & tab) (%of HH) | 85.0 | 72.8 | 94.4 |
| Sanitation (% of HH) | | | |
| Sanitary latrine | 58.9 | 64.1 | 54.5 |
| Non-sanitary latrine | 38.1 | 32.4 | 41.8 |
| no toilet facilities | 3.7 | 3.4 | 3.7 |
| Access to electricity (% of HH) | 41.8 | 30.7 | 58.3 |

Table 3.14: Level (%) of households reporting the numbers of room and the materials of roof and wall

| Household structure (Baseline 2017) | Upazilas under Khulna District within BGP areas | | | | | | | |
|-------------------------------------|---|---------|------|-----------|-------|------|------------|-------|
| | 25 | 31 Part | 28/1 | 34/2 part | 55/2A | 47/4 | 2 & 2 ext. | Total |
| Number of rooms | | | | | | | | |
| One room | 86.9 | 90.5 | 91.3 | 88.4 | 97.7 | 96.8 | 94.6 | 92.6 |
| Two rooms | 13.1 | 9.5 | 8.3 | 10.9 | 2.3 | 3.0 | 4.8 | 7.1 |
| Three or more rooms | 0.0 | 0.0 | 0.4 | 0.7 | 0.0 | 0.2 | 0.6 | 0.3 |
| Materials of roof | | | | | | | | |
| Tin | 83 | 94.7 | 78.9 | 89.7 | 97.7 | 96.8 | 34.9 | 74.9 |
| Concrete | 13.9 | 1.8 | 16.9 | 6.9 | 2.3 | 0.8 | 14.8 | 9.5 |
| Tiles/hemp/hay/ bamboo/ others | 3.1 | 3.6 | 4.1 | 3.3 | 0 | 2.3 | 50.3 | 15.6 |
| Materials of Wall | | | | | | | | |
| Mud brick/CI sheet/ wood | 38.9 | 61.5 | 59.1 | 55.6 | 92.7 | 95.6 | 31.9 | 57 |
| Concrete | 55.2 | 16 | 33.1 | 16.7 | 6.6 | 1.9 | 59.6 | 34.1 |
| Hemp/hay/bamboo/ others | 5.8 | 22.5 | 7.9 | 27.7 | 0.7 | 2.5 | 8.5 | 8.9 |

Polder level data shows that most of the rural households (92.6%) in coastal zones live in the houses that have only one-bedroom. The percentages of one-bedroom households are significantly higher in the polder 55/2A and 47/4 with around 97% in Patuakhali District. On the other hand, the prevalence of two-bedrooms houses is observed in the polders of Khulna District, the percentage is highest in the polder 25 (13.1%) followed by the polder 34/2 Part (10.9%), polder 31 Part (9.5%) and the polder 28/1 (8.3%).

Data also shows that the majority of the households (74.9%) in the polders live in dwelling units roofed with tin with proportions ranging from 34.9% in the polder 2 and 2 Ext. to 97.7% in the polder 55/2A. About 10% of households live in houses that are roofed concrete while around 16% households living in houses roofed with tiles/ hemp/hay/bamboo/others. Data indicates that more than half of the households (57%) live in dwelling units whose outer walls are mainly constructed with either mud brick or CI sheet or wood while around one-third of the households (34.1%) occupy dwelling units with outer walls made of concrete that are considered as pucca house. Overall, 8.9% households having outer wall is made of hemp/ hay/bamboo/others, however, this wall material is significantly high in polder 34/2 Part (27.7%) and the polder 31 Part (22.5%).

Polder level data is related to hygiene and health of the people shows that about 88% of households have access to safe drinking water. Polder 25 has the highest proportion of households (99.1%) have access to safe drinking water while the polder 2 and 2Ext. has the least (61%). Data shows that only around one-third households in the polders have the practice of washing hand with soap before a meal. Approximately 97% households have access to some kind of hygienic toilet facilities. Data from zonal level shows that around 98% households of Patuakhali and Khulna zone have access to safe drinking water and hygienic latrine while having access to safe drinking water is significantly lower in Satkhira zone due to the widespread prevalence of arsenic in the groundwater in this region. Moreover, only 22% of households of Satkhira zone have the habit of washing hand before a meal while the percentage is more than double in Patuakhali zone but still more than half of the households do not have this habit.

Table 3.15: Level (%) of households having access to safe water and sanitation in different polders

| Other facilities (Baseline 2017) | Access to safe drinking water | Access to hygienic latrine | Wash hand with soap before meal |
|----------------------------------|-------------------------------|----------------------------|---------------------------------|
| 25 | 99.1 | 97.2 | 27.4 |
| 31 Part | 89.3 | 98.2 | 43.2 |
| 28/1 | 97.5 | 98.3 | 51.7 |
| 34/2 part | 98.9 | 97.8 | 42.9 |
| 55/2A | 98.9 | 98.2 | 38.4 |
| 47/4 | 96.6 | 97.3 | 56.5 |
| 2 & 2 Ext. | 61.0 | 95.7 | 22.2 |
| Khulna zone | 97.8 | 97.6 | 37 |
| Patuakhali zone | 97.8 | 97.8 | 46.7 |
| Satkhira zone | 61 | 95.7 | 22.2 |
| Total (N=3651) | 87.7 | 97.2 | 35.7 |

3.2.4. Poverty prevalence in coastal areas

Using the upper poverty line as calculated in the Household Income Expenditure Survey (HIES, 2010), the nationwide incidence of poverty is estimated at 35.2 percent in rural areas and 21.3 percent in urban areas. Using the lower poverty line, below which people are considered extreme poor, the incidence of poverty is estimated at 21.1 and 7.7 percent in respectively the rural and urban areas. Overall, a large majority can be said to be vulnerable and be determined as poor. HIES 2010 shows that around 39% households are poor in Khulna while it is more than 46% in Satkhira. Though poverty prevalence is lower (25.8%) in Patuakhali compared to these two Districts, it is still higher than national average 17.6%. Between these lines are the moderate poor. In the Sadar Upazila of Patuakhali, 36.6% households are identified as poor. Most of the cases poverty prevalence is more in the Upazilas levels as well as polders under these Upazilas of BGP areas.

Table 3.16: Poverty prevalence in Khulna District and its Upazila (HIES, 2010)

| District and poverty rank | Polders in these Upazila | % extreme poor (lower poverty line) | % poor (upper poverty line) |
|---------------------------|--------------------------------------|-------------------------------------|-----------------------------|
| Khulna (46/64) | | 21.2 | 38.8 |
| Upazila | | | |
| Batiaghata | 29,30, 31part, 28/1, 28/2, 34/2 part | 22.7 | 40.5 |
| Paikgacha | 22 | 23.3 | 42.2 |
| Dumuria | 29, 26, 25, 27/1, 27/2 | 19.6 | 37.2 |
| Fultala | 25 | 17.0 | 33.7 |

Table 3.17: Poverty prevalence in Satkhira District and its Upazila (HIES, 2010)

| District and poverty rank | Polders in these Upazila | % extreme poor (lower poverty line) | % poor (upper poverty line) |
|---------------------------|--------------------------|-------------------------------------|-----------------------------|
| Satkhira 56/64 | | 29.7 | 46.3 |
| Upazila | | | |
| Satkhira Sadar | 2 ext. | 26 | 43.1 |
| Assasuni | 2 | 32.0 | 48.4 |
| Dumuria | 29, 26, 25, 27/1, 27/2 | 19.6 | 37.2 |

Table 3.18: Poverty prevalence in Patuakhali District and its Upazila (HIES, 2010)

| District and poverty rank | Polders in these Upazila | % extreme poor (lower poverty line) | % poor (upper poverty line) |
|---------------------------|-----------------------------|-------------------------------------|-----------------------------|
| Patuakhali (20/64) | | 14.7 | 25.8 |
| Barguna (9/64) | | 9.8 | 19.0 |
| Upazila | | | |
| Amtali | 43/1A, 43/2A, 43/2B, 43/2F | 12.0 | 22.8 |
| Patuakhali Sadar | 43/2A, 43/2D, 43/2E, 55/2A, | 23.3 | 36.9 |
| Galachipa | 43/2B, 43/2D, 55/2A, 55/2C | 14.4 | 26.0 |
| Bauphal | 55/2A, | 13.9 | 24.0 |
| Dashmina | 55/2A, 55/2C | 11.3 | 21.8 |
| Kalapara | 47/3, 47/3 | 9.7 | 20.3 |

Table 3.19: Percentage of the farmer households based on land owning pattern (Baseline 2017)

| Polder | Landless < 5 dec | Marginal 5- 49 dec | Small 50- 249 dec | Medium 250-749 dec | Large =>750 | Total |
|-----------------------|------------------|--------------------|-------------------|--------------------|-------------|--------------|
| 25 | 15.5 | 42.9 | 32.7 | 8.7 | 0.1 | 100.0 |
| 31 Part | 18.3 | 52.1 | 21.3 | 6.5 | 1.8 | 100.0 |
| 28/1 | 7.0 | 38.8 | 42.1 | 10.3 | 1.7 | 100.0 |
| 34/2 part | 20.8 | 49.6 | 21.7 | 6.3 | 1.8 | 100.0 |
| 55/2A | 7.0 | 44.4 | 40.0 | 7.2 | 1.4 | 100.0 |
| 47/4 | 13.9 | 42.4 | 31.2 | 9.9 | 2.5 | 100.0 |
| 2 & 2 Ext. | 28.7 | 43.9 | 20.2 | 5.7 | 1.6 | 100.0 |
| Total (n=3651) | 17.8 | 44.3 | 28.9 | 7.5 | 1.4 | 100.0 |

Land is a valuable asset that is thinly shared by the majority of the people in the rural areas of Bangladesh, and the situation of the 22 polders of BGP are not an exception. The 2017 Baseline Survey also reveals that about 18% the total HHs of these polders do not even have any cultivated land. Some of them are residing on embankment slopes and/or residing in somebody else's land. The survey further reveals that while 44.3% of the total HHs own some land (less than 50 decimal), only about 29 % of the HHs own 50-249 decimal of land, with only 1.4% as large farm HHs having more than 750 decimals of land.

Table 3.20: Percentage of the farmer households based on land owning pattern (Baseline 2017)

| Baseline Survey 2017 | Landless | | Marginal | | Small | | Medium | | Large | | Total | |
|-------------------------|------------|------------|-------------|------------|-------------|-------------|-------------|--------------|--------------|----------------|-------------|-------------|
| | Homestead | Cultivable | Homestead | Cultivable | Homestead | Cultivable | Homestead | Cultivable | Homestead | Cultivable | Homestead | Cultivable |
| 25 | 2.0 | 0.0 | 9.4 | 10.0 | 19.1 | 96.7 | 48.1 | 326.1 | 100.0 | 1,055.0 | 14.9 | 65.8 |
| 31 Part | 2.3 | 0.0 | 10.9 | 4.6 | 31.6 | 77.1 | 59.1 | 377.3 | 60.0 | 816.7 | 17.7 | 57.9 |
| 28/1 | 2.6 | 0.0 | 11.9 | 5.1 | 16.6 | 91.0 | 40.8 | 350.5 | 106.3 | 768.8 | 17.8 | 89.3 |
| 34/2 part | 1.8 | 0.0 | 10.1 | 3.6 | 25.4 | 89.2 | 77.0 | 333.1 | 147.6 | 1,065.6 | 18.3 | 61.0 |
| 55/2A | 2.4 | 0.0 | 12.4 | 7.6 | 26.9 | 97.2 | 62.8 | 353.5 | 72.5 | 786.4 | 22.0 | 78.8 |
| 47/4 | 1.7 | 0.0 | 18.1 | 3.3 | 37.7 | 82.8 | 64.2 | 318.4 | 133.1 | 1,348.1 | 29.4 | 93.0 |
| 2 & 2 Ext. | 2.1 | 0.0 | 9.9 | 7.7 | 24.7 | 93.1 | 60.8 | 366.1 | 89.0 | 1,061.3 | 14.8 | 59.8 |
| Total (n=3651) | 2.0 | 0.0 | 11.4 | 6.7 | 25.2 | 92.3 | 58.4 | 342.1 | 105.5 | 1,049.1 | 18.6 | 70.3 |

The above table explains the landholding patterns for homestead and cultivable land among the different categories of farmers in the different study polders. The land distribution is highly skewed among different categories of households but is not significantly varied among the polders. There are significant differences among the large and other types of households in terms of the average homestead and agricultural land ownership in each polder. Large farmer households have got larger average homestead and cultivable land compared to the different classes of households. The average of homestead land of all the polders rated 2.0 decimal for landless households. It is noteworthy that households of this category have no cultivable land of their own. For the marginal farmer the average homestead land is more than five times compared to the landless. The average homestead land for small farmer households is 25.2 decimal while it is more than double for medium farmer households and four times more for the large farmer households compared to the small farmer households. In term of cultivable land, the differences are more significant, the average cultivable land for small farm household is around 92 decimals whereas the medium farmer households own three times more and the large farmer households possess more than 10 times compared to them.

Table 3.21: The HIES and BGP baselines survey 2017 relate landownership to respectively poverty incidence and sources of income

| Polder | Land size dec. | % HHs * | Upper ** | Lower *** | Non-agric income | Crop income | Livestock & fisheries | Lease-out land income | Agric labour |
|--------------|----------------|------------|-------------|-------------|------------------|-------------|-----------------------|-----------------------|--------------|
| Landless | < 5 | 17.8 | 53.1 | 35.9 | 62.2 | 7.5 | 15.9 | 0.22 | 14.1 |
| Marginal | 5 - 49 | 44.3 | 38.8 | 22.1 | 58.3 | 11.4 | 20 | 0.6 | 9.7 |
| Small | 50 - 249 | 28.9 | 21.7 | 11.9 | 48.2 | 18.8 | 26.7 | 2.96 | 3.4 |
| Medium | 250 - 749 | 7.5 | 11.6 | 4.3 | 39.5 | 19.1 | 31.2 | 9.89 | 0.2 |
| Large | => 750 | 1.4 | 7.1 | 4.2 | 28.3 | 24.7 | 26.7 | 20.3 | 0 |
| Total | | 100 | 35.2 | 21.1 | 51.9 | 14.9 | 23.4 | 3.26 | 6.6 |

* Data from Baseline Survey Analysis Phase II
** from HIES 2010
*** latter four columns from Baseline Survey Analysis Phase II

Table 3.22: Annual household income (BDT) from agricultural and non-agricultural sector

| Baseline 2017 | Landless | Marginal | Small | Medium | Large | Average |
|--------------------------------|----------|----------|---------|---------|---------|---------|
| Agricultural Sector (BDT) | 40,924 | 58,436 | 91,653 | 169,370 | 312,516 | 76,865 |
| Agri. Sector (% of income) | 37.8 | 41.7 | 51.8 | 60.5 | 71.7 | 48.1 |
| Non-Agri. (BDT) | 67,480 | 81,776 | 85,237 | 110,505 | 123,192 | 82,974 |
| Non-agri. sector (% of income) | 62.2 | 58.3 | 48.2 | 39.5 | 28.3 | 51.9 |
| Total income | 108,404 | 140,212 | 176,890 | 279,875 | 435,708 | 159,839 |
| \$/Capita/day | 0.77 | 1.00 | 1.27 | 2.01 | 3.12 | 1.15 |
| | < 5 dec | < 50 | < 250 | < 750 | >750 | |
| | 17.8% | 44.3% | 28.9% | 7.5% | 1.4% | |

Above two tables show an important deduction is that while there is a strong negative correlation between land ownership and incidence of poverty⁸ (62% households (landless and marginal) live below or just 1 \$/capita/day while another 29% small farmer households having just \$1.27/capita/day), not all landless are poor (in fact some 50% are) and that there are also a substantial number of poor with higher landownership.⁹ The HIES notes that the poverty incidence amongst some landless households is lower than other landless households mainly due to their involvement in non-agricultural activities which provides them with income enough to escape poverty through engaging in various non-farm economic activities¹⁰ (HIES,2010). The respective sources of income contributions to overall HH income, show some clear correlations but above all they provide a glimpse of how mixed the livelihood strategies are in the polders as a large majority is poor. These indications of poverty incidence and sources of income are of importance to BGP twin strategy (see *Chapter 21 and Chapter 25*) and for the selection of participants where this applies in Blue Gold approaches.

8 That is, as land size increases, the incidence of poverty decreases.

9 Not all land is of similar value either, e.g. depending on the cropping intensity.

10 Owning land can also keep the HH away of selling their labour elsewhere, resulting in underemployment. This is corroborated for example by LCS experience where there is also a definite interest by Landless II.

3.2.5. Defining targets – satisfying a realistic outreach of HH for TA FFS

In summary, HIES national statistics for rural areas put poverty at 35%, while the poverty map puts it for the coastal zones at 44% and above, BBS 2011 also indicates that around 60% people are illiterate, more than 65% people live in kacha or jhupri house, and likely to be within the poverty situation. On the other hand, polder level data shows that about 63% household head are either illiterate or having only primary education and around 93% people live in a one-bedroom house that shows it might be as high as this percentage. Those poor are spread over all land ownership categories with some 50% poor amongst landless and with the categories above still having poverty incidence varying from more than 25% to nearly 10%.

With respect to BGP twin strategy, BGP focuses on the following issue.

Some 50% of the households are not considered landless and are definitely involved in cropping. Not all necessarily personally or throughout the whole year, as they lease their land out or allow share cropping. A substantial %¹¹ of the landless in this way join ranks with the landowners to benefit from Blue Gold's water resource management and production system shift programme¹². Amongst both these landless and landowner participants there are a substantial number of poor. As water resource management is geographically determined, the question to identify and select these poor households does not pose itself. All participants do benefit from the commercialisation programme and it is our experience that, especially the poorer households, are participating in the collective actions.

- The second Blue Gold strategy, the TA FFS programme, along with the LCS approach, is aimed at the 50% landless in the polders. To optimise impact of this programme, there is specific attention needed to identify and select the appropriate participants. A few points can be made.
- Not all landless are poor (in fact 50% are) and other criteria than landownership have to be considered.
 - Amongst the landless there are households who provide their labour to the agricultural sector in the polder or on a migrant basis, for shorter or longer duration, to sectors beyond the polder.¹³ Agricultural labour offers 14% of income amongst the landless.
 - Amongst the landless there are those who are leasing or sharecropping land and probably are benefitting from the WRM/commercialisation programme, but it is limited to where infra rehabilitation allows.¹⁴
 - Participating in the FFS modules demand a minimum of specific assets and for most, those with no land at all, are probably not able to benefit from TA FFS.
 - As indicated, there are households at the lower end of the landownership which are already gaining substantial income from other sources (transport, non-agricultural labour, rural services, business, etc).
 - The UP has lists of needy households which they support in a safety net programme. These should be of guidance.

With respect to a target number of households to be reached in the TA FFS program we can state the following. With 50% landless in the total population of 200,000 Blue Gold households, there are 100,000 belonging to the landless category of which again 50% are poor, or 50,000 households. Some of these, involved in leasing land under different forms, will benefit most from increasing the productivity of their land and labour assets in the WRM/commercialization program, while a small percentage do lack the minimum asset requirements to gain from TA FFS participation or are already using their, mainly, labour assets to good results elsewhere and/or in non-agricultural sectors. Without further insights in these

11 This baseline survey refers to 8% of income from cropping sources. Subsistence production might bias this figure though.

12 This includes DAE FFS, CII, CAWM and other water management focused WMO facilitation.

13 Not necessarily all stepping out as some finance their leasing of land by remittances.

14 BGP does not have reliable data on this but at present estimate it at 5 to 10%. Some of this could be seasonal.

percentages a target of 30,000 households to be reached by TA FFS can be considered a fair assessment, while keeping in mind that an additional number will be reached by horizontal learning.

3.3 Physical Context

3.3.1. Purpose of Polder Infrastructure

Safety

One of BWDB's primary responsibilities in the coastal region is to ensure the integrity of the polder embankment and to thus protect the vulnerable communities who live and work in the polders. Polder communities are provided with safety against tidal floods, storm surges, river erosion and salinity through embankment strengthening, breach closing and erosion protection measures. In combination with the infrastructure improvements, disaster risk reduction (DRR) activities involving local community organisations and the concerned government departments has increased the state of preparedness of polder inhabitants to prospects of embankment breaches and overtopping, and encouraged consideration of pre-emptive actions.

All of those who live and work in the SW face the consequences of erosion damage to polder embankments. And many BWDB professionals have practical experience of the consequences of breaches to polder embankments. But those who are resident in the polders, and whose families and livelihoods are dependent on the exclusion of flood waters from the polder bear the brunt of the consequences when polder embankments fail. There is enormous social and economic impact.

Water Management

Within the polders, the re-excavation of primary canals and some major secondary canals, and rehabilitation of water management structures (sluices, outlets etc) aims to improve the overall water management and to create scope for in-polder water management (IPWM) and community-led agricultural water management (CAWM). Where infrastructure works are complete, unobstructed flow of water is possible through the cleared main khals, and the rehabilitated sluices/outlets allow improved water regulation. Previously, many areas were either unable to be drained and remained inundated, or suffered water shortages as their main outlets or inlets were obstructed or poorly functioning.

Photo 3.1 shows one of the 186 regulators which was rehabilitated under Blue Gold. Note the agricultural area to the left of the tree-lined embankment which protects the polder area (P31-part) from high river levels, and the scale of the tidal river – the Kazibacha River. The regulator drains water into a tidal river – it is low tide so there is drainage from the polder. The high tide mark is visible.

3.3.2. Vulnerability of Polder Infrastructure

In the harsh environment of the coastal zone, polder infrastructure is subject to many threats and – sea surges, cyclones, rivers in flood, high salinity tidal flows, sedimentation of river channels, intense rain storms, road traffic, human interventions etc.

There have been more than 40 severe cyclones in the coastal zone of Bangladesh since 1961. Of recent note are the following seven cyclones:

- 15 November 2007: **Cyclone Sidr** with wind speeds up to 260 km/hour, made landfall in southern Bangladesh, causing over 3,500 deaths and severe damage.
- 27–29 May 2009: A **severe Cyclone Aila** devastated 15 Districts of south-western part of Bangladesh with wind speeds up to 120 km/hour; about 150 deaths, 200,000 houses and crop losses across 120,000 ha of cultivated land.

- 29 July 2015: **Cyclone Komen** with wind speeds up to 75 km/hour, Komen made landfall near Chittagong. About 510,000 houses in the country were damaged or destroyed, and many residents lost their source of income as 270,000 ha of crop fields were damaged. The floods killed 132 people, of which at least 39 were directly related to Komen.
- 4 May 2019: **Cyclone Fani** moved into Bangladesh after making landfall in Odisha, resulting in the death of 17 people in ten Districts of Bangladesh. It destroyed about 63,000 ha of farmland in 35 Districts of the country, causing agricultural losses estimated at US\$4.6 million, and a total damage in Bangladesh amounting to US\$64 million.
- 9 November 2019: **Cyclone Bulbul** made landfall near West Bengal, and crossed into Bangladesh. It caused severe flooding and storm surge in the country, with the loss of approximately 72,000 metric tonne of crops with an estimated total value of US\$31 million.
- 20 May 2020: **Cyclone Amphan** moved into Bangladesh after making landfall in West Bengal.
- 26 May 2021: **Cyclone Yaas** crossed the northern Odisha coast around 20 km south of Balasore on 26 May at its peak intensity as a very severe cyclonic storm. Despite the distance of Patuakhali from the landfall in Odisha, the high winds associated with the cyclone combined with the occurrence of a spring tide resulted in extensive damage to polder embankments along many of the major rivers draining into the Bay of Bengal.

Because of this exposure to natural and man-made threats, polder infrastructure requires significant repair and maintenance investments – to provide emergency repairs as well as periodic maintenance. And the repairs to cyclone damage can take many years – for example, repairs caused by Cyclone Sidr (in 2007) were still ongoing in 2015.

Photo 3.1: A regulator draining excess water from Polder 31-part into the Kazibacha River



Table 3.4: Information on Blue Gold Polders

| Sl. No. | Polder | Date of Construction | Previous History | District | BWDB Division | Upazila | Gross Area (hectare) | Cultivable Area (hectare) | Embankment (km) | Regulator (no.) | Flushing Inlet (no) | Drainage Channel (km) |
|---------------|-----------|----------------------|------------------------------|----------|---------------|--------------------------|----------------------|---------------------------|-----------------|-----------------|---------------------|-----------------------|
| Khulna | | | | | | | | | | | | |
| 1 | 22 | 1970-72 DDP | 2003-2011 IPSWAM | Khulna | Khulna O&M-2 | Paikgachha | 1,630 | 1,417 | 19.5 | 7 | 12 | 45.0 |
| 2 | 26 | 1967-68 CEP | none | Khulna | Khulna O&M-1 | Dumuria | 2,696 | 2,100 | 28.7 | 7 | - | 25.0 |
| 3 | 29 | 1966-71 CEP | 2003-2011 IPSWAM 1988 DDP | Khulna | Khulna O&M-1 | Dumuria, Batiaghata | 8,218 | 6,570 | 49.3 | 14 | 43 | 156.4 |
| 4 | 30 | 1967-72 CEP | 2003-2011 IPSWAM | Khulna | Khulna O&M-2 | Batiaghata | 6,396 | 4,048 | 40.3 | 21 | 3 | 39.0 |
| 5 | 31 Part | 1967-72 CEP | none | Khulna | Khulna O&M-2 | Batiaghata | 4,848 | 4,048 | 28.0 | 14 | 2 | 17.5 |
| 6 | 25 | 1963-67 CEP | 1993-2002 KJDRP | Khulna | Khulna O&M-1 | Dumuria, Fultala | 17,400 | 14,379 | 50.5 | 13 | - | 60.0 |
| 7 | 27/1 | 1963-65 CEP | 1993-2002 KJDRP | Khulna | Khulna O&M-1 | Dumuria | 3,765 | 3,000 | 32.4 | 8 | - | 30.0 |
| 8 | 27/2 | 1974-76 CEP | 1993-2002 KJDRP | Khulna | Khulna O&M-1 | Dumuria | 495 | 400 | 15.3 | 3 | - | 15.8 |
| 9 | 28/1 | 1965-70 CEP | 1993-2002 KJDRP | Khulna | Khulna O&M-1 | Dumuria, Batiaghata | 5,600 | 4,500 | 23.2 | 7 | 2 | 27.0 |
| 10 | 28/2 | 1973-75 CEP | 1993-2002 KJDRP | Khulna | Khulna O&M-1 | Batiaghata | 2,590 | 2,000 | 20.1 | 8 | - | 31.0 |
| 11 | 34/2 part | 1998-2005 GoB | none | Khulna | Khulna O&M-2 | Batiaghata | 4,900 | 4,030 | 37.0 | 38 | 14 | 43.0 |
| | | | | | | Sub-Total: Khulna | 58,538 | 46,492 | 344.2 | 140 | 76 | 489.6 |

| Sl. No. | Polder | Date of Construction | Previous History | District | BWDB Division | Upazila | Gross Area (hectare) | Cultivable Area (hectare) | Embankment (km) | Regulator (no.) | Flushing Inlet (no) | Drainage Channel (km) |
|-------------------|-----------------|----------------------|---------------------|----------------------------|----------------|---|----------------------|---------------------------|-----------------|-----------------|---------------------|-----------------------|
| Patuakhali | | | | | | | | | | | | |
| 12 | 43/1A | 1989-90 EIP | 2003-2011 IPSWAM | Barguna O&M | Amtali | 2,675 | 2,200 | 5,129 | 3,571 | 21,131 | 3,936 | 2 |
| 13 | 43/2A | 1985-87 EIP | 2003-2011 IPSWAM | Patuakhali | Patuakhali O&M | Patuakhali Sadar, Amtali | 5,182 | 3,887 | 40.0 | 5 | 34 | 44.3 |
| 14 | 43/2B | 1989-98 EIP | 2003-2011 IPSWAM | Barguna & Patuakhali | Patuakhali O&M | Galachipa, Amtali | 5,460 | 4,000 | 41.5 | 6 | 42 | 39.5 |
| 5 | 43/2D | 1989-98 EIP | 2003-2011 IPSWAM | Patuakhali | Patuakhali O&M | Patuakhali Sadar, Galachipa | 6,500 | 4,875 | 43.0 | 16 | 58 | 110.4 |
| 16 | 43/2E | 1989-90 EIP | 2003-2011 IPSWAM | Patuakhali | Patuakhali O&M | Patuakhali Sadar | 1,650 | 1,300 | 20.3 | 7 | 40 | 42.0 |
| 17 | 43/2F | 1989-94 CEP | 2003-2011 IPSWAM | Barguna | Barguna O&M | Amtali | 4,453 | 3,500 | 35.3 | 17 | 38 | 32.8 |
| 18 | 55/2A | 1988-94 EIP | 2008-2015 WMIP | Patuakhali | Patuakhali O&M | Patuakhali Sadar, Bauphal, Dashmina, Galachipa | 7,166 | 5,000 | 41.0 | 12 | 6 | 35.0 |
| 19 | 55/2C | 1988-90 EIP | none | Patuakhali | Patuakhali O&M | Dashmina, Galachipa | 6,275 | 5,020 | 47.5 | 7 | 29 | 37.5 |
| 20 | 47/3 | 1961-64 CEP | none | Patuakhali | Kalapara | Kalapara | 2,025 | 1,660 | 20.0 | 8 | 10 | 25.3 |
| 21 | 47/4 | 1961-64 CEP | none | Patuakhali | Kalapara | Kalapara | 6,600 | 5,600 | 61.0 | 26 | 1 | 65.0 |
| | | | | | | Sub-Total: Patuakhali | 47,986 | 37,042 | 376.6 | 109 | 269 | 490.3 |
| Satkhira | | | | | | | | | | | | |
| 22 | 2 and 2 ext* | 1963-65 CEP | none | Satkhira | Satkhira O&M-2 | Satkhira Sadar and Assasuni | 11,290 | 10,122 | 63.0 | 17 | | 65.2 |
| | | 1963-65 CEP | none | Satkhira | Satkhira O&M-2 | Satkhira Sadar | 1,310 | 1,174 | | 4 | | |
| | | | | | | Sub-Total: Satkhira | 12,600 | 11,296 | 63.0 | 21 | | 65.2 |
| Total | | | | | | | 119,124 | 94,830 | 783.7 | 270 | 345 | 1,045.2 |

For the 22 Blue Gold polders, *Table 3.4* (on the previous page) provides a summary of the dates of construction, the dates of investments by earlier projects, as well as the location, the responsible BWDB Division and Upazila administration, and characteristics of the infrastructure (length of embankment, numbers of structures and length of primary drainage channels or khals).

The 22 Blue Gold polders were constructed over a nearly 30 year timeframe, with start dates ranging from 1961 to 1989 (with one outlier, P34/2-part in Batiaghata, Khulna where construction started in 1998). Most of the polders in Khulna and Satkhira were constructed between 1963 and 1975, whilst those in Patuakhali date from 1985 to 1998, with two (P47/4 and P47/4) in Kalapara being constructed between 1961 and 1964. They vary in age from 57 years (P47/3 and P47/4 in Kalapara were built from 1961 to 1964) to 16 years (P34/2-part in Khulna, built from 1998 to 2005) with an average age of 42 years (based on the year of completion of construction, up to the year of Blue Gold's completion, 2021). The average age of the 12 polders in Khulna and Satkhira is 48 years, and for the 10 polders in Patuakhali is 34 years.

An aggregation of these polder characteristics represents the scale of the problem: 784km of embankments, 615 large structures and 1,045km of primary drainage channels. Earthen embankments are subject to daily attack from river erosion and road traffic, and can be readily breached when conditions combine - spring tides, monsoon floodwaters, augmented by wind erosion or cyclonic storms. Structures provided in the embankment to allow drainage (or to admit freshwater for storage for subsequent use for irrigation) can be damaged by seepage or piping, mal-operation of the gates, erosion of the bank or bed around the structure, and made non-functional if gates don't close off the flow of water, or if sedimentation in the outfall river obstructs water from discharging from the polder.



04 Policy framework, history of interventions and project definition

4.1 Policy and regulatory framework for Participatory Water Management

BGP combines a substantial investment in water infrastructure with a strong focus on the establishment of Participatory Water Management (PWM). Given this distinguishing feature of the program – a feature which it shares with several other donor-funded water sector projects – this section provides an overview of the policy, legal and regulatory provisions, which establish the bandwidth within which PWM can be implemented.

While communities in Bangladesh, as elsewhere, have always taken initiatives towards managing water resources for their own benefit, Participatory Water Management – i.e. an explicit approach by Government whereby water management actions by water users organised on a scheme or catchment basis, or on the basis of sub-units thereof – complements or replaces centrally organised water management actions – is relatively new. Farmer groups for water management were notably formed for irrigation management purposes in the 1960s and 1970s; both for pump irrigation and in major irrigation schemes. Participatory Water Management, however, only became a Government policy applicable for all water management in flood control, drainage and irrigation schemes by the end of the 20th century. The 1999 National Water Policy sounded the starter's gun for promulgating legal provisions for PWM: several guidelines, regulations and acts that – taken together – provide the regulatory framework for Participatory Water Management.

The table provides an overview of the prevailing policy, legislation and regulation for PWM. Short discussions of each element are available through hyperlinks and/or attachments. After the overview, this concludes with a section that zooms-out again to reflect on today's context for Participatory Water Management.

Table 4.1: Overview of policy and regulatory framework

| Title | Formal publication / approval | Status |
|---|--|---|
| National Water Policy | January 1999 | Policy |
| Guidelines for Participatory Water Management | April 2001 | Guidelines |
| Bangladesh Water Development Board Act | July 2000 | Act |
| National Water Management Plan | March 2004 | Plan |
| BWDB Participatory Water Management Rules | February 2014 | Rules under the BWDB Act 2000 |
| Bangladesh Water Act | 2013 | Act |
| Water Rules (Bangla only) | August 2018, with guidelines for District, Upazila and Union level published in 2019 | Rules under the Bangladesh Water Act 2014 |
| Bangladesh Delta Plan | September 2018 | Plan |

In addition to the above documents that shape present-day Participatory Water Management, several other policies influence water management practices. We mention here the Bangladesh Climate Change Strategy and Action Plan 2009, the National Women in Development Policy 2011.

4.2 History of interventions

Water resources management in Bangladesh faces immense challenges in order to resolve diverse problems and issues. The most critical of these are floods in the wet season and the scarcity of water in the dry season; the expanding water needs of a growing economy and population; the supply of safe drinking water and sanitation; arsenic problem; water pollution and massive river sedimentation and riverbank erosion. Furthermore, there is a growing need for maintaining the eco-systems, particularly the fish resources and wetlands and there is the issue of competitive demand of various water uses. The water management is increasingly facing challenges of exogenous developments of a global nature, such as climate change and sea level rise, as well as of upstream river basin developments in neighbouring countries. Climate changes will influence both food security and water availability in the following ways: extreme weather events will lead to more cyclones and floods with consequent drainage congestion and water logging; salinity and salt water intrusion; higher glacial melt leading to higher river discharge, river and soil erosion; more droughts leading to increased irrigation demands.

Based on the above, the goals and objectives for the development and utilization of water resources in Bangladesh may, in short, be stated as follows:

4.2.1. Goals

- Make efficient use of water resources to optimise the growth of agriculture, including fisheries, forestry and livestock.
- Provide navigational facilities for the growth of commerce, industry and transportation.
- Prevent land, water and environmental degradation.
- Accommodate land reclamation and accretion.
- Minimize the adverse effect of flood and drought on rural and urban communities.
- Adaptation to climate change

4.2.2. Objectives

- Irrigation objectives, including major surface water irrigation and minor irrigation to meet agricultural demand.
- Flood management objectives, including climate change resilience and adaptation through the protection of critical urban and rural areas and control of land erosion from river actions
- Energy and power generation objectives, specifying the use of dams and other control structures.
- Navigation objectives, specifying the use of water for inland navigation.
- Land reclamation and accretion objectives, specifying the use of reclaimed land.
- Poverty alleviation objectives.

The erstwhile East Pakistan Water and Power Development Authority (EPWAPDA), an autonomous organisation, was created in 1959 to fulfil some of these goals and objectives, as a consequence of the United Nations' funded Krug Mission under the East Pakistan Water and Power Development Authority Ordinance of 1959 (EP order No.1 of 1959). The mission concluded that water resources development would be essential to the increase of agricultural production. It therefore recommended the creation of coastal polders to protect the rice crops from tidal floods and salinity. Consequently, the Coastal Embankment Project constructed 37 polders in the period 1960-1972, with a view to cultivating High Yielding Varieties (HYV) of rice. Simultaneous the EPWAPDA Master plan focusing on flood control and drainage was prepared in 1964. Activities created under the Master plan yielded immediate results. However, after a few years, an evaluation showed that the increase in agricultural production was not up to the required level. The present Bangladesh Water Development Board was established in 1972 under presidential order no. 59 of 1972, when the former EPWAPDA was split into two organisations: BWDB dealing with water and PDB dealing with power. BWDB is a body corporate under the administrative control of the Ministry of Water Resources.

A mission funded by the International Bank for Reconstruction and Development (IBRD) in 1972 recommended a strategy for the implementation of small, low cost quick generation Flood Control and Drainage (FCD) and Flood Control, Drainage and Irrigation (FCDI) projects.

In 1974, another devastating flood occurred. This generated a renewed interest in the area of flood control and prevention. A policy was adopted for the quick implementation of flood control and drainage improvement projects. The Early Implementation Project was the first project implemented in line with this new established policy. Thereafter many other projects followed as can be seen below in Table 2, which includes brief descriptions of many of the projects.

4.2.3. Review of Water Resources Projects in the Coastal Zone

Table 2 below lists the 21 projects which have contributed to water resources development in the coastal zone over the last 45 years. Summaries of these projects can be found by following the hyperlinks. Of note is the considerable influence of the Government of the Netherlands (GoN) – which has been the main or co-funder of 14 of the 21 projects.

Table 4.2: Overview of water resources management projects

| No. | Name of the Project | Implementation period | Donor |
|-----|--|-----------------------|-----------|
| 1 | Early Implementation Project (EIP) | 1975-1997 | GoN |
| 2 | Delta Development Project (DDP) | 1976-1988 | GoN |
| 3 | Land Reclamation Project (LRP) | 1977-1991 | GoN |
| 4 | Second Small Scale Flood Control Drainage and Irrigation Project (SSSFCDI) | 1988-1994 | WB & CIDA |

| No. | Name of the Project | Implementation period | Donor |
|------------|---|------------------------------|-------------------|
| 5 | Systems Rehabilitation Project (SRP) | 1990-1997 | WB |
| 6 | Flood Action Plan (FAP) | 1990-1995 | multiple incl GoN |
| 6 | Flood Action Plan (FAP) | 1990-1995 | multiple incl GoN |
| 7 | Compartmentalization Pilot Project (CPP)-FAP-20 | 1991-2000 | GoN & KfW |
| 8 | Khulna Jessore Drainage Rehabilitation Project (KJDRP) | 1993-2002 | ADB |
| 9 | Char Development and Settlement Project (CDSP) | | |
| 9a | Char Development and Settlement Project (CDSP I) | 1994-1999 | GoN |
| 9b | Char Development and Settlement Project (CDSP II) | 2000-2005 | GoN |
| 9c | Char Development and Settlement Project (CDSP III) | 2005-2011 | GoN |
| 9d | Char Development and Settlement Project (CDSP IV) | 2011-2018 | GoN & IFAD |
| 9e | Char Development and Settlement Project Bridging (CDSP- B) | 2019-2022 | GoN & IFAD |
| 10 | Small Scale Water Resources Development Sector projects | | |
| 10a | Small Scale Water Resources Development Sector Project | 1996-2002 | ADB & GoN |
| 10b | Second Small Scale Water Resources Development Sector Project (SSWRDSP) | 2002-2009 | ADB & GoN |
| 10c | Participatory Small-Scale Water Resources Sector Project | 2010-2019 | ADB & GoN |
| 11 | Integrated Coastal Zone Management (ICZM) - Assistance to the Program Development Office of the Integrated Coastal Zone Management Program (PDO-ICZM) | 2002-2006 | GoN |
| 12 | Integrated Planning for Sustainable Water Management (IPSWAM) | 2003-2011 | GoN |
| 13 | South-west Area Integrated Water Resources Planning and Management Project | | |
| 13a | Southwest Area Integrated Water Resources Planning and Management Project (SAIWRPMP) | 2006- 2015 | ADB & GoN |
| 13b | Southwest Area Integrated Water Resources Planning and Management Project - Additional Financing (SAIWRPMP -AF) | 2015-2022 | ADB & GoN |
| 14 | Estuary Development Program (EDP) | 2007-2011 | GoN |

| No. | Name of the Project | Implementation period | Donor |
|-----|--|-----------------------|-------|
| 15 | Small Scale Water Resources Development Project (SSWRDP) | 2007-2014 | JBIC |
| 16 | Water Management Improvement Project (WMIP) | 2008-2015 | WB |
| 17 | Coastal Embankment Improvement Project Phase 1 (CEIP) | 2013-2020 | WB |
| 18 | Blue Gold Program | 2013-2020 | GoN |
| 19 | Bangladesh Delta Plan | | |
| 19a | Preparation Bangladesh Delta Plan 2100 (BDP 2100) | 2014-2017 | GoN |
| 19b | Support to the Implementation of the Bangladesh Delta Plan 2100 (SIBDP 2100) | 2018-2022 | GoN |
| 20 | Irrigation Management Improvement project (IMIP) | 2015-2020 | ADB |
| 21 | Smallholder Agricultural Competitiveness Project (SACP) | 2019-2025 | IFAD |

4.3 Project definition

The Blue Gold Program has been defined on the basis of accumulated insights on how best to pursue Participatory Water Management. In the course of its implementation, it has itself become an arena for refining the approach for Participatory Water Management.

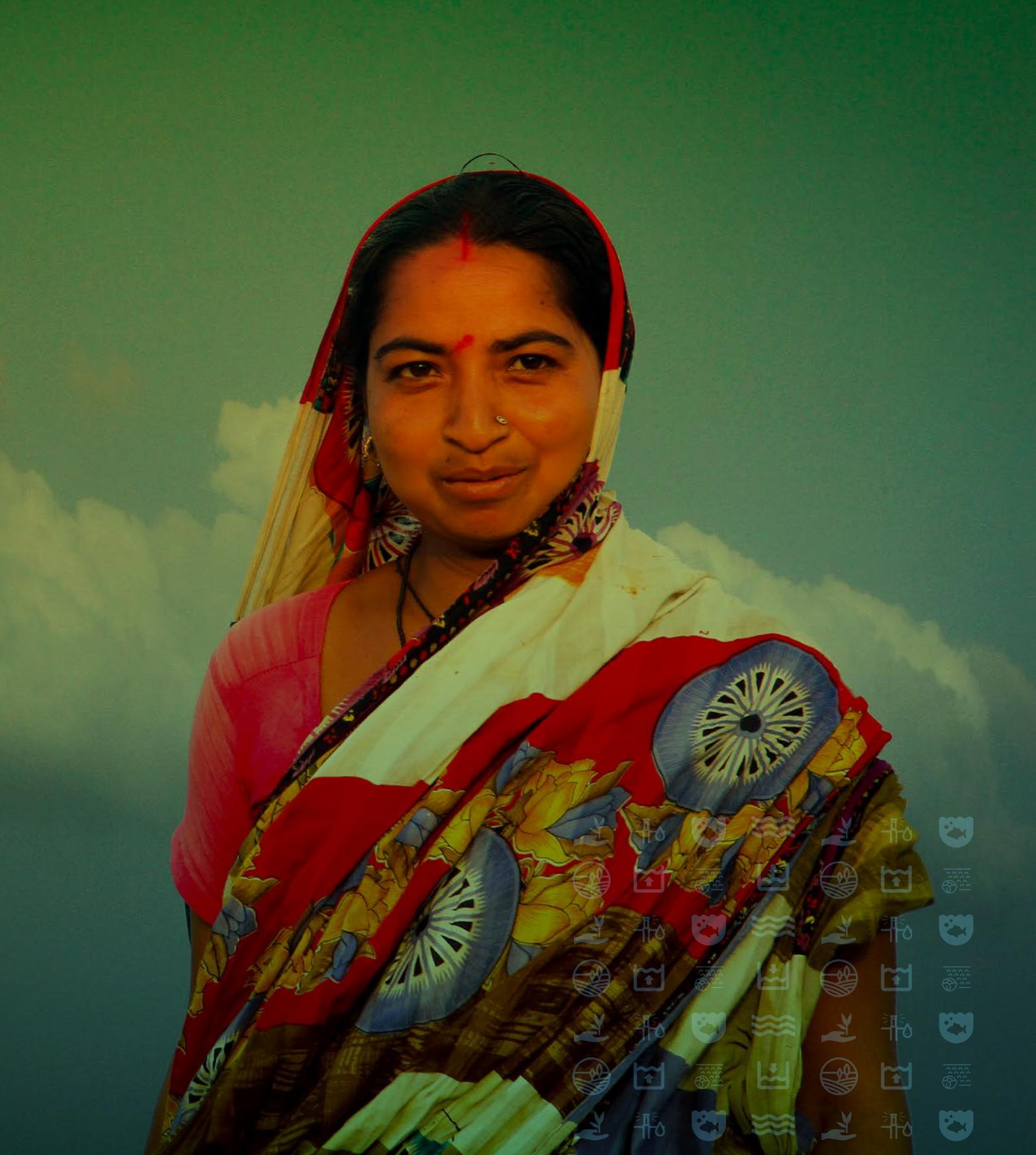
The definition of the Blue Gold Program has been set out in various key project documents, which have been revised and amended over the eight+ year life of the Program:

- The **Administrative Arrangement** signed on 20th February 2013 between the Minister for Foreign Trade and Development Cooperation for the Kingdom of the Netherlands and Economic Relations Division (ERD) for the Government of Bangladesh (GoB) sets out the broad arrangements for the implementation of the Blue Gold Program, including the contributions of both parties, arrangements for the delegation of responsibilities, obligations concerning customs duties and taxes, reporting requirements, arrangements for evaluation and the settlement of disputes. Under this Arrangement, the Embassy of the Kingdom of the Netherlands (EKN) represents the Kingdom of the Netherlands.
- The **Contribution Arrangement** signed on 4th December 2013 between the Minister for Foreign Trade and Development Cooperation for the Kingdom of the Netherlands and Economic Relations Division (ERD) for the Government of Bangladesh (GoB) expands on the Administrative Arrangement setting out details of payments by instalments, reporting requirements for progress and financial reports, final reports, and annual audit reports.
- The **Program Document**¹ of August 2012 prepared for the Embassy of the Kingdom of the Netherlands (EKN) sets out the rationale for the Blue Gold Program ‘taking account the lessons learnt over the past ten years, the new insights into how to deal with the challenges of created by the very dynamic rivers of Bangladesh and the new communication technologies.’ Development of market linkages and the promotion of innovation were included in the project design. During project implementation, project design changes were incorporated by the development partners, and confirmed during Annual Review Missions.

¹ Program for Integrated Sustainable Economic Development by improving the Water and Productive Sectors in selected Polders, Program Document. https://www.bluegoldwiki.com/index.php?title=File:GoN_Program_Document_BGP_28Aug12.pdf. GoB, GoN, BLUE GOLD. August 2012.

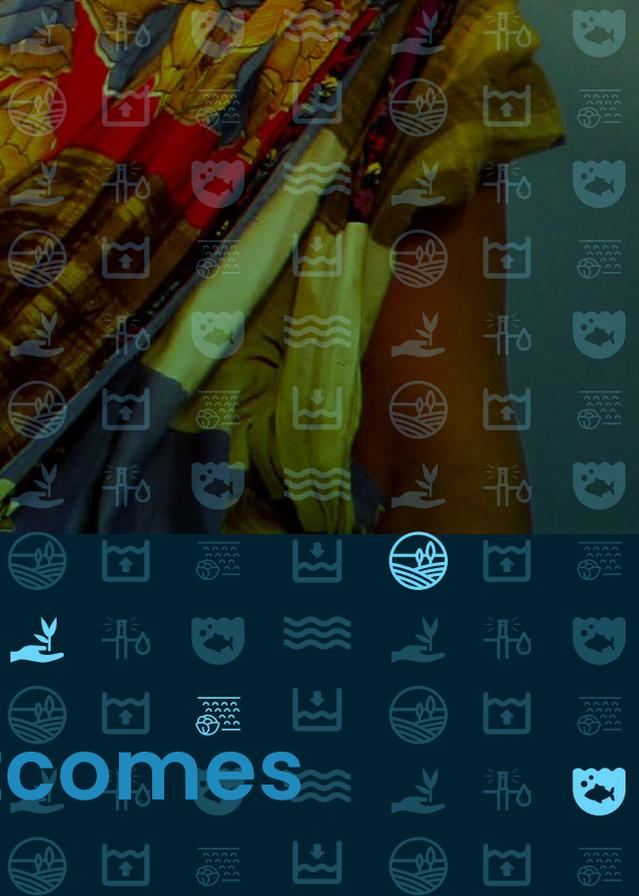
- **Development Project Proforma (DPP)** are the official Government of Bangladesh (GoB) formats for project planning and budget allocation. When approved, allocations against the Project can be made into the departmental annual work plans and budgets (Annual Development Programs). For a department to receive allocations it must have its own DPP. BWDB and DAE each have separate DPPs for the Blue Gold Program, both of which were revised during project implementation, in keeping with Government procedures.
- Separate **Memoranda of Agreement** have been signed between BWDB and the Department for Livestock Services (DLS) and the Department of Fisheries (DoF) since the scope of their activities in Blue Gold did not warrant the formulation of separate DPPs. Funds for the agreed activities of DLS and DoF were provided through the budget of the technical assistance (TA) team on behalf of EKN.
- A **Technical Assistance (TA) Contract** defines the broad scope of activities for the technical assistance team commissioned by EKN to support implementation of the Blue Gold Program. Extensions to the end-date of the Program, and adjustments to the scope of services formalised through a number of amendments to the TA Contract.

Further information on these key documents is presented in *Section G Chapter 28 'Project management Arrangements'*.



Section B

Development Outcomes



Section B

Development Outcomes

Introduction and summary

Bangladesh has experienced significant economic growth in recent decades and classifies as a lower middle-income economy. The incidence of poverty has declined but is still 24.3% overall and 26.4% in rural areas (BBS 2016). Before the start of the Blue Gold Program, the incidence of poverty was 31.5% overall and 35.5% in rural areas (BBS, 2010). One-fifth of the country's GDP comes from agriculture and two-thirds of the workforce is directly or indirectly engaged in agricultural activities. Hence the country's economy is highly vulnerable to the degradation of natural resources and to variability and trends in climate. To eliminate poverty, Bangladesh has a long way to go. The incidence and severity of poverty is even more pressing in the predominantly rural coastal region of Bangladesh (see chapter 3). Alleviating this, requires high and inclusive growth of the rural agricultural economy in a sustainable manner.

To address this situation, the Blue Gold Program (BGP) became operational in March 2013 and extended over an 8+-year period (until end 2021) to improve agricultural water management in 22 polders of four districts: Khulna, Satkhira, Patuakhali, and Barguna (see chapter 1). This project aimed to reduce poverty and improve food security through participatory water management and agricultural development resulting in improved livelihoods for communities. This section presents the outcomes and impacts of the BGP interventions based on independently collected survey data. In other words, this section assesses the effectiveness of BGP's interventions and judges the significance of changes in the livelihoods of BGP beneficiaries. Here, outcomes and impacts are seen as the contribution of the BGP interventions to the overall goal of the program.

Below, we summarise the surveys which have been used in reporting on the impact of the Blue Gold Program; in particular in preparing this section B.

B.1 Baseline and Endline Surveys

The impact of Blue Gold interventions was intended to be measured by a comparison of baseline and endline surveys. Because Blue Gold implemented the interventions in 22 polders in two rounds two baseline surveys were conducted using sample surveys:

- Phase I: 2015 TR14 Baseline Survey (fieldwork Apr/May 2014: 1,401 households in 9 polders)
- Phase II: 2018 TR23 Baseline Survey (fieldwork Apr-Jun 2017: 3,651 households in 7 polders selected as representative of the 13 Phase II polders)
- Endline survey 2020 TR27 – Impact of the Blue Gold Program, April 2021 (field work in last part of 2020; 3,969 households in 9 polders) as a follow-up of the baseline surveys of 2014 and 2017.

The majority of the first round of polders aimed to have relatively a low level of investment (termed 'fine-tuning' in the BWDB DPP) – so nine IPSWAM polders were included. The second round covered a wider spread of polders, the selection for which was finalised in 2015/16.

The endline survey was conducted in 2020. Fieldwork was delayed by COVID and eventually conducted in September 2020, comprising 3,969 households in 9 polders. The results were published in April 2020, in Technical Report 27 (TR27) Impact of the Blue Gold Program. There was a wealth of evidence that BGP has achieved its expected outputs in terms of improved water management leading to better conditions for crop production, and farmers gaining knowledge and skill through training and extension activities. However, the impact in terms of increased farm production and income was less apparent for a number of reasons. Firstly, the period between the collection of Phase II baseline data in 2017 and endline data in 2020 was relatively short, and secondly, 2019 and 2020 were both unfavourable years for farming. In 2019 low crop prices would have discouraged planting and then excessive rain and severe pest attacks virtually destroyed much of the paddy crop. In 2020, cyclone Amphan caused much damage, and COVID-19 disrupted input supplies and markets. Survey data shows that between 2017 and 2019, the area grown has declined significantly for aman, mung bean and a number of other crops, and there was a small decline in the area of boro. From follow-on surveys, we established that 2019 was a poor year for crop production, and did not provide a good basis for assessing gains attributable to BGP over the two year period since 2017 (when the Phase II baseline survey was carried out). For this reason, crop data on aman 2020 and rabi/boro 2021 was collected during the 2021 WMG Survey, fieldwork for which was carried out from June to August 2021.

B.2 WMG Surveys

In September 2017, the Annual Review Mission recommended that greater attention should be paid to the collection and analysis of data to provide: evidence of economic changes for use by Annual Review Missions; increased knowledge and understanding of beneficiaries' responses to project interventions and adaptations; and quality-assured data for the Dutch Policy and Operations Evaluation Department (IOB) with material to carry out a post-project review of Blue Gold. A series of studies was initiated to document the outcomes and impact of the Blue Gold Program, especially the economic changes and significant income increases within the area of the Blue Gold Program, including the changes in profitability over earlier agricultural choices, and the increase in incomes to the various categories of households (landless, small landowner, large landowner, crop producer, fish producer etc). These studies were:

- 2018 WMG Survey (TR25): fieldwork May 2018 (pilot in 2 polders) and Sep 2018: 266 WMGs in 12 polders;
- 2019 WMG Survey (TR26): fieldwork in Jun/Jul 2019: 510 WMGs in 22 polders plus FGDs with 25 WMGs;
- 2021 WMG Survey (TR29): fieldwork in Jul/Aug 2021: 506 WMGs in 22 polders plus interviews with 1,012 households.

B.3 Final Report Section B¹

Data on the outcomes and impact of the Blue Gold Program used here in Section B are mostly derived from the following surveys:

- **The endline survey 2020;**
- **The WMG survey 2021**, and also using data for comparison from the WMG survey 2019; and
- **The household survey 2021.** This household survey was undertaken as complementary to the WMG survey 2021.

¹ **Advisory Note:** Section B presents the latest available data, mostly collected end 2020 and in 2021. However, other sections of this Final Report (especially Sections D, E and F) were prepared during 2020 and early-2021 using data available at that time. This means that occasionally there may be some discrepancies in values between Sections B and Sections D, E and F.

The COVID-19 pandemic affected all Blue Gold communities as well as creating difficulties for those who conducted the field survey work. Chapter 27 includes a section further elaborating the impact of COVID-19 on the Blue Gold beneficiaries and their livelihoods. The impact of COVID-19 on the endline and WMG surveys is summarised below:

- The COVID-19 pandemic, with measures including lockdowns and transport restrictions, contributed to an unfavourable level of agricultural production and incomes in 2020 .
- In 2020, it was not possible to conduct a WMG survey due to COVID-19, because of travel restrictions.
- The data collection for the endline survey of 2020 had to be postponed by several months (from May to September), which in turn affected the recall by respondents of events in aman 2019 and rabi 2020.
- Outcomes of the endline survey in 2020 - and to a lesser degree the WMG survey in 2021 - are likely to be affected to some extent by the impact of COVID-19, for example, because COVID-19 restrictions led to reduced off-farm prices.

B.4 Outcomes and Impact from Participatory Water Management (see Chapter 5)

Improved water management has reduced losses from poor drainage, salinity and lack of irrigation. WMGs continued to report a reduction in water-related constraints to crop production, with 69% of the WMGs saying the situation is now good or very good, compared with only 13% in the pre-project situation and 56% in the 2019 WMG survey. Overall, 79% of WMGs say there has been an improvement in water management conditions, compared with 68% in 2019. However, there are still some problems, and flooding has become a major problem for 20% of WMGs in the kharif-2 season, especially in Patuakhali. Informal interviews found that in many cases BGP had not met all of their expectations regarding water management. Some khals need still to be excavated and sluice gates fixed.

Coastal communities are now more organized and have taken responsibilities for the sustainability of the improvements in water management. The most widely reported improvement in infrastructure was re-excavation, de-silting of khals, cleaning of khal, sluice repairs, new/repared culverts, better sluice operation and repaired embankments. Most of these works were undertaken by BWDB-BGP with WMG support, with WMG themselves mainly being responsible for khal cleaning and better sluice operation. Local Government Institutions had an important role in culvert improvements together with WMGs. WMGs reported that sluice gates are now under the control of WMGs or catchment committees (made up of WMGs); but it is apparent from FGDs that, in some locations, control is, at best, partial, and sluices may not always be operated in the best interests of farmers. In addition, drainage khals may be leased to, or otherwise occupied, by influential individuals who can obstruct their use for drainage. There are also worries that WMG control of infrastructure will not continue after the end of BGP.

BGP had a strong focus on institutional development of coastal communities. In two-thirds (67%) of households someone is member of at least one type of community organization. In 54% of the sample households someone is member of a WMG, compared to 21% in 2017. BGP delivered its field activities via WMGs, inspiring community / WMG members to attend different types trainings and to adopt new technologies. Most (63%) of sample households reported that members of their households have attended BGP Farmer Field Schools (FFS) organised by DAE and by the Technical Assistance (TA) Team. A similar proportion reported attending Blue Gold Farmer Field Days, while over one third (38%) have attended other BGP training. In between 77% and 93% of the households from which someone attended training at least something from what they learned had been adopted.

B.5 Outcomes and Impact from Agricultural Development (see Chapter 6)

Since the start of BGP there have been significant changes in land use and cropping. Fish ghers now make up 60% of the cultivable land in Khulna and 70% in Satkhira. In Satkhira the area under ghers has more than doubled since the start of BGP. There are three main categories of land use in the BGP area – paddy, non-rice crops and fish produced in ghers. Farmers' preferences for these land uses have changed over the BGP period.

The 2018 WMG survey found that small farmers preferred to grow rice rather than fish, as they got food for their families and straw to feed animals. At that time paddy prices were high and there was little difference in the profitability of paddy versus fish/shrimp. In 2019 the situation had changed, with paddy prices falling and fish becoming more profitable than paddy. The areas of fish ghers in Khulna and, especially, in Satkhira, had increased substantially, with a smaller increase in the area under crops. The 2021 WMG survey found further increases in the areas under fish ghers and non-rice crops, with the area under paddy stabilising. However, discussions with farmers suggest that the economic pendulum has swung back in favour of paddy and non-rice crops – especially high value crops such as watermelon and vegetables. Crop budgets suggest these two crops now contribute more to net farm income than fish ghers.

Of the total area of all crops, paddy accounts for 45%, fish ghers 29% and non-rice crops 26%. Overall, the area of paddy has increased by 10%, with the area under both fish ghers and non-rice crops increasing by around 50%. There has been a switch from local to more productive high yielding varieties of paddy. At the start of BGP over half of paddy was local varieties, now HYVs and hybrids account for 79% of the area under paddy.

The area under fish ghers has more than doubled in Satkhira, while non-rice crops have increased by 62% in Patuakhali, largely driven by growth in mung bean which has replaced keshari (a local pulse crop) as the main non-rice crop. There has been a modest (25%) expansion of non-rice crops in Khulna, with high value vegetables and watermelon replacing sesame and other non-irrigated crops, which have become vulnerable to increasingly unreliable weather conditions.

Overall cropping intensity has increased by 55 percentage points, from 186% to 241%, with a larger increase in Satkhira of 99 percentage points - largely due to expansion of fish ghers. Increases in cropping intensity was reported for all polders apart from polder 28/2 (being absorbed into Khulna city) and for 89% of the WMGs. There has been an increase of 13 percentage points since the 2019 WMG survey, when overall cropping intensity was 228%, with increases in Khulna and Satkhira, but little change for Patuakhali. On average WMGs with lower Water Management Problem Scores have a higher cropping intensity.

The WMGs reported that yields have increased for almost all crops compared with the pre-BGP situation – typically by around 30% but doubling for paddy where HYVs have replaced local varieties. Yields are also higher for most crops compared with those reported in 2019 – especially for mung bean which had depressed yields in 2019. Calculations based on crop budgets and cropping patterns show that total labour used in agriculture has increased by almost 50%, with the number of women hired more than doubling.

The incomes from crops and fish ghers have been calculated using crop budgets and WMG data on crop areas. These incomes have more than doubled over the BGP period. Calculated total income in the WMG survey 2021 is 19% less than that reported in household interviews 2021 for crops, field vegetables and fish ghers, suggesting that the calculation is not an overestimate.

An economic analysis of the investment in BGP has been carried out in order to calculate the economic internal rate of return. As in preceding calculation of the payback period, this analysis is limited to the impact of BGP interventions in water management and agricultural extension on crop production and

aquaculture in gher. The analysis has adjusted input and output prices to reflect their real value to the economy. The analysis uses the same data that was collected for the 2021 WMG survey. The analysis covers project costs and benefits over a 30 year period, with investment expenditure on BGP taking place over the first eight of these years (2013-14 to 2020-21).

EIRR calculations assume that only a proportion of the improvement in cropping patterns and crop yields reported in the WMG survey can be attributed to BGP. Interviews for 2021 WMG survey mostly attributed between 40% and 60% of the increase in farm income to BGP interventions. The base case for EIRR calculations assumed that 25% of the increase in net farm income can be attributed to BG interventions. This results in an EIRR of 42%.

The EIRR has also been calculated with smaller proportions of the increase in farm income attributed to BGP. This shows that EIRR remains at an acceptable 15% even if only 10% of the increase in farm income is attributed to BGP. The effect of BGP benefits not being sustained has also been examined. If net benefits were to cease in 2023-24, two years after completion, then the EIRR would be reduced from 42% to 38% in the base case but would still be an acceptable 15% if only 15% of the increase in farm income were attributed to BGP.

B.6 Inclusive Development Approach: Outcomes and Impacts from Homestead Based Production (see Chapter 7)

For around 30% of the polder households that do not have the necessary access to land or family labour to get benefit from the interventions for crop agriculture, a more inclusive Farmer Field School (FFS) program on homestead production was implemented to improve their food security, nutrition, and their overall living standard. From 2013 to 2021 thirteen cycles of 1,178 FFS were implemented for 25 farmers each. In total 1,758 modules were facilitated covering homestead gardening (vegetable and fruit), poultry rearing, pond aquaculture and beef fattening. Overall, 87.6% participant were women.

Most (around 80% or more) of the surveyed households grow homestead vegetables, have fruit trees and keep poultry. Around two-thirds have cattle and one-third goats. These provide food for the household and produce for sale – with around two-thirds of all households selling eggs and poultry; one third selling cattle, one quarter fruit, vegetables and also milk, and 16% selling goats. Overall, there has been a slight increase in the number of households involved in vegetables, fruit and poultry, and a somewhat larger increase in numbers with goats and cattle. Households now especially keep larger numbers of poultry. Overall, 44% of all households have fishponds. The proportion of pond owners has remained more or less stable and about 40% of pond fish is retained for home consumption. This increase in homestead production has been encouraged by training and support from BGP. Although most households report generating income from homestead-based production, the relatively small amounts they earn mean that these are not very important income sources. However, homestead production is an important source to fulfil the nutritional needs of the households, increasing household resilience.

The main problems in the production of crops, poultry, livestock and fish reported by the sampled households relate to pests and diseases. This applies to crops, vegetables, poultry, fish and livestock. Water and weather-related problems are also significant for paddy and other crops. In discussing problems, the FGDs in the 2019 WMG survey were dominated by economic issues, such as the falling prices of farm products (especially paddy) and the increasing cost of labour and farm inputs. This had changed in 2021, although some of the 2021 FGDs reported that they were not getting fair prices for their crops and that markets could be manipulated by middlemen. Input supply sometimes also was an issue. But farmers in 2021 were much more positive about paddy production, and less enthusiastic about expanding fish gher.

B.7 The Outcomes and Impact on the Livelihood of Women (see Chapter 8)

BGP ensured that women fully participated in development activities, and women are now undertaking an increased amount of income generating work around the homestead and on their farms. Women are also working more often now outside their home – particularly in wage labour and in other income generating activities. However, most women still see themselves primarily as housewives, and domestic tasks still occupy most of their time, even though their time spent on productive work increased considerably.

Earning an income helps women to take a larger role in household decision-making, women are now more mobile outside of their homes, and they participate more in community events and community organizations. Their social status has improved. But at the same time the workload of women has increased as they are taking on more productive work in addition to their domestic tasks.

B.8 The Overall Outcomes and Impact on the Livelihood of the Coastal Communities (see Chapter 9)

The livelihoods of the coastal communities of BGP areas has improved significantly. Almost all households own homestead land; very few households in the landless category own any other type of land, while only two-thirds of marginal farm households own cultivated land and 41% have ponds. The proportion of these households owning land has increased very slightly since the start of BGP. The average area owned for all households 133 decimals (0.54 ha). Although land ownership is highly skewed, more households than before, particularly those owning little land, now lease in land, and this means that many landless and marginal households are able to cultivate crops and fish. Increases in leasing of land means that agriculture provides opportunities for poor households. Agriculture remains an appropriate strategy for poverty reduction.

Data shows that 60% of the average total household income comes from agriculture-related sources and 40% from non-agricultural sources. For all land-owning categories, the largest single source of agricultural income is crops, including field vegetables, which contributes 26%. For landless households the combined earnings from farm and non-farm labour are the major sources of income. These households also generate significant income from crops, but wage labour generates considerably more income. Wage labour is also important for marginal land owning households. Income from agriculture in the WMG survey 2021 is double than the income measured by the 2020 endline survey, as farming had recovered from the natural disasters and economic problems in 2019 and 2020, and as further BGP water infrastructure works have been completed. Not only does agriculture generate a large share of income for all land-owning categories, developing agriculture generates opportunities for all income groups – either as producers or through the provision of labour and other services.

Ownership of household assets like agricultural equipment, radio/TV and bicycles/motorbikes is correlated with land ownership, with the number of owners increasing as land ownership rises. Virtually all households own mobile phones, but relatively few own motor vehicles or non-motorised vehicles (such as rickshaws). Ownership of both these types of vehicles is inversely correlated to land ownership, with a higher proportion of households with less land owning these assets. This may be because households who have little land have transport businesses that use these vehicles. Compared to the 2017 baseline survey, there has been a considerable increase in the numbers of households owning agricultural equipment (up from 13% to 70%).

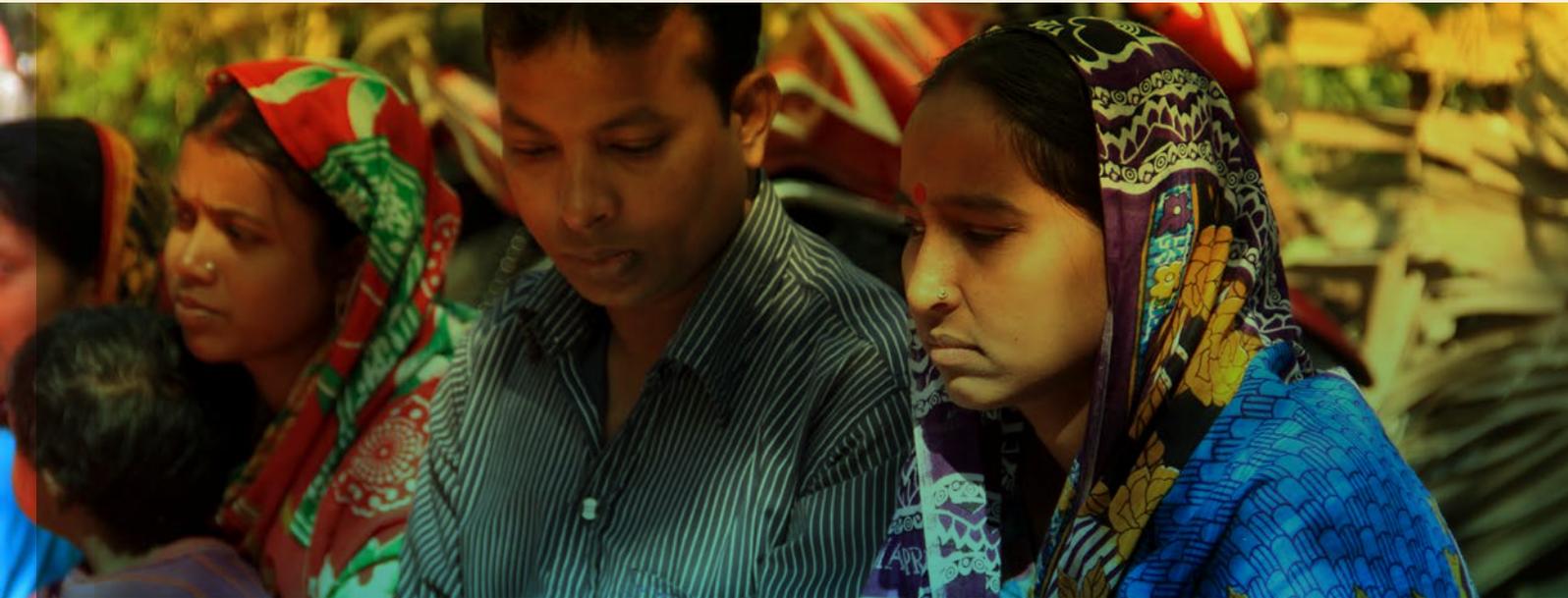
Housing is a useful indicator of well-being. Households that own more land have larger, more valuable houses, constructed with better quality materials. Compared with the 2017 baseline survey, the average number of rooms per house has increased from 2.2 to 2.6 and the average value of a house has more than doubled – from Tk74,694 to Tk155,916. More houses now have brick/concrete walls and roofs, and fewer

use grass, bamboo etc. The number of households obtaining domestic water from tubewells has increased from 88% to 94%, and in total 99% of households now get water from sources which should be safe. Almost all (96%) of the households have sanitary toilet facilities. Most households (88%) report washing their hands with soap before meals and after using toilet, compared with only 36% in the 2017 baseline survey; the hygiene campaigns during the COVID-19 pandemic is likely to have contributed to this.

In the 2020 endline survey, a small proportion of households (8.2%) reported food shortages in terms of not being able to have at least two meals per day at some point in the last 12 months. The shortages were highly correlated to land ownership, with over 20% of the landless households reporting shortages. The proportion of households reporting food shortages in the 2017 baseline survey was slightly lower (7.2%). This slightly higher percentage in 2020 may be linked to the poor rice crop in 2019 and, to a lesser extent, in 2020.

Cropping intensity increased significantly over the years of BGP and crop production, in terms of yields per hectare, was very good again in the year 2021. Income from agriculture in 2021 was double the income achieved in 2020; hence it is likely that the extent of food insecurity, reported by some of the households in 2019 and 2020, was reduced in 2021.

Overall, the increased agricultural and fish production as well as homestead-based production have enhanced food security and fulfilled nutritional needs. The high value and other rabi crops, along with fish provide cash incomes for households. Increased crop and homestead-based production also increased employment opportunities, especially for women. Improved agriculture not only increased agricultural production and employment, but also improved the well-being of the entire family. Rural households are investing towards improved quality of life, like better housing and other amenities, and better futures such as investing in new agricultural and non-agricultural endeavours and in their children's education.



05 Outcomes and Impact from Participatory Water Management

The chapter includes the outcomes and impact of improved water management and institutional development, mostly derived from the Blue Gold WMG survey of 2021, complemented with some findings from the endline survey of 2020.¹ This chapter explores the extent to which the management of water resources has been improved, including the reduction of water-related constraints to crop production in different seasons. This chapter also reports on how coastal communities are engaged in and control local water management, on their membership of community organizations, their participation in training programmes and the rate of adoption of new technologies for agricultural and homestead-based production.

5.1 Increased resilience against climatic variability: outcomes and impact of rehabilitation work on water management

One of the central objectives of the Blue Gold Program (BGP) was to create an enabling environment for the coastal communities for economic development through the improvement of water resources management at the local level, especially to remove water-related constraints to crop production. BGP has especially funded repairs to sluice gates, re-sectioning and repairs of embankments and re-excavation of drainage khals within the 22 BGP polders, with the objective of draining excess water, preventing flooding, while improving access to water for irrigation. At the time of the surveys in 2021, these works were about 90% complete. Apart from these works, water management groups (WMGs) have undertaken minor works using their own labour, while some other agencies, such as Local Government Institutions, have also supported water management improvements benefiting the BGP polders.

Many WMGs reported that they started getting benefits from BGP in 2013 or 2014. For other WMGs, the year of getting benefit is within 2015-2017. These dates precede the completion (or even start) of many water management infrastructure-related interventions by BGP. But even when the infrastructural works

1 Section B Introduction and Summary provides an overview of the studies conducted through the Blue Gold Program, and the studies and reports which were the main sources of information for Section B.

were not yet effective, WMGs may have seen benefits from their own water management initiatives, from Farmer Field Schools and from other interventions related to agricultural production or marketing.

Table 5.1: Severity of water management problems

| | | Pre-project situation (2013-14) | | | | | Current situation (2020-21) | | | | |
|---------------|------------|---------------------------------|-----|-----|-----|-----|-----------------------------|-----|-----|-----|----|
| | | 1 | 2 | 3 | 4 | 5 | 1 | 2 | 3 | 4 | 5 |
| Season | Rabi | 2% | 9% | 25% | 49% | 15% | 17% | 66% | 16% | 2% | 0% |
| | Kharif-2 | 1% | 14% | 37% | 36% | 12% | 22% | 59% | 15% | 3% | 1% |
| | Kharif-1 | 4% | 7% | 26% | 45% | 18% | 7% | 39% | 40% | 10% | 4% |
| | Total | 3% | 10% | 29% | 44% | 15% | 15% | 54% | 24% | 5% | 2% |
| Zone | Khulna | 2% | 12% | 29% | 42% | 14% | 12% | 52% | 27% | 7% | 2% |
| | Satkhira | 8% | 21% | 19% | 30% | 21% | 18% | 45% | 27% | 9% | 2% |
| | Patuakhali | 1% | 2% | 33% | 51% | 13% | 19% | 60% | 18% | 2% | 1% |
| | Total | 3% | 10% | 29% | 44% | 15% | 15% | 54% | 24% | 5% | 2% |

Score: 1 = very good, 2=good (i.e. no problem), 3=average, 4=bad, 5=very bad. Percentage of WMG reports for each season
Source: WMG survey 2021

Table 5.1 shows the improvement of water management through the severity of water management problems (ranked 1 to 5) for each season and each zone. The 2021 WMG endline survey showed that problems have been reduced compared with the pre-project situation. In the reporting per agricultural season, 69% of the WMGs found that the water management situation became good or very good (score of 1 or 2) compared with only 13% in the pre-project situation and with 56% in the 2019 WMG survey (Technical Report 26). The extent of completion of BGP infrastructural works will have contributed to these improvements over time; at the time of the 2019 WMG survey only 53% of these works were complete, whereas at the time of the 2021 WMG survey 90% had been completed.

The improvement has been the greatest in Patuakhali where only 3% of the WMGs rated their water management situation as good or very good before BGP, but now 79% are at this level. In Khulna 14% of WMGs reported their water management situation being good or very good before, compared with 64% now. Satkhira (the single Polder 2&2E) registered the lowest improvement, having had a relatively better position prior to BGP (29% good or very good) and now having 63% of the WMGs in these categories.

Overall, 79% of the WMGs reported that there was a reduction in the seasonal water management problems (Table 5.2), as compared with 68% in the WMG survey of 2019. There is a higher proportion of positive reporting for the rabi season (87%) and a lower proportion for the kharif-1 season (70%). A higher proportion of seasonal reporting from Patuakhali shows an improvement (84%), compared with only 65% from Satkhira. Compared with 2019, there has been a large improvement in Khulna: in 2019 57% of the WMGs reported improvements in the seasonal water management problems, compared with 75% in 2021. Improvements in Satkhira were relatively the smallest, with 65% of the WMGs reporting reduction in water management problems.

Table 5.2: Change in severity of seasonal water management problems

| | | Change in seasonal water management score | | | | | | | | % of WMGs improving |
|---------------|------------|---|----|----|-----|-----|-----|-----|----|---------------------|
| | | -3 | -2 | -1 | 0 | 1 | 2 | 3 | 4 | |
| Season | Rabi | 0% | 0% | 1% | 12% | 28% | 41% | 18% | 1% | 87% |
| | Kharif-2 | 0% | 0% | 1% | 17% | 34% | 34% | 11% | 2% | 82% |
| | Kharif-1 | 0% | 2% | 5% | 23% | 35% | 28% | 7% | 0% | 70% |
| | Total | 0% | 1% | 2% | 17% | 32% | 34% | 12% | 1% | 79% |
| Zone | Khulna | 0% | 0% | 3% | 22% | 34% | 32% | 8% | 0% | 75% |
| | Satkhira | 1% | 4% | 6% | 25% | 26% | 28% | 10% | 2% | 65% |
| | Patuakhali | 0% | 0% | 1% | 8% | 32% | 40% | 17% | 1% | 91% |
| | Total | 0% | 1% | 3% | 17% | 32% | 34% | 12% | 1% | 79% |

Source: WMG survey 2021

The average WMG water management problem scores are presented in Table 5.3 by season and zone. This shows that there has been a greater improvement in water management (i.e. reduction in the water management problem score) in the rabi season, followed by kharif-2, with the least improvement in kharif-1. Improvements in Satkhira were less than in the other two zones, with only a small improvement in the problem score since 2019. The overall average improvement is 1.35 (i.e. reduction in the problem score system of 1 – 5), compared with 1.06 in the 2019 survey.

Improvements in water management reported by WMGs were confirmed in the Focus Group Discussions (FGDs) held as part of the WMG survey 2021. Out of 23 FGDs covering all 22 polders, only in one FGD (in polder 28/1 in Khulna) the participants reported that there was no significant change in water management. This is also the polder (together with polder 28/2) in which BGP had the least impact in terms of increased cropping intensity and farm income. The 22 other FGDs reported that the BGP's interventions resulted in significant improvements in water management.

Table 5.3: Average WMG seasonal Water Management Problem Scores

| | | 2021 WMG survey | | | 2019 survey |
|---------------|------------|-----------------|---------|--------|-------------|
| | | 2013-14 | 2020-21 | Change | Now |
| Season | Rabi | 3.66 | 2.02 | 1.65 | 2.45 |
| | Kharif-2 | 3.44 | 2.02 | 1.42 | 2.34 |
| | Kharif-1 | 3.65 | 2.64 | 1.01 | 2.79 |
| Zone | Khulna | 3.54 | 2.33 | 1.21 | 2.71 |
| | Satkhira | 3.32 | 2.33 | 0.99 | 2.29 |
| | Patuakhali | 3.74 | 2.05 | 1.68 | 2.33 |
| Total | All WMG | 3.58 | 2.23 | 1.35 | 2.53 |

Score: 1 = very good, 2=good (i.e. no problem), 3=average, 4=bad, 5=very bad. Source: WMG survey 2021

The WMG survey 2021 also gathered information on the type of constraints (waterlogging, flooding, water shortage and salinity) per agricultural season and on the overall severity of water problems (very good, good, average, bad, very bad). Table 5.4 shows the proportion of WMGs reporting the principal water management problem per season and per zone, before BGP and in 2021.

Table 5.4: Principal water management problems as reported by WMGs per season and zone

| Main problem | | rabi | kharif-2 | kharif-1 | Khulna | Satkhira | Patuakhali | All |
|--|----------------|------|----------|----------|--------|----------|------------|-----|
| Before 2013-14 | Waterlogging | 0% | 87% | 79% | 54% | 55% | 58% | 56% |
| | Flooding | 0% | 3% | 1% | 1% | 1% | 2% | 1% |
| | Water scarcity | 86% | 6% | 0% | 31% | 30% | 31% | 31% |
| | Salinity | 12% | 3% | 9% | 8% | 6% | 8% | 8% |
| Now 2020-21 | Waterlogging | 0% | 73% | 76% | 54% | 62% | 40% | 50% |
| | Flooding | 0% | 20% | 1% | 1% | 1% | 18% | 7% |
| | Water scarcity | 89% | 1% | 0% | 32% | 24% | 29% | 30% |
| | Salinity | 5% | 1% | 4% | 3% | 1% | 4% | 3% |
| Percentage of WMG reporting in each season. The percentages for zones are the average number of WMG reporting for each of three seasons. As some WMG did not report a main problem in all seasons, the totals in each column may not add up 100%. Source: WMG survey 2021 | | | | | | | | |

Data on the main type of water-related problem in Table 5.4 shows that, both prior to BGP and in 2021, water scarcity (for irrigation purposes) is, as would be expected, the main problem for farmers in the rabi (boro) season. Waterlogging remains the main problem in kharif-1 (aus) and kharif-2 (aman) seasons. The proportion of WMGs reporting on salinity as a main problem in the rabi season declined. There has also been a decline in the percentage of WMGs reporting waterlogging as their main problem in kharif-1 and kharif-2, whereas flooding became the major problem for 20% of WMGs in kharif-2 – and mainly in Patuakhali. Salinity was the major problem in kharif-1 and kharif-2 for only a small number of WMGs, and this problem has declined.

For the three BGP zones, taking the average for the three agricultural seasons, waterlogging was the major issue for over half of all WMGs in all three zones, with water scarcity the main issue for around 30% of WMGs. An increased number of WMGs in Satkhira report that waterlogging is now their major problem, with fewer reporting water scarcity. In Patuakhali, fewer WMGs say waterlogging is the major problem, but more report flooding. There has been little change in Khulna. Compared to the 2019 WMG survey, more WMGs now report waterlogging the major problem, but fewer report water scarcity problems.

Apart from the principal problems, also other water management problems were reported, which are shown in Table 5.5. In the rabi season salinity was, and still is, the main other problem. But this salinity problem seems to have now largely been eliminated in some polders: 31P in Khulna and 47/4 in Patuakhali, but remains a significant issue in polder 47/3 in Patuakhali. In the Patuakhali zone, water scarcity is still an issue in some polders, and seems to have become more widespread, although possibly this problem is more felt now because more farmers now want to grow irrigated crops.

Table 5.5: Other water management problems

| Main problem | | rabi | kharif-2 | kharif-1 | Khulna | Satkhira | Patuakhali | All |
|---|----------------|------|----------|----------|--------|----------|------------|-----|
| Before 2013-14 | Waterlogging | 0% | 0% | 0% | 0% | 0% | 0% | 0% |
| | Flooding | 0% | 2% | 7% | 4% | 1% | 2% | 3% |
| | Water scarcity | 0% | 9% | 2% | 1% | 3% | 7% | 4% |
| | Salinity | 8% | 3% | 0% | 4% | 0% | 5% | 4% |
| Now 2020-21 | Waterlogging | 0% | 0% | 0% | 0% | 0% | 0% | 0% |
| | Flooding | 0% | 2% | 6% | 3% | 2% | 2% | 3% |
| | Water scarcity | 0% | 14% | 1% | 1% | 3% | 12% | 5% |
| | Salinity | 4% | 1% | 0% | 2% | 1% | 1% | 2% |
| | Other | 8% | 0% | 5% | 6% | 1% | 3% | 4% |
| Percentage of WMG reporting. The percentages for zones are the average number reports for each of three seasons. As many WMG did not report other problems in all seasons (but some WMG reported multiple other problems), the totals in each row do not add up 100%. Source: WMG survey 2021 | | | | | | | | |

The FGDs held in the context of the 2021 WMG survey showed that in Khulna BGP had been able to meet between 25% and 100% of the WMGs expectations regarding improved water management infrastructure. In Patuakhali this ranged from 60% to 90%, and in Satkhira from 80% to 85%. The remaining problems include some khals not being excavated and further work needed on some sluice gates and culverts, whereas also significant areas of land remain waterlogged. In some locations proper drainage is impeded by siltation and rising bed levels in the rivers outside the polder. There are also some problems in situations where land levels within a WMG command area vary, so those with high land may want water for irrigation at the same time as those with low land need water to be drained out. In addition, fish ghers can obstruct the drainage of crop land.

5.2 Organised coastal communities: outcomes and impact of institutional development

5.2.1. The role of communities in improving water management infrastructure

Section D (*chapters 14 – 20*) of this BGP's lessons learnt report focuses on Participatory Water Management and elaborates how BGP organised coastal communities for participating in water management for development. The WMG survey 2019 reviewed the roles of WMGs and WMAs in better water management in the BGP areas. Detailed information on the participation of the communities in water management was collected by this 2019 WMG survey.

According to the 2019 WMG survey, the most widely reported improvement in water management infrastructure was re-excavation and de-silting of khals. A significant percentage of WMGs (30-50%) also reported khal cleaning, sluice repairs, new or repaired culverts, better sluice operation and repaired embankments (*Table 5.6*). Digging out the responsible organisations behind the improvements illustrates the roles of the WMGs in improved water management.

Table 5.6: Organisations responsible for infrastructure development

| | Main responsible organisation | Khal excavation | Khal cleaning | Culvert | Sluice works | Sluice operation | Embankment |
|---|-------------------------------|-----------------|---------------|---------|--------------|------------------|------------|
| 1 | WMG with own resources | 4.5% | 60.6% | 6.9% | 7.0% | 66.4% | 10.8% |
| 2 | BWDB-BGP with WMG support | 73.1% | 0.0% | 5.6% | 36.8% | 15.0% | 12.2% |
| 3 | BWDB-BGP without WMG support | 11.9% | 12.6% | 16.7% | 40.4% | 1.9% | 56.8% |
| 4 | BWDB with no BGP involvement | 1.4% | 0.0% | 2.8% | 1.8% | 0.0% | 2.7% |
| 5 | BADC | 3.7% | 0.0% | 11.1% | 3.5% | 0.0% | 0.0% |
| 6 | Local government | 3.4% | 5.5% | 54.2% | 8.8% | 0.0% | 14.9% |
| 7 | Farmers by themselves | 1.7% | 21.3% | 0.0% | 1.8% | 16.8% | 2.7% |
| 8 | Other (LGED, ADB, NGO) | 0.3% | 0.0% | 2.8% | 0.0% | 0.0% | 0.0% |
| | | 100.0% | 100.0% | 100.0% | 100.0% | 100.0% | 100.0% |

Source: WMG survey 2019

Most of these works and tasks were undertaken by BWDB-BGP with WMG support, with the WMGs themselves mainly being responsible for khal cleaning and better sluice operation. Khal re-excavation (including de-silting) was the main type of work reported and was largely done using BGP resources, usually with support from the WMG. Khal cleaning (removal of weeds, cross-dams etc) was mostly done by the WMGs with their own resources (i.e. voluntary labour) and/or by groups of farmers. The same is true for the improved operation of sluices. This is an outcome of BGP's work in establishing

and strengthening the WMGs. The construction and repair of culverts was primarily done by Local Government Institutions (i.e. Union Parishads), as culverts usually cross roads which are a government responsibility. WMGs tend to communicate with these LGIs to inform them on the need to construct or repair such works; WMGs subsequently help to implement the works, with -partial- funding of the LGIs. Where BGP funded work on culverts, this was usually channelled via Union Parishads and with WMGs having an active role in identifying the need for such works as well as in the implementation. The same is also true for other agencies such as BADC, LGED (responsible for water management schemes of up to 1,000 ha), ADB (may be funding LGED schemes) and NGOs occasionally funding water infrastructure. Qualitative interviews also mentioned DANIDA in this context.

5.2.2. Water management by communities

Having control over the operation of sluices is significantly related to improved water management as well as to the institutional development of the WMGs. The 2021 WMG survey found that there has been a total change, with all WMGs reporting that the sluices that drain their land are controlled by their WMG, another WMG or by a group of WMGs (Table 5.7). The 2019 WMG survey results reported a much lower level of sluice control by WMGs, whereafter BGP staff paid special attention to supporting WMGs in taking control of sluices and most 2021 FGDs confirmed that most sluices were now under the control of WMGs or catchment committees involving a number of WMGs. Still, one out of 10 FGDs in Patuakhali, three out of 11 in Khulna and both of the two FGDs in Satkhira reported that sluices were not fully under the control of WMGs. Furthermore, even if sluice gates are under the control of WMGs, another five FGDs in Khulna said that at least some of the drainage khals were under the control of others, including where khals had been leased out to influential individuals, usually for fish production.

In these cases, WMGs are not likely to control the sluices at all times according to the community needs. There are some conflicts. The khals are leased out by the Upazila administration, not by the BWDB, and there is a lack of coordination among the Upazila administration and BWDB. In some cases, WMGs solved the problem (not leasing out the khal anymore) by submitting an application to the Upazila administration to undo the leasing-out. Some FGDs expressed their fear that WMGs may lose control of water management infrastructure in the future.

Table 5.7: Control of sluices

| Sluice control by | Khulna | Satkhira | Patuakhali | Total |
|--|--------|----------|------------|-------|
| WMG interviewed | 47% | 44% | 86% | 60% |
| Another WMG | 20% | 36% | 11% | 19% |
| Group of WMGs | 33% | 11% | 3% | 21% |
| Total | 100% | 100% | 100% | 100% |
| Percentage of WMGs reporting (n=506) Source: WMG survey 2021 | | | | |

5.2.3. Membership in community organizations

Coastal communities are actively engaged in community organizations including the water management organization (Table 5.8). According to endline survey 2020, overall, two-thirds (67%) of households reported being members of at least one type of community institution. BGP has a strong focus on community participation in water management and has supported WMGs over the entire area in which it operates. However, membership of a WMG is voluntary and, just over half (54%) of sample households were WMG members.² This is more than any other type of community institution. The next most frequently reported type of community institution was NGO groups, with membership being reported

2 The 2019 WMG survey covered virtually the entire BGP area and recorded that 61% of households were WMG members.

by almost one third (32%) of households. NGO groups are largely concerned with micro-finance services and other economic and social development schemes. Farmer group membership is reported by 17% of households. These groups may be set up by DAE as a channel for agricultural extension services. Other groups were reported by 7% of households and may be linked to other government agencies for the delivery of their services. Local samities tend to be informal savings and loan associations.

Table 5.8: Membership of community organizations

| Zone | Membership community organisations | Type of community organisation | | | | | | |
|--|------------------------------------|--------------------------------|--------------|-----------|-------------|-------------|--------------|--------------------|
| | | WMG | Farmer Group | NGO group | Other group | Cooperative | Local samity | Other organisation |
| Khulna | 68% | 55% | 13% | 28% | 7% | 11% | 11% | 1% |
| Satkhira | 72% | 66% | 13% | 35% | 9% | 5% | 3% | 1% |
| Patuakhali | 64% | 45% | 24% | 33% | 5% | 7% | 7% | 1% |
| WMG membership | | | | | | | | |
| Member | 100% | 100% | 30% | 38% | 9% | 11% | 9% | 1% |
| Non-member | 29% | 0% | 1% | 24% | 4% | 5% | 6% | 1% |
| Land ownership | | | | | | | | |
| landless | 64% | 52% | 10% | 33% | 8% | 7% | 5% | 0% |
| marginal | 68% | 53% | 15% | 36% | 7% | 7% | 7% | 1% |
| small | 67% | 54% | 21% | 30% | 6% | 10% | 10% | 1% |
| medium | 71% | 64% | 24% | 18% | 6% | 10% | 11% | 3% |
| large | 69% | 60% | 23% | 12% | 0% | 6% | 6% | 2% |
| Total | 67% | 54% | 17% | 32% | 7% | 8% | 8% | 1% |
| Source: End-line survey 2020 (n = 3156 households) | | | | | | | | |

More households in Satkhira report being members of WMGs than in the other two zones. Although a slightly higher proportion of medium and large landowners are WMG members, membership includes at least 50% of the households in all landowning categories. It is worth noting that WMG members are more likely to also be member of all types of groups – underlining that these households are more engaged in agriculture and/or more motivated to join community organisations. WMG membership has more than doubled since the 2017 baseline survey, which recorded 21% of households as WMG members. It is also now more evenly distributed – in 2017 there were no, or almost no, WMG members in three of the seven polders covered.

5.2.4. Training and adaptation of new technologies

The following training was provided to community members in the BGP areas:

- BGP FFS run by DAE covering crop production, homestead vegetables and family nutrition
- BGP FFS run by the Blue Gold TA team covering homestead vegetables, poultry, livestock, pond aquaculture, market orientation and family nutrition
- Other trainings from BGP, which covered the maintenance of water infrastructures, community organization development, partnership with LGIs and other line departments, gender, etc.
- BGP Farmer Field Days showing the results of successful demonstrations and pilots
- Other (non-BGP) training programmes of the government – primarily provided by DAE, but other departments were also involved
- NGO training programmes

Data from the household survey 2021 show the proportion of households where members attended each of these different training events (*Table 5.9*). Most (63%) of sample households reported that members of their households attended Farmer Field Schools (FFS) organised under BGP by DAE and by the Technical Assistance (TA) Team.

Table 5.9: Household members attending training

| Land ownership | Household member attended: (percent of all households) | | | | | |
|----------------|--|--------|-----------|-----------|------|-----|
| | FFS-DAE | FFS-TA | Other BGP | Field day | Govt | NGO |
| landless | 47% | 52% | 22% | 49% | 14% | 27% |
| marginal | 64% | 62% | 39% | 63% | 21% | 30% |
| Small | 67% | 70% | 43% | 69% | 29% | 35% |
| medium | 79% | 71% | 54% | 76% | 35% | 38% |
| Large | 73% | 69% | 50% | 68% | 39% | 38% |
| Total | 63% | 63% | 38% | 63% | 23% | 32% |
| Khulna | 62% | 61% | 36% | 74% | 25% | 43% |
| Satkhira | 53% | 57% | 29% | 60% | 16% | 33% |
| Patuakhali | 69% | 71% | 46% | 53% | 25% | 16% |

* % of all households Source: HH survey 2021

A same proportion of households had at least one member attending BGP Farmer Field Days, while over one third (38%) attended other BGP training.³ Relatively more BGP FFS and other training took place in Patuakhali and least in Satkhira; but fewer households reported attending Farmer Field Days in Patuakhali. Compared with BGP training, training from other government programmes reached fewer households (23%), whereas NGO training reached 32%. Households owning less land are less likely to have received training from BGP, government and NGOs – possibly because they are less engaged in agriculture.

Table 5.10 shows the adoption of training as found by the household survey of 2021. This table shows that, overall, between 77% and 93% of households attending each type of training say they have adopted at least something from what they learned. This may over-state adoption rates as people attending training tend to exaggerate their adoption rates. Nevertheless, training seems to be successful. Adoption rates for BGP training appear a little lower in Satkhira than in the other two zones. More WMG members than non-members report adoption. There is a slightly lower adoption rate reported by landless households (and, to a lesser extent, by marginal households), suggesting that they may find the content of training less useful, which may be linked to their less agricultural livelihood strategies, their more limited access to land and other resources, and lower capacity to take risks with new ideas.

3 13% of sample households were not WMG members, and so are unlikely to have attended BG training events. This means the percentage of WMG members being reached by BG training will be higher (i.e. 72% attend FFS).

Table 5.10: Adoption of ideas from training

| Zone | Membership community organisations | Percent of households attending each type of training who report some adoption | | | | | |
|------------------------|------------------------------------|--|--------|----------|-----------|------------|-----|
| | | DAE FFS | TA FFS | Other BG | Field day | Other govt | NGO |
| Khulna | 90% | 93% | 86% | 88% | 78% | 78% | 11% |
| Satkhira | 81% | 90% | 84% | 77% | 88% | 82% | 3% |
| Patuakhali | 95% | 94% | 90% | 91% | 82% | 72% | 7% |
| WMG | | | | | | | |
| Member | 90% | 93% | 89% | 87% | 83% | 78% | 9% |
| Non-member | 84% | 92% | 64% | 81% | 75% | 75% | 6% |
| Land ownership | | | | | | | |
| landless | 76% | 87% | 78% | 73% | 57% | 70% | 5% |
| marginal | 87% | 91% | 86% | 85% | 74% | 76% | 7% |
| small | 97% | 95% | 91% | 90% | 88% | 82% | 10% |
| medium | 95% | 97% | 94% | 92% | 96% | 77% | 11% |
| large | 95% | 100% | 100% | 100% | 100% | 75% | 6% |
| Total | 89% | 93% | 88% | 87% | 82% | 77% | 8% |
| Source: HH survey 2021 | | | | | | | |

Informal interviews provided more detailed insights. These include:

(a) Khulna

New technologies that were adopted include: (i) crops: new paddy varieties, new types of vegetables, mustard after aman (some areas), watermelon, line sowing and bed sowing of vegetables; (ii) fish: fish after boro, new types of fish (koi, tilapia, pabda), rice-fish, mixed species fish culture; (iii) livestock/poultry: vaccination, cleaning poultry and cattle sheds, balanced feed, cow rearing and fattening, disease control, Napier grass, hajol for brooding eggs; (iv) homestead vegetables: vegetable beds, homestead and commercial fruit, tomatoes.

(b) Satkhira

New technologies that were adopted include: (i) crops - new types of vegetables including hybrids, new paddy varieties; (ii) fish: - mixed shrimp fish and crab, crabs in cages; (iii) livestock: - new breeds of cattle and chicken, beef fattening, rearing male goats.

(c) Patuakhali

New technologies that were adopted include: (i) crops: - new paddy and mung HYVs, boro paddy, hybrid watermelon, sunflower, maize, potato; (ii) fish: digital fish marketing and high quality fish seed – but not many other new things for fish; (iii) livestock: small scale commercial poultry, knowledge on disease; (iv) homestead vegetables: high quality vegetable seeds, new vegetable varieties, compost and bed system for vegetables, correct use of fertiliser and pesticides.

Overall, it seems that things that appear to be most readily adopted include new types of vegetables and new varieties of vegetables and paddy (and mung bean in Patuakhali). However, there are exceptions – in some places, tomatoes and BR52 paddy were rejected. New breeds of poultry and cattle were also said to be popular, as was cow rearing and beef fattening. Small commercial poultry units are another innovation that is spreading, although without direct support from BGP.

Some new ideas were accepted in some areas but not in others. This includes raised beds for vegetable production and hajol for brooding of hatching eggs. The rabi crops of maize, sunflower and potato were said to be adopted in some places and not in others – although data from the questionnaires shows these crops, as well as mustard, are rarely grown. There were no reports of dragon fruit and mushrooms being adopted.

BGP Farmer Field Schools (by DAE and the TA team) have played a key role providing training and knowledge on new technologies. But respondents also said that they were in contact with staff of DAE, DLS, DoF and NGOs, as well as input dealers and other farmers. Although FFS provide detailed information on a range of topics, it is to be expected that farmers need follow-up advice which is provided by government staff and others who are permanently available. Farmers may well have been first introduced to these staff at FFS.

Barriers to adoption of new technologies include lack of suitable land or ponds. Some new crops or enterprises need inputs that may not be available. Pests and diseases are said to hinder adoption of new technologies in crops, vegetables, fish, livestock and poultry. In a number of instances, respondents said that, even after training, they still lacked the required knowledge. The poorest households with little land and no ponds may find that many crop and fishery technologies are not relevant and they may also lack the required capital and capacity to take risks. Lack of time was cited as an adoption barrier by some respondents, while others said modern machinery was needed to ease labour constraints.



06 Outcomes and Impact from Agricultural Development

Coastal areas have a large number of people, who mainly depend on agriculture and aquaculture for their livelihoods and who are likely to be vulnerable to the climate variability. With a high dependency on natural resources (land and water) as well as exposure to extreme weather events, the people of the coastal region of Bangladesh are particularly vulnerable. The Blue Gold Program (BGP) aimed to improve food security and reduce poverty of coastal households living in the area of selected 22 coastal polders through participatory water management and agricultural development. This chapter explore the changes in agricultural land use, improvement in agricultural production, employment generation in agriculture and economic return of agricultural development.¹

6.1 Changes in crop agricultural production

6.1.1. Changes in agriculture land use

The total size of the cultivable areas of BGP is divided up into the following categories of land: (i) highland; (ii) lowland; (iii) fresh water gher; and (iv) salt water gher. WMGs reported about the total size of their command areas and highland and lowland as defined subjectively by each of the WMGs. Cultivable land that is used as perennial gher or as seasonally gher is both identified as gher. Seasonal gher is used for fish production in one and two seasons (most likely in kharif-1 and kharif-2) as well as used for crops (in boro/rabi), whereas also vegetables may be grown on the banks of ghers.

Data in *Table 6.1* for each zone shows that in both Khulna and Satkhira land (mainly lowland) has been converted into ghers – but much more of this has taken place in Satkhira than Khulna. In Khulna 60% of the land is now gher and in Satkhira 70%. Only a small area of saline gher was reported – almost all in Satkhira, but there is also a very small amount in Khulna in polder 30. There has been a small increase in the area of saline gher. Although people say that land has been converted from saline to fresh water ghers

¹ Section E (chapters 21, 22 and 23) of this Final Report provides more information on Blue Gold's approaches, interventions and results on agricultural development.

(especially in Khulna), this conversion seems to have taken place before the start of BGP. There has been a small fall in the total command area as land has been converted into non-agricultural uses or lost to river erosion.

Table 6.1: Land types

| | | | Khulna | Satkhira | Patuakhali | Total BG |
|-------------------------|------------|---------|---------|----------|------------|----------|
| Share of land area | Highland | 2013-14 | 19% | 17% | 49% | 31% |
| | | 2020-21 | 18% | 15% | 49% | 30% |
| | Lowland | 2013-14 | 26% | 55% | 51% | 39% |
| | | 2020-21 | 22% | 14% | 51% | 32% |
| | Fresh gher | 2013-14 | 55% | 22% | 0% | 29% |
| | | 2020-21 | 60% | 62% | 0% | 37% |
| | Salt gher | 2013-14 | 0.1% | 6.4% | 0% | 0.8% |
| | | 2020-21 | 0.1% | 8.5% | 0% | 1.1% |
| Total | | | 100% | 100% | 100% | 100% |
| Area (acres) | Total area | 2013-14 | 112,208 | 7,450 | 90,377 | 230,035 |
| | | 2020-21 | 111,090 | 27,418 | 90,162 | 228,670 |
| Source: WMG survey 2021 | | | | | | |

6.1.2. Changes in use of different types of land

Changes in land use is illustrated below for the high land, low land, fresh water gher and saline gher. Use of cultivated land has been divided for each season into three categories: (i) paddy; (ii) other crops; and (iii) fish/shrimps.

Highland

Changes in the use of highland are shown in *Table 6.2*. In the rabi season, there has been a modest increase in the area under boro paddy, but this increase largely comes from polders in the Khulna zone. Boro is more widely grown in Satkhira, but its share of land is unchanged, and little is grown in Patuakhali. There has been a more significant increase in non-rice crops with increases in all three zones, especially in Patuakhali.

Overall in the kharif-1 season there has been a modest decline in amount of paddy (aus) and a modest increase in non-rice crops. There is little change in the amount of land being used by crops, which at around one third is much lower than in the rabi or kharif-2 seasons. The potential to increase cropping in the kharif-1 season is constrained by land being still occupied by some rabi crops (especially boro paddy) as well as the uncertain start of the monsoon.

Table 6.2: Use of highland

| | | Khulna | | Satkhira | | Patuakhali | | Total | |
|----------|-------------|---------|---------|----------|---------|------------|---------|---------|---------|
| | | 2013-14 | 2020-21 | 2013-14 | 2020-21 | 2013-14 | 2020-21 | 2013-14 | 2020-21 |
| Rabi | paddy | 36% | 60% | 74% | 80% | 0% | 3% | 24% | 40% |
| | other crops | 18% | 13% | 2% | 3% | 54% | 87% | 33% | 45% |
| | Fish | 10% | 8% | 10% | 17% | 0% | 0% | 7% | 8% |
| | Total | 64% | 81% | 85% | 100% | 54% | 90% | 64% | 93% |
| Kharif-1 | paddy | 2% | 2% | 1% | 6% | 22% | 15% | 10% | 8% |
| | other crops | 10% | 22% | 6% | 8% | 0% | 1% | 6% | 12% |
| | Fish | 32% | 47% | 24% | 68% | 0% | 0% | 19% | 31% |
| | Total | 44% | 70% | 31% | 82% | 22% | 16% | 34% | 50% |
| Kharif-2 | paddy | 50% | 40% | 32% | 22% | 94% | 100% | 65% | 62% |
| | other crops | 8% | 10% | 0% | 3% | 0% | 0% | 4% | 5% |
| | Fish | 32% | 49% | 26% | 66% | 0% | 0% | 19% | 32% |
| | Total | 90% | 99% | 58% | 91% | 94% | 100% | 88% | 98% |
| Total | paddy | 88% | 102% | 108% | 109% | 116% | 118% | 99% | 109% |
| | other crops | 36% | 45% | 8% | 14% | 54% | 88% | 42% | 62% |
| | Fish | 74% | 104% | 59% | 150% | 0% | 0% | 45% | 70% |
| | Total | 198% | 250% | 174% | 273% | 171% | 206% | 186% | 241% |

Percentage of cultivable land Source: WMG survey 2021

In the kharif-2 season most land is occupied by aman paddy. There have been increased areas of aman in all three zones, especially in Satkhira where less was grown before BFP. There have also been increases in non-rice crops in Khulna and Satkhira.

Lowland

In the rabi season there has been an overall small increase in the area of boro paddy – with this mainly coming from the Khulna zone. The area under non-rice crops has doubled, with a very large increase in Patuakhali, where this increase was larger than that in highland – suggesting that improved drainage of low land may have contributed. In Khulna there has been a fall in the area of other crops – in contrast with the increase on highland. It may be that on highland these ‘other crops’ are high value crops such as watermelon and vegetables, while on lowland they are pulses and oilseeds which have been discouraged by changing weather patterns.

In the kharif-1 season most land is still fallow, although there has been a significant increase in non-rice crops in Khulna and in aus paddy in Satkhira. In the kharif-2 season most land is used for aman, and there has been an increase in the area of this crop, especially in Satkhira- although here most lowland is now converted into gher.

Table 6.3: Use of lowland

| | | Khulna | | Satkhira | | Patuakhali | | Total | |
|----------|-------------|---------|---------|----------|---------|------------|---------|---------|---------|
| | | 2013-14 | 2020-21 | 2013-14 | 2020-21 | 2013-14 | 2020-21 | 2013-14 | 2020-21 |
| Rabi | paddy | 12% | 54% | 82% | 98% | 0% | 3% | 18% | 25% |
| | other crops | 41% | 31% | 1% | 0% | 32% | 81% | 30% | 60% |
| | Total | 53% | 85% | 83% | 98% | 32% | 84% | 47% | 85% |
| Kharif-1 | paddy | 2% | 2% | 2% | 19% | 5% | 2% | 4% | 3% |
| | other crops | 6% | 27% | 6% | 8% | 0% | 0% | 3% | 9% |
| | Total | 9% | 29% | 8% | 28% | 6% | 2% | 7% | 12% |
| Kharif-2 | paddy | 88% | 94% | 43% | 64% | 92% | 100% | 82% | 96% |
| | other crops | 4% | 4% | 0% | 0% | 0% | 0% | 1% | 1% |
| | Total | 92% | 98% | 43% | 65% | 92% | 100% | 84% | 97% |
| Total | paddy | 103% | 150% | 126% | 182% | 98% | 106% | 104% | 124% |
| | other crops | 51% | 62% | 7% | 9% | 32% | 81% | 34% | 71% |
| | Total | 154% | 211% | 133% | 191% | 130% | 187% | 138% | 195% |

Percentage of cultivable land Source: WMG survey 2021

Fresh water ghers

Fresh water ghers are mainly reported by WMGs in Satkhira and Khulna (*Table 6.4*); there are only a few such ghers in Patuakhali. In the rabi season more fresh water gher land in both zones is now being used for boro – suggesting an improvement in water management. In the kharif-1 season most fresh water gher land is used for fish, although non-rice crops (such as vegetables on the banks of ghers) have also increased. In kharif-2, as in kharif-1, most land is used for fish – the area of fish in both these seasons has increased and less land is fallow – which may have been enabled by better water management. The area of aman paddy has also decreased in kharif-2.

Table 6.4: Use of fresh water gher lands

| | | Khulna | | Satkhira | | Total | |
|----------|-------------|---------|---------|----------|---------|---------|---------|
| | | 2013-14 | 2020-21 | 2013-14 | 2020-21 | 2013-14 | 2020-21 |
| Rabi | Paddy | 41% | 68% | 63% | 83% | 43% | 71% |
| | other crops | 9% | 10% | 1% | 1% | 9% | 8% |
| | fish ghers | 22% | 20% | 17% | 16% | 22% | 19% |
| | Total | 73% | 97% | 80% | 100% | 74% | 98% |
| Kharif-1 | Paddy | 1% | 2% | 0% | 0% | 1% | 1% |
| | other crops | 9% | 13% | 0% | 3% | 8% | 11% |
| | fish ghers | 59% | 77% | 86% | 96% | 61% | 81% |
| | Total | 69% | 92% | 86% | 99% | 70% | 93% |
| Kharif-2 | Paddy | 23% | 10% | 6% | 5% | 22% | 9% |
| | other crops | 7% | 10% | 0% | 2% | 7% | 8% |
| | fish ghers | 59% | 80% | 90% | 93% | 62% | 83% |
| | Total | 90% | 99% | 96% | 100% | 90% | 100% |
| Total | Paddy | 65% | 79% | 69% | 88% | 66% | 81% |
| | other crops | 26% | 33% | 1% | 6% | 23% | 27% |
| | fish ghers | 140% | 177% | 193% | 205% | 145% | 183% |
| | Total | 232% | 289% | 262% | 299% | 234% | 291% |

Percentage of cultivable land Source: WMG survey 2021

Saline water ghers

Saline water ghers are only found in a limited part of polder 30 (Khulna) and polder 2&2E (Satkhira) (Table 6.5). In the rabi season there has been a modest increase in the use of saline water gher land for boro paddy cultivation and decline in area under fish in Satkhira, but an increase in polder 30. In kharif-1 there has been an increase in the amount of land used for fish. In kharif-2 most saline water gher land in polder 30 was being used for aman, but it is all now fish. It is possible that this land used to be non-saline in the monsoon season and so was used for paddy but has now become saline all year round. This saline water gher land is unable to be used at other times of year for crops which are intolerant to high levels of salinity.

Table 6.5: Use of saline water gher land

| | | Khulna | | Satkhira | | Total | |
|---|-------------|---------|---------|----------|---------|---------|---------|
| | | 2013-14 | 2020-21 | 2013-14 | 2020-21 | 2013-14 | 2020-21 |
| Rabi | paddy | 0% | 16% | 7% | 16% | 7% | 16% |
| | other crops | 0% | 8% | 0% | 1% | 0% | 2% |
| | fish | 29% | 47% | 92% | 83% | 89% | 81% |
| | total | 29% | 72% | 99% | 100% | 96% | 98% |
| Kharif-1 | paddy | 0% | 0% | 0% | 0% | 0% | 0% |
| | other crops | 0% | 0% | 0% | 1% | 0% | 1% |
| | fish | 34% | 51% | 83% | 99% | 81% | 96% |
| | total | 34% | 51% | 83% | 100% | 81% | 97% |
| Kharif-2 | paddy | 74% | 0% | 0% | 0% | 3% | 0% |
| | other crops | 0% | 0% | 0% | 1% | 0% | 1% |
| | fish | 26% | 100% | 92% | 99% | 89% | 99% |
| | total | 100% | 100% | 92% | 100% | 92% | 100% |
| Total | paddy | 74% | 16% | 7% | 16% | 10% | 16% |
| | other crops | 0% | 8% | 0% | 4% | 0% | 4% |
| | fish | 89% | 198% | 267% | 280% | 259% | 275% |
| | total | 163% | 222% | 274% | 300% | 269% | 295% |
| Percentage of cultivable land Source: WMG survey 2021 | | | | | | | |

6.1.3.6.1.3 Changes in overall land use

The overall land use in three seasons for each of the three zones is shown in Table 6.6. For the Khulna zone boro paddy and other crops were of almost equal importance in the rabi/boro (winter/dry) season before the project, followed by fish ghers, with over one third of land fallow. There has now been considerable expansion in boro, and some decline in other crops and fish, with significantly less fallow land.

In the kharif-1 (early monsoon) season fish ghers were, and still are, the main land use in Khulna, with the area now significantly increased. This, along with some growth in other crops, means that 70% of the cultivable land is now cultivated in this season. In the kharif-2 (late monsoon) season, half the land was used to grow aman paddy. This has now fallen to 40%, with a significant increase in the area under fish ghers. Overall cropping intensity in this zone has increased from 198% to 250%.

In Satkhira, land use in the rabi-boro season is predominantly boro paddy, and the area of this crop has increased. Along with a small increase in area of fish, overall land use in this season is now 100%. The main land use in kharif-1 is fish ghers, which has more than doubled as before BGP, when over two thirds of land was left fallow. An increasing area under fish, along with small areas of paddy and other crops mean that almost two-thirds of land is now utilized in this season. In kharif-2, prior to BGP, one third of land was growing aman paddy, and just over one quarter used for fish ghers. The area under fish ghers has now more than doubled, with a decline in aman paddy – but with an overall increase in land utilization in this season. Annual cropping intensity has increased from 174% to 273%.

In Patuakhali, there is virtually no land used for fish ghers. In the rabi/boro season almost all land is used for other (non-rice) crops, which have expanded considerably during BGP. In the kharif-1 season almost one quarter of land was used for aus paddy, but this has now declined, with an increase in the area of fallow land. In kharif-2 almost all land is (and was) used for aman paddy. Overall cropping intensity has increased from 171% to 206%.

Table 6.6: Seasonal land use

| | | Khulna | | Satkhira | | Patuakhali | | Total | |
|----------|-------------|---------|---------|----------|---------|------------|---------|---------|---------|
| | | 2013-14 | 2020-21 | 2013-14 | 2020-21 | 2013-14 | 2020-21 | 2013-14 | 2020-21 |
| Rabi | paddy | 36% | 60% | 74% | 80% | 0% | 3% | 24% | 40% |
| | other crops | 18% | 13% | 2% | 3% | 54% | 87% | 33% | 45% |
| | fish ghers | 10% | 8% | 10% | 17% | 0% | 0% | 7% | 8% |
| | Total | 64% | 81% | 85% | 100% | 54% | 90% | 64% | 93% |
| Kharif-1 | paddy | 2% | 2% | 1% | 6% | 22% | 15% | 10% | 8% |
| | other crops | 10% | 22% | 6% | 8% | 0% | 1% | 6% | 12% |
| | fish ghers | 32% | 47% | 24% | 68% | 0% | 0% | 19% | 31% |
| | Total | 44% | 70% | 31% | 82% | 22% | 16% | 34% | 50% |
| Kharif-2 | paddy | 50% | 40% | 32% | 22% | 94% | 100% | 65% | 62% |
| | other crops | 8% | 10% | 0% | 3% | 0% | 0% | 4% | 5% |
| | fish ghers | 32% | 49% | 26% | 66% | 0% | 0% | 19% | 32% |
| | Total | 90% | 99% | 58% | 91% | 94% | 100% | 88% | 98% |
| Total | paddy | 88% | 102% | 108% | 109% | 116% | 118% | 99% | 109% |
| | other crops | 36% | 45% | 8% | 14% | 54% | 88% | 42% | 62% |
| | fish ghers | 74% | 104% | 59% | 150% | 0% | 0% | 45% | 70% |
| | Total | 198% | 250% | 174% | 273% | 171% | 206% | 186% | 241% |

Percentage of cultivable land Source: WMG survey 2021

6.2 Change in cropping pattern and crop types

For paddy there has been a move from traditional local varieties to modern HYVs and hybrids (*Tables 6.7 and 6.8*). There are no reports of cultivation of local varieties of boro (these seem to have disappeared in Bangladesh), but there is a move from conventional HYVs to hybrid seeds for this crop. This is particularly apparent in the Khulna zone, where two-thirds of boro is now hybrid, up from 30% since 2019. Only in Patuakhali is a significant area of aus grown, and there has been a dramatic switch from local varieties to HYVs, with almost no local varieties now grown. There has also been a switch from local to HYV in the aman season – less so in Khulna where almost half of this crop is still local variety (LV). In Satkhira HYV aman predominated before BGP but has continued to increase.

Table 6.7: Land under different types of paddy

| | | Khulna | | Satkhira | | Patuakhali | | Total | |
|-----------|-----------|---------|---------|----------|---------|------------|---------|---------|---------|
| | | 2013-14 | 2020-21 | 2013-14 | 2020-21 | 2013-14 | 2020-21 | 2013-14 | 2020-21 |
| Boro | HYV | 24% | 20% | 63% | 51% | 0% | 2% | 19% | 17% |
| | Hybrid | 6% | 40% | 11% | 29% | 0% | 1% | 4% | 23% |
| Aus | Local | 1% | 0% | 1% | 1% | 17% | 0% | 7% | 0% |
| | HYV | 1% | 2% | 1% | 5% | 5% | 14% | 2% | 7% |
| Aman | Local | 36% | 19% | 10% | 3% | 75% | 35% | 48% | 23% |
| | HYV | 14% | 22% | 22% | 20% | 19% | 65% | 17% | 39% |
| All paddy | Local | 37% | 19% | 11% | 4% | 92% | 35% | 55% | 23% |
| | HY/hybrid | 45% | 84% | 97% | 105% | 25% | 83% | 43% | 86% |
| Total | | 82% | 102% | 108% | 109% | 116% | 118% | 99% | 109% |

Percentage of cultivable land Source: WMG survey 2021

Table 6.8: Share of improved varieties for boro and aman

| | Boro – 2013-14 | | Boro – 2020-21 | | Aman – 2013-14 | | Aman – 2020-21 | |
|------------|----------------|--------|----------------|--------|----------------|-----|----------------|-----|
| | HYV | hybrid | HYV | hybrid | LV | HYV | LV | HYV |
| Khulna | 24% | 20% | 63% | 51% | 0% | 2% | 19% | 17% |
| Satkhira | 6% | 40% | 11% | 29% | 0% | 1% | 4% | 23% |
| Patuakhali | 1% | 0% | 1% | 1% | 17% | 0% | 7% | 0% |

Percentage of total area of each crop Source: WMG survey 2021

The proportion of cultivable land occupied by other crops is shown in *Table 6.9*. In the Khulna zone, sesame was an important crop, but this and a number of other more minor crops (such as mung bean) have declined in importance due to unfavourable growing conditions – with more emphasis being placed on more reliable irrigated boro and on more profitable fish ghers. However, the area of two non-rice crops have greatly expanded – vegetables and watermelons. As a result, the total area occupied by non-rice crops in all three seasons has increased from 41% to 53% of the cultivable land, with most of this increase taking place since 2019 when non-rice crops still accounted for 43% of the cultivable land.

In Satkhira there is only a small area of non-rice crops – mainly vegetables and a little jute. The area of vegetables has been increasing. Non-rice crops are most important in Patuakhali. Mung bean is by far the most important of these crops, and its area has increased by over four times. Prior to BGP, keshari (grass pea, a local pulse crop) was the principal non-rice crop, but this has now virtually disappeared, farmers saying that it is now unprofitable and difficult to grow with uncertain weather conditions. Areas under sesame, felon (cow pea) and sweet potato have also declined, while more groundnut, chili, sunflower, vegetables and watermelon are being grown. Compared to the 2019 WMG survey, more land in Patuakhali is now under mung bean and vegetables, and less under keshari, sesame, watermelon and groundnut.

Table 6.9: Land under non-rice crops

| | Khulna | | Satkhira | | Patuakhali | | Total | |
|--|---------|---------|----------|---------|------------|---------|---------|---------|
| | 2013-14 | 2020-21 | 2013-14 | 2020-21 | 2013-14 | 2020-21 | 2013-14 | 2020-21 |
| mung bean | 2.6% | 0.7% | 0.0% | 0.0% | 15.3% | 62.9% | 7.3% | 25.1% |
| keshari | 0.0% | 0.0% | 0.0% | 0.0% | 18.8% | 0.5% | 7.4% | 0.2% |
| sesame | 11.8% | 1.5% | 0.1% | 0.0% | 2.7% | 0.1% | 6.8% | 0.8% |
| groundnut | 0.0% | 0.0% | 0.0% | 0.0% | 4.6% | 7.9% | 1.8% | 3.1% |
| watermelon | 0.2% | 7.3% | 0.0% | 0.0% | 1.9% | 3.8% | 0.8% | 5.1% |
| vegetable | 19.0% | 34.3% | 2.8% | 7.8% | 0.7% | 1.8% | 9.9% | 18.3% |
| other | 7.9% | 9.1% | 4.7% | 6.0% | 10.1% | 10.6% | 8.4% | 9.3% |
| Total | 41.4% | 52.9% | 7.6% | 13.8% | 54.1% | 87.5% | 42.4% | 61.8% |
| Percentage of cultivable land; Source: WMG survey 2021 | | | | | | | | |

The FGDs in Khulna explained that improved water management had enabled increased areas of crops to be grown with a move from one crop per year to two or three. Reduced waterlogging has enabled high value vegetables to be grown. Even where there has not been much improvement in water management (polder 28/1), some farmers have been able to adopt improved methods. Farmers are now more aware of new technologies and BGP's "farming as a business" theme has been appreciated. There has been widespread adoption of HYVs and new varieties, displacing local varieties along with mung bean and sesame which have become harder to cultivate due to changing weather patterns.

In Satkhira there was one FGD in an area of fresh water gher, and another in the (more limited) area of saline water gher. In the latter area, salinity means little cropping is possible. In the fresh water area, improved water management, along with training, means farmers can now plant the right variety at the right time. Both paddy and fish production have increased, and there is much interest in growing mangos on higher land. FGDs in Patuakhali emphasized the switch from local to high yielding varieties as well as the introduction of multiple cropping. Increased yields have resulted in higher farm income. Farmers now have better contact with DAE which can help in solving problems.

6.3 Increase in Cropping intensity

Data show a significant increase in cropping intensity in three zones of BGP. Cropping intensity has been calculated as the sum of crops and fish gher in each season divided by the sum of crops, gher and fallow land. This definition treats fish gher as another crop in each season and takes no account of the frequency of fish harvests – so land used as a perennial (year-round) gher would have a 300% cropping intensity. With this approach overall cropping intensity has increased from 186% to 241%, with a larger increase in Satkhira of 99 percentage points - largely due to expansion of fish gher in polder 2&2E and their more intensive use, together with an increase in the area of paddy (*Table 6.10*). Overall cropping intensity as recorded by the 2019 WMG survey was 228%, so there has been an increase of 13 percentage points in the last two years.

Table 6.10: Cropping intensity

| | Rabi /boro season | | Kharif-1 season | | Kharif-2 season | | Cropping intensity | | |
|--|-------------------|---------|-----------------|---------|-----------------|---------|--------------------|---------|--------|
| | 2013-14 | 2020-21 | 2013-14 | 2020-21 | 2013-14 | 2020-21 | 2013-14 | 2020-21 | change |
| Khulna ² | 64 | 81 | 44 | 70 | 90 | 99 | 198 | 250 | 52 |
| Satkhira | 85 | 100 | 31 | 82 | 58 | 91 | 174 | 273 | 99 |
| Patuakhali | 54 | 90 | 22 | 16 | 94 | 100 | 171 | 206 | 35 |
| Total | 64 | 93 | 34 | 50 | 89 | 96 | 186 | 241 | 55 |
| Percentage of cultivable area used in each season; Source: WMG survey 2021 | | | | | | | | | |

Changes in cropping intensity vary considerably between WMGs. Overall, 89% of WMGs report an increase in cropping intensity, 4% no change and 7% a decrease (Table 6.11) – compared with the 2019 survey when 80% of WMGs reported increased cropping intensity. The proportion of WMGs with an increase in cropping intensity was highest in Satkhira at 95%, with the other two zones equal at 88%, although the average change was lowest in Patuakhali.

Table 6.11: Change in cropping intensity

| | Average change per WMG | Percentage of WMGs | | |
|-------------------------|------------------------|--------------------|------|----------|
| | | Decrease | same | increase |
| Khulna | 58% | 5% | 7% | 88% |
| Satkhira | 97% | 2% | 3% | 95% |
| Patuakhali | 37% | 10% | 2% | 88% |
| Total | 55% | 7% | 4% | 89% |
| Source: WMG survey 2021 | | | | |

DAE calculates cropping intensity as the area of crops divided by the sum of the areas of crops, fish ghers and fallow land. Cropping intensity calculated in this way is lower in Khulna and Satkhira (as land under ghers is excluded), with a smaller increase (Table 6.12). However, it does show that, even leaving aside the fish ghers, the area of farm crops has expanded. The 2019 WMG survey showed a larger increase of 14 percentage points in Satkhira. This is now only 8 points due to the expansion of area used for fish production.

Table 6.12: Cropping intensity (DAE method)

| | 2013-14 | 2020-21 | change |
|-------------------------|---------|---------|--------|
| Khulna | 124 | 155 | 32 |
| Satkhira | 115 | 123 | 8 |
| Patuakhali | 171 | 206 | 35 |
| Total | 141 | 171 | 30 |
| Source: WMG survey 2021 | | | |

2 Only one polder (28/2) in Khulna recorded a fall of 6 percentage points, going from 199% to 193% (but there has been some recovery since 2019 when cropping intensity was only 162%). Polder 28/2 is close to Khulna city and is being absorbed into the expanding urban area.

6.3.1. Link between water management and cropping intensity

There could be a link between water management problem scores (WMPS) and cropping intensity. It would not be unreasonable to expect that WMGs with less water management problems (i.e. lower WMPS score) are able to use their land more intensively. It may also be possible that WMGs reporting a larger improvement in water management (decrease in WMPS) have been able to increase cropping intensity by more than WMGs where water management has not improved so much

Table 6.13: Water Management Problem Score (WMPS) and cropping intensity

| WMPS | Rabi /boro season | | Kharif-1 season | |
|---------------|-------------------|---------|-----------------|---------|
| | 2013-14 | 2020-21 | 2013-14 | 2020-21 |
| under 2 | 5 | 108 | 242% | 250% |
| 2 to 2.5 | 22 | 261 | 238% | 244% |
| 2.5 to 3 | 42 | 67 | 208% | 233% |
| 3 to 3.5 | 139 | 58 | 196% | 239% |
| 3.5 to 4 | 78 | 10 | 167% | 201% |
| 4 to 4.5 | 187 | 2 | 185% | 214% |
| 4.5 and above | 33 | 0 | 137% | |
| total | 506 | 506 | | |

Score: 1 = very good, 2=good (i.e. no problem), 3=average, 4=bad, 5=very bad; Source: WMG survey 2021

Table 6.13 shows the number of WMGs in each of seven bands of WMPS. It can be seen that there are many more WMGs in the lower WMPS bands at present than before the project – showing how water management has improved with lower WMPS being reported by WMGs. Table 6.13 also shows that the cropping intensity tends to be higher in bands with lower WMPS, suggesting that lower WMPS (less water management problems) is linked with higher cropping intensity. This applies both in the before BGP and current situations, but it can also be seen that cropping intensity is now higher within each WMPS band than it was before the project. This implies that cropping intensity would increase without improved water management – but not to the same extent as it would with improved water management.

It is also possible that WMGs with a greater improvement in their WMPS have a larger increase in cropping intensity. Table 6.14 shows that this applies for those WMGs where the WMPS has improved by more than 1.5 points. Similar analysis in the 2019 WMG survey found a similar link between change in WMPS and change in cropping intensity (CI).

Table 6.14: Improvement in WMPS and change in cropping intensity

| Change in WMPS | Number of WMG | Change in CI |
|----------------|---------------|--------------|
| more than -1 | 2 | 4% |
| -1 to 0 | 13 | 51% |
| 0 to 0.5 | 55 | 43% |
| 0.5 to 1 | 52 | 44% |
| 1 to 1.5 | 151 | 47% |
| 1.5 to 2 | 80 | 57% |
| 2 to 3 | 137 | 70% |
| 3 to 4 | 16 | 84% |
| Total | 506 | 0% |

Change in cropping intensity in percentage points Source: WMG survey 2021

Although average cropping intensity may improve for each group of WMGs grouped according to WMPS, there is great variation within each group and the overall correlation between WMPS and cropping intensity is weak, the correlation coefficient for before project data being -0.35, current data being -0.20 and the coefficient for change in WMPS and cropping intensity is 0.22. As perfect correlation is a coefficient of +/- 1.0, none of these relationships is very strong.

6.4 Increase in Crop yields

There has been a substantial increase in the productivity of paddy (*Table 6.15*). Apart from a switch to more productive HYV and hybrid varieties, average yields of each type of paddy has increased by between 13% to 54% with widely grown HYV boro and aman increasing by about 30%. Yields of non-rice crops have mostly also increased, with the exception of chilli and watermelon. The table also shows yield data from the 2019 WMG survey, and for most crops yields have also increased over the last two years – exceptions being sunflower, chilli and watermelon. The increase in yield of mung bean³ is notable. This is a key crop in Patuakhali, and in 2019 yields were below the pre-project level due to unfavourable weather (excessive drought, unexpected and heavy rainfall). Mung yield has now recovered to over double the 2019 level and is 71% above the pre-project average. Data on aquaculture (gher fish) yields needs to be used with caution as seasonal yield data may not reflect the annual productivity of gher.

Table 6.15: Average crop yields

| | | Yield kg/ha | | | HH reporting (n) | | Yield kg/ha |
|-------------|--------------|-------------|---------|--------|------------------|---------|-------------|
| | | 2013-14 | 2020-21 | change | 2013-14 | 2020-21 | 2019 survey |
| Paddy | boro HYV | 4,983 | 6,370 | 28% | 443 | 711 | 5,649 |
| | boro hybrid | 6,849 | 7,754 | 13% | 262 | 665 | 7,692 |
| | aman local | 2,682 | 3,677 | 37% | 797 | 504 | 3,102 |
| | aman HYV | 3,841 | 4,991 | 30% | 542 | 606 | 4,878 |
| | aus local | 2,252 | 3,460 | 54% | 166 | 59 | 2,757 |
| | aus HYV | 3,657 | 4,711 | 29% | 87 | 233 | 4,313 |
| Other crops | Maize | 2,430 | 4,230 | 74% | 10 | 11 | 2,991 |
| | Mung bean | 913 | 1,558 | 71% | 304 | 263 | 714 |
| | Keshari | 1,142 | 1,456 | 28% | 225 | 27 | 1,062 |
| | Felon | 1,210 | 1,492 | 23% | 37 | 66 | 1,097 |
| | Sesame | 1,137 | 1,475 | 30% | 255 | 90 | 835 |
| | Groundnut | 2,020 | 2,234 | 11% | 170 | 176 | 2,211 |
| | Sunflower | 1,708 | 2,068 | 21% | 14 | 15 | 2,606 |
| | Sweet potato | 3,427 | 8,698 | 39% | 103 | 104 | 13,153 |
| | Jute | 2,263 | 2,290 | 1% | 11 | 103 | 2,485 |
| | Chilli | 1,331 | 1,264 | -5% | 185 | 174 | 2,139 |
| Watermelon | 5,499 | 2,011 | -8% | 39 | 187 | 49,084 | |
| Aquaculture | rabi | 676 | 672 | -1% | 146 | 175 | 699 |
| | khariif-2 | 830 | 1,664 | 100% | 230 | 310 | 1,099 |
| | khariif-1 | 530 | 802 | 52% | 164 | 201 | 637 |

Source: WMG survey 2021

³ Many farmers have adopted modern, high yielding types of mung bean, especially BARI-6. However, these improved types inter-breed with older local types, so much mung bean is of a semi-improved type. For this reason, this report has not tried to differentiate between modern and local varieties of mung bean.

6.5 Increase in employment through agricultural development

Changes in labour use in crop and fish production have been calculated based on the crop budgets for each zone and crop areas in each polder. Pre-project labour use has been estimated, taking into account that lower yields meant that less labour was needed for harvest and post-harvest work.

Table 6.16 shows the total labour used in crop production and gher aquaculture in each of the three zones. The total labour requirement is now estimated to be 18.7 million person-days, an increase of around 50% on the pre-project situation. Paddy production absorbs over half of this labour, followed non-rice crops and then by fish / shrimp aquaculture. The table also shows how much labour is hired (men and women) and how much comes from men and women members of the farm households.

Table 6.16: Increase in employment through agricultural development

| | | Paddy | | other crops | | fish / shrimp | | Total | |
|------------|-------------|---------|---------|-------------|---------|---------------|---------|---------|---------|
| | | 2013-14 | 2020-21 | 2013-14 | 2020-21 | 2013-14 | 2020-21 | 2013-14 | 2020-21 |
| Khulna | hired men | 2,664 | 4,145 | 403 | 913 | - | - | 3,068 | 5,058 |
| | hired women | - | - | 896 | 1,675 | - | - | 896 | 1,675 |
| | HH men | 635 | 782 | 633 | 1,322 | 755 | 1,043 | 2,022 | 3,146 |
| | HH women | 116 | 290 | 223 | 400 | 252 | 348 | 591 | 1,037 |
| Satkhira | hired men | 1,074 | 1,154 | 11 | 32 | - | - | 1,085 | 1,186 |
| | hired women | - | - | 32 | 96 | - | - | 32 | 96 |
| | HH men | 256 | 253 | 36 | 93 | 175 | 446 | 468 | 792 |
| | HH women | - | - | 9 | 25 | 47 | 120 | 56 | 145 |
| Patuakhali | hired men | 2,511 | 2,624 | 219 | 457 | - | - | 2,730 | 3,082 |
| | hired women | - | - | 173 | 511 | - | - | 173 | 511 |
| | HH men | 864 | 927 | 292 | 482 | - | - | 1,156 | 1,409 |
| | HH women | 256 | 309 | 134 | 279 | - | - | 390 | 587 |
| total | hired men | 6,249 | 7,923 | 633 | 1,403 | - | - | 6,883 | 9,326 |
| | hired women | - | - | 1,101 | 2,281 | - | - | 1,101 | 2,281 |
| | HH men | 1,755 | 1,963 | 961 | 1,896 | 930 | 1,488 | 3,646 | 5,347 |
| | HH women | 372 | 598 | 366 | 703 | 299 | 468 | 1,036 | 1,770 |
| | Total | 8,376 | 10,484 | 3,061 | 6,284 | 1,229 | 1,956 | 12,666 | 18,723 |

Thousand person-days; Source: WMG survey 2021

6.6 Economic return of improved agriculture production

6.6.1. Increase in farm income

An increased cropping area, improved cropping patterns and increased yields have resulted in increased farm incomes. This increase in income has been calculated based on budgets for the main crops in each zone and using cropping patterns and yields derived from WMG survey data.

Table 6.17 shows that net farm income has more than doubled (131% increase), and more than half of total net income comes from non-rice crops – especially vegetables. However, in relative terms the increase has been highest for paddy. The relative increase has also been higher in the Patuakhali and Satkhira zones, and lower in Khulna – but in absolute terms the value of the increase is higher in Khulna. High value crops play a major role in this increase. Watermelon and vegetables contribute to almost half (49%) of the total net farm income in Khulna zone, compared with only 26% for fish. While fish contributes much more in Satkhira (61% compared with 12% for vegetables), overall vegetables and watermelon provide 37% of the net income compared with 22% from fish.

Table 6.17: Total net farm income

| | 2013-14 BGP – BDT million | | | | 2020-21 – BDT million | | | | Change | |
|-----------------------|---------------------------|-------------|-------|-------|-----------------------|-------------|-------|--------|--------|------|
| | paddy | other crops | fish | total | paddy | other crops | fish | total | | |
| Khulna | 676 | 1,987 | 1,214 | 3,878 | 1,515 | 4,321 | 2,003 | 7,840 | 3,962 | 102% |
| Satkhira | 174 | 73 | 304 | 551 | 361 | 257 | 949 | 1,567 | 1,016 | 184% |
| Patuakhali | 462 | 1,065 | 0 | 1,527 | 1,512 | 2,809 | 0 | 4,321 | 2,794 | 183% |
| Total | 1,312 | 3,125 | 1,518 | 5,955 | 3,389 | 7,387 | 2,952 | 13,728 | 7,773 | 131% |
| Increase | | | | | 158% | 136% | 94% | 131% | | |
| Share in total income | 22% | 52% | 25% | 100% | 25% | 54% | 22% | 100% | | |

Source: WMG survey 2021

Table 6.18 shows that there is no obvious correlation between increase in net income and increased cropping intensity (CI), reduction in water management problem scores (WMPS), and increase in area of high value crops (HVC - vegetables and water melon).

However, farmers in the FGDs repeatedly said that improved water management had allowed them to crop more intensively, grow more valuable crops and get improved crop yields. There may be too much variation between WMGs within polders for this to show up when comparing the averages for different polders.

Table 6.18: Increase in farm income and performance indicators

| Increase in net income | Number of polder | Average change in | | |
|------------------------|------------------|-------------------|------|-----------|
| | | CI* | WMPS | HVC area* |
| <40% | 2 | 19% | 0.83 | -10% |
| 40-100% | 5 | 54% | 1.50 | 10% |
| 100-150% | 2 | 63% | 1.53 | 23% |
| 150-200% | 7 | 58% | 1.33 | 16% |
| >200% | 6 | 44% | 1.63 | 10% |

* change in percentage points; Source: WMG survey 2021

6.6.2. Return to the investment in BGP

The increase in net farm income can be compared with expenditure of project funds to see if benefits (in terms of increased farm income) are sufficient to justify the investment in BGP. Cumulative expenditure of BGP funds up to June 2021 is shown in Table 6.19. The BWDB and DAE expenditure includes GoB contributions to BGP costs.

Table 6.19: Cumulative expenditure

| zone | Million BDT | | | | Total per WMG |
|------------|-------------|-------|---------|---------|---------------|
| | BWDB | DAE | TA | Total | Million BDT |
| Khulna | 1090.44 | 29.16 | 1259.11 | 2378.71 | 9.15 |
| Satkhira | 263.38 | 13.79 | 311.71 | 588.88 | 9.20 |
| Patuakhali | 1457.52 | 44.85 | 1689.58 | 3191.95 | 17.54 |
| total | 2811.34 | 87.80 | 3260.41 | 6159.55 | 12.17 |

Source: WMG survey 2021

Table 6.20 shows the payback period required for the increase in annual net farm income to equal the cumulative project expenditure. As annual benefits of BDT 7,773 million exceed cumulative expenditure of BDT 6,160 million, the payback period is only 0.79 of a year (about 41 weeks). But this varies considerably between polders. Net farm income has declined in polder 28/2 so there is no payback period here. For other polders it ranges from 0.22 years in polder 25 to 3.12 years in polder 47/3.

Table 6.20 also shows the expenditure and benefits per WMG per polder. Average BGP expenditure per WMG is BDT 12.17 million and average benefit is BDT 15.36 million. Average benefit is fairly similar between the three zones, but there is considerable variation between polders in Khulna and Patuakhali. Average expenditure per WMG also varies greatly between polders, but on average this is higher in Patuakhali than in the other two zones – so the average payback period for Patuakhali is longer (1.14 years).

The four polders with very fast payback (under 0.5 years) have an average benefit of BDT 15.84 million – only a little more than the average for all polders, but their average expenditure is only BDT 5.14 million, under half of the average for all polders of BDT 12.17 million. It may be that the physical circumstances of these polders made water management improvement less costly than in other polders. The five polders (excluding 28/2) with a payback period of over 1.5 years, have average benefits of BDT 9.48 million per WMG, well below the average of 15.36, as well as above average expenditure of BDT 21.77 million. Polder 28/1 is in this group. Although its expenditure is well below average, it has lower benefits for any polder apart from 28/2. Polders 47/3 and 47/4 are also in this group. BG activities started later in these polders, but benefits per WMG in 47/4 are above average – but it has the highest expenditure per WMG of any polder.

An economic analysis of the investment in BGP has been carried out in order to calculate the economic internal rate of return. As in preceding calculation of the payback period, this analysis is limited to the impact of BGP interventions in water management and agricultural extension on crop production and aquaculture in gher. The analysis has adjusted input and output prices to reflect their real value to the economy. The analysis uses the same data that was collected for the 2021 WMG survey. The analysis covers project costs and benefits over a 30 year period, with investment expenditure on BGP taking place over the first eight of these years (2013-14 to 2020-21).⁴

EIRR calculations assume that only a proportion of the improvement in cropping patterns and crop yields reported in the WMG survey can be attributed to BGP. Interviews for 2021 WMG survey mostly attributed between 40% and 60% of the increase in farm income to BGP interventions. The base case for EIRR calculations assume that 25% of the increase in net farm income can be attributed to BG interventions. This results in an EIRR of 42%.

4 The small amount of BG investment in 2021-22 has been excluded as data on benefits refers to the project prior to this expenditure. No further benefits are assumed beyond those quantified in the 2021 WMG survey.

Table 6.20: Payback period for project investment

| polder | Expenditure | Benefit | Payback | Per WMG (BDT m) | |
|-------------------------|----------------|----------------|-------------|-----------------|--------------|
| | BDT m. | BDT m. | years | Expenditure | Benefit |
| Khulna | | | | | |
| 22 | 108.97 | 156.58 | 0.70 | 9.08 | 13.05 |
| 25 | 294.23 | 1324.27 | 0.22 | 4.82 | 21.71 |
| 26 | 260.74 | 267.63 | 0.97 | 17.38 | 17.84 |
| 27/1 | 102.20 | 227.35 | 0.45 | 6.81 | 15.16 |
| 27/2 | 36.99 | 53.71 | 0.69 | 6.17 | 8.95 |
| 28/1 | 84.50 | 29.18 | 2.90 | 7.04 | 2.43 |
| 28/2 | 236.86 | -36.59 | -6.47 | 19.74 | -3.05 |
| 29 | 386.22 | 1015.26 | 0.38 | 6.90 | 18.13 |
| 30 | 272.15 | 426.07 | 0.64 | 6.80 | 10.65 |
| 31P | 280.22 | 363.58 | 0.77 | 23.35 | 30.30 |
| 34/2P | 315.65 | 135.03 | 2.34 | 16.61 | 7.11 |
| sub-total | 2378.71 | 3962.09 | 0.60 | 9.15 | 15.24 |
| Satkhira | | | | | |
| 2&2E | 588.88 | 1016.23 | 0.58 | 9.20 | 15.88 |
| Patuakhali | | | | | |
| 43/1A | 120.85 | 161.14 | 0.75 | 9.30 | 12.40 |
| 43/2A | 415.28 | 257.26 | 1.61 | 20.76 | 12.86 |
| 43/2B | 455.62 | 580.70 | 0.78 | 16.27 | 20.74 |
| 43/2D | 333.34 | 289.37 | 1.15 | 12.35 | 10.72 |
| 43/2E | 37.16 | 100.48 | 0.37 | 3.10 | 8.37 |
| 43/2F | 310.74 | 300.40 | 1.03 | 11.51 | 11.13 |
| 47/3 | 207.33 | 66.46 | 3.12 | 25.92 | 8.31 |
| 47/4 | 693.65 | 300.66 | 2.31 | 38.54 | 16.70 |
| 55/2A | 346.67 | 359.64 | 0.96 | 26.67 | 27.66 |
| 55/2C | 271.30 | 378.37 | 0.72 | 16.96 | 23.65 |
| sub-total | 3191.95 | 2794.47 | 1.14 | 17.54 | 15.35 |
| Total | 6159.55 | 7772.79 | 0.79 | 12.17 | 15.36 |
| Source: WMG survey 2021 | | | | | |

The EIRR has also been calculated with smaller proportions of the increase in farm income attributed to BGP. This shows that EIRR remains at an acceptable 15% even if only 10% of the increase in farm income is attributed to BGP. The effect of BGP benefits not being sustained has also been examined. If net benefits were to cease in 2023-24, two years after completion, then the EIRR would be reduced from 42% to 38% in the base case but would still be an acceptable 15% if only 15% of the increase in farm income were attributed to BGP. It is not surprising that investment in BGP has generated rapid returns and the resulting increase in farm income very quickly equals the investment cost. Improvements in water management infrastructure have removed bottlenecks in an existing system. No account has been taken of the original investment in building the system in the first place as this is a sunk cost. Removing bottlenecks gets the whole system, including the original investments, to work better. Similarly, extension training enables farmers to get their own production systems to work better. Training does not cost much, while increasing productivity generates more income for very little extra cost, mainly harvesting and marketing the increased volume of production.



07 Inclusive Development Approach: Outcomes and Impacts from Homestead Based Production

Around 30% of the polder households do not have the necessary access to land or family labour to benefit from improved cropping systems - delivered through DAE FFSs and made possible by the rehabilitation of water management structures. These households rely on homestead land for part of their income. For such households, a more inclusive Farmer Field School (FFS) program for homestead production was implemented to improve their food security, nutrition, and their overall living standard. Chapter 25 provides more detailed information on how homestead production was enhanced within the Blue Gold Program through homestead FFSs. Most data in this chapter is from the household survey 2021, which complemented the 2021 WMG survey.¹

From 2013 to 2021, thirteen cycles of 1,178 FFS were implemented for 25 farmers each. In total 1,758 modules were delivered, covering homestead gardening (vegetables and fruit), poultry rearing, pond aquaculture, beef fattening and nutrition. From cycle 11 onwards, market orientation was part of the homestead FFS. The male / female ratio in the groups was initially set at a minimum of 50% women but - in practice - varied according to local demand. Overall, 87.6% of the participants were women.

7.1 Homestead vegetables production

Data from the household survey that was part of the 2021 WMG survey shows that most households (79%) grow homestead vegetables; this proportion has increased slightly since the start of BGP (*Table 7.1*). Vegetable sales are reported by 27% of households, or 34% of those growing vegetables. Compared to the other land holding groups of the households, landless and marginal landowning households are less likely to grow or sell vegetables, and households from these groups that do grow vegetables, produce and sell smaller volumes. This is not unexpected as they have less homestead land available.

¹ Section B Introduction and Summary provides an overview of the studies conducted through the Blue Gold Program, and the studies and reports which were the main sources of information for Section B.

Table 7.1: Homestead vegetables

| Land ownership | Grow homestead vegetable | | Sell | | Annual value (BDT) | |
|--|--------------------------|---------|------------|------------|--------------------|-------|
| | 2014-15 | 2020-21 | Vegetables | production | sales | costs |
| landless | 62% | 65% | 13% | 1,892 | 1,092 | 213 |
| marginal | 76% | 78% | 28% | 3,293 | 2,484 | 459 |
| small | 86% | 87% | 32% | 4,080 | 2,790 | 559 |
| medium | 86% | 87% | 37% | 6,128 | 4,825 | 1,017 |
| large | 94% | 94% | 32% | 7,074 | 5,752 | 1,055 |
| total | 77% | 79% | 27% | 3,524 | 2,527 | 492 |
| Khulna | 69% | 71% | 31% | 3,903 | 2,561 | 598 |
| Satkhira | 84% | 89% | 27% | 2,081 | 1,460 | 230 |
| Patuakhali | 87% | 87% | 21% | 3,683 | 3,114 | 470 |
| Percentage of all households, average value for those households reporting. Source: HH survey 2021 | | | | | | |

Households in Satkhira more likely to grow vegetables, but if they do, production and sales are relatively low. In contrast, households in Khulna are less likely to grow vegetables, but if they do, production and sales are higher.

7.2 Homestead fruit production

A higher proportion of all households (94%) report producing homestead fruit than homestead vegetables (79%), and the average value of production is 44% higher (*Table 7.2*). Slightly more households sell fruit (30%) than vegetables (27%) and the average value of fruit sales is 48% higher than the average value of vegetable sales. With limited space landless (and to a lesser extent marginal) land owning households are less likely to grow and sell fruit, and the average value of their production and sales is lower. Slightly fewer households produce fruit in Satkhira, and the average value of production is lower. Fewer households here also sell vegetables, with the average value of sales being lower.

Table 7.2: Homestead fruits

| Land ownership | Grow homestead fruits | | Sell | | Annual value (BDT) | |
|--|-----------------------|---------|-------|------------|--------------------|-------|
| | 2014-15 | 2020-21 | fruit | production | sales | costs |
| landless | 68% | 70% | 10% | 2,061 | 2,026 | 201 |
| marginal | 96% | 96% | 30% | 3,991 | 3,106 | 399 |
| small | 99% | 99% | 39% | 6,771 | 4,521 | 743 |
| medium | 99% | 99% | 44% | 10,400 | 7,490 | 1,327 |
| large | 99% | 99% | 51% | 13,903 | 8,630 | 1,519 |
| total | 91% | 92% | 30% | 5,078 | 3,734 | 550 |
| Khulna | 91% | 92% | 40% | 5,579 | 3,730 | 642 |
| Satkhira | 86% | 88% | 22% | 3,191 | 2,453 | 345 |
| Patuakhali | 94% | 94% | 19% | 5,103 | 4,708 | 478 |
| Percentage of all households, average value for those households reporting. Source: HH survey 2021 | | | | | | |

7.3 Commercial fruit production

In total, 3.4% of project sample households are commercial (i.e. orchard) fruit growers (*Table 7.3*). This is almost 10% in Satkhira and almost none in Patuakhali. Commercial mango production is popular on the high land in Satkhira. Although only 2.8% of households in Khulna are commercial fruit growers, the average area and value of fruit grown is larger than in the other zones. As would be expected, these growers are predominantly medium and large land owners.

Table 7.3: Commercial fruit

| Land ownership | Producers | Area | | Value - BDT per year |
|----------------|-----------|----------|--------|----------------------|
| | % of HH | decimals | Income | costs |
| landless | 0.5% | 50 | 40,000 | 80,000 |
| marginal | 1.0% | 9 | 5,500 | 700 |
| small | 4.1% | 27 | 14,000 | 1,800 |
| medium | 17.2% | 54 | 42,349 | 10,008 |
| large | 21.6% | 96 | 66,560 | 11,980 |
| total | 3.4% | 27 | 18,527 | 17,527 |
| Khulna | 2.8% | 22 | 16,650 | 18,171 |
| Satkhira | 10.5% | 14 | 7,994 | 1,246 |
| Patuakhali | 0.2% | 7 | 6,701 | 543 |

Percentage of all households, average value for those households reporting. Source: HH survey 2021

7.4 Poultry rearing

Almost all (94%) households rear poultry (*Table 7.4*), and there has been a slight increase during the BG period. Most households rear both ducks and chicken. Similar proportions of households in all land ownership categories rear poultry, showing that it is a popular enterprise for those with very little land, and there has been a more significant increase poultry rearing for landless households than for other households.

Table 7.4: Popularity of poultry rearing

| Land ownership | Rear chickens | | Rear ducks | | Rear any poultry | |
|----------------|---------------|---------|------------|---------|------------------|---------|
| | 2013-14 | 2020-21 | 2013-14 | 2020-21 | 2013-14 | 2020-21 |
| landless | 78% | 91% | 74% | 82% | 85% | 91% |
| marginal | 84% | 89% | 84% | 89% | 91% | 93% |
| small | 96% | 93% | 92% | 89% | 98% | 95% |
| medium | 94% | 94% | 88% | 89% | 94% | 94% |
| large | 91% | 89% | 94% | 89% | 94% | 92% |
| total | 90% | 91% | 87% | 89% | 93% | 94% |
| Khulna | 78% | 76% | 76% | 80% | 84% | 86% |
| Satkhira | 79% | 72% | 78% | 78% | 88% | 86% |
| Patuakhali | 90% | 91% | 87% | 89% | 93% | 94% |

Percentage of all households; Source: HH survey 2021

Although the number of households keeping poultry has only increased very slightly, there has been a significant increase in the average number of birds kept by each household – which has gone up by 39% from 15 to 24 – although landless and marginal landowning households do not have as many (*Table 7.5*). Households in Satkhira now have the largest flocks, with double the number of birds (and over three times as many chickens) as in 2013-14.

Table 7.5: Number of poultry birds

| Land ownership | Number of chicken | | Number of ducks | | Number of birds | |
|----------------|-------------------|---------|-----------------|---------|-----------------|---------|
| | 2013-14 | 2020-21 | 2013-14 | 2020-21 | 2013-14 | 2020-21 |
| landless | 7.8 | 9.9 | 7.3 | 9.5 | 13.9 | 17.8 |
| marginal | 8.4 | 12.6 | 7.7 | 9.4 | 14.8 | 20.2 |
| small | 8.4 | 13.9 | 8.6 | 12.1 | 15.7 | 24.0 |
| medium | 10.6 | 13.4 | 10.7 | 14.3 | 19.9 | 25.9 |
| large | 12.6 | 13.6 | 11.3 | 14.7 | 23.2 | 26.5 |
| total | 8.5 | 12.5 | 8.2 | 10.7 | 15.4 | 21.4 |
| Khulna | 10.2 | 12.5 | 9.2 | 12.0 | 17.9 | 22.2 |
| Satkhira | 6.4 | 21.7 | 6.4 | 6.3 | 11.5 | 24.7 |
| Patuakhali | 7.0 | 9.0 | 7.4 | 10.4 | 13.6 | 18.6 |

Average number for those households owning each type of bird; Source: HH survey 2021

Table 7.6 shows that virtually all households that keep poultry produce and consume eggs and also consume birds. About two-thirds of households sell eggs and slightly fewer sell birds. Although they have fewer birds, a higher proportion of households owning less land sell eggs and birds. More household in Khulna sell eggs and birds compared with the other two zones.

Table 7.6: Households selling eggs and birds

| Land ownership | Eggs | | | Birds | |
|----------------|---------|---------|------|-------|---------|
| | produce | consume | sell | sell | consume |
| landless | 99% | 99% | 73% | 73% | 96% |
| marginal | 100% | 99% | 71% | 65% | 96% |
| small | 99% | 99% | 66% | 62% | 97% |
| medium | 99% | 99% | 65% | 56% | 99% |
| large | 100% | 98% | 59% | 54% | 99% |
| total | 100% | 99% | 67% | 62% | 97% |
| Khulna | 100% | 100% | 78% | 76% | 98% |
| Satkhira | 99% | 98% | 67% | 52% | 98% |
| Patuakhali | 99% | 99% | 52% | 48% | 97% |

Percentage of households with poultry; Source: HH survey 2021

Data in *Table 7.7* on poultry production and sales shows that households with larger land holdings (and with larger flocks) tend to produce, consume and sell more eggs and birds. Landless households consume a slightly smaller share of their egg production – possibly because they need income from sales, although this is not so apparent for birds. Households in Satkhira have higher sales of birds, but lower sales of eggs. Taking eggs and birds together, households in Khulna have higher sales.

Table 7.7: Poultry production and sales

| Land ownership | Number of eggs per month | | Egg sales | Birds sold | Consumed | Bird sales | Cost |
|----------------|--------------------------|----------|-----------|------------|----------|------------|-----------|
| | produced | consumed | BDT/month | No./year | No./year | BDT/year | BDT/month |
| landless | 79 | 30 | 642 | 9 | 6 | 3155 | 162 |
| marginal | 75 | 36 | 538 | 15 | 7 | 4726 | 226 |
| small | 85 | 41 | 655 | 17 | 8 | 5416 | 241 |
| medium | 108 | 51 | 852 | 17 | 10 | 5244 | 224 |
| large | 117 | 58 | 975 | 13 | 11 | 4586 | 202 |
| total | 82 | 37 | 624 | 15 | 7 | 4664 | 217 |
| Khulna | 104 | 35 | 838 | 14 | 7 | 4502 | 228 |
| Satkhira | 38 | 21 | 224 | 29 | 5 | 7530 | 346 |
| Patuakhali | 69 | 47 | 409 | 10 | 9 | 3348 | 148 |

Average number for those households reporting; Source: HH survey 2021

In total 5% of households reported to have ceased poultry production during BGP – less than for goats and cattle. Medium and large land owners are slightly less likely to have ceased keeping poultry. The main reason to stop rearing poultry was reported to be pests and diseases, followed by lack of space. Lack of space was reported by a higher proportion of landless and small land owners, while households with more land tended to cite lack of labour or time, poor economics and problems in getting inputs.

7.5 Goats

Overall, 30% of the surveyed households rear goats and/or sheep (but mainly goats), which is an increase from 24% since the start of BGP (*Table 7.8*). Increases are reported for all land-owning categories and in all three zones. The average number of animals per flock has fallen slightly, more so for landless households that own fewer animals. The average number of animals per household has increased in Patuakhali. Over the last 12 months, 16% of households (= 53% of goat rearers) sold an average of 3.1 animals, with fewer sales being made by those owning less land. Households in Satkhira now keep fewer goats, but fewer sell goats in Patuakhali. The value of sales is highest in Khulna.

Table 7.8: Goat rearing

| Land ownership | Goat rearing HH* | | Number of goats | | In last 12 months | | | |
|----------------|------------------|---------|-----------------|---------|-------------------|----------|------------|----------|
| | 2013-14 | 2020-21 | 2013-14 | 2020-21 | selling HH* | no. sell | income BDT | cost BDT |
| landless | 21% | 25% | 4.5 | 3.9 | 14% | 2.5 | 13,107 | 3,027 |
| marginal | 24% | 30% | 4.1 | 4.2 | 14% | 3.5 | 18,883 | 2,429 |
| small | 24% | 32% | 4.0 | 4.2 | 17% | 2.6 | 14,865 | 2,869 |
| medium | 26% | 33% | 5.3 | 5.2 | 20% | 3.5 | 20,461 | 4,498 |
| large | 27% | 29% | 5.7 | 5.8 | 18% | 3.3 | 17,240 | 4,739 |
| total | 24% | 30% | 4.7 | 4.6 | 16% | 3.1 | 17,298 | 3,495 |
| Khulna | 23% | 30% | 5.3 | 5.0 | 18% | 3.3 | 17,706 | 3,370 |
| Satkhira | 35% | 41% | 3.7 | 3.0 | 18% | 1.7 | 10,180 | 2,403 |
| Patuakhali | 20% | 26% | 2.9 | 3.8 | 12% | 2.8 | 17,775 | 2,222 |

* % of all households. Average number / value is average for reporting households; Source: HH survey 2021

Data also shows that overall, 7% of all households reported ceasing keeping goats during the BGP period, but the proportion is higher for landless households (especially in Khulna and Satkhira), and for the Satkhira zone as a whole. Overall, the main reason to quit is lack of space, especially for landless and marginal land owners, followed by availability of inputs (this being the main reason in Khulna). Lack of labour was cited by most medium land owners and was the main reason in Patuakhali.

7.6 Cattle and buffalo

Almost two-thirds (64%) of households own bovines (cattle and buffalo – mainly cattle), this having increased from 61% since the start of BGP (*Table 7.9*). Households with larger areas of land more often own animals. Since the start of BGP an increased number of households in all land ownership categories (except medium) now own animals, but fewer now own animals in Satkhira. The average number of animals for owning households has increased from 3.2 to 3.4 – but numbers have fallen in Satkhira. Again, households with more land own more animals. Half of all households have milking cows – with these being less widely owned by landless and marginal land owners. Households that have milk cows, own, on average, 1.5 animals.

Table 7.9: Ownership of cattle and buffalo

| Land ownership | Have bovine* | | Have milk cow* | | Number of bovines | | Number of milk cow | |
|----------------|--------------|---------|----------------|---------|-------------------|---------|--------------------|---------|
| | 2013-14 | 2020-21 | 2013-14 | 2020-21 | 2013-14 | 2013-14 | 2013-14 | 2020-21 |
| landless | 42% | 47% | 26% | 33% | 2.4 | 2.8 | 1.4 | 1.3 |
| marginal | 60% | 62% | 45% | 45% | 3.1 | 3.2 | 1.5 | 1.6 |
| small | 74% | 75% | 67% | 64% | 3.6 | 3.9 | 1.5 | 1.5 |
| medium | 71% | 69% | 66% | 60% | 4.2 | 4.4 | 1.7 | 1.7 |
| large | 76% | 71% | 67% | 68% | 4.9 | 5.3 | 1.9 | 1.8 |
| total | 61% | 64% | 50% | 50% | 3.2 | 3.4 | 1.5 | 1.5 |
| Khulna | 68% | 70% | 53% | 55% | 3.4 | 3.6 | 1.6 | 1.6 |
| Satkhira | 58% | 51% | 50% | 35% | 2.3 | 1.8 | 1.6 | 1.3 |
| Patuakhali | 56% | 60% | 47% | 48% | 3.4 | 3.8 | 1.2 | 1.5 |

* % of all households. Average number / value is average for reporting households; Source: HH survey 2021

Almost half (48%) of all households consume some of their milk (which amounts to almost all households with milking animals, and three-quarters of households that own bovines (*Table 7.10*). 24% of all households sell milk. Over one third (36%) of all households sold animals in the last year (=56% of bovine owners).

Table 7.10: Utilisation of milk and sales of animals

| Land ownership | Consume milk | | Sell milk | | Sale of animals in last year | | | Costs |
|----------------|--------------|--------------|-----------|--------------|------------------------------|----------|--------------|--------------|
| | % HH* | BDT/ year | % HH* | BDT/ year | % HH* | no. sold | BDT/ year | BDT/ year |
| landless | 30% | 10,157 | 14% | 15,320 | 22% | 1.4 | 58,349 | 18,543 |
| marginal | 43% | 11,690 | 20% | 17,416 | 34% | 1.3 | 60,313 | 24,371 |
| small | 63% | 13,079 | 33% | 28,052 | 46% | 1.7 | 76,931 | 37,463 |
| medium | 59% | 13,209 | 30% | 37,817 | 44% | 2.0 | 98,234 | 37,895 |
| large | 67% | 15,185 | 29% | 40,546 | 47% | 1.9 | 95,239 | 38,915 |
| total | 48% | 11,972 | 24% | 22,105 | 36% | 1.5 | 68,351 | 28,421 |
| Khulna | 55% | 10,845 | 30% | 22,775 | 41% | 1.4 | 66,396 | 33,889 |
| Satkhira | 29% | 22,105 | 24% | 29,577 | 28% | 1.7 | 84,688 | 28,996 |
| Patuakhali | 47% | 11,941 | 14% | 8,439 | 33% | 1.7 | 67,690 | 17,613 |

*% of all households. Average number / value is average for reporting households; Source: HH survey 2021

Although average sales of milk are about double the average value of milk consumed at home, twice as many households consume milk as sell milk, so the overall value of milk produced is more or less evenly split between home consumption and sales (but only 17% of milk is consumed in Patuakhali). Of the total value of bovine production, sales of animals make up 69%, home consumed milk 16% and milk sales 15%. However the value of animal sales may over-state the output of this sub-sector as animals tend to be bought and sold a number of times over their life-cycles.

During the BG period 10% of all households report that they ceased to keep bovines. With little use now being made of draught animals, there is no longer a need to keep animals to cultivate land, but they are still useful to produce milk, manure and as animals to sell. The main reason cited to cease keeping bovines was lack of labour or time, followed by lack of space. Landless households said lack of space was the main reason, while marginal households placed lack of space equal with lack of labour.

7.7 Pond fisheries

Overall 44% of households have fish ponds and 31% operate ghers (*Table 7.11*). Almost no landless households have fish ponds, but 18% operate ghers using rented land (all of them are in Khulna). There has been very little change in the number of fish pond households since the start of BGP, but more households now operate fish ghers— especially landless and marginal households in Khulna and medium land owning households in Satkhira. Almost two thirds (64%) of the households are involved in a forms of aquaculture, either operating ponds (*see Table 7.11*) or ghers (as discussed in *chapter 6*).

Table 7.11: Fish ponds

| Land ownership | Pond operators* | | Pond area decimals | |
|--|-----------------|---------|--------------------|---------|
| | 2013-14 | 2020-21 | 2013-14 | 2020-21 |
| landless | 1% | 2% | 1.5 | 6.3 |
| marginal | 39% | 40% | 6.9 | 7.0 |
| small | 66% | 65% | 12.1 | 12.2 |
| medium | 81% | 84% | 19.1 | 19.3 |
| large | 91% | 91% | 32.9 | 34.4 |
| total | 44% | 44% | 18.5 | 19.7 |
| Khulna | 35% | 36% | 17.5 | 17.6 |
| Satkhira | 24% | 24% | 19.4 | 19.7 |
| Patuakhali | 67% | 68% | 19.4 | 22.2 |
| * % of all households Average for households with ponds ; Source: HH survey 2021 | | | | |

As would be expected, households owning more land have larger pond and gher areas. There has been a tiny increase in the average size of pond and small increase in size of gher since the start of BGP. All pond operators consume some or all of the fish they produce (*Table 7.12*). This table also shows that 5% of the surveyed households produce vegetables on the sides of fish ponds.

Table 7.12: Fish pond production

| Land ownership | Percent of all households | | | Fish produce | Fish consume | Fish sold | Vegetables | Costs |
|--|---------------------------|------|----------|--------------|--------------|-----------|------------|----------|
| | Produce | Sell | Prod veg | Kg/year | BDT/year | BDT/year | BDT/year | BDT/year |
| landless | 2% | 1% | 0% | 84 | 7,160 | 15,000 | - | 3,667 |
| marginal | 40% | 10% | 3% | 90 | 8,355 | 12,945 | 5,267 | 3,082 |
| small | 66% | 26% | 7% | 141 | 11,180 | 15,233 | 2,688 | 4,470 |
| medium | 84% | 36% | 13% | 183 | 13,606 | 20,425 | 3,188 | 6,398 |
| large | 91% | 50% | 19% | 293 | 18,225 | 38,377 | 3,781 | 12,642 |
| total | 44% | 16% | 5% | 114 | 9,510 | 14,955 | 3,269 | 3,999 |
| Khulna | 36% | 13% | 6% | 90 | 7,256 | 13,576 | 4,203 | 3,160 |
| Satkhira | 24% | 9% | 0% | 64 | 5,018 | 6,980 | 95 | 2,254 |
| Patuakhali | 68% | 23% | 4% | 131 | 11,204 | 14,118 | 1,876 | 4,277 |
| Average for households reporting production and/or sales; Source: HH survey 2021 | | | | | | | | |

Performance parameters in *Table 7.13*, calculated from data in *Table 7.12*, show that over one third (35%) of fishpond owners sell fish – with a higher proportion for larger land owners – as they have bigger ponds and so produce more fish. Vegetables are grown on the sides of ponds by 10% of pond operators – again this is more common with larger land owners. The yield of fish per unit area of pond increases as land owning gets less – suggesting that smaller ponds are managed more intensively. However, the very high yield for landless households should be disregarded as there was only one landless household with a pond. Just over 60% of fish produced (by value) is sold, and marginal (and landless) pond owners obtain a higher average price per kg. A higher proportion of fish is sold in Khulna where prices are also higher.

Table 7.13: Fish pond performance

| Land ownership | % of pond operators | | yield | % sold | Fish price | Costs |
|----------------|---------------------|----------|--------|----------|------------|--------|
| | sell fish | grow veg | kg/dec | by value | Tk/kg | Tk/dec |
| landless | 33% | 0% | 56.0 | 68% | 264 | 44 |
| marginal | 25% | 7% | 13.1 | 61% | 238 | 34 |
| small | 40% | 11% | 11.6 | 58% | 187 | 32 |
| medium | 42% | 15% | 9.6 | 60% | 186 | 35 |
| large | 54% | 20% | 8.9 | 68% | 193 | 43 |
| total | 35% | 10% | 13.1 | 61% | 215 | 35 |
| Khulna | 37% | 16% | 10.7 | 65% | 232 | 35 |
| Satkhira | 39% | 1% | 11.5 | 58% | 188 | 35 |
| Patuakhali | 33% | 7% | 12.9 | 56% | 193 | 33 |

Fish price includes fish consumed at home; Source: HH survey 2021

7.8 Feedback from FGDs on homestead production

The information from informal interviews and anecdotal feedback from field staff suggested homestead production became both more widespread and had increased during the BG period. Data from the household survey in 2021 shows that 79% of the households produce homestead vegetables (an increase from 71%) and 92% homestead fruit (up from 91%). This data is supported by information from FGDs which indicated that homestead vegetables were grown by 50% to 90% of households in Khulna, 50% to 80% in Satkhira and 80% to 100% in Patuakhali. FGDs reported that homestead fruit was grown by 50% to 100% of households in Khulna, 80% to 20% in Satkhira, and 70% to 100% in Patuakhali. The lower figures from Satkhira refer to an area of saline gher, which is not typical of the zone (polder 2&2E) as a whole. FGDs reported that production of homestead vegetables had increased by between 30% and 65% in Khulna, zero to 80% in Satkhira and 40% to 90% in Patuakhali. For fruit the increases were 30% to 70% in Khulna, zero to 40% in Satkhira and 30% to 70% in Patuakhali. These increases were attributed to improved production methods learned in the Blue Gold homestead Farmer Field Schools as well as more households now being involved in agriculture; increases could be constrained in some locations by unfavourable water management conditions.

The household survey 2021 reported that there has been a marginal increase (90% to 91%) in the number of households keeping poultry. This is supported by the FGDs which indicated that poultry are reared by 80% to 100% of households in Khulna, 90% to 100% in Satkhira and 50% to 100% in Patuakhali. The survey shows growth in average flock size (15 to 21 birds in this WMG survey). FGDs reported increased poultry production (20%-70% in Khulna, 20% in Satkhira and 30% to 70% in Patuakhali) due to the provision of know-how and inputs as incentives by BGP.

The household survey 2021 reported a larger proportion of households with goats (30%), this having increased from 24% since the start of BGP, with average flock size slightly declining from 4.7 to 4.6 animals. The FGDs reported that between 2% and 80% of households keep goats in Khulna, 30% to 80% in Satkhira, and 5% to 80% in Patuakhali. In Khulna five FGDs reported an increase in goats of between 10% and 55%, and six FGD reported a decrease of 20% to 70%. In Satkhira one FGD reported a 20% increase, and the other a 10% decrease. In Patuakhali five FGDs reported increases of 15% to 100%, and five reported decreases of 10% to 30%. The reasons for increases were the profitability, adoption of improved methods for livestock (with training and support from BGP and/or NGOs), as well as availability of grazing. Decreases were caused by problems with keeping goats out of crops and homestead gardens – as crop areas are increasing.

The household survey 2021 found that a larger and increasing proportion of households kept cattle (64%, increasing from 61% before BGP) with herd size increasing from 3.2 to 3.4 animals. The FGDs in Khulna found that between 10% and 100% of households kept bovines, in Satkhira this was 30% to 70%, and in Patuakhali 50% to 100%. All 23 FGDs said bovine numbers had increased, except for one in Khulna (decrease of 25%), one in Satkhira (down 20%) and three in Patuakhali (down 10% to 30%). Increases ranged from 10% to 80%. The reasons for decreasing the numbers of bovines were the move away from the use of animals in ploughing land, lack of grazing, and the cost, time and effort needed for their care. Increasing bovine numbers were attributed to training and support from BGP.

The household survey data 2021 showed that the number of ponds owners has been static since the start of BGP. The FGDs in Khulna reported that up to 90% of the households had ponds, and production had increased by 10% to 60% due to training and support from BGP. However, at two locations the number of ponds were decreasing - in polder 28/2 ponds are being filled in to build houses, and in polder 25 they are being replaced by fish ghers. In Satkhira at one location all households have ponds and production is increasing. At the other location, only 20% have ponds and fish production is decreasing due to salt contamination (due to saline water fish ghers). In Patuakhali, between 50% and 100% of households have ponds and production increased by between 30% and 80% due to support from BGP.

7.9 Problems of agricultural and homestead production

Sample households were asked to identify the problems they face in production of crops, poultry, livestock and fish. These problems have been grouped into five categories (i) pests and diseases, including damage by birds and animals; (ii) water and weather-related problems, including waterlogging/poor drainage heavy rain/hail, flooding, drought, lack of irrigation water and salinity; (iii) input problems including lack of fertilisers, pesticides, medicines, feeds, seeds, plants, fish fry etc, high and rising cost of inputs, low quality of inputs (including adulteration), labour shortages and high wages; (iv) finance problems including lack of capital for investment and difficulty in getting loans; and (v) other problems including lack of technical services and lack of technical knowledge and skills.

The data in *Table 7.14* is reported as a percentage of all households, so the proportion of households reporting problems partly depends on the numbers of households involved in different sub-sectors. Almost three-quarters (74%) of households reported a major problem for poultry, but these are reared by 94% of all households, so 79% of the poultry rearers reported a problem. Almost two-thirds (64%) of households are involved in aquaculture, and 31% reported a main problem, which is 48% of aquaculture households. Most (79%) households grew homestead vegetables, and a small number also grew field vegetables. Main problems for vegetables were reported by 62% of households so most vegetable growers had problems. Land was cultivated by 88% of the households – almost all of whom grew paddy and main problems for paddy were reported by 74% of all households. A quarter (24%) of households reported main problems in non-rice crops, but fewer households grew non-rice crops. Some households specifically said that they have no major problems. This is as much of 32% of all households for fish (=50% of fish producers), and 29% for vegetables (=37% of vegetable growers), but only 7% for paddy (=8% of crop cultivators).

Table 7.14: Production problems

| Sub-sector | problem | pests and diseases | water and weather | inputs | finance | other | no problem |
|-------------|---------|--------------------|-------------------|--------|---------|-------|------------|
| Paddy | main | 54% | 20% | 0% | 0% | 0% | 7% |
| | other | 9% | 23% | 1% | 0% | 0% | 0% |
| Vegetables | main | 60% | 1% | 1% | 0% | 0% | 29% |
| | other | 5% | 2% | 1% | 0% | 0% | 1% |
| Other crops | main | 11% | 14% | 0% | 0% | 0% | 6% |
| | other | 5% | 2% | 0% | 0% | 0% | 0% |
| Fish | main | 20% | 1% | 9% | 0% | 1% | 32% |
| | other | 2% | 1% | 2% | 5% | 0% | 0% |
| Poultry | main | 74% | 0% | 0% | 0% | 0% | 15% |
| | other | 7% | 0% | 4% | 0% | 0% | 0% |
| Livestock | main | 39% | 0% | 0% | 2% | 3% | 27% |
| | other | 0% | 0% | 0% | 5% | 1% | 0% |

* % of all households; Source: HH survey 2021

Problems reported by sample households mainly relate to pests and diseases (which also include losses due to damage by animal and birds – but this is much less widespread). This is followed by water and weather-related problems, mainly flooding and also drought. Water and weather-related problems are placed slightly higher than pests and diseases for non-rice crops. In all other sub-sectors, pests and diseases were the main problem. Relatively few households reported other problems. Input problems for fish (mainly lack of good quality fingerlings) were reported as a major or secondary problems by 11% of households (=17% of fish producers). Lack of finance was an issue for some livestock and fish producers.

FGDs also identified pests and diseases as major problems in crops (and virus diseases for fish), and some groups mentioned that farmers lacked knowledge on this problem and on how to use pesticides. Weather related disasters including heavy rainfall and drought were also problems, and a number of FGDs mentioned problems in water management, including lack of control over the infrastructure. Input quality (especially seed) along with high prices were also often mentioned. In a few locations, FGDs said there were clashes over water management between different crops such as local aman and boro. In one place grazing cattle was damaging crops. Lack of labour and high wages were another problem.

COVID-19 was still said to be a significant problem in 20 out of the 23 FGDs. Limitations on movement made marketing difficult and there were shortages of labour with rising wages. Prices of perishable commodities were lower and inputs could be difficult to get. In discussing problems, economic issues dominated the FGDs in the 2019 WMG survey – the falling price of farm products (especially paddy) and the increasing cost of labour and farm inputs. This has now changed, although some of the 2021 FGDs did feel they were not getting fair prices for their crops and markets could be manipulated by middlemen. Farmers were now much more positive about paddy production, but less enthusiastic about expanding fish.



08 The Outcomes and Impact on the Livelihoods of Women

The status of women has a bearing on the economic wellbeing of the households, and the importance of the status of women in society has a positive impact on the overall status of a community. Gender inequality is recognized as a key constraint to pursuing secure livelihoods. To ensure the overall objectives of BGP are met, interventions of the Blue Gold Program (BGP) were designed and implemented in a way that both men and women benefited. BGP worked on women's empowerment in its coastal communities, thus women got more access to economic resources and they became able to more participate in and also influence decision-making. As a result, women of BGP areas now have an improved livelihood and better well-being compared to the pre-project situation. For more information on BGP's gender strategy, interventions and results, see Chapter 24 Gender Equality and Women's Empowerment. This chapter presents findings from the endline survey of 2020 and the household survey of 2021.¹

8.1 Women's role in economic activities

Household survey 2021 data shows that almost all (over 99%) of the surveyed women are engaged in some type of income generating activities, mostly (over 90% of women) within the homestead for homestead cultivation and poultry rearing (*Table 8.1*). About three-quarters of women are involved in post-harvest activities (77%) and livestock rearing (74%), and half are engaged in aquaculture (50%).

¹ Section B Introduction and Summary provides an overview of the studies conducted through the Blue Gold Program, and the studies and reports which were the main sources of information for Section B.

Table 8.1: Women's economic participation

| | Zone – Percent of HH | | | Land category – Percent of HH | | | | | Total |
|-------------------------|----------------------|------------|----------|-------------------------------|----------|-------|--------|-------|-------|
| | Khulna | Patuakhali | Satkhira | landless | marginal | small | medium | Large | |
| Homestead agriculture | 90.0% | 91.8% | 95.3% | 77.4% | 90.5% | 96.3% | 96.0% | 95.7% | 91.3% |
| Field crops | 74.8% | 9.9% | 22.7% | 36.4% | 46.7% | 47.2% | 48.4% | 43.9% | 44.9% |
| Post-harvest work | 77.1% | 74.2% | 81.3% | 56.9% | 81.0% | 83.5% | 83.6% | 74.1% | 76.6% |
| Poultry rearing | 87.9% | 93.1% | 89.8% | 83.6% | 90.5% | 94.0% | 90.0% | 92.1% | 90.0% |
| Livestock rearing | 80.2% | 64.8% | 77.3% | 58.5% | 75.7% | 81.7% | 78.0% | 76.3% | 74.3% |
| Aquaculture | 68.5% | 32.7% | 25.0% | 16.4% | 46.7% | 58.7% | 67.2% | 58.3% | 50.1% |
| Non-farm activities | 11.7% | 1.6% | 15.6% | 13.3% | 9.5% | 7.8% | 6.8% | 5.0% | 8.6% |
| Wages (farm, earthwork) | 4.4% | 2.7% | 8.6% | 16.4% | 4.8% | 0.5% | 0.4% | 0.0% | 4.3% |
| Salaried employment | 5.6% | 3.6% | 2.3% | 2.1% | 2.4% | 2.8% | 7.2% | 8.6% | 4.4% |
| Handicrafts | 15.8% | 3.3% | 27.3% | 13.3% | 10.0% | 15.6% | 12.8% | 11.5% | 12.7% |
| Other IGA | 5.6% | 0.8% | 32.8% | 9.2% | 5.2% | 6.4% | 5.6% | 12.2% | 7.3% |
| No economic activities | 0.6% | 1.1% | 0.8% | 3.6% | 0.5% | 0.0% | 0.0% | 0.0% | 0.8% |
| Sample size (n) | 520 | 364 | 128 | 195 | 210 | 218 | 250 | 139 | 1012 |
| Source: HH survey 2021 | | | | | | | | | |

A significant percentage of the women are doing farm work (45%) with field crops. Only a few women do non-farm work (9%), work for wages on other farms (4.3%), or have salaried jobs (4.4%); and 13% are engaged in handicrafts. Women in BGP areas participate to a greater extent in different economic activities, and a very low proportion (less than 1%) has no economic role at all.

Compared with the 2017 baseline survey, there has been a decrease (4% to 0.8%) in the proportion of women with no economic activities and increase in the proportion involved in homestead cultivation (66% to over 91%), poultry rearing (81% to 90%), and livestock rearing (57% to 74%), reflecting both the increase in numbers of households that report these activities, and more especially, the increase of women's participation in this work. There has been a very significant increase (7% to 45%) in the proportion of households where women are involved in field crop production. There is considerable variation in women's economic participation between zones. Around three quarters of women in Khulna zone are doing farm work. A high proportion of women (68.5%) in Khulna are participating in aquaculture. Women in Satkhira are doing more non-farm activities, wage labour, handicrafts and other IGA activities compared to the other two zones.

8.2 Main Occupation of women

Although in the WMG household survey 2021 over 99% of women are economically active, the endline survey 2020 shows that in 81% of the households, the women's main occupation was stated to be housewife. This can be explained by the fact that most women tend to spend 6 to 8 hours per day on care

and domestic activities, which is nearly always more hours than they spend on economic activities.²

Table 8.2: Main occupation of adult women*

| | Percentage of households in each land ownership category | | | | | |
|---------------------------|--|----------|--------|--------|--------|--------|
| | landless | marginal | small | medium | large | Total |
| Agricultural crops | 0.1% | 0.3% | 0.0% | 0.2% | 0.0% | 0.2% |
| Livestock, poultry, fish | 2.1% | 1.9% | 1.4% | 2.2% | 0.0% | 1.8% |
| Agricultural wage labour | 1.5% | 0.3% | 0.1% | 0.0% | 0.0% | 0.4% |
| sub-total agriculture | 3.7% | 2.6% | 1.5% | 2.4% | 0.0% | 2.4% |
| Artisan/handicraft | 0.1% | 0.3% | 0.1% | 0.2% | 0.0% | 0.2% |
| Business/trade | 0.2% | 0.3% | 0.3% | 0.0% | 0.0% | 0.3% |
| Services | 0.9% | 0.8% | 1.5% | 1.9% | 2.9% | 1.2% |
| Non-agricultural labour | 2.2% | 0.6% | 0.0% | 0.0% | 0.0% | 0.6% |
| Other | 1.8% | 0.8% | 0.5% | 1.2% | 1.0% | 0.9% |
| sub-total non-agriculture | 5.2% | 2.9% | 2.5% | 3.3% | 3.8% | 3.2% |
| Student | 4.5% | 5.8% | 7.0% | 9.0% | 4.8% | 6.2% |
| Housewife | 80.0% | 81.4% | 81.8% | 77.8% | 81.9% | 81.0% |
| Not working | 6.5% | 7.4% | 7.3% | 7.6% | 9.5% | 7.2% |
| sub-total – non-earning | 91.0% | 94.6% | 96.1% | 94.3% | 96.2% | 94.5% |
| Total | 100.0% | 100.0% | 100.0% | 100.0% | 100.0% | 100.0% |

* women aged over 16 years, data from endline survey 2020

Only in 2.4% of households is agriculture the main occupation for women, and only in 3.2% of households is a non-agricultural occupation the main occupation (*Table 8.2*). It is worth noting that the “not working” category increases with land ownership, despite evidence from the previous table that women in households with more land are more likely to have economic activities.

The informal interviews discussed how the role of women had changed over a longer timeframe since the start of BGP. In all zones women have greatly increased their involvement in agriculture and off-farm work. This has been driven by the improved education and literacy of women and changing attitudes of men. The Blue Gold interventions to enhance agricultural production, including the crop and homestead Farmer Field Schools, are also likely to have contributed to women’s increased involvement in agricultural production. However, women are still held back by social rules and discrimination, domestic work and child rearing, and women are often expected to stay at home and engage in homestead based economic activities.

In Khulna women seem to have more opportunities for non-farm work, including salaried jobs and work in factories. In Satkhira the work of women is still mostly limited to homestead farming. The position of women in Patuakhali appears to be in between those in Khulna and Satkhira, with some women working outside the home and having their own businesses. Increased participation in income generating work alongside their domestic tasks means women have had an increase in their overall workload. Men are reported to be doing some more domestic work, more so in Khulna and not really at all in Satkhira. Wages paid to women have increased substantially in all zones but are still significantly less than those paid to men – apart from some examples in Patuakhali.

2 This leads to the situation that a man who works 6 hours/day in agriculture is categorized as a farmer, whereas a woman who works 6 hours in agriculture and 7 hours in domestic tasks, is categorized as a housewife. It may also reflect established social norms – a male head of household is said to be a farmer even if most of his income comes from non-farm sources, with his wife being classified as a housewife even if she spends more time on income generating activities.

8.3 Equality in food consumption

The gender division of meat, fish and eggs consumption is shown in *Table 8.3*. These foods can be divided between male and female household members in three ways: (i) only consumed by men and boys; (ii) consumed by all household members, but with a larger share going to men and boys; and (iii) divided equally between all household members irrespective of their gender.

Table 8.3: Gender equality of consumption of meat, fish and eggs

| Zone | men and boys only | men and boys more | equally | Total | Sample no |
|------------------------|-------------------|-------------------|---------|--------|-----------|
| Khulna | 3.7% | 21.5% | 74.6% | 100.0% | 520 |
| Satkhira | 1.1% | 39.3% | 59.6% | 100.0% | 364 |
| Patuakhali | 0.0% | 32.8% | 67.2% | 100.0% | 128 |
| Land ownership | | | | | |
| landless | 2.1% | 29.2% | 68.2% | 100.0% | 195 |
| marginal | 0.5% | 27.6% | 71.9% | 100.0% | 210 |
| small | 3.2% | 28.4% | 68.3% | 100.0% | 218 |
| medium | 3.6% | 29.6% | 66.8% | 100.0% | 250 |
| large | 1.4% | 33.1% | 65.5% | 100.0% | 139 |
| Total | 2.3% | 29.3% | 68.3% | 100.0% | 1012 |
| Source: HH survey 2021 | | | | | |

The data shows that in around two thirds (68%) of households, meat, fish and eggs are shared equally, and only in 2.3% of households is consumption of these foods restricted to men and boys. In nearly 30% households, men and boys consume more than women. There is equal sharing in a higher proportion (75%) of households in Khulna, but there are also more households (3.7%) where consumption is limited to men and boys. Around 40% households in Patuakhali reported men and boys consume more than women. There is no discernible relationship between the amount of land owned and food equality, although in the households (small and medium) a slightly higher proportion (more than 3%) limit consumption to men and boys

8.4 Decision making regarding assets and land

Women were asked to report regarding decision-making on the purchase and sale of assets and leasing of land. This is important as such decisions are related to access to economic resources and production. More than two-thirds (72.5%) of all households decide jointly while only in 1.2% of the households these decisions are made by men alone. There is a lower level of joint decision-making in Patuakhali (47%) and higher in Satkhira (93%). A slight variation regarding decision-making authority within the households is visible among the household categories based on land holding but it does not follow any trend. The highest percentage of women (over 3%) who take decisions on their own are from landless category households, and this may relate to the higher percentage of the female-headed households in this category.

Table 8.4: Decision making regarding assets and land by household members

| Zone | only men | some role for women | concerning own prod* | joint decision | only women | total | Sample no |
|-----------------------|----------|---------------------|----------------------|----------------|------------|--------|-----------|
| Khulna | 1.5% | 10.8% | 0.8% | 85.4% | 1.5% | 100.0% | 520 |
| Satkhira | 0.3% | 51.6% | 1.1% | 47.0% | 0.0% | 100.0% | 364 |
| Patuakhali | 2.3% | 1.6% | 0.8% | 93.0% | 2.3% | 100.0% | 128 |
| Land ownership | | | | | | | |
| landless | 1.0% | 21.0% | 2.1% | 72.8% | 3.1% | 100.0% | 195 |
| marginal | 0.5% | 22.4% | 0.5% | 76.2% | 0.5% | 100.0% | 210 |
| small | 2.3% | 22.9% | 1.8% | 72.0% | 0.9% | 100.0% | 218 |
| medium | 0.4% | 29.6% | 0.0% | 69.6% | 0.4% | 100.0% | 250 |
| large | 2.2% | 24.5% | 0.0% | 72.7% | 0.7% | 100.0% | 139 |
| Total | 1.2% | 24.3% | 0.9% | 72.5% | 1.1% | 100.0% | 1012 |

Source: HH survey 2021

8.5 Mobility and participation

Women were asked about visiting places outside of their homes on their own - i.e. not accompanied by a male household member. This indicates their mobility and participation in various economic and social spaces (*Table 8.5*). More than 95% of the women can visit on their own a health clinic and hospital; also around 95% of the women can go to their children's school if necessary. Over 80% women can go to a Union Parishad office and local market. Around 66% women can attend national festivals alone, while 64% can go to an office of an NGO or CBO. More than 40% women can go alone to Upazila level offices, while just over 30% women can go alone to a district level office.

Table 8.5: Women's economic participation

| Places visited | Zone – Percent of HH | | | Land category – Percent of HH | | | | | Total |
|--|----------------------|------------|----------|-------------------------------|----------|-------|--------|-------|-------|
| | Khulna | Patuakhali | Satkhira | landless | marginal | small | medium | Large | |
| Local market | 98.5% | 56.0% | 92.2% | 92.8% | 82.4% | 78.9% | 80.0% | 77.7% | 82.4% |
| Health centre/clinic | 99.8% | 98.9% | 96.9% | 100.0% | 100.0% | 99.1% | 98.8% | 97.1% | 99.1% |
| Hospital | 99.4% | 93.1% | 92.2% | 98.5% | 94.8% | 95.4% | 96.4% | 96.4% | 96.2% |
| NGO/CBO office | 90.6% | 35.4% | 51.6% | 68.2% | 70.0% | 63.3% | 64.8% | 61.9% | 65.8% |
| Attend national festival | 89.4% | 31.3% | 53.1% | 59.0% | 61.0% | 63.8% | 67.2% | 69.8% | 63.9% |
| Upazila agriculture, fish. etc. office | 69.2% | 8.5% | 30.5% | 39.5% | 40.5% | 42.2% | 47.2% | 41.7% | 42.5% |
| UP office | 97.1% | 63.5% | 90.6% | 90.8% | 88.1% | 78.0% | 83.2% | 80.6% | 84.2% |
| District level offices | 46.4% | 11.8% | 24.2% | 25.6% | 28.5% | 27.1% | 37.6% | 37.4% | 31.1% |
| Upazila social welfare office | 62.5% | 20.9% | 33.6% | 41.0% | 44.8% | 40.4% | 47.2% | 46.0% | 43.9% |
| Schools | 95.2% | 92.6% | 94.5% | 92.8% | 93.3% | 95.0% | 94.8% | 95.0% | 94.2% |
| Other place | 0.0% | 0.0% | 0.0% | 0.0% | 0.0% | 0.0% | 0.0% | 0.0% | 0.0% |
| Do not go anywhere on their own | 0.0% | 0.5% | 0.0% | 0.0% | 0.0% | 0.9% | 0.0% | 0.0% | 0.2% |
| Sample size (n) | 520 | 364 | 128 | 195 | 210 | 218 | 250 | 139 | 1012 |

Source: HH survey 2021

Substantial changes have occurred in women mobility since the 2017 baseline survey. The data suggests a significant decline (9.4% to 0.2%) in the number of households where women do not go anywhere on their own, and there have been increases in the number of households where women go to markets (45% to 82.4%) and to NGO/CBO offices (36% to 66%). The number of households where women visit for health facilities has also increased 13% for health clinic and 24% for hospital. There are also significant changes in visiting schools (51% to 94%), UP offices (26% to 84%), national festivals (10% to 64%), Upazila offices of agriculture, fishery and livestock departments (0% to 42.4%), Upazila social welfare offices (2% to 43.3%), and district level offices (2% to 31%) - maybe as a result of getting to know these departments via Farmer Field Schools and through other BG activities.

There is considerable variation in mobility within the zones, with less women mobility in the Patuakhali zone compared to Khulna and Satkhira zone. There is no discernible relationship between the amount of land owned and women mobility. However, mobility varies with the places visited. Households owning less land tend to have greater female mobility to markets, health facilities (only slightly), UP and NGO/CBO offices; while households with more land will tend to have greater female mobility to festivals and schools. Women from all types of households appear to be mobile – with a very few households (0.2%) reporting that their women do not go out unaccompanied.

8.6 Overall empowerment of women

The findings from the household survey questionnaire and informal interviews provide more insights into improvements into the position of women within the household. BGP organized women and ensured their participation in water management (33% women in executive committee of WMG and WMA), in Farmer Field Schools (FFS) and in other training activities. Half of the participants of crop FFS (1139 FFS) by DAE were women while 87.6% of the participants were women in TA FFS (1178 FFS) on homestead-based production (homestead vegetable production, poultry, livestock, fish pond and nutrition). BGP also provided training on water management, gender awareness and leadership, on market orientation and different social issues. All of these helped to improve the position of women within their households and the communities.

Findings show that the area of crops and homestead production have increased, and women are now working on farms and homesteads to a greater extent than previously. Women now have an income, not only from working within the homestead, but also from working in the crop fields and other outside income-generating activities. In Khulna and Satkhira, women may now be hired for almost all farm operations, including transplanting and weeding paddy, and preparation of fish ghers, and have, to some extent, replaced male labour. Around 75% women in Khulna report working in crop fields. However, this pattern varies between zones. In Patuakhali, women are still primarily hired for work in mung beans and other non-rice crops (but they may provide all the hired labour for these crops). Here women provide little or none of the hired labour for paddy - at most only doing some limited tasks, such as uprooting aman seedlings.

Compared with the 2017 baseline survey, there is an apparent increase in the number of households with women working in homestead agriculture and crop agriculture, including work in crop fields and post-harvest activities. When households are producing homestead vegetables, poultry, livestock, and aquaculture, it is the women who are mostly involved in such production. The role of women in many of these 'enterprises' has also grown, as households are keeping more chicken and ducks, have bigger or better stocked fish ponds, and are rearing more livestock.

Women now have more mobility and participate more in organizations within the community. They have access to and are more engaged with institutions beyond their community. They are doing small business (e. g. collection of basok leaves or drumstick) and salaried jobs (but with limited options). Women have

now economic roles within the homestead and outside the home. The returns they receive from these activities reflect the relation with economic improvement for them and their households.

Informal interviews confirm that the return of women's income generating activities contribute the improved livelihood of women and their families. Economic contribution within the family and participation in social spaces and community activities support women to have a greater say in household decision making and higher social status within the community. They often do not need to lend their hand anymore for small amounts to their husband. They more often can earn money and spend according to their own and family needs.

Women are now having roles in the decision-making with their husbands regarding production, asset sale and family issues. While making a contribution to household income gives women a greater say in household decision making, income earning work on top of their existing domestic tasks can also lead to an excessive workload with very little leisure time. Informal interviews conform that woman are almost always paid less than men for the same work. Only in a few instances equal wages are paid, such as sometimes for tasks as weeding of paddy. In some cases, the differential between male and female has narrowed, at least in relative terms, with female wages doubling since the start of BGP, while male wages have only gone up by 50%.



09 The Overall Outcomes and Impacts on the Livelihoods of Coastal Communities in Blue Gold Polders

This chapter focuses on the overall outcomes and impacts of Blue Gold Program interventions on the livelihoods of the coastal communities in BGP polders. The chapter includes the changes of demographic composition, the gender of the household head over the time of BGP, the level of education of the household head and the school enrolment of children to explore the general features of coastal households. The income flow of the households and the stock of household assets are emphasized as the important components of rural people's livelihood, in that it can be converted into other forms of capital or used for the direct achievement of livelihood outcomes. Income-earning sectors identify the income flows into the household, such as from crop cultivation and non-agricultural income sectors. The aggregate household income provides a useful indicator of economic security. This chapter also focuses on the living standard through the condition of dwelling, access to water for domestic use and sanitation and consumption pattern and food security. The income, poverty ranking and asset data offer an opportunity to cross-check the reporting bias and to examine the balance struck by households between consumption pattern, investment in agricultural and non-agricultural sectors and pursuing different livelihood strategies for a secure livelihood. As such, its availability is directly related to the capacity of a household to withstand or buffer livelihood shocks, and to achieve improvements in overall well-being. The main source of the data used in this chapter is the endline survey of 2020, as reported upon in Technical Report 27, complemented with data from the household survey 2021 reported in Technical Report 29.¹

¹ Section B Introduction and Summary provides an overview of the studies conducted through the Blue Gold Program, and the studies and reports which were the main sources of information for Section B.

9.1 General features of coastal households

9.1.1. Household composition

The average family size is 4.4, which has reduced by 2 points as compared to the baseline 2017. There is a significant difference in the average size of households among the different types of land holding households.

Table 9.1: Household composition (n=3,969 hhs)

| Zone | % of HH | Average size of household | | | | Female headed HH |
|-----------------------|---------|---------------------------|-------|--------|-------|------------------|
| | | Men | women | child* | Total | |
| Khulna | 39.6% | 1.74 | 1.70 | 0.86 | 4.31 | 4.9% |
| Satkhira | 24.7% | 1.72 | 1.60 | 0.77 | 4.09 | 4.7% |
| Patuakhali | 35.6% | 1.92 | 1.83 | 1.09 | 4.84 | 5.7% |
| Land ownership | | | | | | |
| landless | 19.7% | 1.47 | 1.52 | 0.98 | 3.97 | 6.8% |
| marginal | 41.0% | 1.78 | 1.67 | 0.93 | 4.38 | 5.4% |
| small | 30.2% | 1.94 | 1.82 | 0.89 | 4.65 | 4.3% |
| medium | 7.8% | 2.09 | 2.04 | 0.88 | 5.01 | 3.2% |
| large | 1.3% | 2.19 | 2.17 | 0.81 | 5.17 | 1.9% |
| Total | 100.0% | 1.80 | 1.72 | 0.92 | 4.44 | 5.1% |

* upto and including 12 years; source: Endline survey 2020

Data shows as well-being improves from the landless to the large farmer, household sizes become significantly larger from 3.9 to 5.2. The average number of male and female members within the households is very similar with a slightly higher average number of male members. The average number of children is around 1. Overall, only 5.1% of the households are female headed, which has increased 1.5 points compared to baseline 2017. Female-headed households are more prevalent (6.8%) in the landless household category while lowest (1.9%) in the large farm households. Informal interviews found that husbands of many women of the poor group in the rural areas work and reside outside their villages for a certain period within a year.

9.1.2. Educational status of the household members

Among the members of the sampled households, more than 46% completed their primary education while around 20% of members are illiterate or can sign only. *Table 9.2* for the educational status of the household head also indicates the education accomplishment of the household heads with 41% having primary education while 37% of them do not have any formal education.

Table 9.2: Educational level of all members of the households

| Zone | Primary | Secondary | SSC | HSC | Graduate & above | Illiterate & can sign only | Under school age | Religious education & others | Total |
|-----------------------|---------|-----------|-------|-------|------------------|----------------------------|------------------|------------------------------|--------|
| Khulna | 42.3% | 8.0% | 9.2% | 6.1% | 4.2% | 21.1% | 8.7% | 0.3% | 100.0% |
| Satkhira | 48.7% | 6.8% | 7.0% | 5.3% | 3.4% | 19.4% | 8.9% | 0.6% | 100.0% |
| Patuakhali | 49.6% | 5.5% | 7.2% | 6.4% | 2.9% | 16.2% | 9.9% | 2.4% | 100.0% |
| Land ownership | | | | | | | | | |
| landless | 49.6% | 5.2% | 4.8% | 2.5% | 1.4% | 26.1% | 10.2% | 0.3% | 100.0% |
| marginal | 48.9% | 6.6% | 6.8% | 4.3% | 2.2% | 22.0% | 8.5% | 0.7% | 100.0% |
| small | 44.0% | 8.2% | 9.5% | 7.8% | 4.6% | 16.5% | 8.8% | 0.6% | 100.0% |
| medium | 38.3% | 9.9% | 12.0% | 10.4% | 10.6% | 10.4% | 7.8% | 0.6% | 100.0% |
| large | 31.2% | 6.3% | 15.2% | 10.4% | 12.6% | 14.1% | 10.0% | 0.0% | 100.0% |
| Total | 46.3% | 7.2% | 7.9% | 5.7% | 3.7% | 19.8% | 8.9% | 0.6% | 100.0% |

source: Endline survey 2020

Table 9.3: Educational level of household head (n=3,969)

| Zone | Primary | Secondary | SSC | HSC | Graduate & above | Illiterate & can sign only | Under school age | Religious education & others | Total |
|-----------------------|---------|-----------|-------|-------|------------------|----------------------------|------------------|------------------------------|--------|
| Khulna | 37.6% | 7.8% | 9.3% | 4.5% | 4.9% | 35.6% | 0.0% | 0.2% | 100.0% |
| Satkhira | 44.5% | 5.0% | 6.4% | 3.6% | 2.7% | 37.7% | 0.0% | 0.1% | 100.0% |
| Patuakhali | 43.3% | 7.9% | 5.4% | 4.4% | 3.4% | 35.5% | 0.0% | 0.0% | 100.0% |
| Land ownership | | | | | | | | | |
| landless | 41.2% | 4.0% | 4.2% | 1.3% | 0.9% | 48.3% | 0.0% | 0.1% | 100.0% |
| marginal | 43.3% | 5.2% | 5.2% | 2.6% | 1.6% | 41.7% | 0.1% | 0.2% | 100.0% |
| small | 42.3% | 8.1% | 9.6% | 5.9% | 4.9% | 29.2% | 0.0% | 0.1% | 100.0% |
| medium | 34.7% | 10.1% | 16.2% | 8.8% | 15.3% | 14.6% | 0.0% | 0.3% | 100.0% |
| large | 28.8% | 7.7% | 30.8% | 13.5% | 7.7% | 11.5% | 0.0% | 0.0% | 100.0% |
| Total | 46.3% | 7.2% | 7.9% | 5.7% | 3.7% | 19.8% | 8.9% | 0.6% | 100.0% |

source: Endline survey 2020

The level of education of the household members and household heads do not vary significantly among the zones. However, it varies considerably with the land ownership categories.

Table 9.4: Household composition (n=3,969 hhs)

| Zone | Enrolled | Unenrolled | Total |
|-----------------------------|----------|------------|--------|
| Khulna | 93.4% | 6.6% | 100.0% |
| Satkhira | 95.1% | 4.9% | 100.0% |
| Patuakhali | 98.4% | 1.6% | 100.0% |
| Land ownership | | | |
| landless | 93.8% | 6.2% | 100.0% |
| marginal | 94.2% | 5.8% | 100.0% |
| small | 95.6% | 4.4% | 100.0% |
| medium | 96.2% | 3.8% | 100.0% |
| large | 96.6% | 3.4% | 100.0% |
| Total | 94.7% | 5.3% | 100.0% |
| source: Endline survey 2020 | | | |

Table 9.2 and 9.3 show that the educational attainment in terms of the level of education of the household members and head is positively correlated with the size of land ownership. The percentages of completion of secondary, SSC and HSC level education are higher for the medium and large farm households compared to the landless and marginal land holding category.

Overall, a considerable percentage (94.8%) of the school enrolment of children is visible among the zones and all types of households, while it was highest (98.4%) in Satkhira compared to the lowest 93.3% in Khulna (see Table 9.4). The trend does not vary significantly among different types of households. The percentage of sending children to school increases rapidly due to the initiatives of government and NGOs. The school enrolment of children percentage has increased by 1% compared to the baseline survey 2017. However, the long-term closure of all schools due to COVID-19 reportedly also led to an increase in numbers of school drop-outs.

9.1.3. Occupation of adult male

Table 9.5 shows that 28.5% of adult males have agriculture as their main occupation, with a total of 37.5% having an occupation related to agriculture including livestock, poultry rearing and fisheries (4.4%), and agricultural labour (4.6%). On the other hand, around 44% of men have non-agricultural activities as their main occupation. Males from medium and large farm households are more likely to take agricultural activities as the main occupation, while the males of landless and smallholder households tend to have non-agricultural activities as the main source of their livelihoods. Approximately 20% of males are from the dependent group who are not engaged in any income-earning activities.

Table 9.5: Main occupation of adult male (n=6445)

| Zone | agriculture | Livestock, poultry, fish | Agri. wage labour | sub-total agriculture | Artisan/handicraft | Business, services | Non-agri. labour | Transport | other | sub-total non-agri. | student | Not working | Sub total non-earning | Total |
|-----------------------------|-------------|--------------------------|-------------------|-----------------------|--------------------|--------------------|------------------|-----------|-------|---------------------|---------|-------------|-----------------------|--------|
| Khulna | 30.4% | 4.0% | 5.5% | 39.9% | 1.4% | 23.7% | 11.8% | 3.3% | 0.4% | 40.6% | 10.6% | 8.9% | 19.5% | 100.0% |
| Satkhira | 26.8% | 5.1% | 4.3% | 36.2% | 1.5% | 21.0% | 18.0% | 4.9% | 0.4% | 45.8% | 10.2% | 8.0% | 18.2% | 100.0% |
| Patuakhali | 31.9% | 0.0% | 1.7% | 33.6% | 0.6% | 24.3% | 12.7% | 6.5% | 0.3% | 44.4% | 11.3% | 10.7% | 22.0% | 100.0% |
| Land ownership | | | | | | | | | | | | | | |
| landless | 12.6% | 4.9% | 9.4% | 26.9% | 2.0% | 17.3% | 32.1% | 8.3% | 0.5% | 60.2% | 6.4% | 6.4% | 12.8% | 100.0% |
| marginal | 23.3% | 4.0% | 6.8% | 34.1% | 1.9% | 22.0% | 18.8% | 5.2% | 0.2% | 48.1% | 9.7% | 8.1% | 17.8% | 100.0% |
| small | 38.9% | 4.1% | 1.1% | 44.1% | 0.8% | 23.2% | 7.3% | 2.4% | 0.5% | 34.2% | 12.8% | 8.9% | 21.7% | 100.0% |
| medium | 37.8% | 5.8% | 0.0% | 43.6% | 0.2% | 28.9% | 1.4% | 1.4% | 0.7% | 32.6% | 12.7% | 11.1% | 23.8% | 100.0% |
| large | 48.1% | 6.6% | 0.9% | 55.6% | 0.0% | 19.8% | 0.0% | 1.9% | 0.0% | 21.7% | 7.5% | 15.1% | 22.6% | 100.0% |
| Total | 28.5% | 4.4% | 4.6% | 37.5% | 1.4% | 22.2% | 15.3% | 4.4% | 0.4% | 43.7% | 10.4% | 8.5% | 18.9% | 100.0% |
| source: Endline survey 2020 | | | | | | | | | | | | | | |

Around 35% of adult males reported that they have a secondary occupation. From them, 67% have an agriculture-related occupation. Along with agriculture, a significant percentage (26.7%) have livestock, poultry and fisheries as their second occupation. Besides, around 31% of males undertake non-agricultural activities to support their earning sources, which mainly include business or services and non-agricultural labour. In the case of adult women, the endline survey 2020 showed that women of 81% households are classified as housewives; however, the household survey 2021 showed that over 99% of the surveyed women were economically active (for more details, see *chapter 8, table 8.3*).

9.2 Land ownership and land tenure

9.2.1. changes in land ownership

In all surveys of BGP, households have been classified according to the total amount of land owned. As poor households tend to have little or no land, this is a useful indicator of the general level of poverty. Households have been classified according to the following land ownership groups and the percentage of households in each category according to the impact survey 2020.

- Landless – owning less than 5 decimals (0.02 ha)- 20% of households
- Marginal farmer: 5 to 49 decimals (0.02 to 0.2 ha)- 41% of households
- Small farmer: 50 to 249 decimals (0.2 to 1.01 ha)- 30% of households
- Medium farmer: 250 to 749 decimals (1.01 to 3.03 ha)- 8% of households
- Large farmer: 750 decimals and above (3.04 ha and above)-1% of households

These same categories were used in the baseline surveys and are nationally recognized. Data on the landless category in *Table 9.6* is further subdivided into those households who own absolutely no land at all and those who have some land but under 5 decimals. However, under 2% of project households fall into the absolutely landless category.

Table 9.6: Land ownership categories

| Zone | Land ownership categories in decimals, 2020. Percentage of all households | | | | | | |
|------------|---|---------|-------|--------|---------|------|--------|
| | no land | under 5 | 5-49 | 50-249 | 250-749 | 750+ | Total |
| Khulna | 1.0% | 19.7% | 43.1% | 27.7% | 7.7% | 0.8% | 100.0% |
| Satkhira | 3.0% | 32.0% | 38.1% | 20.5% | 5.1% | 1.4% | 100.0% |
| Patuakhali | 0.8% | 7.1% | 40.7% | 39.9% | 9.7% | 1.8% | 100.0% |
| Total | 1.4% | 18.3% | 41.0% | 30.2% | 7.8% | 1.3% | 100.0% |

Source: Endline survey 2020

This distribution varies between the zones, most significantly in the Patuakhali zone where there are fewer farmers in the landless category, and rather more small and medium farmers. Satkhira has a higher proportion in the landless category, and fewer small and medium farmers.

The household survey 2021 showed the proportion of different types of households owning different type of land (*Table 9.7*). Almost all households own homestead land, but very few households in the landless category own any other type of land, while only two thirds of marginal farm households own cultivated land and 41% have ponds. The proportion of these households owning land has increased very slightly since the start of BGP. A higher proportion of households in Patuakhali own land, and rather fewer in Satkhira (*Table 9.7*). The average area of land owned per household is 133 decimals (0.54 ha), but households in the landless category only own an average of 3.4 decimals (138 m²) – see *Table 9.8*.

Table 9.7: Percentage of households owning different types of land

| Land ownership | homestead land | | cultivated land* | | pond | | fallow | | other land | |
|----------------------|----------------|---------|------------------|---------|---------|---------|---------|---------|------------|---------|
| | 2013-14 | 2020-21 | 2013-14 | 2020-21 | 2013-14 | 2020-21 | 2013-14 | 2020-21 | 2013-14 | 2020-21 |
| landless <5 decimals | 92% | 94% | 0% | 1% | 1% | 1% | 0% | 0% | 0% | 0% |
| marginal 5-49 dec. | 100% | 100% | 66% | 68% | 40% | 41% | 3% | 3% | 8% | 8% |
| small 50-249 dec | 100% | 100% | 99% | 100% | 67% | 67% | 6% | 6% | 26% | 26% |
| medium 250-749 dec. | 100% | 100% | 100% | 100% | 83% | 84% | 10% | 10% | 51% | 52% |
| large 750 decimals + | 100% | 100% | 100% | 100% | 91% | 92% | 9% | 8% | 55% | 55% |
| Zone | | | | | | | | | | |
| Khulna | 98% | 99% | 64% | 65% | 35% | 36% | 4% | 4% | 15% | 15% |
| Satkhira | 92% | 95% | 53% | 56% | 28% | 28% | 1% | 2% | 21% | 20% |
| Patuakhali | 100% | 100% | 77% | 78% | 68% | 69% | 5% | 5% | 15% | 15% |
| Total | 98% | 99% | 66% | 67% | 44% | 45% | 4% | 4% | 16% | 16% |

* Cultivated land includes gher; source: HH survey 2021

Table 9.8: Average area owned per household*

| Land ownership | homestead land | | cultivated land* | | pond | | fallow | | other land | | Total land | |
|----------------|----------------|---------|------------------|---------|---------|---------|---------|---------|------------|---------|------------|---------|
| | 2013-14 | 2020-21 | 2013-14 | 2020-21 | 2013-14 | 2020-21 | 2013-14 | 2020-21 | 2013-14 | 2020-21 | 2013-14 | 2020-21 |
| Landless | 3.2 | 3.4 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 | 3.2 | 3.4 |
| Marginal | 9.3 | 9.1 | 18.8 | 19.7 | 2.4 | 2.5 | 0.2 | 0.2 | 0.8 | 0.9 | 31.5 | 32.4 |
| Small | 13.5 | 13.6 | 113.4 | 115.0 | 7.6 | 7.6 | 1.7 | 1.7 | 6.1 | 6.1 | 142.4 | 143.9 |
| Medium | 22.4 | 22.5 | 332.5 | 333.5 | 12.5 | 12.8 | 8.9 | 8.1 | 20.3 | 22.4 | 396.5 | 399.2 |
| Large | 28.9 | 28.9 | 958.1 | 957.3 | 25.7 | 25.7 | 10.3 | 9.6 | 34.9 | 34.0 | 1057.9 | 1055.5 |
| Zone | | | | | | | | | | | | |
| Khulna | 10.3 | 10.3 | 67.8 | 68.7 | 4.2 | 4.3 | 1.3 | 1.2 | 3.8 | 4.0 | 87.4 | 88.5 |
| Satkhira | 8.2 | 8.1 | 55.3 | 56.9 | 2.8 | 2.8 | 0.2 | 0.3 | 6.4 | 6.6 | 72.9 | 74.7 |
| Patuakhali | 16.9 | 17.1 | 97.7 | 102.3 | 8.3 | 8.3 | 0.7 | 0.7 | 4.5 | 4.6 | 128.1 | 132.9 |
| Total | 10.3 | 10.3 | 67.8 | 68.7 | 4.2 | 4.3 | 1.3 | 1.2 | 3.8 | 4.0 | 87.4 | 88.5 |

* area in decimals. Average for all households in each category, including those who do not own each type of land. source: HH survey 2021

Since the start of BGP more households, especially those with less land, have taken up land operation. Although the overall increase is small –from 84% to 88%, see *Table 9.9* – the increase for landless households has been from 41% to 56%. More landless and marginal land owning households (and to a lesser extent small land owning households) are leasing in land, which includes sharecropping and other rental arrangements of crop and gher land, while more households in the medium and large categories are leasing out land.

Table 9.9: Percentage of households operating and leasing land

| Land ownership | farm own land | | lease in land | | lease out land | | lease in gher | | lease out gher | | Farm any land | |
|----------------|---------------|---------|---------------|---------|----------------|---------|---------------|---------|----------------|---------|---------------|---------|
| | 2013-14 | 2020-21 | 2013-14 | 2020-21 | 2013-14 | 2020-21 | 2013-14 | 2020-21 | 2013-14 | 2020-21 | 2013-14 | 2020-21 |
| Landless | 1% | 1% | 31% | 43% | 0% | 0% | 10% | 16% | 0% | 0% | 41% | 56% |
| Marginal | 81% | 84% | 36% | 49% | 2% | 4% | 14% | 20% | 2% | 3% | 85% | 89% |
| Small | 100% | 100% | 21% | 30% | 8% | 12% | 11% | 19% | 4% | 6% | 99% | 99% |
| Medium | 100% | 100% | 8% | 12% | 25% | 37% | 6% | 10% | 18% | 21% | 98% | 98% |
| Large | 100% | 100% | 4% | 4% | 52% | 65% | 5% | 6% | 22% | 27% | 100% | 99% |
| Zone | | | | | | | | | | | | |
| Khulna | 69% | 71% | 24% | 32% | 4% | 7% | 19% | 30% | 5% | 7% | 81% | 87% |
| Satkhira | 60% | 62% | 26% | 35% | 4% | 4% | 13% | 18% | 7% | 9% | 67% | 70% |
| Patuakhali | 86% | 87% | 33% | 46% | 9% | 15% | 0% | 0% | 0% | 0% | 89% | 91% |
| Total | 77% | 78% | 20% | 28% | 15% | 22% | 9% | 15% | 9% | 11% | 84% | 88% |

source: HH survey 2021

The average area of owned and leased in and out land is shown in *Table 9.10*. For those households that farm land, the average area operated is 187 decimals (0.76 ha). Since the start of BGP the average area operated by landless, marginal and small land owners has increased, while it has decreased for medium and large land owners.

The average area farmed for all households (including those who do not farm) is shown in *Table 9.11*. This shows that more land is being farmed – increasing from an average of 118 decimals (0.48 ha) to 135 decimals (0.55 decimals). This is largely because more land is being leased (which includes sharecropping

and other rental arrangements) and less land remains fallow. In 2013-14 leased land amounted to 43% of the total area farmed, it is now 52%. The average holding size in Patuakhali is larger, with those in Satkhira being smaller.

Table 9.10: Average area operated or leased out

| Land ownership | farm own land | | lease in land | | lease out land | | lease in gher | | lease out gher | | Total area farmed | |
|----------------|---------------|---------|---------------|---------|----------------|---------|---------------|---------|----------------|---------|-------------------|---------|
| | 2013-14 | 2020-21 | 2013-14 | 2020-21 | 2013-14 | 2020-21 | 2013-14 | 2020-21 | 2013-14 | 2020-21 | 2013-14 | 2020-21 |
| Landless | 2.0 | 17.5 | 102.8 | 110.4 | 0.0 | 0.0 | 83.4 | 90.5 | 0.0 | 0.0 | 99.5 | 111.2 |
| Marginal | 25.3 | 25.2 | 124.9 | 122.5 | 27.0 | 41.9 | 120.3 | 120.9 | 28.3 | 21.9 | 95.1 | 115.1 |
| Small | 117.9 | 119.9 | 152.6 | 133.5 | 97.2 | 78.6 | 160.2 | 136.0 | 70.5 | 81.1 | 158.8 | 174.0 |
| Medium | 349.9 | 355.8 | 194.2 | 167.5 | 208.2 | 208.0 | 177.3 | 160.7 | 194.4 | 182.2 | 294.2 | 282.2 |
| Large | 948.8 | 982.4 | 124.0 | 243.0 | 589.2 | 577.5 | 914.3 | 1033.9 | 478.6 | 473.2 | 590.8 | 564.0 |
| Zone | | | | | | | | | | | | |
| Khulna | 75.1 | 75.4 | 129.3 | 125.6 | 56.5 | 64.7 | 121.7 | 119.0 | 44.8 | 48.0 | 224.7 | 207.1 |
| Satkhira | 59.7 | 71.5 | 72.7 | 64.1 | 37.2 | 30.0 | 168.6 | 152.3 | 46.8 | 38.7 | 217.1 | 219.1 |
| Patuakhali | 107.6 | 112.2 | 160.0 | 148.0 | 79.2 | 74.4 | 0.0 | 1.3 | 0.0 | 0.0 | 188.4 | 187.1 |
| Total | 86.0 | 90.5 | 134.3 | 128.5 | 64.3 | 64.6 | 139.9 | 134.5 | 54.3 | 53.8 | 137.2 | 151.0 |

Area in decimals. Average area for those households farming / leasing each type of land. Source: HH survey 2021

Table 9.11: Average area* for all households

| Land ownership | farm own land | | Lease in land | | lease out land | | lease in gher | | lease out gher | | Net area farmed | |
|----------------|---------------|---------|---------------|---------|----------------|---------|---------------|---------|----------------|---------|-----------------|---------|
| | 2013-14 | 2020-21 | 2013-14 | 2020-21 | 2013-14 | 2020-21 | 2013-14 | 2020-21 | 2013-14 | 2020-21 | 2013-14 | 2020-21 |
| landless | 0.0 | 0.2 | 32.2 | 47.6 | 0.0 | 0.0 | 8.1 | 14.4 | 0.0 | 0.0 | 40.3 | 62.1 |
| marginal | 20.5 | 21.2 | 44.6 | 59.5 | 0.5 | 1.6 | 16.6 | 24.2 | 0.5 | 0.7 | 80.6 | 102.5 |
| small | 117.3 | 119.9 | 31.5 | 40.4 | 8.0 | 9.7 | 18.4 | 26.2 | 2.6 | 5.2 | 156.6 | 171.6 |
| medium | 349.9 | 355.8 | 14.8 | 20.1 | 51.6 | 77.4 | 9.9 | 16.7 | 35.8 | 38.6 | 287.1 | 276.6 |
| large | 948.8 | 982.4 | 4.5 | 10.5 | 305.2 | 373.9 | 46.0 | 66.9 | 103.3 | 125.9 | 590.8 | 560.0 |
| total | 83.4 | 85.5 | 35.3 | 47.7 | 10.6 | 14.5 | 15.3 | 22.8 | 5.1 | 6.5 | 118.4 | 135.0 |
| Khulna | 72.2 | 73.1 | 28.7 | 38.8 | 5.8 | 8.5 | 23.7 | 35.4 | 5.8 | 7.7 | 112.9 | 131.2 |
| Satkhira | 58.1 | 59.6 | 21.5 | 24.0 | 6.6 | 7.1 | 21.2 | 30.7 | 7.5 | 9.3 | 86.6 | 98.0 |
| Patuakhali | 106.0 | 110.7 | 49.8 | 66.5 | 17.6 | 25.4 | 0.0 | 0.0 | 0.0 | 0.0 | 138.2 | 151.8 |

* area in decimals. Average for all households in each category, including those who do not own each type of land; source: HH survey 2021

Land leasing enables landless households, who have virtually no crop or gher land, to participate in farming. Marginal land owners, who own less than 20 decimals of cultivable land, are able to lease in land so they can farm an average of 102 decimals. On the other hand, medium and large farmers lease out some of the larger areas that they own.

9.3 Improvement in household income and asset

9.3.1.Changes in sources of income

Sources of household income reported by the sampled households in the household survey 2021, *table 9.12* shows that almost all (94%) households reported getting income from homestead vegetables, 89% from poultry and 82% from crops. Non-agricultural sources are not so widely reported. A higher proportion of households owning little land report getting income from wage labour (both agricultural and non-agricultural), fishing and transport-related activities. More households owning larger areas of land report getting income from pond fish and, to a lesser extent, gher fish, leasing out land, agri-business, other business, jobs and pensions. Relatively few (55%) landless households report income from crops, compared with 84% for marginal land owners - with other categories being over 90%.

Table 9.12: Sources of income in 2021

| | landless | marginal | small | medium | large | all |
|--|----------|----------|-------|--------|-------|------|
| Crops | 55% | 84% | 93% | 91% | 91% | 82% |
| Homestead vegetable | 79% | 97% | 99% | 99% | 100% | 94% |
| Field vegetable | 17% | 29% | 39% | 55% | 55% | 32% |
| Poultry | 82% | 90% | 91% | 89% | 91% | 89% |
| Livestock | 57% | 75% | 80% | 76% | 76% | 73% |
| pond fish | 2% | 40% | 66% | 84% | 91% | 44% |
| gher fish | 17% | 29% | 37% | 48% | 44% | 31% |
| agricultural labour | 55% | 40% | 19% | 4% | 0% | 33% |
| agricultural services | 0% | 0% | 2% | 1% | 1% | 1% |
| agric. machine rental | 1% | 2% | 3% | 8% | 6% | 3% |
| leasing out land | 0% | 8% | 15% | 52% | 77% | 13% |
| Fishing | 31% | 26% | 16% | 10% | 6% | 22% |
| other agricultural | 1% | 3% | 4% | 10% | 22% | 4% |
| agricultural business | 2% | 4% | 10% | 12% | 8% | 6% |
| Business | 15% | 23% | 33% | 34% | 38% | 25% |
| Labour | 39% | 32% | 15% | 6% | 1% | 26% |
| self-employment | 4% | 5% | 6% | 4% | 4% | 5% |
| job and pension | 10% | 12% | 14% | 27% | 24% | 14% |
| transport related | 20% | 12% | 5% | 3% | 2% | 10% |
| handicraft, tailoring etc | 13% | 8% | 11% | 8% | 9% | 10% |
| Remittance | 4% | 7% | 3% | 9% | 16% | 6% |
| other | 10% | 7% | 5% | 3% | 4% | 7% |
| n | 195 | 210 | 218 | 250 | 139 | 1012 |
| percentage of all households; source: HH survey 2021 | | | | | | |

There have not been any large changes since 2013-14 in the percentages of households getting income from different sources (*Table 9.13*). More households now get income from homestead vegetables and livestock, and also from leasing out land. Slightly fewer households report income from field vegetables and poultry. More households are now getting income from all the non-agricultural sources, especially business and jobs or pensions.

Table 9.13: Sources of income in 2013-14

| | | landless | marginal | small | medium | large | all | change |
|--|---------------------------|----------|----------|-------|--------|-------|------|--------|
| Agricultural | Crops | 49% | 83% | 94% | 91% | 94% | 80% | 2% |
| | Homestead vegetable | 73% | 94% | 97% | 96% | 100% | 91% | 4% |
| | Field vegetable | 19% | 30% | 46% | 54% | 55% | 35% | -3% |
| | Poultry | 82% | 89% | 95% | 92% | 94% | 90% | -1% |
| | Livestock | 51% | 69% | 80% | 79% | 81% | 70% | 4% |
| | pond fish | 2% | 41% | 65% | 83% | 90% | 45% | 0% |
| | gher fish | 15% | 28% | 39% | 48% | 45% | 30% | 0% |
| | agricultural labour | 52% | 39% | 18% | 4% | 0% | 32% | 1% |
| | agricultural services | 0% | 0% | 2% | 0% | 1% | 1% | 0% |
| | agric. machine rental | 0% | 2% | 2% | 6% | 6% | 2% | 0% |
| | leasing out land | 0% | 5% | 11% | 40% | 66% | 10% | 3% |
| | Fishing | 30% | 24% | 17% | 11% | 6% | 22% | 0% |
| | other agricultural | 1% | 4% | 4% | 9% | 17% | 4% | 0% |
| | agricultural business | 2% | 4% | 8% | 10% | 6% | 5% | 1% |
| Non-agricultural | Business | 10% | 20% | 27% | 27% | 30% | 20% | 5% |
| | Labour | 38% | 30% | 13% | 4% | 1% | 24% | 2% |
| | self-employment | 3% | 4% | 6% | 3% | 1% | 4% | 1% |
| | job and pension | 6% | 10% | 9% | 22% | 21% | 10% | 4% |
| | transport related | 17% | 9% | 4% | 1% | 2% | 8% | 2% |
| | handicraft, tailoring etc | 10% | 5% | 8% | 6% | 7% | 7% | 3% |
| | Remittance | 3% | 3% | 3% | 4% | 9% | 3% | 2% |
| | other | 3% | 4% | 2% | 2% | 3% | 3% | 3% |
| Sample | n | 195 | 210 | 218 | 250 | 139 | 1012 | |
| percentage of all households. Change is change for all households in percentage points, 2013-14 to 2021. Source: HH survey 2021 | | | | | | | | |

9.3.2. Average income by source

Table 9.14 shows the average income for those households earning income from each source. For the landless category, the highest amounts are earned in the agricultural sector from renting out farm machinery and agri-business, followed by gher and pond fisheries – but not many landless households have these sources. Most non-agricultural sources generate more income than agricultural sources, and overall jobs/pensions, business and transport are the most lucrative. For large land owners, ghers, agribusiness and crops generate the highest income from agriculture, but more is earned by those with non-farm business, job/pension and remittances.

Table 9.14: Average income for those households reporting each source

| | landless | marginal | small | medium | large | all |
|--|----------|----------|---------|---------|---------|-----|
| Crops | 44,520 | 46,925 | 72,384 | 114,846 | 203,303 | 82% |
| Homestead vegetable | 3,053 | 5,864 | 9,196 | 13,628 | 18,011 | 94% |
| Field vegetable | 32,197 | 31,462 | 37,134 | 47,164 | 60,126 | 32% |
| Poultry | 2,836 | 3,494 | 3,969 | 3,736 | 3,229 | 89% |
| Livestock | 13,226 | 14,443 | 23,870 | 41,802 | 42,496 | 73% |
| pond fish | 8,493 | 8,510 | 12,888 | 15,899 | 26,289 | 44% |
| gher fish | 47,324 | 45,176 | 69,797 | 99,071 | 212,475 | 31% |
| agricultural labour | 45,380 | 49,899 | 49,071 | 41,600 | | |
| agricultural services | | 15,000 | 93,000 | 114,667 | 180,000 | |
| agric. machine rental | 79,000 | 43,000 | 37,500 | 33,000 | 72,333 | |
| leasing out land | | 4,569 | 25,745 | 45,300 | 124,540 | |
| Fishing | 13,975 | 12,685 | 16,568 | 12,696 | 11,813 | |
| other agricultural | 11,000 | 10,643 | 23,625 | 42,313 | 38,483 | |
| agricultural business | 56,250 | 120,000 | 117,909 | 151,000 | 212,273 | |
| Non-agricultural | | | | | | |
| Business | 97,414 | 124,667 | 132,583 | 190,477 | 273,434 | 25% |
| Labour | 62,260 | 67,761 | 92,125 | 168,143 | 110,000 | 26% |
| self-employment | 73,125 | 86,900 | 93,692 | 123,222 | 140,000 | 5% |
| job and pension | 111,842 | 189,408 | 167,774 | 227,176 | 246,382 | 14% |
| transport related | 93,955 | 93,480 | 100,780 | 101,875 | 190,000 | 10% |
| handicraft, tailoring etc | 11,462 | 14,513 | 15,020 | 16,965 | 4,908 | 10% |
| Remittance | 46,750 | 58,800 | 126,286 | 168,391 | 224,091 | 6% |
| other | 7,642 | 21,800 | 41,130 | 54,900 | 19,400 | 7% |
| Average income per household, BDT per year; source: HH survey 2021 | | | | | | |

Table 9.15: Average income for all households

| | landless | marginal | small | medium | large | all |
|--|----------|----------|---------|---------|---------|---------|
| Crops | 4,657 | 9,551 | 7,404 | 104,739 | 184,289 | 51,993 |
| Homestead vegetable | 2,427 | 5,696 | 9,111 | 13,464 | 18,011 | 6,849 |
| Field vegetable | 5,449 | 9,139 | 14,649 | 25,846 | 33,307 | 11,691 |
| Poultry | 2,327 | 3,128 | 3,623 | 3,332 | 2,950 | 3,134 |
| Livestock | 7,596 | 10,798 | 19,162 | 31,937 | 32,407 | 14,619 |
| pond fish | 131 | 3,404 | 8,454 | 13,355 | 24,020 | 5,328 |
| gher fish | 8,251 | 12,907 | 25,614 | 47,158 | 93,245 | 19,542 |
| agricultural labour | 25,133 | 19,960 | 9,454 | 1,664 | - | 16,121 |
| agricultural services | - | 71 | 1,706 | 1,376 | 1,295 | 669 |
| agric. machine rental | 810 | 1,024 | 1,032 | 2,508 | 4,683 | 1,147 |
| leasing out land | - | 348 | 3,897 | 23,556 | 95,869 | 4,405 |
| Fishing | 4,372 | 3,322 | 2,584 | 1,219 | 680 | 3,108 |
| other agricultural | 56 | 355 | 867 | 4,062 | 8,306 | 843 |
| agricultural business | 1,154 | 5,143 | 11,899 | 18,120 | 16,799 | 7,559 |
| Non-agricultural | | | | | | |
| Business | 14,487 | 28,495 | 43,789 | 65,524 | 104,259 | 34,225 |
| Labour | 24,585 | 21,619 | 13,523 | 9,416 | 1,583 | 18,546 |
| self-employment | 3,000 | 4,138 | 5,587 | 4,436 | 5,036 | 4,387 |
| job and pension | 10,897 | 22,549 | 23,858 | 61,792 | 60,266 | 24,188 |
| transport related | 18,791 | 11,129 | 4,623 | 3,260 | 4,101 | 9,969 |
| handicraft, tailoring etc | 1,528 | 1,106 | 1,722 | 1,357 | 459 | 1,386 |
| Remittance | 1,918 | 4,200 | 4,055 | 15,492 | 35,468 | 4,992 |
| other | 745 | 1,557 | 1,887 | 1,757 | 837 | 1,503 |
| Total income | 158,315 | 209,639 | 278,501 | 455,370 | 727,870 | 246,206 |
| Average income for all sample households, BDT per year. Source: HH survey 2021 | | | | | | |

Average income across all sample households, including those who do not earn an income from individual sources, is in *Table 9.15*. This shows how each source contributes to total income for each land holding category. The percentage share of each source is shown in *Table 9.16*.

For all land-owning categories, the largest single source is crops, which contribute 21% of total income (26% if field vegetables are also included). This underlines the importance of BG interventions in water management and agriculture. Although most households report generating income from homestead vegetables and poultry, the small amount they earn mean these are not important sources. However, consumption of homestead produce can mean that a household's expenditure is reduced, because less of their income is used to fulfil basic needs.

Table 9.15: Average income for all households

| | landless | marginal | small | medium | large | all |
|---------------------------|----------|----------|-------|--------|-------|------|
| Crops | 16% | 19% | 24% | 23% | 25% | 21% |
| Homestead vegetable | 2% | 3% | 3% | 3% | 2% | 3% |
| Field vegetable | 3% | 4% | 5% | 6% | 5% | 5% |
| Poultry | 1% | 1% | 1% | 1% | 0% | 1% |
| Livestock | 5% | 5% | 7% | 7% | 4% | 6% |
| pond fish | 0% | 2% | 3% | 3% | 3% | 2% |
| gher fish | 5% | 6% | 9% | 10% | 13% | 8% |
| agricultural labour | 16% | 10% | 3% | 0% | 0% | 7% |
| agricultural services | 0% | 0% | 1% | 0% | 0% | 0% |
| agric. machine rental | 1% | 0% | 0% | 1% | 1% | 0% |
| leasing out land | 0% | 0% | 1% | 5% | 13% | 2% |
| Fishing | 3% | 2% | 1% | 0% | 0% | 1% |
| other agricultural | 0% | 0% | 0% | 1% | 1% | 0% |
| agricultural business | 1% | 2% | 4% | 4% | 2% | 3% |
| Non-agricultural | | | | | | |
| business | 9% | 14% | 16% | 14% | 14% | 14% |
| labour | 16% | 10% | 5% | 2% | 0% | 8% |
| self-employment | 2% | 2% | 2% | 1% | 1% | 2% |
| job and pension | 7% | 11% | 9% | 14% | 8% | 10% |
| transport related | 12% | 5% | 2% | 1% | 1% | 4% |
| handicraft, tailoring etc | 1% | 1% | 1% | 0% | 0% | 1% |
| remittance | 1% | 2% | 1% | 3% | 5% | 2% |
| other | 0% | 1% | 1% | 0% | 0% | 1% |
| Total income | 100% | 100% | 100% | 100% | 100% | 100% |
| Share from agriculture | 52% | 55% | 64% | 64% | 71% | 60% |
| Share from other sectors | 48% | 45% | 36% | 36% | 29% | 40% |
| Source: HH survey 2021 | | | | | | |

Households involved in agribusiness, machinery rental and aquaculture generate considerable income, but as not so many households have these sources, their overall contribution is more modest. In total agriculture contributes 60% of household income. Important non-agricultural sources are business (contributing 14%) and jobs/pension (10%).

Crops are also the major source of income for landless and marginal land-owning households, but for landless households agricultural labour and non-agricultural labour are each of equal importance. Jobs/pension and non-agricultural business are important sources for households in the marginal category. Landless households get almost half (48%) of their income from non-agricultural sources. As land ownership increases, households get a higher proportion of their income from agriculture (Table 9.16). Households in the large land holding category get 71% of their income from agriculture with crops (25%), gher fish (13%) and leasing out land (13%) being important sources.

9.3.3. Changes in total household income

Average income for each zone is shown in *Table 9.17*. Income for all land-owning categories is higher in Khulna than in the other two zones. The share of income from agricultural and other sources in each zone is shown in *Table 9.18*. This shows that the share of income from agriculture is considerably higher in Khulna – with even landless households getting over 60% of their income from this sector. In both Satkhira and Patuakhali, most income comes from non-agricultural sources. In Satkhira landless households only get 30% of their income from agriculture, but this increases substantially for households with more land as they are more involved in gher aquaculture. In Patuakhali, all land ownership categories get more than half of their income from non-agricultural sources.

Table 9.17: Household income by zone

| | | landless | marginal | small | medium | large | all |
|--|-------------|----------|----------|---------|---------|---------|---------|
| Khulna | agriculture | 109,458 | 141,535 | 238,309 | 353,613 | 630,504 | 182,004 |
| | non-agric | 66,895 | 85,789 | 86,364 | 157,905 | 181,545 | 88,371 |
| | total | 176,353 | 227,324 | 324,673 | 511,518 | 812,049 | 270,375 |
| Satkhira | agriculture | 38,022 | 90,385 | 141,252 | 328,753 | 683,186 | 103,095 |
| | non-agric | 87,019 | 141,286 | 76,327 | 107,552 | 137,984 | 107,270 |
| | total | 125,041 | 231,671 | 217,579 | 436,305 | 821,170 | 210,366 |
| Patuakhali | agriculture | 48,201 | 69,573 | 90,018 | 149,220 | 241,641 | 86,779 |
| | non-agric | 86,014 | 90,341 | 122,379 | 189,070 | 277,057 | 115,641 |
| | total | 134,215 | 159,914 | 212,396 | 338,291 | 518,697 | 202,420 |
| Total | agriculture | 82,364 | 114,847 | 179,457 | 292,336 | 515,861 | 147,009 |
| | non-agric | 75,951 | 94,792 | 99,044 | 163,034 | 212,009 | 99,197 |
| | total | 158,315 | 209,639 | 278,501 | 455,370 | 727,870 | 246,206 |
| Average income for all sample households, BDT per year; Source: HH survey 2021 | | | | | | | |

Compared with the 2020 endline survey, there has been a very large rise in income from agriculture. The 2020 endline survey gathered income data from 2019 to avoid distortions due to COVID-19 and cyclone Amphan in May 2020. However, income in 2019 was affected by severe pest attacks and low crop prices, and the 2020 survey recorded a lower average income from agriculture than the baseline survey of 2017. Income from agriculture in the 2021 household survey was double that in the endline 2020 survey (Tk147,009 compared with Tk71,564), though there has only been a small increase in non-agricultural income (Tk99,197 compared with Tk95,042). Income may also have been boosted by completion of more BGP water infrastructure works. As a result, agriculture in 2021 provided 60% of the total household income compared with only 43% in 2020. These figures are in line with statements in FGDs saying that income from farming has doubled since the start of BGP.

Table 9.18: Share of household income by zone

| | | landless | marginal | small | medium | large | all |
|------------|-------------|----------|----------|-------|--------|-------|------|
| Khulna | agriculture | 62% | 62% | 73% | 69% | 78% | 67% |
| | non-agric | 38% | 38% | 27% | 31% | 22% | 33% |
| | total | 100% | 100% | 100% | 100% | 100% | 100% |
| Satkhira | agriculture | 30% | 39% | 65% | 75% | 83% | 49% |
| | non-agric | 70% | 61% | 35% | 25% | 17% | 51% |
| | total | 100% | 100% | 100% | 100% | 100% | 100% |
| Patuakhali | agriculture | 36% | 44% | 42% | 44% | 47% | 43% |
| | non-agric | 64% | 56% | 58% | 56% | 53% | 57% |
| | total | 100% | 100% | 100% | 100% | 100% | 100% |
| Total | agriculture | 52% | 55% | 64% | 64% | 71% | 60% |
| | non-agric | 48% | 45% | 36% | 36% | 29% | 40% |
| | total | 100% | 100% | 100% | 100% | 100% | 100% |

Source: HH survey 2021

9.3.4. Improvement in assets

Informal interviews show that with the increase of income people of coastal areas are likely to invest their extra income to improve their housing, buying or leasing-in agricultural land and other assets for their households, next to investing in their children's education. *Table 9.19* shows the average value of land for different zones and for different land owner categories. This has been increased compared to the baseline survey 2017. The unit value of land is higher in the Khulna zone, especially. As almost all the land owned by the landless category is more valuable homestead land, the value of land per decimal for this group is higher – with the lowest value for medium and large farmers who primarily own less valuable cultivable land

Table 9.19: Value of land

| Zone | Tk per HH | Tk per dec |
|-----------------------|------------|------------|
| Khulna | 2,293,832 | 28,946 |
| Satkhira | 1,132,132 | 16,506 |
| Patuakhali | 1,895,802 | 16,616 |
| Land ownership | | |
| landless | 133,288 | 50,826 |
| marginal | 624,829 | 32,104 |
| small | 2,296,775 | 20,355 |
| medium | 7,449,604 | 18,874 |
| large | 23,638,026 | 19,617 |
| Total | 1,864,604 | 20,945 |

source: Endline survey 2020

Other than their house and different types of land, people also consider their poultry and livestock as assets. The number of poultry and livestock and their price have already been presented in *chapter 7*. Apart from these assets, the percentage of households owning other key assets is shown in *Table 9.20*.

Table 9.20: Key assets – percentage of households owning

| Zone | agricultural equipment | motor vehicle | non-motor vehicle | motorbike / bicycle | radio / TV | cell phone |
|-----------------------------|------------------------|---------------|-------------------|---------------------|------------|------------|
| Khulna | 81% | 8% | 17% | 50% | 45% | 99% |
| Satkhira | 49% | 6% | 5% | 60% | 55% | 98% |
| Patuakhali | 73% | 2% | 3% | 12% | 15% | 99% |
| Land ownership | | | | | | |
| landless | 48% | 8% | 11% | 36% | 34% | 96% |
| marginal | 68% | 7% | 10% | 37% | 33% | 99% |
| small | 83% | 2% | 8% | 41% | 39% | 99% |
| medium | 85% | 3% | 7% | 50% | 53% | 99% |
| large | 87% | 2% | 4% | 50% | 63% | 98% |
| Total | 70% | 5% | 9% | 39% | 37% | 99% |
| source: Endline survey 2020 | | | | | | |

Ownership of agricultural machinery, radio/TV and bicycles/motorbikes is correlated with land ownership, with the number of owners increasing as land ownership rises; the correlation is weaker for motorcycles and bicycles. Virtually all households own mobile phones, but relatively few own motor vehicles and non-motorised vehicles (rickshaws etc). Ownership of both motor vehicles and non-motorised vehicles is inversely correlated to land ownership, with a higher proportion of households with less land owning these assets. The reason for this may well be because some households who have little land have transport businesses that use these vehicles.

Compared to the 2017 baseline survey, there has been a considerable increase in the numbers of households owning agricultural equipment (up from 13% to 70%). There has also been a small rise in ownership of motor vehicles (2% to 5%) offsetting a fall in non-motorised vehicles (12% to 9%) as transport services become mechanized.

The average value of assets per household is shown in *Table 9.21* This is the average for all households and reflects both the value of the assets and the proportion of households owning the assets. However, the last row of the table shows the average value of each type of asset only for those households that own the asset. Although motor vehicles are the highest value type of asset for those households that own the asset, only 5% of households have motor vehicles, so the most valuable type of asset for all households are bicycles / motor bikes as these are owned by 39% of all households.

Table 9.21: Value (BDT) of different types of assets – average for all households

| Zone | agricultural equipment | motor vehicle | non-motor vehicle | motorbike / bicycle | radio / TV | cell phone |
|-----------------------------|------------------------|---------------|-------------------|---------------------|------------|------------|
| Khulna | 5463 | 6080 | 2185 | 12132 | 2717 | 4658 |
| Satkhira | 2749 | 2425 | 1359 | 10979 | 2974 | 3949 |
| Patuakhali | 3277 | 963 | 2074 | 6021 | 1159 | 4891 |
| Land ownership | | | | | | |
| landless | 1178 | 3784 | 2584 | 3094 | 1461 | 2339 |
| marginal | 2600 | 3925 | 1901 | 6229 | 1857 | 3593 |
| small | 5235 | 1092 | 1728 | 12797 | 2429 | 5575 |
| medium | 11728 | 8214 | 1610 | 26970 | 4679 | 9848 |
| large | 16927 | 2308 | 423 | 41577 | 6006 | 13871 |
| Total | 4013 | 3352 | 1941 | 9670 | 2225 | 4565 |
| source: Endline survey 2020 | | | | | | |

Mobile phones, owned by 99% of households, are next most valuable type of asset. Although at least 96% of households own phones in all land ownership categories, the value of these phones increases sharply as land ownership increases. This is because households with more land have more phones and each of their phones is more valuable (*Table 9.22*).

The types of assets shown in these tables are not the only assets, or even principal assets, owned by households. The value of house and livestock are mentioned in other sections of this report. In addition, there are other valuable household assets such as gold jewellery, furniture, and solar power systems, as well as other productive assets including trees and shops, and financial assets such as savings.

Table 9.22: Mobile phones

| Land ownership | % own | value (BDT) | avg. number | value (BDT)/unit |
|-----------------------------|-------|-------------|-------------|------------------|
| landless | 96% | 2339 | 1.6 | 1483 |
| marginal | 99% | 3593 | 1.9 | 1921 |
| small | 99% | 5575 | 2.2 | 2555 |
| medium | 99% | 9848 | 2.6 | 3749 |
| large | 98% | 13871 | 3.0 | 4565 |
| Total | 99% | 4565 | 2.0 | 2305 |
| source: Endline survey 2020 | | | | |

9.3.5. Changes in poverty ranking

Sample households were asked to place themselves in one of four socio-economic wealth ranks in 2013-14 and in 2021. *Table 9.23* shows that overall 70% of households said they were very poor or poor in 2013-14; this has now reduced to 58%. There has especially been a significant change in the landless land ownership category. In 2013-14, 72% of households in this category were very poor, now it is 39%. Because COVID-19 caused an increase in poverty again in Bangladesh, it is likely that the poverty ranking results would have even been better without COVID-19.

Table 9.23: Poverty ranking

| Land ownership | | very poor | poor | Medium | rich | total |
|-----------------------------|---------|-----------|------|--------|------|-------|
| landless | 2013-14 | 72% | 26% | 2% | 0% | 100% |
| | 2021 | 39% | 55% | 6% | 0% | 100% |
| marginal | 2013-14 | 18% | 72% | 8% | 0% | 100% |
| | 2021 | 5% | 71% | 21% | 0% | 100% |
| small | 2013-14 | 2% | 41% | 52% | 0% | 100% |
| | 2021 | 0% | 28% | 69% | 1% | 100% |
| medium | 2013-14 | 0% | 9% | 65% | 23% | 100% |
| | 2021 | 0% | 3% | 64% | 30% | 100% |
| large | 2013-14 | 0% | 1% | 27% | 68% | 100% |
| | 2021 | 0% | 0% | 11% | 84% | 100% |
| All | 2013-14 | 22% | 48% | 25% | 3% | 100% |
| | 2021 | 10% | 48% | 36% | 4% | 100% |
| source: Endline survey 2020 | | | | | | |

9.4 Enterprise development

Data shows that a larger cropping area, improved cropping patterns and increased yields have resulted in increased farm income. Informal interviews found that people are investing their additional income from agriculture in agricultural and non-agricultural enterprise. Over one fifth (22%) of the sampled households report having enterprises or some type of business activity other than farming (*Table 9.24*). This is a marginal fall on the 23% recorded in the 2017 baseline survey. Of these businesses, 23% are related to agriculture and 80% are non-agricultural; a few households have both types of business.

Table 9.24: Non-farm enterprises and businesses

| Zone | Percent of all HH have a business | Percentage of all business | | | |
|-----------------------------|-----------------------------------|----------------------------|-------------|------------------|-------------|
| | | Agriculture-related | | Non-agricultural | |
| | | business | hire labour | business | hire labour |
| Khulna | 25% | 26% | 7% | 76% | 13% |
| Satkhira | 20% | 34% | 6% | 71% | 17% |
| Patuakhali | 21% | 12% | 1% | 90% | 10% |
| Land ownership | | | | | |
| landless | 17% | 27% | 0% | 74% | 10% |
| marginal | 22% | 23% | 5% | 79% | 13% |
| small | 23% | 23% | 6% | 82% | 12% |
| medium | 32% | 23% | 8% | 81% | 17% |
| large | 23% | 17% | 17% | 83% | 42% |
| Total | 22% | 23% | 5% | 80% | 13% |
| source: Endline survey 2020 | | | | | |

A smaller proportion (17%) of landless households have a business, while a greater proportion (33%) of medium owner households have a business. Compared to the 2017 baseline survey, there have been small increases in the proportion of households with businesses in the landless (up from 15% to 17%), medium (31% to 32%) and large (21% to 23%) landowner categories and falls in the marginal (down 25% to 22%) and small (24% to 23%) landowner categories.

Out of the total number of businesses, 5% of agricultural related businesses hire labour as do 13% of non-agricultural businesses. Taking account of the fact that there are more non-agricultural businesses, 22% of agricultural businesses, and 16% of non-agricultural businesses hire labour.

Table 9.25 shows the average number of family members and hired workers, and income generated per business that reports using this labour and generating income. This shows that a typical business in both sectors employs 1.2 family members, but where workers are hired, there are more in non-agricultural businesses (2.4) than in agriculture (1.8). Overall, an average business employs 1.3 household members and 0.4 hired workers. These businesses generate significant levels of income (generally more than farm enterprises), with higher incomes for non-agricultural businesses.

Table 9.25: Employment and income – average per business reporting.

| Zone | Agriculture business | | | Non-agricultural business | | |
|-----------------------------|----------------------|---------------|-----------------|---------------------------|---------------|-----------------|
| | Family employ | Hired workers | Income BDT/year | Family employ | Hired workers | Income BDT/year |
| Khulna | 1.2 | 1.8 | 109,246 | 1.2 | 2.7 | 133,468 |
| Satkhira | 1.1 | 1.7 | 85,911 | 1.2 | 1.4 | 137,561 |
| Patuakhali | 1.1 | 2.3 | 109,372 | 1.2 | 3.1 | 129,824 |
| Land ownership | | | | | | |
| landless | 1.1 | 0.0 | 67,966 | 1.2 | 2.0 | 113,828 |
| marginal | 1.2 | 1.8 | 105,490 | 1.2 | 2.6 | 116,124 |
| small | 1.1 | 1.5 | 107,776 | 1.2 | 2.2 | 145,182 |
| medium | 1.2 | 2.1 | 110,274 | 1.2 | 2.5 | 158,025 |
| large | 1.0 | 3.5 | 270,000 | 1.4 | 3.2 | 315,200 |
| Total | 1.1 | 1.8 | 101,875 | 1.2 | 2.4 | 132,912 |
| source: Endline survey 2020 | | | | | | |

9.5 Improvements in Living Standards

FGD participants attribute between 30% and 100% of the increased incomes to BGP interventions – but most common is the range 40% to 60%. Participants in FGDs said that they spent their additional income on a range of items. Improving housing and sanitation seems to have been a major priority, but households have also invested in more land for good housing, livestock and different agricultural and non-agricultural endeavors. Most FGDs say expenditure on health and education also has increased, and households have acquired a range of consumer durables. Increased production of both crops and fisheries have improved food security and fulfilled nutritional needs. Improved agricultural practices not only led to increased production and employment, but also the well-being of the entire family.

9.5.1. Changes in housing

Two indicators of housing quality are shown in Table 9.26. Respondents placed the greatest value on houses in Satkhira although they had fewer rooms. Houses in Patuakhali have the most rooms, but are least valued. Moving up the landownership categories both the number of rooms and house value increase. But the increase in house value is greater than the increase in the number of rooms, so the value per room also

goes up – suggesting that quality of housing increases as well as size of house. Compared with the 2017 baseline survey, the number of rooms has increased from 2.2 to 2.6 and the average value of a house has more than doubled – from BDT 74,694 to BDT 155,916.

Table 9.26: Number of rooms and house value

| Zone | Number of rooms | House value BDT |
|-----------------------------|-----------------|-----------------|
| Khulna | 2.25 | 114,022 |
| Satkhira | 2.01 | 120,663 |
| Patuakhali | 3.26 | 93,624 |
| Land ownership | | |
| landless | 1.79 | 77,105 |
| marginal | 2.38 | 112,949 |
| small | 2.93 | 208,197 |
| medium | 3.53 | 331,847 |
| large | 4.50 | 436,942 |
| Total | 2.55 | 155,916 |
| source: Endline survey 2020 | | |

Table 9.27 shows almost two-thirds (65%) of houses have walls made of brick and cement in Satkhira, while in Patuakhali around 92% of houses have tin, mud or wood walls. Few houses (3%) now have grass, bamboo and other non-substantial walls, which is likely to be found in households who own little land.

Table 9.27: Housing wall materials – percentage of households

| Zone | grass, bamboo & similar | tin, mud & wood | brick, cement | total |
|-----------------------------|-------------------------|-----------------|---------------|-------|
| Khulna | 5.3% | 49.1% | 45.5% | 100% |
| Satkhira | 3.1% | 32.2% | 64.8% | 100% |
| Patuakhali | 0.1% | 91.6% | 8.3% | 100% |
| Land ownership | | | | |
| landless | 5.2% | 62.3% | 32.4% | 100% |
| marginal | 3.3% | 63.6% | 33.2% | 100% |
| small | 1.5% | 58.3% | 40.2% | 100% |
| medium | 1.3% | 44.8% | 53.9% | 100% |
| large | 0.0% | 48.1% | 51.9% | 100% |
| Total | 2.9% | 60.1% | 37.0% | 100% |
| source: Endline survey 2020 | | | | |

There is some correlation between land ownership and more houses with brick and cement walls, but the large variations between polders suggest that local preferences are more important. House wall construction has improved since the 2017 baseline survey, when 9% had grass or similar walls, 57% had tin etc. and 34% had concrete.

Table 9.28: House roof materials- percentage of households

| Zone | concrete | tin | tiles | grass etc. | other | total |
|-----------------------------|----------|-------|-------|------------|-------|-------|
| Khulna | 15.9% | 81.6% | 1.6% | 0.8% | 0.1% | 100% |
| Satkhira | 22.5% | 32.3% | 41.6% | 1.0% | 2.5% | 100% |
| Patuakhali | 4.8% | 94.8% | 0.1% | 0.2% | 0.1% | 100% |
| Land ownership | | | | | | |
| landless | 7.2% | 67.4% | 22.9% | 1.3% | 1.3% | 100% |
| marginal | 9.7% | 77.9% | 11.1% | 0.8% | 0.5% | 100% |
| small | 17.8% | 75.4% | 5.9% | 0.2% | 0.7% | 100% |
| medium | 29.5% | 67.9% | 1.9% | 0.3% | 0.3% | 100% |
| large | 38.5% | 61.5% | 0.0% | 0.0% | 0.0% | 100% |
| Total | 13.6% | 74.1% | 11.0% | 0.7% | 0.7% | 100% |
| source: Endline survey 2020 | | | | | | |

Tiles are a popular roofing material in Satkhira (42% of houses), and also concrete (23%) is more widely used than in the other two zones, where tin is the predominant roofing material (*Table 9.28*). The use of grass, straw and palm leaves for roofing has almost disappeared. As land ownership increases, more houses have concrete roofs, but tile roofs are more frequently found on houses of those owning less land. Compared with the 2017 baseline survey, the use of concrete roofs has increased (10% to 14%), tin roofs are almost unchanged (75% to 74%), and tile and other materials have fallen from 15% to 12%.

9.5.2. Improvement in drinking water and sanitation

Table 9.29 shows that most water for domestic use comes from groundwater, with 32% of the households using shallow tubewells (STW) and 62% using deep tubewells (DTW). In Satkhira a significant minority use rainwater (5%) or other sources (13%) - such as piped systems or purchasing from water vendors. In this zone there is significant contamination of groundwater by arsenic, whereas saline intrusion may also be an issue in some places. There is considerable variation between polders in both Khulna and Patuakhali in terms of the balance between STW and DTW sources – which may be due to the availability and quality of water in the deep and shallow aquifers. Households owning less land are more likely to get their water from STW, although the converse relationship (households with more land being more likely to get water from DTW) is not so strong.

Table 9.29: Sources of water for domestic uses- percentage of households

| Zone | STW | pond | DTW | Rainwater | other | total |
|-----------------------------|-------|------|-------|-----------|-------|-------|
| Khulna | 34.8% | 1.8% | 62.1% | 1.3% | 0.0% | 100% |
| Satkhira | 39.0% | 1.3% | 42.0% | 4.7% | 13.0% | 100% |
| Patuakhali | 22.8% | 0.6% | 76.6% | 0.0% | 0.0% | 100% |
| Land ownership | | | | | | |
| landless | 37.5% | 1.8% | 53.6% | 3.1% | 4.1% | 100% |
| marginal | 33.3% | 1.2% | 61.2% | 1.3% | 3.0% | 100% |
| small | 27.7% | 1.2% | 67.3% | 1.3% | 2.6% | 100% |
| medium | 24.7% | 0.3% | 69.2% | 1.9% | 3.9% | 100% |
| large | 19.2% | 1.9% | 71.2% | 0.0% | 7.7% | 100% |
| Total | 31.6% | 1.3% | 62.3% | 1.7% | 3.2% | 100% |
| source: Endline survey 2020 | | | | | | |

The 2017 baseline survey recorded 88% of households having access to “safe” drinking water – this being defined as water from a tubewell (STW or DTW). In fact, safe water can be obtained from rainwater and other sources (piped systems, vendors etc), but any source that is not properly installed, maintained or used can become unsafe. In comparison the endline survey recorded 94% of households using tubewell water and 98.7% having sources that should be safe (this being all sources except ponds).

Table 9.30: Sanitation- percentage of households with type of latrine

| Zone | unpaved, katcha | sanitary slab | pucca, paved | pit latrine | unsanitary | none | total | total unsanitary* | total sanitary |
|--|-----------------|---------------|--------------|-------------|------------|------|--------|-------------------|----------------|
| Khulna | 40.3% | 31.2% | 26.4% | 1.9% | 0.0% | 0.2% | 100.0% | 2.1% | 97.9% |
| Satkhira | 29.5% | 28.3% | 33.8% | 7.8% | 0.5% | 0.0% | 99.5% | 8.4% | 91.6% |
| Patuakhali | 40.0% | 47.7% | 8.6% | 3.7% | 0.0% | 0.0% | 100.0% | 3.7% | 96.3% |
| Land ownership | | | | | | | | | |
| landless | 51.9% | 29.8% | 12.9% | 4.9% | 0.4% | 0.1% | 99.6% | 5.4% | 94.6% |
| marginal | 42.0% | 35.8% | 17.8% | 4.2% | 0.1% | 0.1% | 99.9% | 4.4% | 95.6% |
| small | 29.0% | 39.9% | 27.0% | 4.0% | 0.1% | 0.0% | 99.9% | 4.1% | 95.9% |
| medium | 15.6% | 40.3% | 43.2% | 1.0% | 0.0% | 0.0% | 100.0% | 1.0% | 99.0% |
| large | 7.7% | 50.0% | 40.4% | 1.9% | 0.0% | 0.0% | 100.0% | 1.9% | 98.1% |
| Total | 37.5% | 36.4% | 21.9% | 4.0% | 0.1% | 0.1% | 99.9% | 4.2% | 95.8% |
| Unsanitary include pit latrine, unsanitary and none. All others are defined as sanitary. Source: Endline survey 2020 | | | | | | | | | |

Most households (88%) report that they wash their hands with soap before meals and after using toilet (Table 9.31). This compares with only 36% in the 2017 baseline survey. The huge increase in hand washing is probably -at least partially- due to the hygiene measures promoted after the start of the COVID-19 pandemic. Fewer households in Satkhira (79%) wash hands and hand washing is also quite strongly correlated with land ownership, with only 76% of landless households but 100% of large owner households washing hands.

Table 9.31: Wash hands before meal and after using toilet

| Zone | % of HH Wash hands |
|-----------------------------|--------------------|
| Khulna | 89% |
| Satkhira | 79% |
| Patuakhali | 93% |
| Land ownership | |
| landless | 76% |
| marginal | 88% |
| small | 94% |
| medium | 97% |
| large | 100% |
| Total | 88% |
| source: Endline survey 2020 | |

9.5.3. Improvement in food security

The end-line survey enquired about food consumption and food shortages for the years 2019 and 2020. The reason to cover these two years was to find out to which extent the events of 2020 (cyclone Amphan and the COVID pandemic) had damaged food security (Table 9.32). Over 90% of households reported consuming fish, meat and eggs at least once in the month preceding the 2020 survey (and in the same month in 2019).

The proportion of households reporting consumption of fish was unchanged between 2019 and 2020, but there were marginal declines in the proportion of households consuming meat (0.4 percentage points) and eggs (1.0 percentage points). Sharper declines were reported in the Satkhira zone and for landless households. However, the average number of times households consumed these foods increased between 2019 and 2020 (Table 9.33) – by 10% for fish, 15% for meat and 9% for eggs. Although there is a good correlation between land ownership and frequency of consumption of these three foods, landless and marginal owner households (who consume less) reported larger increases in the frequency of consumption between 2019 and 2020.

Table 9.32: Percentage of households reporting consumption of fish, meat and eggs

| Zone | 2019 | | | 2020 | | | change | | |
|-----------------------|------|------|------|------|------|------|--------|-------|-------|
| | fish | Meat | eggs | fish | meat | Eggs | fish | Meat | eggs |
| Khulna | 100% | 96% | 99% | 100% | 96% | 99% | 0.0% | 0.1% | 0.0% |
| Satkhira | 100% | 95% | 93% | 100% | 93% | 90% | 0.0% | -2.1% | -3.4% |
| Patuakhali | 100% | 90% | 98% | 100% | 91% | 97% | 0.0% | 0.2% | -0.4% |
| Land ownership | | | | | | | | | |
| landless | 100% | 90% | 94% | 100% | 88% | 92% | 0.0% | -2.2% | -2.2% |
| marginal | 100% | 92% | 97% | 100% | 93% | 96% | 0.0% | 1.2% | -0.9% |
| small | 100% | 97% | 99% | 100% | 95% | 98% | 0.0% | -1.5% | -0.5% |
| medium | 100% | 99% | 99% | 100% | 99% | 99% | 0.0% | -0.3% | -0.3% |
| large | 100% | 98% | 98% | 100% | 98% | 98% | 0.0% | 0.0% | 0.0% |
| Total | 100% | 94% | 97% | 100% | 93% | 96% | 0.0% | -0.4% | -1.0% |

source: Endline survey 2020

Table 9.33: Frequency of consumption of foods during the preceding month

| Zone | 2019 | | | 2020 | | | change | | |
|-----------------------|------|------|------|------|------|------|--------|------|------|
| | fish | Meat | eggs | fish | meat | Eggs | fish | Meat | eggs |
| Khulna | 16.4 | 2.5 | 8.9 | 18.3 | 2.9 | 9.5 | 12% | 17% | 7% |
| Satkhira | 16.6 | 2.5 | 7.0 | 18.8 | 2.9 | 7.9 | 13% | 16% | 12% |
| Patuakhali | 16.0 | 2.6 | 10.0 | 17.0 | 2.9 | 10.9 | 6% | 13% | 9% |
| Land ownership | | | | | | | | | |
| landless | 14.2 | 1.8 | 7.0 | 15.9 | 2.1 | 7.6 | 12% | 15% | 9% |
| marginal | 15.5 | 2.3 | 8.5 | 17.2 | 2.6 | 9.3 | 11% | 16% | 10% |
| small | 17.6 | 2.9 | 9.5 | 19.2 | 3.3 | 10.4 | 9% | 14% | 9% |
| medium | 20.0 | 3.8 | 11.1 | 21.3 | 4.3 | 11.9 | 7% | 15% | 7% |
| large | 21.4 | 4.8 | 13.9 | 22.9 | 5.1 | 14.9 | 7% | 5% | 7% |
| Total | 16.3 | 2.5 | 8.8 | 18.0 | 2.9 | 9.6 | 10% | 15% | 9% |

source: Endline survey 2020

Just over three-quarters of the households (see *code 4 in Table 9.34*) reported they did not suffer any food shortages in the last one month. Of households reporting food shortages, about half said it only happened once or twice (*code 1 in Table 9.34*). A higher proportion (about one third) of households in Satkhira reported food shortages, with fewer (just over 10%) in Patuakhali. There is a strong correlation between land ownership and food shortages, with households owning less land being more likely to report shortages.

Table 9.34: Food shortages in last one month

| Zone | Not enough food 2019- % of HH | | | | Not enough food 2020 - % of HH | | | |
|---|-------------------------------|-------|------|-------|--------------------------------|-------|------|-------|
| | 1 | 2 | 3 | 4 | 1 | 2 | 3 | 4 |
| Khulna | 17.0% | 8.8% | 1.8% | 72.5% | 14.6% | 7.1% | 2.1% | 76.2% |
| Satkhira | 16.8% | 13.7% | 4.3% | 65.2% | 12.7% | 15.2% | 6.0% | 66.1% |
| Patuakhali | 3.6% | 6.5% | 0.8% | 89.1% | 4.2% | 5.9% | 1.1% | 88.8% |
| Land ownership | | | | | | | | |
| landless | 20.5% | 17.1% | 5.6% | 56.8% | 17.6% | 17.9% | 6.5% | 57.9% |
| marginal | 14.5% | 11.8% | 2.0% | 71.7% | 13.1% | 10.0% | 3.1% | 73.8% |
| small | 6.7% | 3.1% | 0.3% | 89.9% | 4.7% | 3.3% | 0.5% | 91.6% |
| medium | 2.3% | 0.3% | 0.0% | 97.4% | 1.9% | 0.3% | 0.3% | 97.4% |
| large | 0.0% | 1.9% | 0.0% | 98.1% | 1.9% | 0.0% | 0.0% | 98.1% |
| Total | 12.2% | 9.2% | 2.0% | 76.6% | 10.4% | 8.6% | 2.7% | 78.2% |
| Code: 1-rarely (1 to 2 times); 2=sometimes (3 to 5 times); 3=often (> 5 times); 4=never; Source: Endline survey | | | | | | | | |

Table 9.35: Change in food shortage in last one month

| Zone | Change 2019 to 2020 in percentage points | | | |
|-----------------------------|--|-------|------|-------|
| | 1 | 2 | 3 | 4 |
| Khulna | -2.4% | -1.7% | 0.3% | 3.8% |
| Satkhira | -4.1% | 1.4% | 1.7% | 0.9% |
| Patuakhali | 0.6% | -0.6% | 0.4% | -0.3% |
| Land ownership | | | | |
| landless | -2.8% | 0.8% | 0.9% | 1.2% |
| marginal | -1.4% | -1.8% | 1.0% | 2.2% |
| small | -2.0% | 0.2% | 0.2% | 1.7% |
| medium | -0.3% | 0.0% | 0.3% | 0.0% |
| large | 1.9% | -1.9% | 0.0% | 0.0% |
| Total | -1.7% | -0.6% | 0.7% | 1.6% |
| Source: Endline survey 2020 | | | | |

Table 9.34 shows data on food shortages for 2019 and 2020 and the changes between these two years are shown in *Table 9.35*. This shows that there has been a small increase of 1.6 percentage points in the proportion of households saying there is no food shortage but, of those reporting shortages, some more (0.6 percentage points) report these to be frequent (over 5 times in the month).

In the 2017 baseline survey slightly fewer households reported food shortages in the last month, but as these surveys collected data at different times of year, the data is not really comparable.

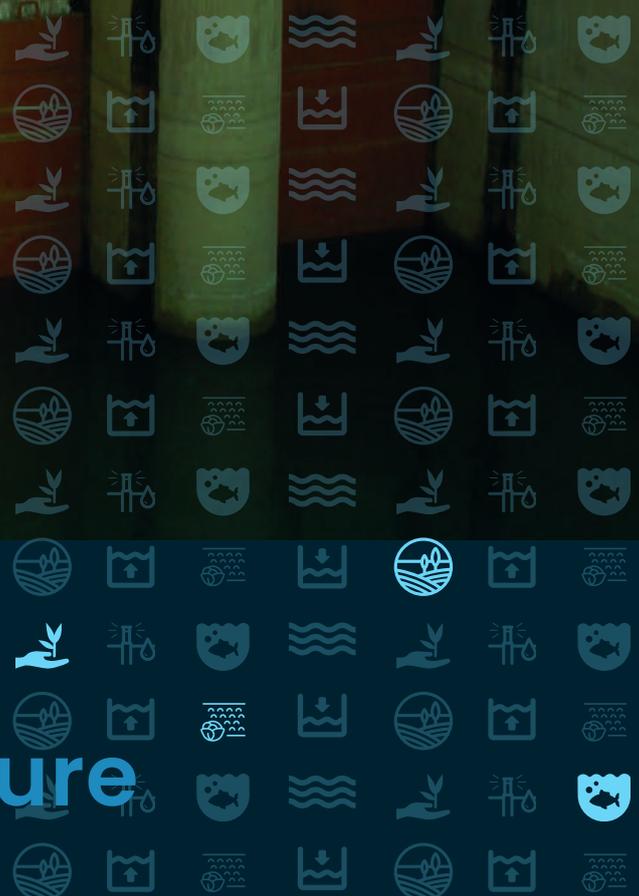
Table 9.36: Food shortages in last 12 months

| Zone | number | Percent |
|-----------------------------|--------|---------|
| Khulna | 157 | 10.0% |
| Satkhira | 140 | 14.3% |
| Patuakhali | 28 | 2.0% |
| Land ownership | | |
| landless | 160 | 20.5% |
| marginal | 149 | 9.2% |
| small | 16 | 1.3% |
| medium | 0 | 0.0% |
| large | 0 | 0.0% |
| Total | 325 | 8.2% |
| Source: Endline survey 2020 | | |

A small proportion of households (8.2%) reported in 2020 food shortages in terms of not being able to have at least two meals per day at some point in the last 12 months (Table 9.36). A higher proportion in Satkhira (14%) report these shortages, with only 2% in Patuakhali and 10% in Khulna. The shortages are highly correlated to land ownership, with over 20% of landless and 9% of marginal owner households reporting shortages compared to only 1.3% of small owners and no medium or large owners. The fact that land holdings tend to be larger in Satkhira may help explain why there are fewer food-insecure households here.

The proportion of households reporting food shortages (less than two meals per day) during the last 12 months was slightly lower in the 2017 baseline survey – 7.2% compared to 8.2% in 2020. This applies more in Khulna 7.1% to 10.0%, but also in Satkhira 13.1% to 14.3%, and Patuakhali 1.6% to 2.0%. This may be linked to the poor rice crop in 2019 and, to a lesser extent, in 2020. However, chapter 6 showed that the cropping intensity increased significantly over the years and that crop production (yield) was again very good in the year 2021, thus it is likely that in 2021 food insecurity was reduced as compared to 2019 and 2020.

Overall, the increased agricultural and fish production, and homestead-based production have enhanced food security and fulfilled nutritional needs. The high value and other rabi crops, along with fish, provide cash incomes for the households. Increased crop and homestead-based production also increased employment opportunities (agricultural wage labour), especially for women from landless households. Improved agriculture not only increased agricultural production and employment, but also improved well-being of the entire family. Rural households are investing towards an improved quality of life, like better housing and other amenities, and better futures such as investing in new agricultural and non-agricultural endeavours and in their children's education.



Section C Water Infrastructure

Section C

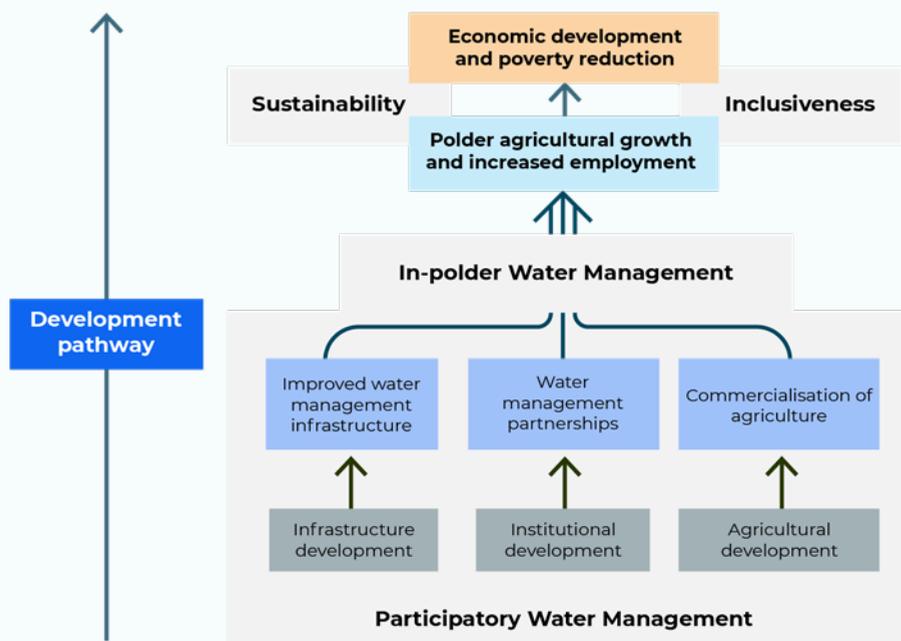
Water Infrastructure

Summary

The Theory of Change for the Blue Gold Program (BGP) describes the three main sets of interventions -infrastructure, institutional and agricultural development- as the core elements of Blue Gold’s approach.

Section C focuses on the improvements made through Blue Gold to the water infrastructure, specifically the polder embankments and associated structures, and the re-excavation of some of the primary drainage khals within the polder. Later sections cover water management partnerships (*Section D*), commercialisation of agriculture (*Section E*) and sustainability and inclusiveness (*Section F*).

Figure C.1: Simplified Blue Gold Program Theory of Change



C.1 Context

The coastal zone in Bangladesh has a complex agro-ecology, with low lying land and huge tidal rivers. To provide protection to agricultural land from tidal and monsoonal flooding and saline water intrusion, around 1.2 million hectares are now enclosed in 139 polders, whose construction started from the 1960s and 1970s. Now, the polders are home to about ten million people.

The tidal rivers draining the coastal zone carry flood flows during the monsoon season but are highly saline during the dry season when outflows in the tidal rivers are at their lowest. The rivers cause greatest damage

to polder infrastructure during times of flood and cyclonic storms – compounded during high water spring tides - when the erosive power of the rivers can damage and even breach the polder embankments.

A breach can result in loss of life in severe cases; immediate loss of economic production - crops, fish, livestock, and businesses; damage to infrastructure – roads, utilities, homes, shops, schools; and longer-term impacts on the productivity of agricultural lands. These problems will be increasingly exacerbated by climate change and sea-level rise.

C.2 Purpose of Polder Infrastructure

C.2.1. Safety

One of the primary functions of the polder embankment is to protect the vulnerable communities who live and work in the polders from tidal floods, storm surges, river erosion and salinity through embankment strengthening, breach closing and erosion protection measures. In combination with the infrastructure improvements, disaster risk reduction (DRR) activities involving local community organisations and the concerned government departments has increased the state of preparedness of polder inhabitants to prospects of embankment breaches and overtopping and encouraged consideration of pre-emptive actions.

C.2.2. Water Management

Within the polders, the re-excavation of primary canals and some major secondary canals, and rehabilitation of water management structures (sluices, outlets etc) aims to improve the overall water management and to create scope for in-polder water management (IPWM) and community-led agricultural water management (CAWM) – which is discussed in Section D Chapter 17. Where infrastructure works are complete, unobstructed flow of water is possible through the cleared main khals, and the rehabilitated sluices/outlets allow improved water regulation. Previously, many areas were either unable to be drained and remained inundated or suffered water shortages as their main outlets or inlets were obstructed or poorly functioning.

Photo C.1 shows one of the 186 regulators which was rehabilitated under Blue Gold. Note the agricultural area to the left of the tree-lined embankment which protects the polder area (P31-part) from high river levels, and the scale of the tidal river – the Kazibacha River. The regulator drains water into a tidal river – it is low tide so there is drainage from the polder. The high tide mark is fringed by trees and bushes.

Photo C.1: A regulator draining excess water from Polder 31-part into the Kazibacha River



C.3 Infrastructure Investments

A budget of BDT 31,420 lakh (equivalent to Euro 31.20 million) was allocated for infrastructure, in the amounts and proportions indicated in *Table C.1* below.

Table C.1: Budget Allocation

| Item | Allocation (September 2020) | |
|-----------------------------------|-----------------------------|------|
| | BDT lakh | %age |
| Embankments (1, 2, 11, 12, 13) | 6,544 | 21% |
| Drainage improvements (3, 14) | 8,932 | 28% |
| Structures (4, 5, 6, 7, 8, 9, 10) | 14,544 | 46% |
| O&M (15,16) | 1,400 | 4% |
| TOTAL | 31,420 | |

Note: See *Table 11.1* for explanation of item numbers

C.4 Emergency Repairs

In the coastal zone, water infrastructure serving polder communities is expected to provide protection and facilitate water management in a particularly aggressive environment - where floods, cyclones, river erosion and accretion, salinity, tidal flows etc can cause devastating damage to embankments with the associated adverse economic consequences of large-scale flooding, or result in structures falling into disuse and unable to regulate the flow of water in and out of the polder. The resultant heavy repair and maintenance costs required to ensure the continued serviceability of the infrastructure are currently not met in full - because O&M budgets with government organisations such as BWDB are – inevitably – thinly stretched and never sufficient, local government is not mandated for this role, and community contributions fall far short of the huge sums required. This conundrum is well understood but remains unresolved, and because of these gaps, the coastal zone remains locked in a project-driven cycle where infrastructure deterioration both precedes and follows rehabilitation.

Adequate funds for unforeseen emergencies should be made available. Under BWDB rules, funds for “emergency works” are allocated only after a breach is imminent or has occurred. At this stage, costs for repair are much more expensive because land in the vicinity of a breach is flooded, so:

- borrow pits with soils suitable for use in embankments are generally not available close to the site of a breach, so there is a cost of haulage – delivering materials to the site of the breach
- It is difficult to get machinery, equipment and materials to the site of a breach, and required labour gangs and boats
- Access by land to the site of a breach is restricted, along narrow embankments especially constructed to gain access to the breach site
- Soil from borrow pits is often saturated, and achieving acceptable level of soil compaction at high moisture content is impossible

Pre-emptive action to strengthen vulnerable embankments before they fail is justified because costs of repair of threatened infrastructure (embankments, sluices etc) are much reduced if work is done before embankment failure; and costs in terms of human lives, and damage to crops, livestock, businesses and households can be prevented.

Emergency maintenance is a major role of BWDB in the O&M Agreement between BWDB and the

polder-level WMA, and should be extended to include investments for pre-emptive works – with BWDB and WMA together agreeing a prioritized list of actions.

C.5 Design Issues

C.5.1. Embankments: Climate Change

Some of the direct effects of climate change on water infrastructure in the coastal zone includes:

- A rise in sea level resulting in drainage congestion and prolonged waterlogging within the polders
- More frequent cyclones and tidal surges damaging water infrastructure, properties and livelihoods as well as endangering polder communities
- Increased siltation in tidal rivers resulting in reduced drainage capacity, that impedes drainage flows from the polders.

To account for climate change effects in design, consideration was given by BWDB to harmonising Blue Gold design criteria - for raised embankment crest levels, and replacing sluices/outlets compatible with the raised embankment crest heights and with increased numbers of vents - with other projects (including WMIP, ECRRP and CEIP).

It was quickly realised that the direct costs of raising embankment crest levels and replacing regulators exceeded the Blue Gold budget allocation by many orders of magnitude. And this would be compounded by the requirement for significant land acquisition (of a strip of land 4 to 5 times the height increase for marginal and interior bunds, and significantly more for sea dykes) and compensation (eg for the relocation of assets and loss of crops).

During the first years of the project, Blue Gold intended to adopt climate change design levels including a benchmark (BM) correction partly for Polders 26, 31-part and 2. However, due to budget constraints, the 2015 Annual Review Mission recommended that the established design levels should be adopted for the rehabilitation of all Blue Gold polders.

The limited available budget for infrastructure has meant that: (a) the choice of polders for Blue Gold has avoided those requiring high levels of investment; and (b) it has not been possible to achieve embankment crest levels which can meet the 25 year return period maximum surge height (used by CEIP-1), or to upgrade existing structures or construct new structures to suit this higher crest level, or indeed to construct the wider structures (requiring longer culvert barrels) for the higher levels of traffic on roads along the embankments.

C.5.2. Structures

Life Cycle Costing

After compiling all costs for an element of water infrastructure over its lifespan – including construction, operation, repair, maintenance and rehabilitation – the total can be reduced to a present value with expected return on investment (ROI). The application of life cycle costing in BWDB could achieve a balance between performance (serviceability requirements), risks and overall life cycle cost.

Gates

For sluices and regulators to be functional, the gates must act to prevent saline river water from entering the polder (the purpose of the flap gates on the river side), to allow excess water to be drained (by opening the vertical gates on the country side), or to allow freshwater in the rivers - during the monsoon months - to be stored in khals for subsequent use for irrigation (ie operating as a “flushing sluice” when flap gates are raised using a pulley system mounted on a lifting frame).

If the gates are of poor quality or are not properly fitted, then they quickly become inoperable, and thus the major investment in the overall structure becomes quickly un-useable. Although the cost of manufacturing and installing gates on a new regulator varies from 3.3% (1-V) to 6.5% (4-V) of the total cost of the regulator, the functionality of the structure depends on the operability of the gates. Whilst many gated structures in the coastal zone date from the 1960s, gates have a much shorter lifetime especially when they are manufactured from materials such as steel which corrode in a marine environment. There is a strong case for reviewing the design, manufacture and installation of gates to maximise their operating lifetime – taking account of the experience with life cycle costing approaches and the use of composite materials.

Siting of Regulators

The siltation of a river channel into which a regulator discharges, is likely to result in the regulator falling into disuse and the loss of a considerable capital investment (of up to €500k for a 4-vent structure), as well as the loss of agricultural benefits within the catchment drained by the regulator. The siting of new regulators on a river channel that will remain active for the 50+ year life of a regulator is a difficult task and relies on expertise in tidal river morphology and historical records.

In cases where regulators become blocked by sediment, internal drainage systems within the polder are re-routed to discharge water to regulators on active rivers. This is assisted by the relatively flat terrain within a polder, and the cross-linking of drainage khals. The drainage capacity of a regulator (ie the number of vents) is determined from the sluice catchment area. By including additional drainage capacity (ie more vents in a regulator) during the design process, it would be possible to reroute and dispose of drainage water from an adjacent regulator which falls into disuse because of sedimentation.



10 Coastal infrastructure

10.1 Coastal Zone

The coastal zone in Bangladesh has a complex agro-ecology, with low lying land and huge tidal rivers. To provide protection to agricultural land from tidal and monsoonal flooding and saline water intrusion, around 1.2 million hectares are now enclosed in 139 polders, whose construction started from the 1960s and 1970s. Now, the polders are home to about ten million people.

The tidal rivers draining the coastal zone carry flood flows during the monsoon season but are highly saline during the dry season when outflows in the tidal rivers are at their lowest. The rivers cause greatest damage to polder infrastructure during times of flood and cyclonic storms – compounded during high water spring tides - when the erosive power of the rivers can damage and even breach the polder embankments. The consequence of a breach can have enormous social and economic impact, resulting in loss of life in severe cases; immediate loss of economic production - crops, fish, livestock, and businesses; damage to infrastructure – roads, utilities, homes, shops, schools; and longer term impacts on the productivity of agricultural lands. These problems will be increasingly exacerbated by climate change and sea-level rise over time.

During the monsoon, polder farmers are keen to capture and store the non-saline floodwaters in the khals or drainage channels. For this purpose, the new regulators constructed under Blue Gold are provided with a lifting frame (also known as ‘goal posts’) with a pulley and chain so that the flap gates on the river-side of the regulators can be lifted at high tide to admit freshwater (within BWDB these regulators are known as ‘flushing sluices’).

This chapter provides background to the development of infrastructure in the coastal zone as a result of Dutch/Bangladesh cooperation.

10.2 Background to Dutch–Bangladesh cooperation in the coastal region^[1]

During the 1950s and 1960s, two Dutch water engineers contributed to the mitigation of the impact of flooding in Bangladesh: Professor J.Th. Thijsse and Professor Willem Johan van Blommestein.

From 1951 to 1959, the Dutch water engineer, Professor Willem Johan van Blommestein, was posted to East Pakistan (now Bangladesh) by the Food and Agriculture Organisation (FAO). During this time, he prepared a series of plans to protect the country from storms, cyclones and floods: including a plan for the Brahmaputra-Ganges delta which consisted of a moveable weir in the Brahmaputra with horizontal hydropower turbines, a channel between the Brahmaputra and Ganges, sea dykes with weirs and locks, pumping stations, polders and large-scale irrigation systems.

Research by Professor J.Th. Thijsse from Delft resulted in “Report on hydrology of East Pakistan” (published in 1964) which concluded that the regulation of large and unstable rivers with massive discharges, such as the Ganges and the Brahmaputra, was impossible. The Thijsse report advised the government against the construction of embankments alongside these rivers before adequate knowledge had been gathered. A main concern was that sedimentation between embankments would lead to the rising of river-beds and flood levels, but he was also apprehensive about the potentially catastrophic consequences of embankment failure, given the deceptive sense of security felt by those living inside the ‘protected’ areas.

After the large-scale flooding of Bangladesh in 1954/55, a United Nations’ mission (the Krug Mission) mobilised in 1956-1957 to advise the government about water and flood dynamics in East Pakistan. The Krug Mission Report of 1957 recommended *Inter alia* the setting up of a Department of Waterways (modelled after Rijkswaterstaat: the Dutch agency for public works and water management) – which resulted in the establishment of the East Pakistan Water and Power Development Authority (EPWAPDA).^[2]

In December 1964, a Master Plan prepared by EPWAPDA, assisted by the International Engineering Company (IECO) of San Francisco, California USA, recommended large-scale flood control, drainage and irrigation projects.

Starting from the early-1960s, many polders and embankments were constructed in coastal areas, to protect coastal communities from salinity intrusion, daily tidal movement and occasional surges, and to support the population engaged in farming and aquaculture activities. The Coastal Embankment Project (CEP) was the first comprehensive plan for providing protection against flood and saline water intrusion in the coastal area. CEP constructed more than 4,000 km of embankment and 1,039 drainage sluices in fourteen coastal Districts between 1961 and 1978 in two phases: Phase I included 92 polders and provided protection to one million ha of land; and Phase II consisted of 16 polders covering another 0.40 million ha.

Throughout the 1970s, Dutch-Bangladesh cooperation focused on transport, water management and industry, reflecting the need to reboot the economy of a war-ravaged country. In 1972, an agreement was signed between the Netherlands and Bangladesh to carry out dredging activities in Bangladesh. The Early Implementation Project (EIP 1975-1997) introduced people’s participation into the project development cycles through sub-project identification, feasibility, planning, design and implementation.

The construction of two cross-dams over branches of the river Meghna on the coast of the Noakhali District during 1957 and 1963 showed the positive potential of settling accreted land. During 1976, encouraged by the tremendous accretion, the Government of Bangladesh requested the Netherlands Government for technical assistance in land reclamation. Based on the Identification Mission Report, the Land Reclamation Project (LRP) began to function in late 1977 and continued to 1991.

Building on the earlier success of the Early Implementation Project (EIP), the Netherlands supported the participatory water management (PWM) approach and, with IFAD, jointly funded the Local Government Engineering Department's (LGED) Small-Scale Project Water Resources Management Project (<1,000ha) from 1996 to 2002. SSWRMP successfully demonstrated people's active participation in taking responsibility for operation (100%) and routine maintenance of small-scale water infrastructure works.

Based on the positive outcome of the Land Reclamation Project (LRP), the Char Development and Settlement Project^[6] (CDSP 1994-2022) was designed to facilitate settlement of government (khash) lands by the landless in Noakhali District; integrated development of reclaimed (khash) lands settled by the landless, including the construction of climate resilient infrastructure; poverty alleviation through livelihood improvement for the new land (char) dwellers; and a contribution to the accumulation and dissemination of data and knowledge on the coastal areas, including Integrated Coastal Zone Management (ICZM). In order to address all these aspects, a multi-sectoral and multi-institutional approach was employed.

Integrated Planning for Sustainable Water Management (IPSWAM 2002-2011) led to the rehabilitation of nine polders in the coastal zone and improved the lives of many thousands. The Guidelines on Participatory Water Management (GPWM) was published in April 2001, bringing together and harmonising a number of project-level approaches. IPSWAM was the first project to adopt GPWM and put the principles into practice. Between 2006 and 2015 a renewed, a more practical and sustainable model of participatory water management was implemented with Dutch support through the South West Area Integrated Water Resources Planning and Management Project (SWAIWRPMP 2006-2022). The Blue Gold Program (2013-2021) was then designed on the back of this cumulative experience to empower rural communities to be the driving force for change.

References

- [1] This section supplements the discussion under 'Previous History' in Section A Chapter 4
- [2] The present Bangladesh Water Development Board was established in 1972 under presidential order no. 59 of 1972, when the former EPWAPDA was split into two organisations: BWDB dealing with water and the Power Development Board (PDB) dealing with power.



11 Investments for polder safety and water management

This chapter describes the evolution of investment fund allocations for infrastructure made through the Blue Gold Program as demonstrated by the revisions made to the original BWDB Development Project Proforma (DPP) in June 2018 and September 2020, then to itemise the actual investments made to each of the 22 polders, and to comment on lessons learnt in designing future projects. The final section of the chapter emphasises the importance of budgeting for emergency repairs to coastal infrastructure.

11.1 Polder investments

Under the Blue Gold Program, investments have been made to the physical infrastructure. Table 11.1 below summarises the 16 different budget headings of the interventions and repairs that have been carried out. Of these, four investments account for 80% of the budget: Item 1 re-sectioning of 330km of embankment, Item 3 re-excavation of 545km of drainage channels or khals, Item 4 repair of 186 regulators/sluices, and Item 6 construction of 31 new regulators or sluices.

Table 11.1: Budget Allocations by Work Item (extracted from re-adjusted DPP)

| | Work Items | Re-Adjustment (September 2020) | | | |
|--|---|--------------------------------|-----------------------|-------------------|-------------|
| | | Quantity | Total Cost Allocation | | |
| | | | BDT lakh | Euro | |
| 1 | Re-sectioning of Embankment (km) | 330 | 4,233 | 4,203,247 | 13% |
| 2 | Retired Embankment (km) | 21 | 1,252 | 1,243,307 | 4% |
| 3 | Re-excavation of khals (km) | 545 | 8,676 | 8,615,650 | 28% |
| 4 | Repair of Regulator/ Sluice with gate (nos.) | 186 | 5,025 | 4,990,308 | 16% |
| 5 | Repair of Inlets/Outlets (nos.) | 235 | 276 | 274,111 | 1% |
| 6 | Construction of Drainage Regulator/ Sluice (nos.) | 31 | 7,220 | 7,170,278 | 23% |
| 7 | Construction of Drainage Outlet (nos.) | 8 | 192 | 190,665 | 1% |
| 8 | Construction Irrigation inlet (nos.) | 17 | 1,480 | 1,469,712 | 5% |
| 9 | Construction of culvert (nos.) | 32 | 302 | 299,901 | 1% |
| 10 | Pump shed (nos.) | 6 | 48 | 48,093 | 0% |
| 11 | Low cost Bank Protection work (km) | LS | 620 | 615,690 | 2% |
| 12 | Rehabilitation of Interior Dike (km) | 21 | 419 | 416,445 | 1% |
| 13 | Closure/ Cross-bundh (km) | LS | 20 | 19,861 | 0% |
| 14 | Supply of Drain pipe (m) | 9,000 | 256 | 254,220 | 1% |
| 15 | Flood damage repair / Breach Closing | LS | 800 | 794,439 | 3% |
| 16 | GoB O&M | LS | 600 | 595,829 | 2% |
| | | | 31,420 | 31,201,758 | 100% |
| Exchange rate as of 25 November 2020 @100.7 BDT : 1 Euro | | | | | |

11.2 Revisions to Polder Infrastructure Investments¹

In this sub-chapter, we review and comment on changes made to the original BWDB Development Project Proforma (in May 2013) through revisions approved in June 2018 and September 2020, which are set out below in Table 11.2.

Table 11.2: Investment Allocations by Budget Heads for DPPs and RDPPs (Costs in BDT lakh ie BDT 100,000)

| Sl. No | Work Items | DPP (May 2013) | | RDPP (June 2018) | | Cost Adjustment RDPP (September 2020) | |
|--------------|---|----------------|---------------|------------------|---------------|---------------------------------------|---------------|
| | | Qty | Cost | Qty | Cost | Qty | Cost |
| 1 | Re-sectioning of Embankment (km) | 551 | 6,627 | 330 | 5,327 | 330 | 4,233 |
| 2 | Retired Embankment (km) | 2 | 86 | 21 | 2,303 | 21 | 1,252 |
| 3 | Re-excavation of khals (km) | 1514 | 5,229 | 545 | 6,945 | 545 | 8,676 |
| 4 | Repair of Regulator/Sluice with gate (nos.) | 239 | 3,322 | 186 | 4,876 | 186 | 5,025 |
| 5 | Repair of Inlets/Outlets (nos.) | 664 | 2,887 | 235 | 674 | 235 | 276 |
| 6 | Construction of Drainage Regulator/ Sluice (nos.) | 11 | 1,428 | 31 | 6,847 | 31 | 7,220 |
| 7 | Construction Irrigation inlets (nos.) | 11 | 65 | 8 | 192 | 8 | 192 |
| 8 | Construction of Drainage Outlet (nos.) | 11 | 267 | 17 | 1,300 | 17 | 1,480 |
| 9 | Construction of culvert (nos.) | | | 32 | 704 | 32 | 302 |
| 10 | Pump shed (nos.) | | | 6 | 60 | 6 | 48 |
| 11 | Low cost Bank Protection work (km) | 1.1 | 66 | LS | 620 | LS | 620 |
| 12 | Rehabilitation of Interior Dike (km) | 38 | 785 | 21 | 96 | 21 | 419 |
| 13 | Closure/ Cross-bundh (km) | 1 | 20 | LS | 20 | LS | 20 |
| 14 | Supply of drainage pipe (m) | | | 9,000 | 256 | 9,000 | 256 |
| 15 | Flood damage repair / Breach Closing | | | LS | 600 | LS | 800 |
| 16 | GoB O&M | LS | 600 | LS | 600 | LS | 600 |
| | Re-excavation of ponds | 2 | 8 | | | | |
| Total | | | 21,390 | | 31,420 | | 31,420 |

¹ See also Section G Chapter 28.3

Original DPP

The DPP was split into two categories ‘Rehabilitation Polders’ (anticipating 5 to 6² polders with an area of 25,000 ha) and ‘Fine-Tuning Polders’ (anticipating 20 to 22 polders with an area of 135,000 ha). The ‘Rehabilitation Polders’ had a heavier investment allocation (of circa Euro 300 per ha) as compared to the ‘Fine-Tuning Polders’ (of Euro 100 per ha). In addition, the scope for investments in ‘Rehabilitation Polders’ covered 11 of 12 DPP budget heads, whilst the scope for ‘Fine-Tuning Polders’ were restricted to 5 of 12 budget heads (refer Table 11.3): re-sectioning of embankments, re-excavation of khals, repairs to regulators/sluiques, repairs to inlets/outlets, and O&M.

Table 11.3: DPP Allocations for Rehabilitation and Fine-Tuning Polders (costs in BDT lakh)

| SI. No | Work Items | DPP (approved 30 July 2013) | | Rehab Works | | Fine Tuning | |
|--------------|---|-----------------------------|---------------|-------------|--------------|-------------|---------------|
| | | Qty | Cost | Qty | Cost | Qty | Cost |
| 1 | Re-sectioning of Embankment (km) | 551 | 6,627 | 112 | 2,617 | 439 | 4,010 |
| 2 | Retired Embankment (km) | 2 | 86 | 2 | 86 | | |
| 3 | Re-excavation of khals (km) | 1516 | 5,237 | 194 | 1,220 | 1320 | 4,009 |
| 4 | Repair of Regulator/Sluice with gate (nos.) | 239 | 3,322 | 25 | 649 | 214 | 2,673 |
| 5 | Repair of Inlets/Outlets (nos.) | 664 | 2,887 | 40 | 214 | 624 | 2,673 |
| 6 | Construction of Drainage Regulator/ Sluice (nos.) | 11 | 1,428 | 11 | 1,428 | | |
| 7 | Construction of Drainage Outlet (nos.) | 11 | 267 | 11 | 267 | | |
| 8 | Construction Irrigation inlet (nos.) | 11 | 65 | 11 | 65 | | |
| 9 | Construction of culvert (nos.) | | | | | | |
| 10 | Pump shed (nos.) | | | | | | |
| 11 | Low cost Bank Protection work (km) | 1.1 | 66 | 1.1 | 66 | | |
| 12 | Rehabilitation of Interior Dike (km) | 38 | 785 | 38 | 785 | | |
| 13 | Closure/ Cross-budh (km) | 1 | 20 | 1 | 20 | | |
| 14 | Supply of drainage pipe (m) | | | | | | |
| 15 | Flood damage repair / Breach Closing | | | | | | |
| 16 | GoB O&M | LS | 600 | | | | 600 |
| | Re-excavation of ponds | 2 | 8 | 2 | 8 | | |
| Total | | | 21,398 | | 7,425 | | 13,965 |

The initial priority for infrastructure activities was on four 'Fine-Tuning' polders, thus allowing time for survey data to be collected and designs to be prepared for the 'Rehabilitation' polders.

Early surveys showed that a number of new regulators were required in the 'Fine-Tuning Polders' for which no allocation had been made. For example, the new 3-Vent Kherjurtala Sluice on the east side of P30 and draining to the active Kazibacha River was proposed to be located close to the existing 1-V Kherjurtala Sluice but with larger drainage capacity to take waters which had otherwise been expected to drain via the 2-V Kalatola Sluice on the west side of P30. However, the Jhapjhapia River which previously carried the drainage water from Kalatola Sluice had become blocked by sediment and so the sluice had become non-functional.

The absence of a DPP budget allocation for land acquisition and for the construction of new regulators in Fine-Tuning Polders meant that important investments were unable to be processed in the first five years of the project – from its start in March 2013 to June 2018, before the RDPP (first revision, June 2018) was approved. Although designs for some new structures and retired embankments had been prepared, tenders for these contracts could only be advertised when budgets were available in the Annual Development Plan (ADP) – and this required their inclusion in the revised DPP.

First Revision (June 2018)

To allow for the completion of investments, it was agreed that an additional fund would be made available which resulted in an increase to Blue Gold infrastructure investments from BDT 21,390 lakh to BDT 31,420 lakh, and that the duration of the project would be extended from end-December 2018 to end-December 2020.

The major increases in budget allocations in the June 2018 revision were for: retired embankments (from BDT 86 lakh to BDT 2,303 lakh), the construction of drainage regulators/sluices (from BDT 1,428 lakh to BDT 6,847 lakh), construction of drainage outlets (from BDT 267 lakh to BDT 1,300 lakh) and to add in culverts, pump-sheds, supply of drainage pipe, and flood damage repair.

The distinction between the two categories of 'Rehabilitation Polders' and 'Fine Tuning Polders' was abandoned in the June 2018 RDPP to allow greater flexibility in meeting the investment needs, and to thus allow the construction of new regulators and retired embankments in the earlier category of Fine-Tuning Polders. The 2018 revision also included a new item for land acquisition of BDT 3,300 lakh (equivalent to €3.3 million) by GoB alone, sufficient for the acquisition of an estimated 34.5 ha. This aimed to encourage landowners in Blue Gold to release land for retired embankments, since they had objected to releasing land when land acquisition payments were being made to landowners in nearby polders subject to rehabilitation under CEIP-1.

Second Revision (September 2020)

By December 2019, it was recognised that an additional season (ie FY 2020/21) would be required to complete project investments. A zero-cost extension to end-December 2021 was therefore agreed, along with adjustments between budget heads to maximise the use of available funds. It was also agreed that the functionality of infrastructure (ie operability of all gates, and removal of obstructions in primary khals) was an important objective of the extension.

A main aim of the September 2020 re-adjustment was to make transfers (of from 20% to 60% of the 2018 budget) between budget heads, taking account of implementation experience and the projected pipeline of new investments. The one major change made in the September 2020 revision was to increase the allocation to the rehabilitation of interior dykes (from BDT 96 lakh to BDT 419 lakh).

Lessons Learnt

A number of lessons learnt from the practical challenges which emerged from the planning process:

Build in allowance for climate change effects³ – The budget allocation was insufficient for the significantly higher budgets (ca 10+ times multiplier of funds available to Blue Gold) required to address the effects of climate change. This resulted in inconsistencies with design policies adopted for adjacent polders (eg where World Bank's CEIP-1 designs allowed for incorporation of the full effects of climate change).

Go for greater flexibility – Don't categorise polders as Fine-Tuning or Rehabilitation, since the dynamic situation in the coastal zone requires adaptation to changing events (eg previously active tidal rivers becoming silted up).

Include funds for land acquisition – No funds for land acquisition were envisaged in the DPP so no budget allocation was allowed for the land acquisition for retired embankments or for new structures. The June 2018 revision included a new item for land acquisition to which BDT 3,300 lakh (€ 330,000) was allocated for GoB funding, sufficient for the acquisition of an estimated 34.5 ha.

O&M Budget: In the coastal zone, water infrastructure serving polder communities is expected to provide protection and facilitate water management in a particularly aggressive environment - where floods, cyclones, river erosion and accretion, salinity, tidal flows etc can cause devastating damage to embankments with the associated adverse economic consequences of large-scale flooding, or result in structures falling into disuse and unable to regulate the flow of water in and out of the polder. The resultant heavy repair and maintenance costs required to ensure the continued serviceability of the infrastructure are currently not met in full - because O&M budgets with government organisations such as BWDB are – inevitably – heavily and never sufficient, local government is not mandated for this role, and community contributions fall far short of the huge sums required. This conundrum is well understood but remains unresolved, and because of these gaps, the coastal zone remains locked in a project-driven cycle where infrastructure deterioration both precedes and follows rehabilitation.

Given this unsatisfactory arrangement, the GoB O&M fund in the RDPP provides for the inevitable repairs to breached or vulnerable embankments in Blue Gold. In processing the RDPP (approved in June 2018), the O&M budget was set at BDT 18 crore by MoWR but was eliminated by the Planning Commission in the first round of discussions and then included after protests from MoWR but at the reduced amount of BDT 6 crore – an amount which was known by MoWR to be insufficient for the remaining three years of the project. In compensation, BDT 2 crore was added in the September 2020 re-adjustment to the allocation of BDT 6 crore provided for Flood Damage and Repair (Item 15) in the June 2018 RDPP. For future projects in the coastal zone, the importance of this budget is worth emphasising. A consideration of the implications for emergency repairs is presented below, with particular reference to the repair of a breach in Polder 29 along the Lower Bhadra River at the village of Chandghar.

Participatory Planning: Pre-DPP planning visits to rural communities are often exploratory and result in a long list of required interventions, some of which are later excluded from the DPP because of budgetary constraints. Because of the pressure to finalise a DPP, the choice of which investments to exclude from the DPP is often not referred back to the community. The high level of detail required in the DPP in order to obtain approval of the Project Evaluation Committee (PEC) means that there is limited opportunity for community participation after the DPP formulation has been approved, and only when the DPP is subject to revision. It is only during early contact with representatives from rural communities,

3 See also Chapter 12.3 concerning design allowance for climate change effects.

and union and upazila parishads after DPP approval – when there is heightened interest by local parties in influencing how funds will be spent – that communities become aware that some of their priority investments are not included in the project. This breach of trust results in understandable reluctance from the local communities to start the process of formation of water management groups – which underpins participatory water management.

11.2.1. Investments by Polder and by BWDB Division

For each of the six BWDB divisions responsible for polders in the Blue Gold Program, Table 11.4 summarises the amount invested in infrastructure for each polder. It shows the investments vary from BDT 166 lakh (equivalent to Euro 166,000) for P43/2E in Patuakhali O&M to BDT 3,318 lakh (equivalent to Euro 3.3 million) for P47/4 in Kalapara – with an average investment of BDT 1,304 lakh (equivalent to Euro 1.3 million).

Separate links to a series of tables provide the quantity and amount of infrastructure works contracted for each polder by each of the six BWDB Division against the RDPP budget heads: Satkhira O&M-2, Khulna O&M-1, Khulna O&M-2, Patuakhali O&M, Barguna and Kalapara. A series of infrastructure maps covering each of the 22 Blue Gold polders is available here showing the location of Blue Gold investments, with a summary table on each map of the quantity and cost for the RDPP budget heads.

Table 11.4: Summary of Works Contracted by Polder by BWDB Division

| BWDB Division | Polder | Amount to Polder | | Amount to Divn | |
|----------------|--------------|------------------|-----|----------------|-----|
| | | BDT lakh | % | BDT lakh | % |
| Satkhira O&M-2 | 2 | 2,634 | 9% | 2,634 | 9% |
| Khulna O&M1 | 25 | 1,387 | 5% | | |
| | 26 | 1,222 | 4% | | |
| | 29 | 1,794 | 6% | | |
| | 27/1 | 483 | 2% | | |
| | 27/2 | 170 | 1% | | |
| | 28/1 | 387 | 1% | | |
| | 28/2 | 1,130 | 4% | 6,573 | 23% |
| | 22 | 448 | 2% | | |
| Khulna O&M-2 | 30 | 1,199 | 4% | | |
| | 31-part | 1,404 | 5% | | |
| | 34/2-part | 1,560 | 5% | 4,611 | 16% |
| | 43/2A | 2,045 | 7% | | |
| Patuakhali O&M | 43/2B | 2,100 | 7% | | |
| | 43/2D | 1,528 | 5% | | |
| | 43/2E | 166 | 1% | | |
| | 55/2A | 1,588 | 6% | | |
| | 55/2C | 1,236 | 4% | 8,663 | 30% |
| | 43/1A | 504 | 2% | | |
| Barguna O&M | 43/2F | 1,423 | 5% | 1,927 | 7% |
| | 47/3 | 961 | 3% | | |
| Kalapara | 47/4 | 3,318 | 12% | 4,279 | 15% |
| | Total | 28,686 | | | |

11.2.2. Emergency Repairs

The importance of access to a budget for repairs and maintenance to water infrastructure in the coastal zone has been mentioned above under ‘O&M Budget’ in ‘Lessons Learnt’.

To give an idea of the scale of the threat of breaches to polder embankments, records from March 2017 for the 22 Blue Gold polders showed an active threat to 13 polders at 29 different locations in Patuakhali, Khulna and Satkhira. Since BWDB is responsible for 139 polders, the potential emergency arrangements to be addressed by the Board is considerable.

At polder level, when a BWDB Executive Engineer is confronted by a threatened breach to a polder embankment, he needs to make a series of decisions. One of his/her options is for embankment retirement, for which agreement will be required from the community: (a) that land will be provided for the retired embankment and/or to check whether funds are available for land acquisition; and (b) that the alignment of the retired embankment is accepted, and that it is sufficiently distant from the face of a bank which is being actively eroded to ensure embankment integrity for a period of (say) ten years – and this can be a distance of around 100m. Other options include provision of revetment to the affected length of embankment (plus a transition length both upstream and downstream) with a design that addresses the cause – which might be wind- or wave-induced erosion, or sub-surface riverbank scour resulting in geotechnical instability.

The ADB-funded Flood and Riverbank Erosion Risk Management Investment Program (FRERMIP) has significant experience with sand-filled geo-textile bags providing low-cost flexible revetment below low-water level in combination with concrete block revetment from low-water level to the upper limit of flood flows including a freeboard allowance. Although this form of revetment is being increasingly used in the tidal regions, it is generally restricted to sand-filled geo-textile bags alone. Because the geo-textile bags are degraded through exposure to ultraviolet (UV) when energy from sunlight breaks the bonds within the polymer structure, they do not provide a long-term solution for the inter-tidal zone. Whilst geo-textile bags are effective in stabilising riverbanks below low-flow level, other treatment is required for sections of riverbank which are exposed to sunlight. For tidal rivers, the diurnal variation in river levels means that the reaches exposed at low-tide level should be treated with materials that are resistant to UV exposure, potentially the reinforced concrete jute mattresses which are being tested and developed under FRERMIP. The jute mattress is filled with a dry sand-cement mix, laid across the shaped ground from the low-tide level to the flood-level with an allowance for freeboard (to cater for the wind-induced waves caused by a storm during high tide conditions) and overlapping the geo-textile bags. By soaking the mattress, the sand-cement mixture reacts to form a concrete blanket shaped to the ground profile. In due course, the jute material breaks down and is washed or blown away.

Case Study: Polder 29 at Chadghar in the Lower Bhadra River, Khulna District

All of those who live and work in the coastal zone face the consequences of erosion damage to polder embankments. But those who are resident in the polders, and whose families and livelihoods are dependent on the exclusion of flood waters from the polder bear the brunt of the consequences when polder embankments fail.

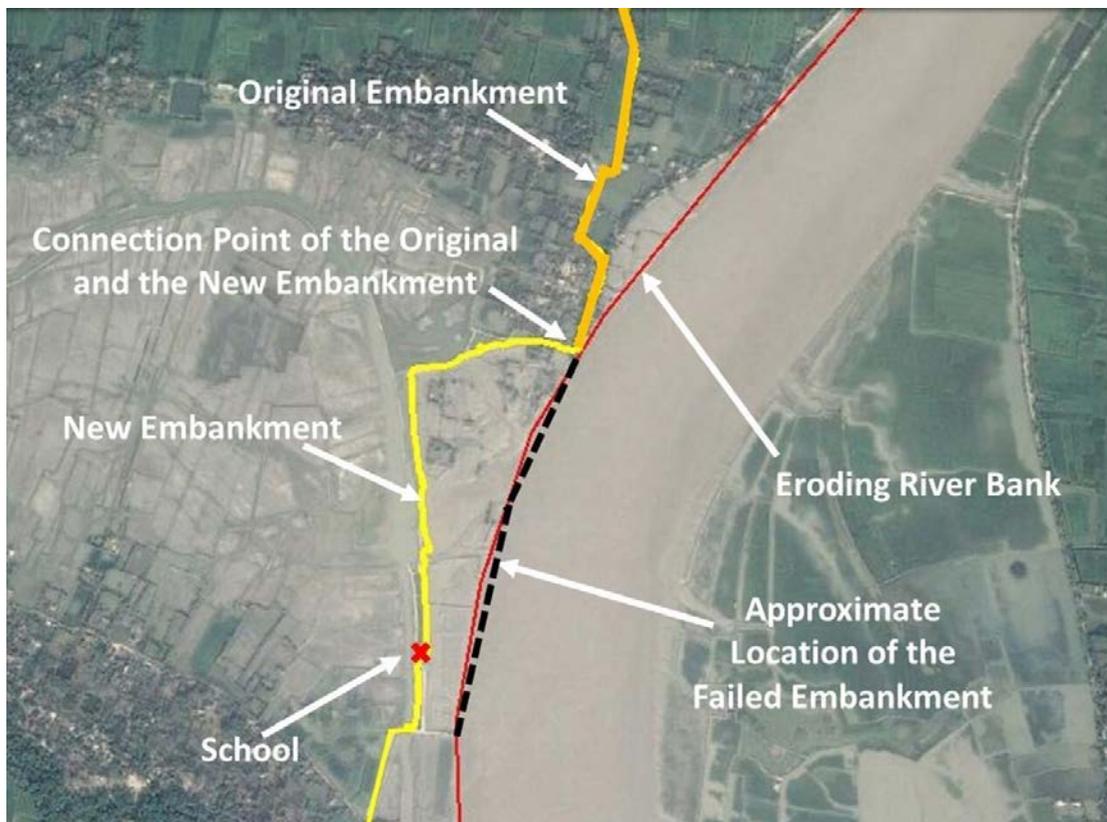
As a case study⁴, this section recounts the history leading to a breach in a polder embankment, the immediate aftermath and the consequences for the community. The section which follows it summarises the studies and research which was conducted in parallel to determine a longer-term intervention strategy.

Chadghar village is located in Sharafpur union of Dumuria upazila in Khulna district, close to the eastern perimeter bund of Polder 29 and adjacent to the Lower Bhadra river. Since the creation of the polder in 1968, the embankment has been prone to river erosion and has reportedly been eroded eleven times in this reach. During IPSWAM (2004-2011), the embankment was eroded twice.

To provide context, the image below in Figure 11.1 presents the eroding riverbank as well as alignments of the old and new embankments – and the extent of flooding.

4 A presentation at a seminar on bank protection in April 2017 adds to the summary given below. https://www.bluegoldwiki.com/index.php?title=File:P29_BGP_erosion_presentation.pdf

Figure 11.1: Aerial photograph of breach in Lower Bhadra River near Chadghar village



For the sake of this discussion, the timeline starts from dry season 2014:

2014 Dry Season: Several meetings about a retired (realigned) embankment with a setback distance of around a 100m were held with WMGs, WMA and UPs. The community, however, was unwilling to accept a retirement of the embankment as a considerable area of land had been lost through erosion and retirement during over the last decade.

2014 Monsoon: Further erosion of the riverbank occurred and lengths of the polder embankment close to Chadghar were in a critical state and close to being breached by river-waters. WMA, WMGs, UP and the BWDB Divisional Executive Engineer held meetings at the erosion site to persuade landowners to donate land for a retired embankment.

2015 Dry Season: Despite the imminence of a breach, the local community (Chatchatia Sluice WMA - known as “CS WMA” in 2015) objected to the alignment of the proposed retired embankment because funds for land acquisition or compensation were not offered⁵, and because many houses and land would be outside the proposed embankment and remain at risk. Eventually, BWDB reluctantly accepted a compromise alignment acceptable to CS WMA but which was too close to the actively eroding riverbank.

April 2015: A construction contract for the retired embankment was awarded. In the meantime, apprehending a probable breach, the UP provided ‘backing’⁶ to the embankment in several reaches, as well

5 The CS WMA was aware that the World Bank-funded Coastal Embankment Improvement Project Phase 1 was offering land acquisition and compensation in Polders 32, 33, 35/1 and 35/3. In a public meeting, they made clear their preference for financial compensation.

6 ‘Backing’ is the practice of using earth to build up the width of the embankment on its country-side.

as ‘porcupines’⁷. Other local techniques were also used, but nothing worked well. At one location, because the embankment was weakened to such an extent that a breach was expected imminently, the BWDB Executive Engineer constructed a ‘ring dike’ on the country-side to provide a line of defence in the event of a breach.

July 2015: Early in the month, BWDB and TA visited the site and estimated physical progress to be around 20%, noting poor-quality uncompacted earthwork in an embankment which was aligned only 20m from the riverbank. There was fierce community hostility towards BWDB/TA. On 30 July 2015, a depression developed in the Bay of Bengal becoming ‘Cyclone Komen’ which crossed the shoreline on 31 July 2015. The original embankment breached at the end point Baintala khal during high tide compounded by effects of cyclone Komen accompanied with heavy rainfall, resulting in flooding and damage to houses and crops. The breach also developed three deep channels across the alignment of the partially-constructed retired embankment, making continuation of the work very difficult.

Impact of Breach: According to preliminary reports, the flood affected about 9 to 11 villages under Dumuria Upazila and 2 villages under Shurkhali Union of Batiaghata Upazila of Khulna District. About 1286 households were affected, 404 houses were destroyed and 325 houses were partially damaged. Some 684 ghers were destroyed. T Aman seedlings were damaged in about 30 ha of land and vegetables were damaged in about 20 ha of land. A vast area of land was covered by silt and saline water.

Emergency Measures: The Union Parishad (UP) and WMA, with technical advice from BWDB, mobilised the local community to construct a ring dike around the country-side of the existing embankment. Although all efforts were made to close the breach, they were prevented by high velocity flows. Photo 11.1 shows one of the three breaches through the realigned embankment at Chadghar, showing: (a) the high velocity flows leading to high tide; (b) the failed attempts – bamboo bandals and narrow earthen embankment - by the local community to close the breach; and (c) a child from one of the families whose home was on the original embankment.

Photo 11.1: The third breach in the realigned embankment (August 2015)



⁷ To prevent riverbank erosion, ‘porcupines’ are installed to slow river velocities and thus encourage sediment deposition close to the riverbank.

Photo 11.2: Emergency embankment (August 2015)



Photo 11.2 provides more detail of the failed attempts by the local community to close the breach, with bamboo bandals and narrow earthen embankment formed from sandbags.

2016 Dry Season: To close the three breaches (deep channels/creeks) formed during monsoon 2015 and to protect Chadghar, BWDB's Design Circle designed a new embankment with three closures provided with a minimum set-back distance of 100m. A contract for the works was awarded in February 2016. Two of the three breaches were closed by the contractor. For the closure of the third creek "breach 3", an immense amount of work was required to drive bullah piles which would provide the framework for the sand-filled geobags which would close the breach. In late-May and early-June, repeated attempts to close the channel of the third creek failed as the inter-tidal velocities were too high. It was finally closed on 28 June 2016. The main embankment was still very weak but intact. The embankment withstood the 2016 floods.

Photo 11.3: Driving bullah piles in Breach 3 to provide a framework for sand-filled geobags



2017 Dry Season: The embankment withstood the 2016 floods. By April 2017, repair works carried over from 2015/16 were still only 50% complete. By June 2017, the contract was completed – in time for the flood season.

Research Leading to Intervention

In parallel, with the activities to complete the polder embankment at Chadghar, various studies and investigations were initiated to address the cause of the long-term erosion and to invest in mitigation measures.

IWM was contracted by Blue Gold on 19th February 2015 to carry out investigations for "Riverbank Erosion Management in polder 29, Khulna" to identify the causes of erosion and develop a comprehensive adaptive approach to mitigation. The final report, submitted in May 2016, recommended a series of top blocked semi-permeable spars with sand filled geo-bag in the scour holes as erosion protection measure. In October 2016, BWDB's Design Circle-5 supplied a design in line with IWM's recommendation. A review by Deltares (May 2017) of the design documents expressed serious reservations about the current design and recommended against proceeding with the design in its present form:

'If the purpose of the structure merely consists of testing a new type of groyne battery, it remains worth noting that bank erosion upstream and downstream of the battery will change the direction of attack at the upstream and downstream terminations. The structure has not been conceived for this and might fail as a result, putting an untimely end to the corresponding monitoring programme.'

Furthermore, the results of a report in July 2017 on the numerical modelling of top blocked spurs, recommending that a more suitable location (than the Lower Bhadra River) should be selected for pilot testing where environmental conditions are milder and where there would be no interaction with any other bank protection or river training structures.

In March 2017, a reconnaissance visit was made to the site of the breach by a specialist river engineer, the team leader of the Flood and Riverbank Erosion Risk Management Investment Program (FRERMIP). During the field trip, the thalweg of the incoming high velocity spring tide flows were close to the riverbank in the area of the breached embankment. The report on the visit recommended emergency riverbank protection, to control the riverbank erosion, using sand-filled geotextile bags along the bank. These bags, once undercut from erosion slide down the underwater slope and protect the slope against further erosion, as the sand-fill acts as filter against the fine clayey and silty subsoils. Further investigation was recommended to: (a) study the underwater slopes of the eroding banks, to assure that the launching process can take place; and (b) fix the scour depth to correctly calculate the required number of bags.

A series of studies were undertaken to provide design information:

- Float tracking survey results – Abdul Ghani (April 2017)
- IWM River surveys (12/13 and 27/28 May 2017)
- IWM Borehole investigation (11 to 15 June 2017)

and after the installation of the emergency protection works:

- IWM Post-monsoon river survey (11 and 17 November 2017)

Procurement arrangements were put in place for the award of a contract to carry out the emergency protection works. Tenders from a number of pre-alerted shortlisted contractors were evaluated and a contract was awarded on 15th May 2017 to LA-TTSL Joint Venture, a firm with experience in implementing similar works in the Jamuna River under FRERMIP. The works were completed by early July 2017, involving the placement of nearly 17,250 geobags.

The emergency protection works implemented by Blue Gold comprised of: (i) a dumped 6m wide underwater apron consisting of 3 layers of 250kg geobags along 950m of bankline and (ii) an above low water level protection of 1.5 layers of placed 250kg geobags on the slope along 111m. While the purpose of the underwater protection is to prevent large scale, continuous erosion of the bankline, the slope protection above low water level is designed to minimize local erosion in places with settlements close to the bankline.

In June 2018, a report on the emergency works provided an overview of the studies, the results, the type of protection works, the works which were implemented and the performance of the works after the 2017 flood season. The report concluded that the implemented emergency works appeared to perform satisfactorily, and that the river was not expected to significantly change course over the next years. However, it also noted that the nature of the protection was not suitable for a long-term protection, and that adaptation works were required as well as erosion protection of the upper bank above low water level. To ensure the sustainability of the implemented works and to avoid future problems with erosion in the vulnerable reach, the report advised that the implemented emergency works should be upgraded and extended in both upstream and downstream directions to minimize the risk of outflanking of the protection.

Through the Blue Gold Innovation Fund, EKN financed all the research studies and reports, as well as the contract for the emergency protection works by the LA-TTSL Joint Venture.

Lessons Learnt

Adequate funds for unforeseen emergencies should be made available.

Under BWDB rules, funds for “emergency works” are allocated only after a breach is imminent or has occurred. At this stage, costs for repair are much more expensive because land in the vicinity of a breach is flooded, so:

- a. borrow pits with soils suitable for use in embankments are generally not available close to the site of a breach, so there is a cost of haulage – delivering materials to the site of the breach
- b. It is difficult to get machinery, equipment and materials to the site of a breach, and required labour gangs and boats
- c. Access by land to the site of a breach is restricted, along narrow embankments especially constructed to gain access to the breach site
- d. Soil from borrow pits is often saturated, and achieving acceptable level of soil compaction at high moisture content is impossible
- e. In tidal reaches of coastal rivers
 - i. the effective working time for a contractor is limited to 4 hours in two sessions either side of high or low tide (depending on the tidal regime during daylight hours); and
 - ii. the velocities either side of high tide can be very considerable. In these conditions, the final closure of breaches often requires driving bandals to contain earth-filled geotextile bags – so that they are not swept away by the high velocity flows

Pre-emptive action to strengthen vulnerable embankments before they fail is justified because:

1. Costs of repair of threatened infrastructure (embankments, sluices etc) are much reduced if work is done before embankment failure; and
2. Costs in terms of human lives, and damage to crops, livestock, businesses and households can be prevented

Possible measures which could be considered:

1. Providing the field XEN with technical assistance from an experienced design team – supported, for example, by IWM - who would prepare recommended engineering interventions and obtain local community acceptance, assisted by representatives from WMG, WMA, UP, UZP and any local MP
2. Providing flexible funding arrangements by pre-allocating budgets under the Annual Development Plan (ADP) so that pre-emptive actions can be included in the Revised Annual Development Plan (RADP) in February/March, thus leaving a four-month window for tendering and construction from March to June (when the onset of the monsoon prevents work from continuing)
3. Providing a 5-year on-call framework contract for pre-emptive emergency repair including stock-piling geotextile bags in godowns (storage sheds) of BWDB Divisions. Incentivising contractors through appropriate contractual arrangements to complete pre-emptive works on time and to a good quality, and to be accountable for successful implementation and the integrity of the embankment, perhaps for the duration of the framework contract

Emergency maintenance is a major role of BWDB in the O&M Agreement between BWDB and polder-level WMA, and should be extended to include investments for pre-emptive works – with BWDB and WMA together agreeing a prioritized list of actions.



12 Survey, design and procurement

This chapter aims to cover survey, design and data collection, and the steps leading to the award of contracts.

12.1 Survey and design data collection

12.1.1. Survey

Topographical surveys are required for design purposes for earthworks and new structures, then for measurement purposes at pre-contract and post-contract stages – during which joint measurements are taken, attended by representatives of BWDB, the contractor and the TA team.

As part of the crash program recommended by the 2016 Annual Review Mission (see Chapter 13), a budget was allocated so that local firms could be contracted directly by the BWDB Field Executive Engineer to carry out surveys.

12.1.2. Design Data

Design data is collected by the BWDB Divisions and sent to the BWDB Design Circles.

12.2 Design

Using the survey and design data provided by the BWDB Divisions, designs are prepared by the BWDB Design Circles.

12.2.1. Embankment Design Criteria

There are three types of full flood protection embankment aimed to prevent entry into the polder of the highest flood flows, and, in coastal areas, to prevent entry of tidal floods and surges, and saline water:

1. marginal dykes along small rivers/canals
2. interior dykes along big rivers
3. sea dykes along sea faces or large rivers close to the sea

The embankment crest level is designed either: (a) for a 1 in 20 year flood plus a freeboard allowance to protect agricultural assets; or (b) for a 1 in 100 year flood plus a freeboard allowance to protect against loss of human life, property and installations (especially along Jamuna, Padma and Meghna Rivers). The free board depends on the fetch (the normal distance from windward shore to the embankment affected) and wind characteristics. It allows for wave height, wave run-up height and a factor of safety against overtopping. For BWDB embankments in the coastal region, freeboard usually varies from 0.30m to 1.00m depending on the type of embankment.

Table 12.1 Embankment Types, Slope and Crest Width

| Dyke | Slope | | Crest width(m) |
|----------|--------------|---------------------|----------------|
| Marginal | country side | 1V:2H | 2.44 |
| | river side | 1V:2H | |
| Sea dyke | country side | 1V:2H | 4.30 |
| | river side | 1V:3H | |
| Sea dyke | country side | from 1V:2H to 1V:3H | by calculation |
| | river side | from 1V:5H to 1V:7H | |

Table 12.2: Design Crest Levels and Widths for Blue Gold Polders^[1]

| Polder | Type | Crest Level (m PWD) | Crest Width (m) |
|---------------|-------------|----------------------------|------------------------|
| 2 | interior | 4.30 | 4.30 |
| 22 | interior | 4.30 | 4.30 |
| 25 | interior | 4.30 | 4.30 |
| 26 | interior | 4.30 | 4.30 |
| 27/1 | interior | 4.30 | 4.30 |
| 27/2 | interior | 4.30 | 4.30 |
| 28/1 | interior | 4.30 | 4.30 |
| 28/2 | interior | 4.30 | 4.30 |
| 29 | interior | 4.30 | 4.30 |
| 30 | interior | 4.30 | 4.30 |
| 31-part | interior | 4.30 | 4.30 |
| 34/2-part | interior | 4.30 | 4.30 |
| 43/1A | marginal | 4.30 | 2.44 |
| | interior | 4.30 | 4.30 |
| 43/2A | marginal | 4.30 | 2.44 |
| | interior | 4.30 | 4.30 |
| 43/2B | marginal | 4.30 | 2.44 |
| | interior | 4.30 | 4.30 |
| 43/2D | marginal | 4.30 | 2.44 |
| | interior | 4.30 | 4.30 |
| 43/2F | marginal | 4.30 | 2.44 |
| | interior | 4.30 | 4.30 |
| 55/2C | marginal | 4.30 | 2.44 |
| | interior | 4.30 | 4.30 |
| 47/3 | marginal | 4.57 | 2.44 |
| | interior | 4.88 | 4.30 |
| 47/4 | marginal | 4.57 | 2.44 |
| | interior | 4.88 | 4.30 |
| | sea dyke | 6.10 | 4.30 |

12.2.2. Climate Change Effects

Some of the direct effects of climate change on water infrastructure in the coastal zone includes:

- A rise in sea level resulting in drainage congestion and prolonged waterlogging within the polders
- More frequent cyclones and tidal surges damaging water infrastructure, properties and livelihoods as well as endangering polder communities
- Increased siltation in tidal rivers resulting in reduced drainage capacity, that impedes drainage flows from the polders

To account for climate change effects in design, consideration was given by BWDB to harmonising Blue Gold design criteria - for raised embankment crest levels, and replacing sluices/outlets compatible with the raised embankment crest heights and with increased numbers of vents - with other projects (including WMIP, ECRRP and CEIP).

It was quickly realised that the direct costs of raising embankment crest levels and replacing regulators exceeded the Blue Gold budget allocation by many orders of magnitude¹. And this would be compounded by the requirement for significant land acquisition (of a strip of land 4 to 5 times the height increase for marginal and interior bunds, and significantly more for sea dykes) and compensation (eg for the relocation of assets and loss of crops).

During the first years of the project, Blue Gold intended to adopt climate change design levels including a benchmark (BM) correction partly for Polders 26, 31-part and 2. However, due to budget constraints, the 2015 Annual Review Mission recommended that the established design levels (as shown in Table 11.2) should be adopted for the rehabilitation of all Blue Gold polders.

The limited available budget for infrastructure has meant that: (a) the choice of polders for Blue Gold has avoided those requiring high levels of investment; and (b) it has not been possible to achieve embankment crest levels which can meet the 25 year return period maximum surge height (used by CEIP-1), or to upgrade existing structures or construct new structures to suit this higher crest level, or indeed to construct the wider structures (requiring longer culvert barrels) for the higher levels of traffic on roads along the embankments.

12.2.3. Mean Sea Level (MSL) Datum Adjustment

Corrections were made to Survey of Bangladesh (SoB) levels over the period 1994 to 2008². The Institute of Water Modelling (IWM) was engaged by Blue Gold to establish the new SoB benchmark levels to first 12, then all, polders selected by Blue Gold. From IWM's report on the first 12 polders, existing design levels of embankments need to be raised by 0.30m to 0.90m to compensate for the MSL/BM correction.

- 1 Under Blue Gold, the investment in infrastructure totalled BDT 28,686 lakh (equivalent to €28.7 million). Thus, the average level of investment in the infrastructure to each of the 22 polders is around €1.33 million. By comparison, the investment in 17 CEIP polders is USD 286 million (ref CEIP Project Appraisal Document 29th May 2013) an average of USD 16.8 million per polder (equivalent to €15.3 million - or more than ten times the Blue Gold investment in infrastructure per polder - assuming a USD-€ exchange rate of 0.91).
- 2 All existing design crest levels of embankment were based on previous SOB (Survey of Bangladesh) levels transferred from Mean Sea Level in India (Arabian Sea). Since these levels were transferred over very long distances, there were considerable uncertainties and sources of errors in these levels, which were confirmed during 1990s (by IWM). In 1993, SOB/JICA initiated a project which set up a new permanent Tidal Observation Station at Rangadia, Chittagong and established a tentative Mean Sea Level (MSL) of the Bay of Bengal. With respect to this new MSL a National Vertical Datum was also established at Gulshan, Dhaka in 1994. With reference to this Vertical Datum a national Control Network was established. SOB carried out 3,800 km of 1st order level survey to determine the MSL height of 849 benchmarks (BMs) from 1994 to 2004. To intensify the number of vertical control points, about 3,500 km of 2nd order level survey was carried out to establish 237 more BMs from 2002 to 2004. From 2004 to 2008, SOB also carried 1,600 km of 2nd order level surveys to establish another set of 150 BMs. The 1st order level surveys were carried out from the Vertical Datum at Gulshan, Dhaka and the 2nd order level surveys were carried out by IWM from the 1st order BMs.

12.2.4. Design of Structures

In many cases, the standard 4m carriageway width over a regulator or inlet/outlet structure or culvert is insufficient for the much higher volumes of traffic now using the roads maintained by the Roads and Highways Department (RHD) or Local Government Engineering Department (LGED). RHD is responsible for national and regional highways and District roads, whilst LGED is responsible for Upazila, Union and village roads.

The tables below give recommended road carriageway widths. For future designs, carriageway widths over BWDB structures should be a minimum of 5.5m, and possibly even 6.2m – the width recommended by RHD.

Table 12.3: LGED Geometric Design Standards

| Category | Design Type | Traffic (DCVs) | Carriageway (m) | Hard Shoulder (m) | Verge (m) | Crest Width (m) |
|---|-------------|----------------|-----------------|-------------------|-----------|-----------------|
| Upazila Roads | 4 | 600 | 5.5 | | 2.15 | 9.8 |
| | 5 | 300 | 3.7 | 0.9 | 0.9 | 7.3 |
| | 6 | 200 | 3.7 | | 1.8 | 7.3 |
| Union Roads | 7 | 100 | 3.7 | | 0.9 | 5.5 |
| | 8 | 50 | 3.0 | | 1.25 | 5.5 |
| Village Roads | | | | | | |
| Note: DCVs = daily commercial vehicles | | | | | | |

LGED recommends bridge carriageway widths of 5.5m for Union and Upazila roads, except in the case of a Union road with a bridge length of less than 30m where a bridge carriageway width of 3.7 m is accepted.

Table 12.4: RHD Carriageway Widths

| Width (m) | Design Type |
|-----------|--|
| 3.7 | This is the standard single lane carriageway width and is suitable for the more lightly-trafficked Feeder Roads. Vehicles travelling in opposing directions can pass each other by putting their outer wheels on the shoulder. |
| 5.5 | This is a minimum width two-lane carriageway. Large vehicles can pass each other at slow speed. |
| 6.2 | This is the lowest economic cost option for a very wide range of traffic volumes. It allows most vehicles to pass with sufficient clearance to avoid the need to slow down or move aside. |
| 7.3 | This is a high standard two-lane single carriageway. |
| 11 | This is a three-lane carriageway as one half of a dual 3-lane road. |

12.2.5. Design Issues

Life Cycle Costing

After compiling all costs for an element of water infrastructure over its lifespan – including construction, operation, repair, maintenance and rehabilitation – the total can be reduced to a present value with expected return on investment (ROI). The purpose of life cycle costing is to achieve a balance between performance (serviceability requirements), risks and overall life cycle cost. In Europe, asset management is based on life cycle costing.

In January 2015, a Reconnaissance Mission by the Dutch Water Authorities (DWA) prepared a report^[2] for BWDB to consider As a result, senior BWDB officials visited the Netherlands and UK in November 2015 for briefings on policy approaches to asset management.^[3] In May 2016, DWA submitted a proposal for training in life cycle costing and design^[4] from different angles: theory and practice on technical, managerial, institutional and financial aspects and stakeholder interests. In September 2016, twelve mid-level BWDB engineers attended a course on ‘Advanced Level Design and Life Cycle Costing of Sustainable Water Management Infrastructure’^[5]. And in October 2016, a presentation was made by Poly Das (BWDB Design Circle) to the Mid-Term Review Mission about the outcome of her attendance at the September 2016 course.

Gates – importance of fundamental design review

For sluices and regulators to be functional, the gates must act to prevent saline river water from entering the polder (the purpose of the flap gates on the river side), to allow excess water to be drained (by opening the vertical gates on the country side), or to allow freshwater in the rivers - during the monsoon months - to be stored in khals for subsequent use for irrigation (ie operating as a “flushing sluice” when flap gates are raised using a pulley system mounted on a lifting frame).

If the gates are of poor quality or are not properly fitted, then they quickly become inoperable, and thus the major investment in the overall structure becomes quickly un-useable. Although the cost of manufacturing and installing gates on a new regulator varies from 3.3% (1-V) to 6.5% (4-V) of the total cost of the regulator, the functionality of the structure depends on the operability of the gates. Whilst many gated structures in the coastal zone date from the 1960s, gates have a much shorter lifetime. There is a strong case for reviewing the design, manufacture and installation of gates to maximise their operating lifetime – taking account of the experience with life cycle costing approaches and the use of composite materials.

Gates in the coastal zone are manufactured from steel, which is subject to corrosion in the aggressive coastal environment. During a visit to the Netherlands in September 2016 for a course in Life Cycle Costing and Design, BWDB mid-level design engineers were inter alia introduced to gates made from composite materials which are inert and resistant to corrosion. As a result, investigations were started under the Blue Gold Innovation Fund into the testing of composite gate materials, in preparation for major investments in water infrastructure under the Delta Plan. From December 2017, this early work was taken-up by Deltares and the Institute of Water Modelling (IWM) under the Water Management Knowledge and Innovation Program (WMKIP).

Siting of Regulators

The siltation of a river channel into which a regulator discharges, is likely to result in the regulator falling into disuse and the loss of a considerable capital investment (of up to €500k for a 4-vent structure), as well as the loss of agricultural benefits within the catchment drained by the regulator. The siting of new

regulators on a river channel that will remain active for the 50+ year life of a regulator is a difficult task and relies on expertise in tidal river morphology and historical records.

In cases where regulators become blocked by sediment, internal drainage systems within the polder are re-routed to discharge water to regulators on active rivers. This is assisted by the relatively flat terrain within a polder, and the cross-linking of drainage khals. The drainage capacity of a regulator (ie the number of vents) is determined from the sluice catchment area. By including additional drainage capacity (ie more vents in a regulator) during the design process, it would be possible to reroute and dispose of drainage water from an adjacent regulator which falls into disuse because of sedimentation.

Concrete blocks – The cost of providing revetment to structures can be expensive (some 8 to 13% of the total cost of a new structure). Because of the high cost of rock in Bangladesh (mostly found in the riverbeds in the north-east of the country), concrete blocks are provided as revetment to structures in the coastal zone (on both the river-side and country-side). There is a case for phasing the revetment – providing an acceptable minimum to guard the structure from side-cutting and then monitoring the development of scour over the first year of operation and extending the revetment as required.

| Activity | Responsibility | Duration |
|-----------------------------|---------------------------|--------------|
| Estimate preparation | BWDB Field Office | 1 week |
| Estimate vetting | Technical Assistance team | 1 week |
| e-Tendering process | Tenderers | 2 weeks |
| Notification of Award (NOA) | BWDB Field Office | 2 to 4 weeks |
| Work Orders | BWDB Field Office | 1 week |
| Contract mobilisation | Contractor | 1 week |

Role of Technical Assistance (TA) Team

All estimates submitted by BWDB field offices are formally vetted by the TA Team.

12.1 References

- [1] Standard Design Criteria. Standard Design Manual. Volume 1. Standard Design Manual Committee, BWDB Chief Engineer (Design). June 1995.
- [2] Mission Report, Reconnaissance mission Bangladesh - 16-28 January 2015. Dutch Water Authorities (DWA). 2015. https://www.bluegoldwiki.com/index.php?title=File:OT_DWA_Mission_Report_-_Reconnaissance_mission_Bangladesh_-_16-28_January_2015_....pdf
- [3] International Water Week and Netherland/UK Policy Approaches. Blue Gold Program. December 2015. https://www.bluegoldwiki.com/index.php?title=File:OT_AIWW_and_Water_Management_Policy_Approaches_in_Netherlands_and_UK_1-12nov2015.pdf
- [4] Proposal Training Life Cycle Costing and Design for Water Systems. Dutch Water Authorities (DWA). 2016. https://www.bluegoldwiki.com/index.php?title=File:OT_int7_Proposal_Training_Life_Cycle_Costing_and_Design_for_Water_Systems.pdf
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13 Construction: Progress, Modalities and Lessons Learnt

This chapter describes the progress of construction over the eight construction seasons from 2013/14 to 2020/21, analyses the nature of the works and the contractors, the contracting modalities, makes some general observations on construction quality, and draws the lessons learnt.

Six BWDB divisions in three Circles are responsible for tendering, the award of contracts and the day-to-day monitoring and quality control of the works:

| Zone | Circle | Division |
|------------|---------------|----------------|
| South-West | Khulna O&M | Satkhira O&M-2 |
| | Jashore O&M | Khulna O&M-1 |
| | Khulna O&M | Khulna O&M-2 |
| South | Patuakhali WD | Patuakhali O&M |
| | | Barguna O&M |
| | | Kalapara |

The role of the Technical Assistance (TA) team during construction is to assist in occasional monitoring and quality control of implementation works, to carry out site checks and surveys prior to certifying payments, and to process all bills submitted by BWDB field offices for reimbursement by EKN.

13.1 Analysis of progress

Table 13.1 sets out the quantity and value of certified works for each of the construction seasons against each of the RDPP budget heads.

In 2019/20, the most active construction season (as judged by the value of certified payments), there were a total of 332 active contracts: comprising 167 new contracts which started in the season and 165 contracts for carried-over works. Within the total of 332, there were 64 contracts for miscellaneous works (ie low cost bank protection, rehabilitation of interior dykes, flood damage repair, etc). The 167 new contracts included 87 for earthworks (or 11% of the total number of earthworks contracts awarded), 30 for the rehabilitation of structures (25% of the total number of the contracts awarded for the rehabilitation of structures) and 9 for the construction of new structures (15% of the total number of the contracts awarded for new structures).

Table 13.2 sets out the cumulative quantity and value of certified works for each of the construction seasons against each of the RDPP budget heads.

The tables show the relatively slow start to the construction effort. The five-year duration assumed in the original DPP would have meant an average rate of implementation of BDT 5,350 lakh per annum (ie BDT 21,390 lakh over an effective four-year period¹. By the end of the construction season in FY 2015/16 – just over half-way through the original 69 month project period – only 18% (a cumulative value of BDT 3,954 lakh against a total provision of BDT 21,390 lakh in the DPP of May 2013) had been disbursed, and Blue Gold was classified by MoWR/BWDB as a “sick project”.

To compensate for the numerous vacancies within the BWDB Division and Design Offices, the 2016 Annual Review Mission (Recommendation 1.1) allocated a € 500,000 budget for additional resources

¹ The ‘effective four-year period’ is recognition that a project start date in March 2013 does not allow the development of contracts for award in the first construction season (from January to June 2013).

to BWDB. The fund was channelled through the TA team and used for additional junior professional staff in the BWDB Design Circles, field and technical support staff in Khulna and Patuakhali, and the appointment of survey firms to carry out surveys and design data collection under contract to the Executive Engineer of the responsible BWDB Division.

Design staff: Four junior design engineers were identified and selected by BWDB and subsequently contracted through the TA Team in April 2017 and appointed to Design Circles 2 and 5 in BWDB's Green Road complex – and provided with computers and office furniture. In October 2017, a junior mechanical engineer for ME Khulna was appointed. These staff were recruited through the TA team but were accountable to BWDB line managers.

Survey and design data collection (SDDC): After appreciating the range of support likely to be required by BWDB if survey teams were recruited locally (ie recruitment of trained staff, provision of survey equipment, transport, field allowances etc), and the complexity of managing and obtaining transparent financing procedures, preference was instead given to contracting local survey firms to conduct survey and design data collection. Survey contracts were therefore outsourced to local service companies instead of hiring additional staff.

Procurement and quality control staff: Additional staff have yet to be appointed in field offices in field offices for the preparation of estimates and tendering, and quality control. With respect to estimates and tendering, there was understandable reluctance within BWDB about providing confidential and sensitive information on prices and tendering procedures to part-time staff – for fear of collusion with contractors.

These measures and the efforts of the incoming BWDB Program Coordinating Director (who started in March 2016) resulted in a steady increase in the construction during FY 2017/18 followed by significant year-on-year increases in both FY 2018/19 and FY 2019/20.²

2 The increase in FY 2018/19 over FY 2017/18 was 100%+ (BDT 6,434 lakh cf BDT 3,181 lakh) followed by a 25% increase from FY 2019/20 over FY 2018/19 (BDT 8,027 lakh cf BDT 6,434 lakh).

Table 13.1: Sample design of the baseline phase-I survey

| Sl. No | Work items | FY 2013/14 | | | FY 2014/15 | | | FY 2015/16 | | | FY 2016/17 | | | FY 2017/18 | |
|--------------|---|------------|------------|---------------|------------|------------|-----------------|------------|------------|-----------------|------------|------------|-----------------|------------|------------|
| | | Qty (Full) | Qty (Part) | Total Cost | Qty (Full) | Qty (Part) | Total Cost | Qty (Full) | Qty (Part) | Total Cost | Qty (Full) | Qty (Part) | Total Cost | Qty (Full) | Qty (Part) |
| 1 | Re-sectioning of Embankment | 2.80 | 63.42 | 220.88 | 68.93 | 82.98 | 947.49 | 89.31 | 27.25 | 781.83 | 45.80 | 44.35 | 804.39 | 57.86 | 30.61 |
| 2 | Retired Embankment (km) | | 0.60 | 0.99 | 0.60 | 2.24 | 190.97 | 2.24 | 1.47 | 123.90 | | 1.08 | 24.57 | 1.71 | |
| 3 | Re-excavation of khals (km) | 6.63 | 0.55 | 47.27 | 21.36 | 17.42 | 365.30 | 21.59 | 33.35 | 267.33 | 50.14 | 33.04 | 798.57 | 78.30 | 30.10 |
| 4 | Repair of Regulator/Sluice with gate (nos.) | | | | 2 | 5 | 27.98 | 19 | 27 | 664.81 | 27 | 12 | 610.02 | 27 | 3 |
| 5 | Repair of Inlets/ Outlets (nos.) | | | | | 4 | 20.42 | 139 | 49 | 207.12 | 72 | | 41.70 | 5 | |
| 6 | Construction of Drainage Regulator/ Sluice (nos.) | | | | | | | | 2 | 88.29 | | 7 | 464.99 | 3 | 5 |
| 7 | Construction of Drainage Outlet (nos.) | | | | | | | | | | | | | | |
| 8 | Construction of Irrigation Inlet (nos.) | | | | | | | | | | 2 | | 54.59 | | |
| 9 | Construction of culvert (nos.) | | | | | | | | | | | | | | |
| 10 | Pump shed (nos.) | | | | | | | | | | | | | | |
| 11 | Low cost Bank Protection work (km) | | | | | | | | | | | | | | |
| 12 | Rehabilitation of Interior Dike (km) | | | | | | | | | | | | | | |
| 13 | Closure/ Cross-bundh (km) | | | | | | | | | | | | | | |
| 14 | Supply of Drain pipe (m) | | | | | | | | | | | | | | |
| 15 | Flood damage repair / Breach Closing | | | | | | | | | | | | | | |
| 16 | GoB O&M | | | | | | | | | | | | | 1.19 | 2.18 |
| Total | | | | 269.14 | | | 1,552.16 | | | 2,133.28 | | | 2,798.82 | | |

| | | FY 2018/19 | | | FY 2019/20 | | | FY 2020/21 | | | FY 2021/22 to end-Sep 2021 | | | | | TOTAL cost adj RDPP (as revised September 2020) | | |
|--|-----------------|---------------|---------------|-----------------|---------------|---------------|-----------------|---------------|---------------|-----------------|-------------------------------|---------------|---------------|------------------|----------|---|------------|--|
| | Total Cost | Qty (Full) | Qty (Part) | Total Cost | Qty (Full) | Qty (Part) | Total Cost | Qty (Full) | Qty (Part) | Total Cost | Qty (Full) | Qty (Part) | Total Cost | Cum Total | Qty | Cost | %age | |
| | 778.8 | 51.82 | 13.76 | 565.71 | 8.48 | | 79.83 | 5.12 | | 12.37 | | | | 4,190.70 | 330.12 | 4,232.67 | 99% | |
| | 168.95 | 0.40 | 1.31 | 70.32 | 9.86 | | 305.04 | 5.21 | | 170.01 | 0.33 | | 19.47 | 1,074.22 | 20.34 | 1,252.01 | 86% | |
| | 924.37 | 152.13 | 47.25 | 2,692.27 | 82.07 | 24.02 | 1,237.74 | 106.98 | 2.29 | 1,156.72 | 2.29 | | 7.94 | 7,497.51 | 521.48 | 8,675.96 | 86% | |
| | 610.69 | 26 | 24 | 605.70 | 55 | 5 | 1,336.47 | 14 | | 551.19 | 6 | | 235.10 | 4,641.96 | 4,641.96 | 5,025.24 | 92% | |
| | 4.91 | | | | | | | 2 | | 4.61 | | | | 278.76 | 218 | 276.03 | 101% | |
| | 480.74 | 3 | 12 | 1,476.63 | 6 | 13 | 3,279.51 | 11 | 6 | 1,104.53 | 6 | | 116.01 | 7,010.71 | 29 | 7,220.47 | 97% | |
| | | | 7 | 286.08 | 5 | 11 | 782.25 | 10 | 2 | 207.97 | 2 | | 160.65 | 1,436.95 | 17 | 1,480 | 97% | |
| | | | | | | | | | | | | | | 54.59 | 8 | 192 | 28% | |
| | 3.42 | 6 | | 126.13 | | 1 | 12.86 | 2 | | 34.02 | | | 7.56 | 183.99 | 4 | 302 | 61% | |
| | | | 3 | 8.49 | 3 | 1 | 26.24 | 1 | | 3.00 | | | | 37.73 | 6 | 48.43 | 78% | |
| | 19.21 | 0.74 | 0.51 | 119.81 | 0.80 | 0.09 | 159.49 | 0.61 | | 87.02 | | | | 385.53 | LS | 620 | 62% | |
| | | 0.60 | | 32.03 | 3.95 | 12.25 | 213.75 | 17.69 | | 124.37 | | | | 370.15 | 21 | 419.36 | 88% | |
| | | | 0.14 | 20.58 | | | | | | | 0.14 | 0.53 | 0.53 | 21.11 | LS | 20 | 106% | |
| | | | | | 4,168 | 1,314 | 139.62 | 4,609.34 | | 87.86 | 198 | 5.17 | 5.17 | 232.65 | 9,000 | 256 | 91% | |
| | | 0.72 | 0.12 | 104.35 | 13.58 | 8.59 | 482.22 | 10.78 | | 161.09 | 0.40 | | 0.22 | 747.88 | LS | 800 | 93% | |
| | 173.28 | 10.27 | 0.03 | 265.59 | 0.44 | | 28.98 | | | 35.44 | | | 18.35 | 521.64 | LS | 600 | 87% | |
| | | | | | | | | | | | | | | 31,420 | | | | |
| | 3,164.38 | | | 6,373.09 | | | 8,084.00 | | | 3,740.20 | | | 571.00 | 28,686.08 | | 31,420 | 91% | |

Table 13.2: Cumulative Expenditure against RDPP Budget Heads

| Sl. No | Work items | Comulative progress upto June 2014 | | | Comulative progress upto June 2015 | | | Comulative progress upto June 2016 | | | Comulative progress upto June 2017 | | | Comulative progress upto June 2018 | | |
|--------------|---|------------------------------------|------------|------------|------------------------------------|------------|------------|------------------------------------|------------|------------|------------------------------------|------------|------------|------------------------------------|------------|------------|
| | | Qty (Full) | Qty (Part) | Total Cost | Qty (Full) | Qty (Part) | Total Cost | Qty (Full) | Qty (Part) | Total Cost | Qty (Full) | Qty (Part) | Total Cost | Qty (Full) | Qty (Part) | Total Cost |
| 1 | Re-sectioning of Embankment | 2.80 | 63.42 | 220.88 | 71.73 | 82.98 | 1,168.37 | 161.04 | 27.25 | 1,950.20 | 206.84 | 44.35 | 2,754.59 | 264.70 | 30.61 | |
| 2 | Retired Embankment (km) | | 0.60 | 0.99 | 0.60 | 2.24 | 191.96 | 2.84 | 1.47 | 315.86 | 2.84 | 1.08 | 340.43 | 4.55 | | |
| 3 | Re-excavation of khals (km) | 6.63 | 0.55 | 47.27 | 27.98 | 17.42 | 412.57 | 49.57 | 33.35 | 679.90 | 99.71 | 33.04 | 1,478.47 | 178.01 | 30.10 | |
| 4 | Repair of Regulator/Sluice with gate (nos.) | | | | 2 | 5 | 27.98 | 21 | 27 | 692.79 | 48 | 12 | 1,302.81 | 75 | 3 | |
| 5 | Repair of Inlets/ Outlets (nos.) | | | | | 4 | 20.42 | 139 | 49 | 227.54 | 211 | | 269.24 | 216 | | |
| 6 | Construction of Drainage Regulator/ Sluice (nos.) | | | | | | | | 2 | 88.29 | | 7 | 553.28 | 3 | 5 | |
| 7 | Construction of Drainage Outlet (nos.) | | | | | | | | | | | | | | | |
| 8 | Construction of Irrigation Inlet (nos.) | | | | | | | | | | 2 | | 54.59 | 2 | | |
| 9 | Construction of culvert (nos.) | | | | | | | | | | | | | | | |
| 10 | Pump shed (nos.) | | | | | | | | | | | | | | | |
| 11 | Low cost Bank Protection work (km) | | | | | | | | | | | | | | | |
| 12 | Rehabilitation of Interior Dike (km) | | | | | | | | | | | | | | | |
| 13 | Closure/ Cross-bundh (km) | | | | | | | | | | | | | | | |
| 14 | Supply of Drain pipe (m) | | | | | | | | | | | | | | | |
| 15 | Flood damage repair / Breach Closing | | | | | | | | | | | | | | | |
| 16 | GoB O&M | | | | | | | | | | | | | 1.19 | 2.18 | |
| | Re-excavation of ponds | | | | | | | | | | | | | | | |
| Total | | | | 269.14 | | | 1,821.30 | | | 3,954.58 | | | 6,753.40 | | | |

| s | Comulative progress upto June 2019 | | | Comulative progress upto June 2020 | | | Comulative progress upto June 2021 | | | Cumulative Progress to end-Sep 2021 | | | TOTAL cost adj RDPP (as revised September 2020) | | | |
|---|------------------------------------|------------|------------|------------------------------------|------------|------------|------------------------------------|------------------|------------|-------------------------------------|------------|------------|---|-------|---------------|------------|
| | Total Cost | Qty (Full) | Qty (Part) | Total Cost | Qty (Full) | Qty (Part) | Total Cost | Qty (Full) | Qty (Part) | Total Cost | Qty (Full) | Qty (Part) | Total Cost | Qty | Cost | %age |
| | 3,533.39 | 316.52 | 13.76 | 4,098.50 | 325.00 | | 4,178.33 | 330.12 | | 4,190.70 | 330.12 | | 4,190.70 | 330 | 4,233 | 99% |
| | 509.38 | 4.95 | 1.31 | 579.70 | 14.81 | | 884.74 | 20.01 | | 1,054.75 | 20.34 | | 1,074.22 | 21 | 1,252 | 86% |
| | 2,402.84 | 330.14 | 47.25 | 5,095.11 | 412.21 | 24.02 | 6,332.85 | 519.19 | 2.29 | 7,489.57 | 521.48 | | | 545 | 8,676 | 86% |
| | 1,913.50 | 101 | 24 | 2,519.20 | 156 | 5 | 3,855.67 | 170 | | 4,406.86 | 176 | | | 186 | 5,025 | 92% |
| | 274.15 | 216 | | 274.15 | 216 | | 274.15 | 218 | | 278.56 | 218 | | 278.76 | 235 | 276 | 101% |
| | 1,034.02 | 6 | 12 | 2,510.65 | 12 | 13 | 5,790.17 | 23 | 6 | 6,894.70 | 29 | | 7,010.71 | 31 | 7,220 | 97% |
| | | | 7 | 286.08 | 5 | 11 | 1,068.33 | 15 | 2 | 1,276.30 | 17 | | 1,436.95 | 8 | 192 | 97% |
| | 54.59 | 2 | | 54.59 | 2 | | 54.59 | 2 | | 54.59 | 2 | | 54.59 | 17 | 1,480 | 28% |
| | 3.42 | 6 | | 129.55 | 6 | 1 | 142.41 | 8 | | 176.43 | 8 | | 183.99 | 32 | 302 | 61% |
| | | | 3 | 8.49 | 3 | 1 | 34.73 | 4 | | 37.73 | 4 | | 37.73 | 6 | 48 | 78% |
| | 19.21 | 0.74 | 0.51 | 139.02 | 1.54 | 0.09 | 298.51 | 2.15 | | 385.53 | 2.15 | | 385.53 | LS | 620 | 62% |
| | | 0.60 | | 32.03 | 4.55 | 12.25 | 245.78 | 22.23 | | 370.15 | 22.23 | | 370.15 | 21 | 419 | 88% |
| | | | 0.14 | 20.58 | | | 20.58 | | | 20.58 | 0.14 | | 21.11 | LS | 20 | 106% |
| | | | | | 4,168 | 1,314 | 139.62 | 8,777 | | 227.48 | 8,975 | | 232.65 | 9,000 | 256 | 91% |
| | | | 0.720 | 0.12 | 104.35 | 14.30 | 8.59 | 586.57 | 25.09 | 747.66 | 25.49 | | 747.88 | LS | 800 | 93% |
| | 173.28 | 11.46 | 0.03 | 438.87 | 11.89 | | | 467.85 | 11.89 | 503.29 | 11.89 | | 521.64 | LS | 600 | 87% |
| | 9,917.78 | | | 16,290.87 | | | | 24,374.87 | | 28,115.08 | | | 28,686.08 | | 31,420 | 91% |

13.2 Nature of works

Blue Gold infrastructure works comprise simple, relatively low-value, but scattered construction activities for which expertise in earthworks and reinforced concrete structures is required, as well as experience in working in, and alongside, tidal rivers.

Over the eight-year lifetime of Blue Gold (2013 to 2021), some 1,157 contracts have been awarded (excluding those awarded for GoB O&M works) for the fifteen main work items defined in RDPP in Table 12.1 as well as to BWDB's Mechanical Engineering (ME) Division.

For each of the fifteen main RDPP work items, Table 13.3 presents the numbers and values of contracts awarded to Labour Contracting Societies (LCSs) and to general contractors.

Table 13.3: Number and Values of Infrastructure Contracts Awarded under Blue Gold

| Sl. No | Work Items | Re- Adjustment (approved 1 September 2020) | | No. of Contracts | | | Contract Value (BDT lakh) | | | | | |
|--------------|---|--|-----------------|------------------|------------|--------------|---------------------------|------|-----|------------|-------|-------|
| | | | | LCS | Contractor | TOTAL | LCS | | | Contractor | | |
| | | Quantity | Cost (BDT lakh) | | | | Min | Max | Avg | Min | Max | Avg |
| 1 | Re-sectioning of Embankment (km) | 330.13 | 4,233 | 228 | 104 | 332 | 3.0 | 13.7 | 7.7 | 4.8 | 132.3 | 28.2 |
| 2 | Retired Embankment (km) | 20.58 | 1,252 | 14 | 33 | 47 | 7.3 | 9.9 | 8.9 | 2.8 | 259.5 | 35.1 |
| 3 | Re-excavation of khals (km) | 545.0 | 8,676 | 218 | 228 | 446 | 4.2 | 14.0 | 7.6 | 3.4 | 332.3 | 29.8 |
| 4 | Repair of Regulator/ Sluice with gate (nos.) | 186 | 5,025 | | 108 | 108 | | | | 1.7 | 95.9 | 24.2 |
| 5 | Repair of Inlets/Outlets (nos.) | 235 | 276 | | 13 | 13 | | | | 1.6 | 43.8 | 15.8 |
| 6 | Construction of Drainage Regulator/ Sluice (nos.) | 31 | 7,220 | | 29 | 29 | | | | 101.9 | 515.8 | 241.7 |
| 7 | Construction Irrigation inlet (nos.) | 8 | 192 | | 2 | 2 | | | | 26.7 | 28.8 | 27.7 |
| 8 | Construction of Drainage Outlet (nos.) | 17 | 1,480 | | 17 | 17 | | | | 52.6 | 139.6 | 86.1 |
| 9 | Construction of culvert (nos.) | 32 | 302 | | 8 | 8 | | | | 14.3 | 28.6 | 23.0 |
| 10 | Pump shed (nos.) | 6 | 48 | | 4 | 4 | | | | 9.3 | 9.7 | 9.5 |
| 11 | Low cost Bank Protection work (km) | LS | 620 | | 24 | 24 | | | | 2.3 | 40.5 | 16.7 |
| 12 | Rehabilitation of Interior Dike (km) | 21.02 | 419 | | 17 | 17 | | | | 2.3 | 63.9 | 24.5 |
| 13 | Closure/ Cross-budh (km) | LS | 20 | | 1 | 1 | | | | 21.4 | 21.4 | 21.4 |
| 14 | Supply of Drain pipe (m) | 9,000 | | | 13 | 13 | | | | 7.8 | 37.2 | 16.7 |
| 15 | Flood damage repair / Breach Closing | LS | 800 | | 49 | 49 | | | | 0.8 | 76.5 | 16.7 |
| | ME Works | | | | 47 | 47 | | | | | | |
| Total | | | 31,420 | 460 | 697 | 1,157 | | | | | | |

A summary of the information in Table 13.3 is provided below in Table 13.4.

Table 13.4: Summary of Contracts Awarded

| Grouping | Work Items (Ref Table 12.1) | No. of contracts |
|------------------|-----------------------------|--------------------------------|
| Earthworks | 1, 2, 3, | 825: 460 LCSs, 365 contractors |
| No. of contracts | 4, 5 | 121 |
| New structures | 6, 7, 8, 9, 10 | 60 |
| Others | 11, 12, 13, 14, 15 | 151 (including ME works) |
| TOTAL | | 1,157 |

13.2.1. Earthworks

The scope of earthworks contracts includes the re-sectioning of embankments (Item 1), the construction of retired embankments (Item 2) and the re-excavation of khals (Item 3).

For earthworks, the value of contract varies depending on whether it is awarded to a contractor or a Labour Contracting Society (LCS). The value of earthworks contracts awarded to a contractor varied between BDT 2.8 lakh (for a retired embankment) and BDT 332.3 lakh (for re-excavation of khals). The value of an earthworks contract awarded to an LCS varied from BDT 3.0 lakh (for re-sectioning of an embankment) to BDT 14.0 lakh (for re-excavation of a khal).

The total value of the 460 earthworks contracts awarded to LCSs amounted to BDT 3,532 lakh, which was just under 25% of the total value of 825 earthworks contracts of BDT 14,447 lakh.

13.2.2. Structures – Rehabilitation

The description ‘rehabilitation of structures’ covers contracts for the repair of regulators (Item 4), and the repair of outlets and inlets (Item 5). The analysis of 120 repair contracts is provided in Table 13.5.

Table 13.5: Analysis of Contracts for Repair of Structures

| Item | No. of contracts | No of structures | Contract Value (BDT lakh) | | |
|-------------------------------|------------------|------------------|---------------------------|------|-------|
| | | | Max | Min | Avg |
| 4. Repair of regulator | 108 | 148 | 95.91 | 1.70 | 24.95 |
| 5(a) Repair of outlet | 5 | 20 | 36.74 | 1.61 | 23.26 |
| 5(b) Repair of inlet | 8 | 172 | 43.78 | 3.08 | 20.93 |

Table 13.5 shows that the value of contracts for the rehabilitation of existing structures varies from an average of BDT 24.95 lakh for the repair of a regulator or sluice structure (based on 108 contracts for 148 structures) to an average of BDT 23.26 lakh for the repair of an outlet (based on 5 contracts for 20 structures) and an average of BDT 20.93 lakh for the repair of an inlet (based on 8 contracts for 172 structures).

13.2.3. Structures – New

The description ‘new structures’ covers contracts for the construction of regulators (Item 6), irrigation inlets (Item 7) and drainage outlets (Item 8), construction of culverts (Item 9), as well as the erection of pump sheds (Item 10).

The purpose of a regulator or drainage sluice is principally to allow the drainage of water from the polder into the tidal river when there is a differential head across the regulator (ie when the polder or country-side water level exceeds the level in the tidal river). The regulator is provided with a lift gate on the country-side (to allow freshwater to be held in the khal for irrigation during the dry season) and a flap gate on the river-side (to prevent water entry to the polder during high tide conditions). A frame is provided on the river-side so that the flap gate can be lifted when there is freshwater in the river (during the monsoon flood season) so that water can be stored in the khal within the polder and used for irrigation during the dry season. The size of the culvert is determined from the drainage area served by the structure.

An irrigation inlet or flushing sluice is a single barrelled 0.6m diameter piped structure provided with a lift gate on the country-side and a flap gate on the river-side. The purpose of the inlet is to allow freshwater to enter the polder during the monsoon period when there is freshwater in the tidal river, for storage for irrigation purposes during the dry season. Only two inlets were constructed under Blue Gold.

A drainage outlet comprises a single barrelled box culvert of one of three dimensions (0.6 x 0.9, 0.9 x 1.2, and 1.2 x 1.2m) and provided with lift gate on the country-side and a flap gate on the river-side. There is no provision for a frame to allow the flap gate to be raised to admit freshwater from the river.

A typical contract for the construction of a new regulator involves the closure of the area of works from tidal river/khal and arrangements for the pumping out of water, excavation for the structural foundation, sand piling across the foundation, construction of the reinforced concrete structure, and – after the installation of gates and associated equipment by a nominated contractor – the removal of the cross-bundhs and the commissioning and handing over of the completed structure to the BWDB Executive Engineer. The installation of gates is the responsibility of the BWDB’s Mechanical Engineering (ME) Department (see below).

Because a contract for a new regulator (for example) is in one location, it can be readily managed. But there are many technical complexities to be managed – the variable nature of ground conditions during excavation, and whilst excavations remain open, the presence of unrecorded abandoned structures below original ground level, heavy inflows into the excavation due to monsoonal rainfall, tidal river conditions as well as the threat of breaches to the cross-bundhs due to river erosion or cyclonic storms.

From an analysis of the 29 contracts awarded for new sluices, Table 13.6 presents the contract values against the number of vents. The first contracts were awarded in 2015/16 and the most recent in 2020/21, so the comparison is indicative as no account is taken of annual increases in the BWDB schedule of rates.

Table 13.6: Contract Values for Regulators

| | | Contract Value (BDT lakh) | | |
|------|----|---------------------------|--------|--------|
| Size | No | Max | Min | Avg |
| 4-V | 1 | 515.83 | 515.83 | 515.83 |
| 3-V | 6 | 430.09 | 225.21 | 332.58 |
| 2-V | 6 | 285.83 | 159.64 | 245.10 |
| 1-V | 16 | 299.00 | 101.89 | 191.9 |

From an analysis of 17 contracts awarded for drainage outlets (as of end-November 2020), Table 13.7 presents the contract values against the size of the box culvert. The first contracts were awarded in 2018/19 and the most recent in 2019/20, so the comparison is indicative as no account is taken of annual increases in the BWDB schedule of rates.

Table 13.7: Contract Values for Drainage Outlets

| | | Contract Value (BDT lakh) | | |
|-----------|----|---------------------------|-------|--------|
| Size (m) | No | Max | Min | Avg |
| 0.6 x 0.9 | 5 | 60.73 | 52.59 | 54.77 |
| 0.9 x 1.2 | 9 | 139.55 | 65.93 | 106.70 |
| 1.2 x 1.2 | 3 | 92.22 | 61.81 | 76.56 |

For the smaller structures:

- Average value of the 2 contracts awarded for 0.6m diameter flushing inlets was BDT 27.7 lakh
- Average value of the 8 contracts awarded for the construction of culverts was BDT 23 lakh
- Average value of the 4 contracts awarded for the construction of pump sheds was BDT 9.5 lakh

13.2.4. Gates

The manufacture and installation of gates is contracted separately to BWDB's Mechanical Engineering (ME) Department.

For all new structures, the installation of gates requires close coordination with the civil engineering contractor since gates are installed in dry conditions ie when earth bundhs are in position. Gates can only be manufactured when measurements have been taken after the construction of the regulator. There is therefore a limited window for the ME Department to survey, design, manufacture and instal the gates after the completion of the reinforced concrete regulator structure and before the contractor finalises the works for handover to BWDB/WMA.

13.3 Contractors

13.3.1. General Contractors

BWDB adheres to the Public Procurement Act 2006 and Public Procurement Rules 2008 in identifying contractors, preparing tenders and awarding contracts. For Blue Gold contracts, the Open Tendering

Method (OTM) is the preferred modality and this specifically excludes the process of pre-qualification. Tenders are therefore invited from all eligible Tenderers through public advertisement. The eligibility criteria from a typical tender data sheet (TDS) are as follows:

15 Experience Criteria: *Tenderers shall have the following minimum level of construction experience to qualify for the performance of the Works under the Contract:*

- (a) a minimum number of years of general experience in the construction of works as Prime Contractor or Subcontractor or Management Contractor as specified in the TDS; and*
- (b) specific experience as a Prime Contractor or Subcontractor or Management Contractor in construction works of a nature, complexity and methods/construction technology similar to the proposed Works in at least a number of contract(s) and of a minimum value over the period, as specified in the TDS.*
- (c) The minimum number of years of general experience of the Tenderer in the construction works as Prime Contractor or Subcontractor or Management Contractor shall be 3 (three) years.*
- (d) The minimum specific experience as a Prime Contractor or Subcontractor or Management Contractor in construction works of at least 1 (one) contract(s) of similar nature (repair/re-sectioning/construction of embankment), complexity and methods/construction technology successfully completed within the last 3 (three) years, each with the value specified in the TDS [years counting backward from the date of publication of IFT in the e-gp website/newspaper]*

16. Financial Criteria: *Tenderers shall have the following minimum level of financial capacity to qualify for the performance of the Works under the Contract:*

- (a) Average annual construction turnover i.e total certified payments received for contracts in progress or completed under public sector for a period as stated under ITT Sub Clause 16.1(a), substantiated by Statement(s) of Receipts, from any scheduled Bank of Bangladesh, issued not earlier than twenty-eight (28) days prior to the day of the original deadline for submission of Tenders;*
- (b) Availability of minimum liquid assets i.e. working capital or credit line(s) from any Scheduled Bank, net of other contractual commitments of the amount specified in the TDS;*
- (c) Satisfactory resolution of all claims, arbitrations or other litigation cases and shall not have serious negative impact on the financial capacity of Tenderer.*
- (d) The required average annual construction turnover shall be greater than the amount specified in the TDS over the last 3 (three) years. [years counting backward from the date of publication of IFT in the e-gp website/newspaper]*
- (e) The minimum amount of liquid assets or working capital or credit facilities of the Tenderer shall be as specified in the TDS. Note: The tenderer shall be submitted liquid asset by bank credit facilities as STD prescribed form is provided in Section 7 (General Specifications).*
- (f) Satisfactory resolution of all claims, arbitrations or other litigation cases and shall not have serious negative impact on the financial capacity of Tenderer.*

17. Personnel Capacity: *Tenderers shall have the minimum level of personnel capacity to qualify for the performance of the Works under the Contract consisting of a Construction Project Manager, Engineers, and other key staff with qualifications and experience as specified in the TDS:*

- *Project Manager (B.Sc. in Civil Eng) 5 years' total experience, 3 years' experience with similar works*
- *Site Engineer (Diploma in Civil Eng) 10 years' total experience, 5 years' experience with similar works*
- *Site Supervisor (Diploma in Civil Eng) 5 years' total experience, 3 years' experience with similar works*

18. Equipment Capacity: *Tenderers shall own suitable equipment and other physical facilities or have proven access through contractual arrangement to hire or lease such equipment or facilities for the desired period, where necessary or have assured access through lease, hire, or other such method, of the essential equipment, in full working order, as specified in the TDS. Tenderer shall own or have proven access to hire or lease of the major construction equipment, in full working order as follows:*

1. *Levelling Machine with Staff 1 nos*
2. *Tape (30m) 2 nos*

13.3.2. Labour Contracting Societies³

A Labour Contracting Society (LCS) is a group of disadvantaged rural people who are organised to carry out small-scale earthworks. Since the early-1980s, LCS construction activities have provided an important source of income for large numbers of rural poor men and women in Bangladesh. The inclusion of LCSs in development projects has aimed to provide some of the poorest households, particularly women from these households, with an income that could set them on a pathway out of poverty.

Recent legislation has formalised contracting arrangements for LCSs. To stimulate the engagement of the local poor in the construction and maintenance of small-scale earthworks, the Public Procurement Act 2006, and Public Procurement Rules 2008, endorsed 'Direct Contracts' with Labour Contracting Societies (LCSs) consisting of a group of landless men and/or women from the local community 'under Direct Procurement Method'. The aim is to bypass traditional modes of contracting so that poorer members of the community can directly benefit from development projects.

BWDB's Participatory Water Management Rules of 2014 (PWMR 2014)⁴ set out the mechanisms for the formation of LCSs by WMGs and the contractual arrangements. PWMR 2014 Clause 44.1 stipulates that 'at least 25 percent of the earthwork of a project should be given to related WMGs which will implement the earthwork through LCSs'. In Blue Gold, this was increased to 50%.⁵

Under PWMR 2014 Clause 44, BWDB contracts a WMG to execute the earthwork, and the WMG in turn enters into a contract with an LCS. However, the WMG is responsible to BWDB for the proper execution of the earthworks. Payments for the earthwork are made in three equal instalments to the bank account of the WMG, each with a 10% deduction for the security deposit: first instalment, after the start of work; second, on completion of 50% of the work; and the third and final instalment, after completion of all works. The WMG is entitled to deduct 5% from the bills as a management fee. The security deposit is disbursed six months after the completion of work if any defects have been made good. Because of the transient nature of the LCSs, there is often some uncertainty as to whether this payment reaches individual LCS members.

Under the PWMR 2014 processes, BWDB has no direct dealings with the LCSs. Prior to PWMR 2014, LCSs were directly contracted by BWDB.

3 Refer to the Blue Gold Program report, "Impact of LCS Work on Poverty Reduction and Women's Empowerment" by Dr Sharmin Neelormi (May 2020) and to LLR Section F Chapter 24.2 for a thorough presentation of the role of LCSs.

4 Refer to Chapter Six, Clauses 43 and 44 PWMR 2014

5 Part B Clause 26 DPP (May 2013)

13.3.3. BWDB Mechanical Engineering Department

For Blue Gold, all gates and ancillary items are fabricated and installed by BWDB's Mechanical Engineering (ME) Department. ME workshops in Tejgaon (for Patuakhali O&M, Barguna O&M and Kalapara) and in Khulna (for Khulna O&M-1, Khulna O&M-2 and Satkhira O&M-2) are assigned to carry out the manufacture and installation of the gates.

13.4 Construction quality

This section comments on the quality of construction of earthworks, repair of structures, new structures and the gates installed in repaired and new structures.

13.4.1. Earthworks

Earthworks constructed in the coastal zone are generally of poor quality, and particularly vulnerable to settlement and gullyng by rain before the turfing, and river erosion immediately after construction especially if there has been no compaction.

For Blue Gold earthworks, BWDB initially adopted an arrangement in which an allowance of 10% surcharge above crest design level was made to allow for consolidation settlement. Thus, an additional quantity of earthwork was provided in lieu of compaction. This arrangement was withdrawn in 2017 by the BWDB Task Force and replaced by BWDB's Schedule of Rates Item Code 16-140 which included for placing earth in layers, breaking down of clods and manual ramming of earthwork with a 7kg hammer.⁶ This method has been found to be ineffective in coastal areas where the fill material has a high moisture content and is almost impossible to compact if it hasn't been first laid out to dry. The increasing use of mechanical excavators for earthworks has resulted in large clods of earth placed in layers which are many more times the 150mm thickness of layers specified in Item Code 16-140, and this results – conversely – in embankments constructed using mechanical equipment being of even lower density than those prepared by manual labour.

If there is no compaction during construction, the resultant embankments are particularly susceptible to rainfall and erosion damage until “natural consolidation” takes place. Because there is no compaction, the settlement is non-uniform, and a certain amount of compensatory filling should be expected along embankment sections which settle below the design level. Embankments constructed without compaction should be subject to repair by contractors before final survey to check that the design crest level has been achieved along its full length before acceptance by BWDB and the WMG.

13.4.2. Earthworks – Alternative Modalities

In order to address the concerns about earthwork compaction, consideration could be given to including:

(a) Multi-year earthworks contracts so that consolidation settlement of earthworks during monsoon is made up to design levels in the subsequent construction season before final payment is made. However, Field XENs consider that there is no clear provision in the Public Procurement Rules 2008 (PPR 2008) for such multi-year contracts specifying yearly progress for earthwork, and therefore, is difficult to enforce in the field. In practice, however, most Blue Gold earthwork contracts are not completed in a single season and are inevitably extended – so they are in fact “unofficial multi-year contracts”.

⁶ Item Code 16-140 Earth work by manual labour in re-sectioning of embankment manually compacted by 7kg iron rammer to avoid any air pockets in clayey soil and all lifts including throwing the spoils to profile in layers not exceeding 150mm thickness with clod breaking to a max size of 100mm.

(b) “Build, operate and transfer“ (BOT) contracts in which the contractor would be responsible for all works completed under the contract - for maintenance, and for any breach or damage to the embankment or structures – for a period of (say) five years.

13.4.3. Structures – Rehabilitation

The rehabilitation of structures can include repairs to the reinforced concrete structure, the railing and posts, head wall and abutment pier, to the concrete block revetment and to the gates (see below). For repairs to the concrete structure, the durability of the repair can be affected by the quality of the original concrete work to which the new work is bonded.

The successful replacement of gates in an existing structure requires careful investigation and measurement, ensuring that all silt is removed from the bed slab before the dimensions of the gates are determined, and that the installed gates are checked for full and complete closure. Where gates are to be replaced by ME Department without a civil contractor, experience has shown that detailed investigations required by the contractor before manufacture of the gate can reveal complexities which require assistance from a civil engineering contractor - for instance, the construction of cross-bundhs so that work on the sluice or regulator can be done in the dry, to remove silt from the invert base slab to ensure an effective gate seal, and to fix the gate frame securely into the concrete structure (for more on this, see below under ‘Gates’.)

13.4.4. Structures – New

New structures discussed below are regulators/drainage sluices, flushing inlets and drainage outlets.

New Regulators/Sluices (Item 6)

An analysis of construction records for new regulators shows that the length of construction is not related to size of structure (ie number of vents). The length of contract (in construction seasons) for 29 regulators is presented in Table 13.8 below. As can be seen from the table, it is possible for the largest 4-V regulator (P55/2A Dharandi) to be completed in two seasons, and conversely the construction of a 1-V regulator can take 3 seasons (P26 Boro Beeler Khal, P43/2D Keshobpur and P47/4 Tulatali). Thus, the quality of the contractor can have a considerable influence.

Table 13.8: Contract Period for New Regulators

| Size (Seasons) | Nos. | Average Length (Seasons) | Range of Seasons |
|----------------|------|--------------------------|------------------|
| 4V | 1 | 2.0 | 2 |
| 3V | 6 | 2.7 | 2 to 4 |
| 2V | 6 | 1.8 | 1 to 3 |
| 1V | 16 | 1.9 | 1 to 3 |

Lessons learnt from construction experiences are: (a) To avoid differential settlement, ground treatments should not be mixed ie don't use bored piles and sand piles together as foundation treatment; and (b) ensure that checks are made on filter materials behind wing walls since piping failure can very quickly result in differential settlement and failure of the structure.

New Flushing Inlets (Item 7)

Only two flushing inlets were provided (P31-part and P22), so few general conclusions can be drawn from such a small sample. Both were completed in one season.

New Drainage Outlets (Item 8)

An analysis of construction records for new outlets shows that the length of construction is not related to size of structure. The length of contract (in construction seasons) for 17 outlets is presented in Table 13.9 below. As can be seen from the table, the average length of construction varies from 1.6 to 2.3 seasons with a range of 1 to 3 seasons. Thus, the construction of a relatively simply structure, such as a box culvert, can be affected by its proximity to a tidal river which, for example, can require cross bundhs or coffer dams and pumping to allow working in the dry below (tidal) river level, installing upstream and downstream sheet piling, dealing with complex ground conditions, and providing temporary drainage from khals within the polder during the construction period. Nevertheless, the capability and experience of the contractor – and the range of equipment he has available for construction activities – can influence the length of construction

Table 13.9: Contract Period for New Outlets

| Size (Seasons) | Nos. | Average Length (Seasons) | Range of Seasons |
|----------------|------|--------------------------|------------------|
| 0.6 x 0.9 | 5 | 1.6 | 1 to 3 |
| 0.9 x 1.2 | 9 | 1.9 | 1 to 2 |
| 1.2 x 1.2 | 3 | 2.3 | 2 to 3 |

13.4.5. Gates

Given the critical importance of gates for water management (and that the sole function of the reinforced concrete structure is to provide support for the gates), insufficient emphasis has been given to the functionality and durability of gates.

There have been many examples in Blue Gold where installation work has been repeated because the fixing of the gates to the structure was insufficient, or because the gates never achieved full closure. Some examples are provided: (a) In P55/2C, the flap gates were installed on the country-side and the vertical gates on the river-side; (b) the gap between the vertical lift gate and the channels for the fall board provides insufficient workspace for any maintenance activity; and (c) rubber seals are often missing.

Most of the work on regulators and inlets/outlets is carried out by a civil works contractor. The BWDB ME (Mechanical Engineering) is responsible for the fabrication and installation of gates, and ancillary fixings. The timing of commissioning needs to be carefully coordinated between the civil contractor and ME – for example, the closure bundhs which have to be removed by the civil contractor before he receives a final payment.

For durability, the gate frame needs to be firmly fixed to the concrete structure. This involves cutting back the concrete work and welding lugs attached to the frame to reinforcing bars in the concrete structure before replacing the concrete using a dry mix to minimise shrinkage. If this process is not carried out (perhaps because a civil contractor has not been contracted), then the durability of the gate is severely compromised, and its operational lifetime can be limited – especially if the operators use excessive force to close the gates.

There is a historical justification for the role of ME - when relatively few private sector operators had access to raw materials, and the facilities for fabrication, sandblasting and painting to meet the specifications for gates to regulating structures. However, with the increasing number of private sector workshops, the justification for ME's continued monopoly of BWDB gates work is questionable.

For simplicity, it would be preferable to allow the civil contractor to select a firm, from an approved list, to manufacture and install the gates, so that the responsibility for coordination between the civil and mechanical contractor is given under a single contract – rather than relying on ME, a semi-autonomous organisation coming under the BWDB umbrella, and whose payments are only occasionally withheld.

The importance of taking life cycle costing approach to the design of gates, fixings and ancillary structures and the potential value of a fundamental design review has been emphasised elsewhere.⁷

Section D

Participatory Water Management

Summary

Participatory Water Management (PWM) in BGP comprises a set of activities that aims to utilise water infrastructure for transforming agriculture in the coastal polders; and which thereby forms the central driver for intensified local economic development in the project area. The PWM activities includes: **consultation** of communities; **capacity building** of water management organisations; addressing **gender dimensions** of water management; physical **in-polder water management interventions**); and development of a **water management partnership**.

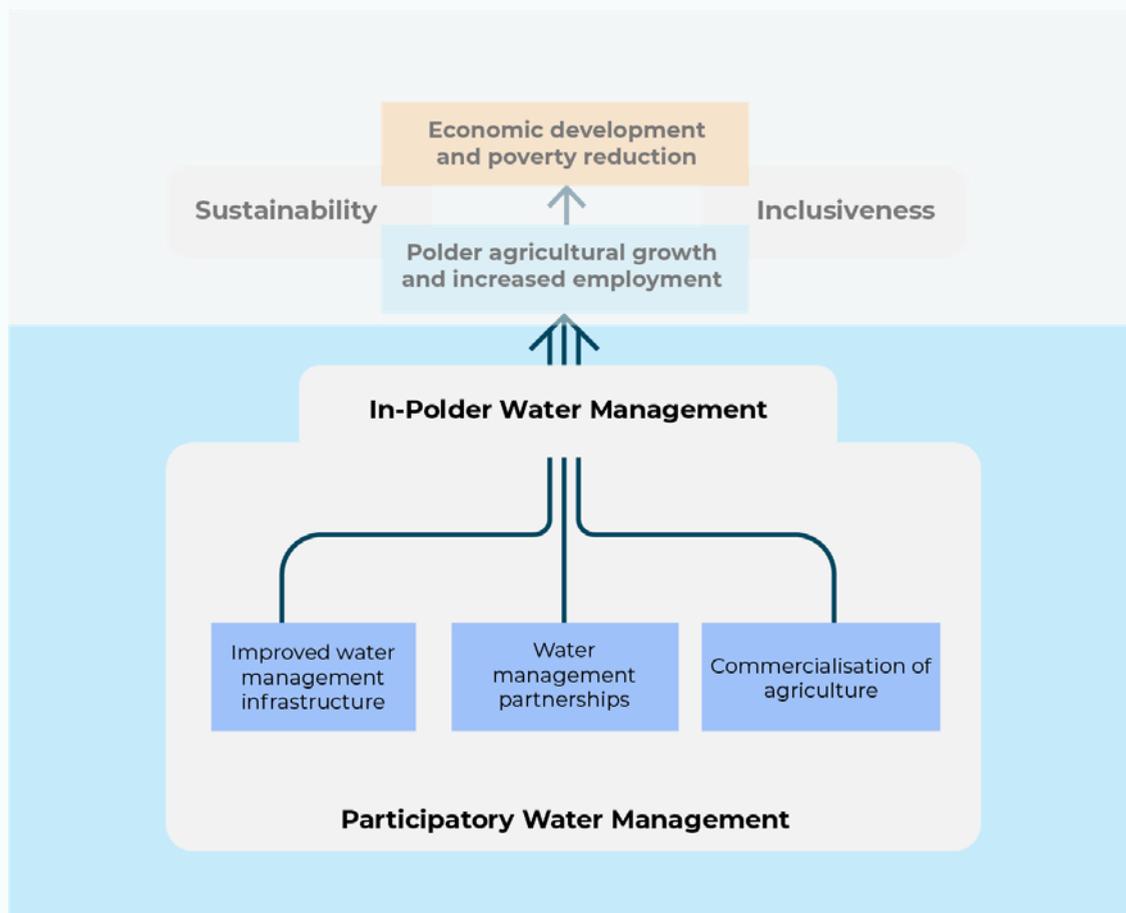
Under Blue Gold, a unified approach towards Participatory Water Management was developed. This approach was documented in February 2017 in the form of a PWM Field Manual (*in English and Bangla*). Alongside the distribution of the manual, dedicated training in the unified approach was provided to all Community Development Facilitators (CDFs) in December 2016 and January 2017. A vivid testimony on the implementation of this approach in Polder 47/4 in Kalapara is presented in a paper prepared on behalf of the CDFs by colleagues at zonal level.

Through Blue Gold, O&M Agreements have been used to set out the respective responsibilities of BWDB and WMAs for routine, periodic and emergency maintenance. The main purpose of the agreements is to sustain the benefits arising from bringing land into cultivation – to protect the land from further waterlogging and to bring new land into cultivation. O&M agreements have been signed by the BWDB Executive Engineer with representatives of the Executive Councils for the 36 WMAs in the Blue Gold Program area.

To encourage good practice in water management, two versions of a manual for WMO executive members and BWDB field staff were prepared: a ‘text-based’ manual (*in Bangla*) for a more literate audience; and a ‘picture-based’ manual (*again in Bangla*) for an audience that is less familiar with text-based advice. During preparation of the manuals, Blue Gold worked closely with field staff, WMO executives and other WMO members and incorporated their feedback to ensure that the manuals serve the needs and interests of farmers and fishermen. Feedback sessions with BWDB zonal staff have been used to establish that all required material is covered. Copies of the manuals were distributed to WMOs during the first quarter of 2021.

The key message of this section is that presently, Bangladesh does not use the full potential of participatory water management for engendering local economic development. Infrastructure development and agricultural development are generally undertaken as separate interventions, often under a strong central coordination; while the capability of local stakeholders to utilise water resources and associate infrastructure for a dynamic development of agriculture goes largely ignored. In addition to reviewing the PWM activities listed above, this section also looks at how BGP operationalised the PWM concept and it concludes with a section on a way forward for participatory water management to become the glue that welds water resources infrastructure and local agricultural-based development together.

Figure D.1: Participatory Water Management and its components, highlighted on the ToC.



D.1 Consultation and participation in planning

BGP, at its inception, addressed community consultation and participation in planning through a Polder Development Plan and local-level WMG Action Plans. Several lessons are drawn:

- Consultation of communities and their representatives is more meaningful if it starts well before the definition of infrastructure investments in implementation budgets;
- Local governments and representatives of decentralised departments are relevant and constructive partners in local water resources planning;
- Facilitated community planning should be complemented with coaching of community actions, e.g. for better agricultural production. A little encouragement helps people undertake the actions that they have planned for.

Periodic review and adjustment is required to arrive at realistic ambitions, possibly in terms of higher productivity or profitability, and coherent and do-able actions.

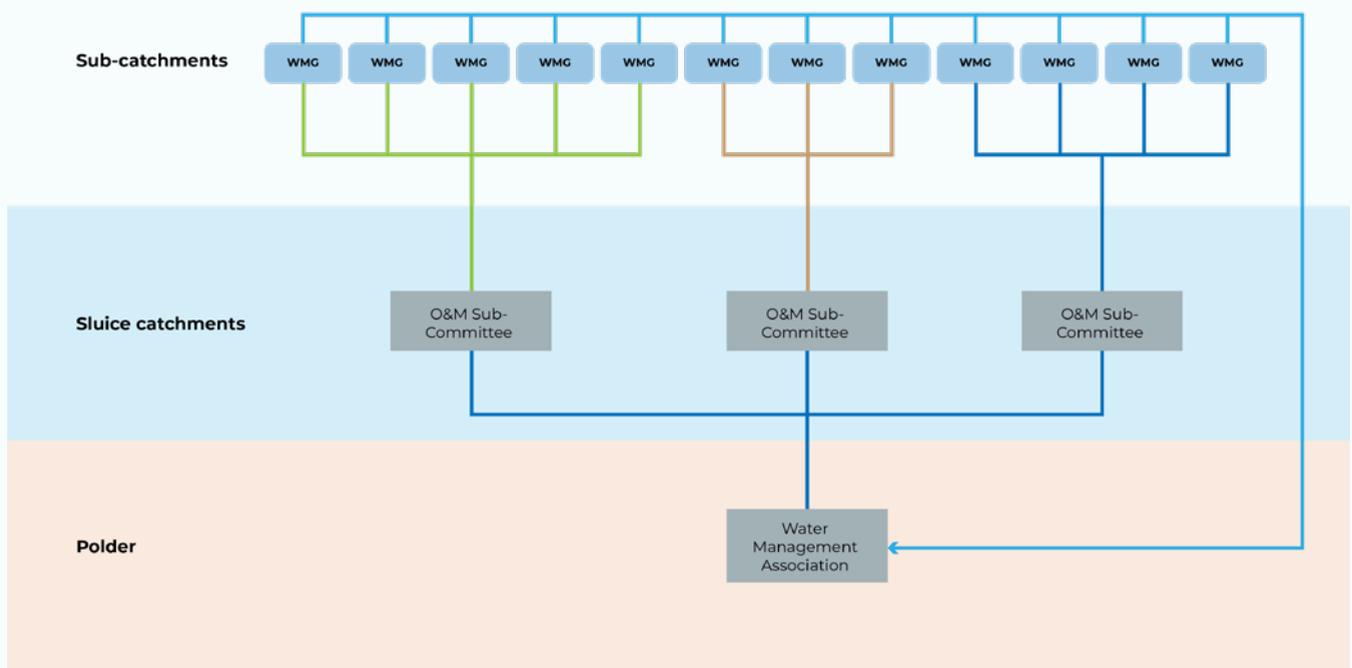
Using these insights, BGP in the second half of its implementation period, linked local water management plans to catchment plans and subsequently to polder-level WMA plans. The ensuing plans focus on water management actions at different levels of the polder water system (*see: In-Polder Water Management*).

D.2 WMO capacity building

BGP helped activate 511 water management groups and 36 water management associations in 22 polders. In order to help these organisations to work for better water management, BGP applied the following principles in building their capacity:

- Build capacities of groups and teams;
- Support both planning and implementation;
- Let WMOs take the lead in implementing actions;
- Promote WMOs to use their local network for achieving their aspirations.

Figure D.2: Structure of water management organisations in a polder



D.3 Women's participation in water management

While the regulatory framework sets quota for women's participation in WMOs, BGP explicitly pursued that women in and above this quota would participate in an active and significant way. This resulted in women taking part with voice and vote in WMO meetings; in a significant number of women being executives in the WMOs; and in experienced female office bearers becoming successful contestants in local government elections.

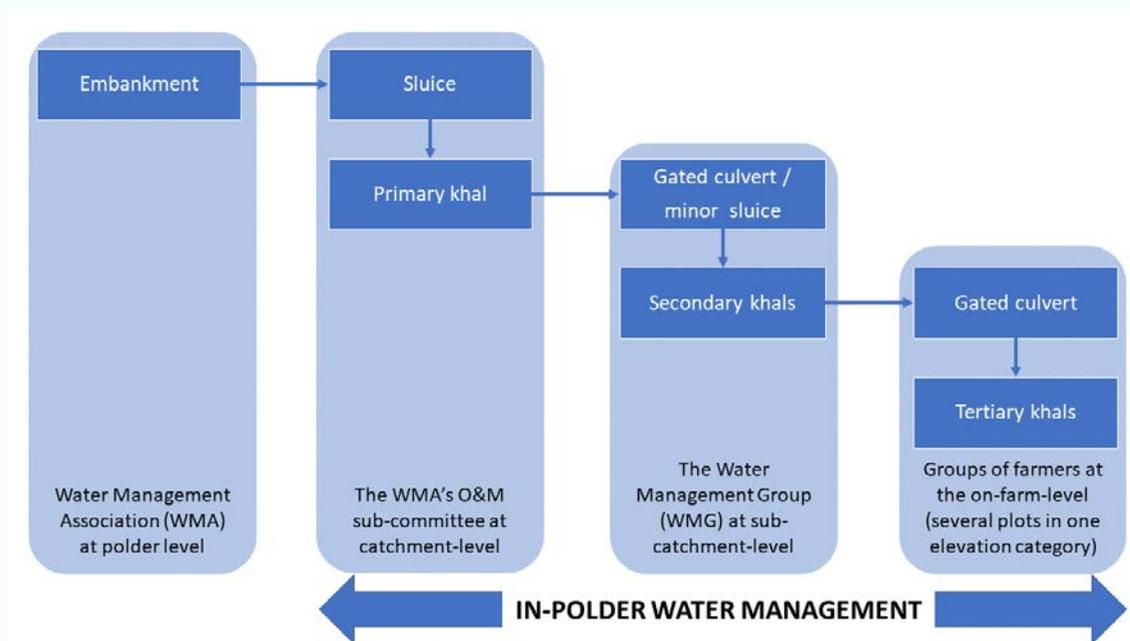
D.4 In-Polder Water Management

Community participation helps shape actions that make better combinations of production practices and water management, at different levels of scale:

- Small-scale infrastructure and synchronised cropping at sub-catchments help bring forward the harvest of T.Aman and creates the possibility to grow an additional winter season crop, often of high commercial value. Other combinations of improved production and better water management are possible;
- Operation of a sluice combined with keeping the khal functional ensures better water levels for production within the catchment.

Sound plans for catchment management together with active water management associations, helps local communities exercise control over the sluices that serve their areas.

Figure D.2: In-polder water management – interventions at different levels of scale



D.5 Water Management Partnership

Water Management Groups and Associations achieve more when working with other people and entities:

- Having an 'orbit' of capable resource persons, helps WMOs undertake actions for better production;
- Good relations with local governments ensures WMOs are backed in a practical sense when (i) taking control over sluices; (ii) pursuing open drainage connections, and: (iii) mobilising resources for investment in small-scale infrastructure;
- Being known to staff of government departments enables WMOs to access their expertise and support. Given the special relation between WMAs and the BWDB, for each polder O&M Agreements have been entered into by these parties;
- Entering into a formal O&M agreement with BWDB makes it easier to face future challenges to the sustainability of main infrastructure.

Representing their members to market partners (private sector) creates win-win opportunities in input procurement, production and marketing. *A strong WMO ensures it is supported by good and close friends.*

D.6 Evolution of the PWM concept

BGP has built on the national regulations, rules and practices of participatory water management. It helped clarify the WMO's relation to commercial activities; it enhanced the WMOs' focus on water management; it defined WMOs as entities with their own mandate; and it established a functional relationship between WMA and WMGs. In doing so, BGP – while being true to the spirit of the national policies – went beyond their letter. The regulatory framework now should consider the innovations that were tested in practice.

D.7 Way Forward

In realising that its take on Participatory Water Management has moved beyond how PWM is defined; BGP is presenting its experiences for review and consideration by the sector. To this end, it facilitated an independent expert panel to review how participatory water management can be improved as part of the overall governance of water resources in Bangladesh. This expert panel is to present its recommendations to the Bangladesh Delta Plan and its community of professionals.



14 Consultation and participation in planning

This section discusses early efforts by BGP to consult and involve communities in planning. It specifically reflects on the Polder Development Plans (PDP) and the WMG Action Plans (WAP).

14.1 Polder Development Plan

In September 2008, BWDB approved the Guidelines for Integrated Planning for Sustainable Water Resources Management (IPSWARM) for use in existing medium-sized Flood Control and Drainage Projects^[1]. The Blue Gold Program initially followed the 6-step approach described in these guidelines^[2]. In this ‘polder development approach’ (see Figure 14.1) the formulation and finalisation of a Polder Development Plan plays a pivotal role.

Subsequently, Polder Development Plans (PDPs) were developed for each of the 22 polders that BGP intervened in. With hindsight, the value of these documents is limited:

- The flowchart in Figure 14.1 suggests that PDPs were made with the WMOs and that they were defined to provide direction to subsequent implementation. In actuality, plans for rehabilitation of works and for Farmer Field Schools were defined in the Development Project Proforma of BWDB and DAE respectively, with a limited scope for adjustment. The water resources management plan announced in box 4 of Figure 14.1 did not cover management of water resources, but listed the proposed rehabilitation works
- The PDPs adhered to the component-wise organisational structure of the BGP TA team and were – at best – plans for TA team activities to be implemented in the polders. Within the PDP action plans for each component were included, with little or no synergy between them and sometimes even contradictory choices¹. The insights gathered on cropping patterns and potential improvements therein were not used to inform choices on water management

¹ In the polder 22 PDP, khal re-excavation is attributed second priority in the water resources management section, while the environmental section emphasises the benefits of re-excavation of khals for drainage improvement during monsoon and post monsoon periods as well as for storage of rain water.

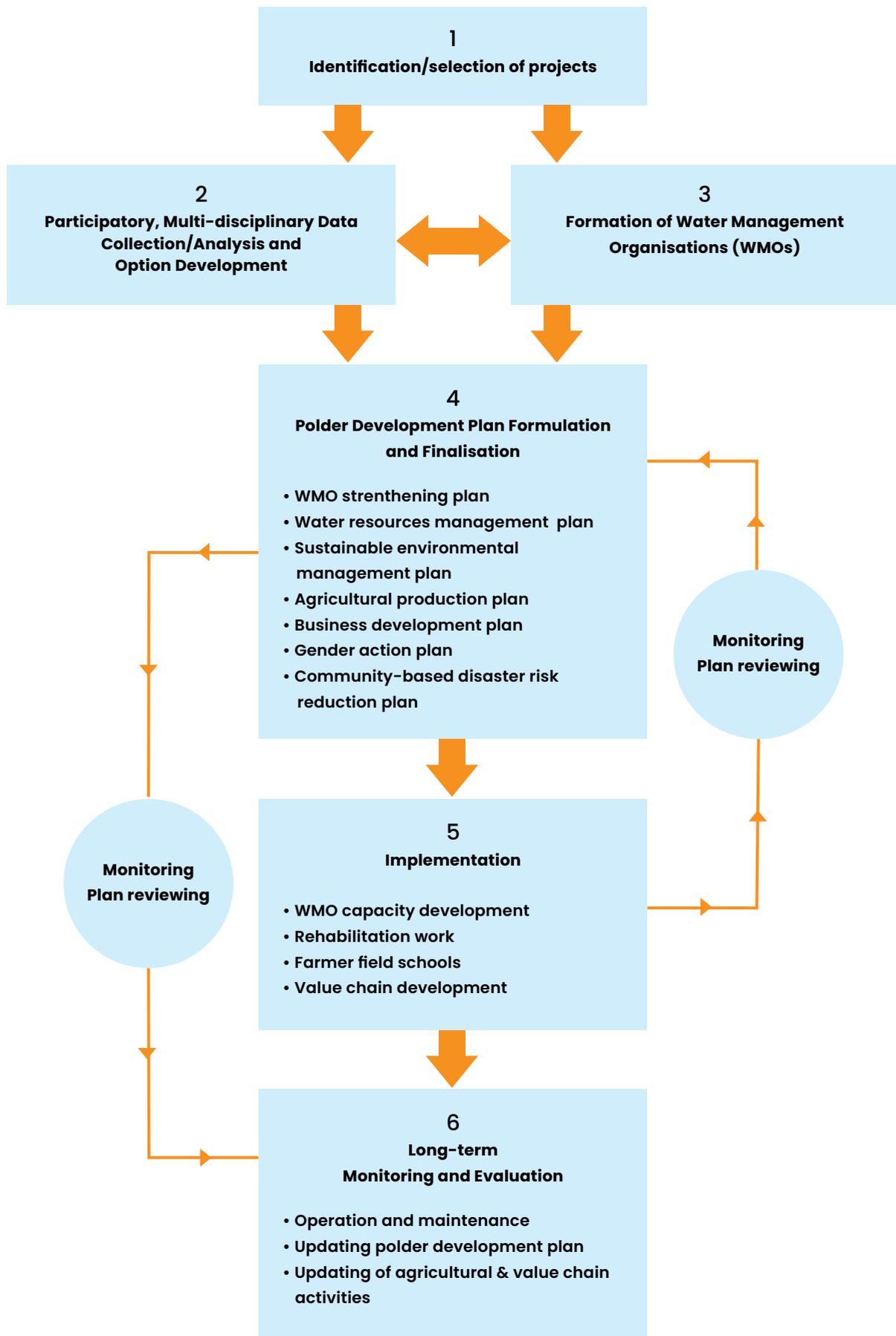


Figure 14.1: BGP Polder Development Approach at inception, based on IPSWARM 2008

- While the PDPs did offer a compilation of information about each of the polders – and thereby provided useful polder profiles – they have no value as planning documents and have consequently not been used as such. The ownership of the plans has been unclear from the beginning.

The PDP formulation and finalisation were largely internally-oriented exercises, with limited interaction with the intended beneficiary communities, their representatives and other stakeholder agencies at the local level. Making updates of the PDPs (box 6 in Figure 14.1) became redundant with the emergence of the Catchment Plans discussed later on.

The PDPs were completed as a contractual obligation, and had limited value for the polder development. The BGP TA team did however undertake planning activities in some of the polders, which showed an alternative approach to the overly internal oriented PDP exercise:

- **Land and Water Use workshops at polder level** – With a view to understand cropping patterns and major water management challenges per polder and to identify options for crop diversification and water management improvement; one-day workshops were held with an increasingly wide participation. Whereas initially discussions were held between BGP TA and local DAE staff, at later events BWDB, LGIs, staff from other departments and selected WMG representatives participated. While the participation in such workshops was amplified; the focus was sensibly narrowed to cropping patterns and water management. This was a first step towards ‘in-polder water management’, which is discussed in chapter 17. The Land and Water Use workshops also served to enhance involvement of stakeholder agencies in BGP activities and to establish good relations between the program and local agencies; and to a lesser extent between beneficiary communities and local agencies.
- **Infrastructure consultation workshops** – In order to set priorities for works implementation and to impress upon the beneficiaries that not all desired works could be undertaken, the TA engineers together with representatives from the concerned O&M Divisions conducted courtyard sessions. Here, maps were used to show locations of existing works and discussions were held on the relative priority of new works (especially khal re-excavation), vis-à-vis the limitations imposed by the Project’s resources. These workshops confirmed that it is possible – and well-appreciated – to inform beneficiaries beforehand of infrastructural works decided upon for their areas; as well to constructively consult beneficiary communities on choices with respect to major infrastructure.

Both exercises demonstrated the merit of using large maps visualising aspects of the polder for engendering constructive discussion on constraints and solutions.

14.2 WMG Action Plans

The PWMR 2014 lists among the responsibilities and functions of the WMG inter alia:

Plan for Annual ‘crops and other production’ and preparation of plan for operation and maintenance (O&M)^[3]

This plan is referred to in BGP reports as the Water Management Group Action Plan, WMG Action Plan or WAP. As the WAPs are listed in the PWMR 2014, their production has been seen as a reporting obligation and WAPs have been prepared by the WMGs and subsequently submitted to the regional offices of OCWM.

The WMGs were advised and assisted to make plans that coincided to the four components of BGP; i.e. they were advised to include actions with respect to their organisation, to infrastructure, agricultural extension and back- and forward market linkages. A standard format for activity planning was provided, which included a list of some 30 suggested activities.

In the end, the WMG executive committees produced, with overly strong handholding by the BGP TA community organisers, virtually identical plans, largely copied from the standard list of over 30 actions. The WMG action planning was flawed:

- The WAPs were seen as a means to ensure the continued registration of the WMGs with BWDB's OCWM rather than as serious own action plans.
- While the WAPs did contain some specification for the specific WMG (e.g. use of the proper name of local khals), the commitment to the actions can in many cases be doubted.
- The strong adherence to the BGP components raised the expectation that BGP would take the initiative to support the listed actions. The action list was seen as a wish list, and there was no mechanism to prioritise any of the actions.
- The TA community organisers – or community development facilitators as they were known at later stages of the BGP implementation period – did not guide a process of local planning and capacity development but helped WMGs meet the perceived criteria for a good plan.
- No follow-up was given to the plans. WMGs were neither asked about the progress in WAP implementation nor prompted to undertake a periodic update (other than for renewing the registration)
- The planning process was strongly focussed on action lists and did not dwell upon the purpose of the WMGs.

Despite the severely flawed process, WMGs did undertake actions:

- Many continued to run the credit and savings operation that was an obligatory part of the organisations when the registration was with the Department of Cooperatives. Savings & Credit are used to extend loans at concessional rates to individual group members, and are thereby hardly relevant for water management. Some argue that the continuous loan operations keep the WMG active and thereby help to mobilise members in cases of a water-related emergency, such as embankment erosion. The outcome survey, however, argues that flaws in how a community runs the savings and credit operation (is it well-administered? Is it inclusive?) pose substantial risks to the continuity of the WMG^[4].
- A number of WMGs took the infrastructure-related actions seriously and made a start with sluice operation and khal cleaning; The re-excavation of a canal through community labour to reduce waterlogging by Dakhin-Paschim Kalibari WMG in polder 43/2F is a telling example. In many initiatives a supportive engagement of the Union Parishad is noted.
- Within some WMGs – prompted possibly by the action planning and more likely by the BGP staff involved in business development – initiatives were undertaken for collective actions with respect to input supply.

From 2018 onwards, a link was made between plans at WMG level with respect to water management on the one hand; and the catchment plan on the other. This is discussed in chapter 17.

References

- [1] Guidelines for Integrated Planning for Sustainable Water Resources Management (IPSWARM). BWDB. September 2008.
- [2] Blue Gold Program Inception Report (PDF). Euroconsult Mott MacDonald & Associates. November 2013. https://www.bluegoldwiki.com/index.php?title=File:IR_Inception_Report,_revised_March_2014.pdf
- [3] Participatory Water Management Rules (BWDB, unofficial translation). Government of Bangladesh. 2014.
- [4] Improving the Productivity of Land in the Coastal Bangladesh: The Outcomes of Blue Gold Program Interventions, Technical Report 25 (PDF). Euroconsult Mott MacDonald & Associates. October 2018. https://www.bluegoldwiki.com/index.php?title=File:TR25_Outcomes_report_WMGS_survey_2018_29oct_18.pdf



15 WMO capacity building

Within the development sector, the inclusion of a training program is a widely applied method for strengthening capacities of user organisations; and BGP is no exception to that practice. The idea is, simply put, to establish community organisations and to subsequently train their executives for the capacities that the organisations require. For new organisations to sustain, external factors are, however, more decisive than the capabilities of their first batch of executives. It is however easier to address the capacity needs of the executives through a short-term training programme, than to undertake a lengthy process to re-model the institutions around the new organisation. Training is a useful booster for individual capacities, but does not comprise a systematic and comprehensive approach towards building sustainable organisational practices.

In BGP, during its first years, a Training Needs Analysis was conducted and a training program was defined; with a training coordination cell ensuring that the identified courses were planned and organised. The Training Cell was to provide management to the training program, and to hire external resource persons to provide the requisite knowledge. Courses were outsourced, rather than implemented in-house and generally had a duration of 3–5 days. This ensured that the skills and knowledge of WMG EC members was brought to a higher level and helped bring consistency in the organisational roles between WMGs. The training courses helped define WMG and WMA organisational management and laid a basis for conflict resolution and record keeping.

The following courses were included (for more detail, see chapter 31):

- Organisational Management – improving the conceptual understanding of the WMG leadership of the position and function of their organisation
- Gender and Leadership Development – improving the capacity of men and women to make joint decisions in WMG executive committees
- Accounts Keeping – the concepts and analysis of; and the basic skills for account keeping
- LCS training – improving understanding and awareness of the earthwork measurement and the payment system

The ensuing program was largely classroom-based and strongly aimed at transferring knowledge (as opposed to developing skills or changing behaviour). Behavioural change is hard to achieve in a short course and to really effectuate behavioural change follow-up and coaching in the work environment are essential and powerful tools. The continuity between classroom training and on-the-job follow-up was, however, not particularly strong, basically because during this early period of BGP implementation the components of the TA team worked independently from each other.

Outsourcing of the training program was abandoned in 2016. The training cell's staff was, however, maintained and they worked hard to make meaningful use of their training and training management skills for the benefit of the program. In doing so, the character of the training in BGP underwent fundamental changes for the better. These are discussed under the following headings.

15.1 From individual to group capacity

Training sessions originally aimed for 'graduating' their participants in a specific knowledge domain. Often representatives of different WMGs were grouped together, trained and subsequently send back to their WMG as 'specialist'. A telling example is the training for bookkeeping, where only the cashiers were trained. The capacity of the WMG executive committee to work as a team on the planning of budgets and the review of financial information was, however, not developed.

Increasingly, training sessions aimed at groups. When the Community Development Facilitators were induced to their function in 2016, the different disciplines were brought together and they were, as a group, trained in community development for water management.

15.2 From transferring knowledge to promoting behaviour change

Against an early predominance of guest lectures, increasingly emphasis was given to 'learning by doing' approaches, with group assignments based on real life situations. Thus, participants were placed in a position where they had to think for themselves and develop new behavioural repertoire. The early LCS training sessions had a classroom character, with the SDE or SO hired to explain the intricacies of earthwork contracts to a group of LCS leaders. Later on, LCS training was given on-the-job, with explanations culminating in the making of a model cross-section of the earthwork to be implemented. The Gender and Leadership Development Training was also taken out of its initial classroom environment and conducted as a series of courtyard sessions for each WMG facilitated by the CDFs, using flipcharts and other visualisation. The new Catchment planning workshops had a slightly different pattern, where planning was for real. Here, the trainers focussed on ensuring that constructive interaction would take place; and a community cadre of catchment planning facilitators was developed.

15.3 From dependence to self-reliance

In the original approach, the WMGs were dependent on external suppliers of the knowledge. Taking a leaf from the FFS-approach in which DAE trained Lead Farmers who would continue to assist their community beyond the capacity building period, the training unit shifted its attention towards developing the capacity of a larger group of people, who could act as resource to the WMG:

- As a first step, during staff retreats and in capacity building workshops, field staff of TA, BWDB and DAE were enabled to develop their skills as community facilitator. The idea behind these training sessions was that polder teams along with BWDB and DAE field staff would be able to provide tailor-made and situation-specific support to the WMGs. To this end, the various approaches used by BGP were envisioned to constitute a toolbox upon which the polder staff could draw. Zonal and HQ staff

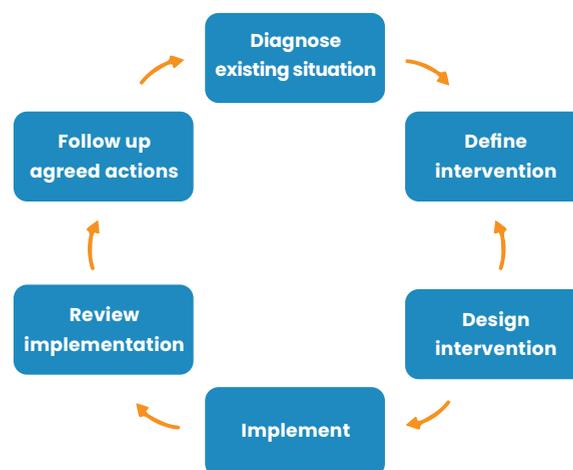
would play a role as back-stoppers and in developing new tools, if the need would arise. While CDFs became visibly better at public speaking and at facilitating community meetings, they did not always succeed in taking own initiatives towards WMG development

- Subsequently, and after a prolonged gestation period, emphasis shifted towards developing community resource persons. The FFS-approach of DAE and BGP TA produced community resource persons in the field of crop farming and integrated homestead food production (small stock, beef fattening, pond aquaculture and home gardening). Especially the Community Animal Health Workers (CAHW) were able to make a living out of the services they delivered. Taking the approach a step further; a cadre of community facilitators was developed to guide the catchment planning exercise. They were trained by BGP but worked for the WMA to help develop WMG priorities and subsequently the catchment O&M plans

15.4 From autonomous WMGs to networked organisations

Where initially, the emphasis was strongly on building WMG capacity so that these organisations would be able to function independently; increasingly the training workshops were used to strengthen the relation of WMGs to the local governments representing them, and to the (government) services available to them. An example of the early training was the ‘gender and leadership’ training, which was provided by a hired service, with WMG EC members forming the core of the participants. In addition female Union Council members and potential future female leaders were included. In other training sessions, departmental staff would feature as resource person or lecturer, but not as participant. The Land and Water Use Planning workshops – described in the chapter 14 – were a first occasion where WMG representatives partook in a workshop setting alongside representatives of departments and local governments. Network events were subsequently developed further and culminated in the Upazila workshops, which provide a forum for discussing the WMA role in local economic development.

Figure 15.1: Role of the polder teams in WMG capacity building



While the above four transformations constitute an improvement in the way the instrument of training is used to foster community initiative; BGP was not particularly successful in its efforts towards making capacity building responsive to locally specific situations. Following the reorganisation of the TA team from four component-wise and centrally managed teams to 22 polder teams, the Training Cell took it upon itself to transfer the lead in WMG capacity development to these polder teams:

- The role of the polder team vis-à-vis the WMG capacity was defined by a cyclic process of assessment, intervention and re-assessment, which is shown in Figure 16.1
- The aim was set for the polder teams to assist the self-evolution of the WMGs. Self-evolving WMGs would undergo an incremental process, whereby the benefits of their first actions would motivate them to organise better and undertake further actions, especially in the domain of water management

- At the same time, the Zonal Offices developed a very simple checklist to rapidly gauge the functionality of a WMG, based on its performance in the realms of organisation, water management infrastructure, water management activities, partnership and agricultural & business development. This instrument would provide the polder teams a basis for prioritising WMGs for capacity building support, and for identifying the type of support that would be most suited

The training unit oriented all CDFs in this approach during 3-day training workshops. Higher levels in the TA organisation were involved in the development of the above and asked to support its application. The polder teams have, however, embraced their role in WMG capacity building only to a limited degree. Subsequent tools developed to support WMGs continued to rely on a central hand in their application. This applies to community agricultural water management, the facility for small-scale infrastructure, the crop intensification initiative and the catchment planning. The easy-to-replicate tool of horizontal learning has been applied sparingly by the polder teams; and generally only with direct involvement of zonal or central staff. Apparently, it was difficult to decentralise initiative within the BGP TA organisation. With hindsight, the following reasons for the limited decentralised initiative within the TA team can be indicated:

- While the reorganisation aimed to establish decentral and integrated teams with a good deal of own initiative; the erstwhile line managers continued to play a role in the BGP team and 'old' hierarchical relations continued to exist as an informal structure
- After the CDF training, there has been no systematic coaching of polder teams in the desired new routines, nor has there been a structured effort at reviewing progress. On the positive side, the management did award distinctions for excellent team work, thereby setting examples for other teams
- Central experts who took the lead in developing new tools for WMG development (CAWM, catchment planning, CII, etc.) were not stimulated to hand-over their approaches to the decentral teams
- The rather large contingent of zonal and national staff continued to rely on the polder teams for data collection and preparatory works for centrally-led activities. The burden of such duties placed substantial time demands on the polder staff
- The decentralisation of the BGP TA team took shape from 2016 (the fourth year of implementation). From 2017 (the fifth year of implementation), there was a gradual transfer of staff into new polders; while the phasing-out from the first batch of polders led to redundancies. Staff reductions and transfers may have undermined morale of the polder teams
- Initiative at lower echelons of an organisation is not strongly supported by Bangla culture, where there is a high degree of respect for senior experts and a high reliance on their guidance and approval

Thus, while there remains scope to further improve WMO capacity building approaches, the shifts made in the course of the BGP project (discussed at the beginning of this chapter) have been a stride forward. The net result is that most WMOs are active and well-linked organisations that are oriented towards contributing to an inclusive local economic development.¹

Future PWM projects willing to stimulate local initiative in water management would continue to require locally-stationed integrated teams to foster the performance of the newly-formed community organisations. For these teams to provide situation-specific and tailor-made support, they need to be given a clear mandate and authority and a suitable degree of freedom in their actions. This must be done from the onset of the project, rather than as an adjustment at mid-course.

¹ See for instance Grassroot level Field Experience in Water Management by Dr Shamsul Alam. The original article was published in Bangla in the "Bonik Barta", a Bangla-language daily newspaper, on 3rd February 2020. https://www.bluegoldwiki.com/index.php?title=File:3feb_20_PWM_field_experience_shamsul_alam_English.pdf. https://www.bluegoldwiki.com/index.php?title=File:3feb_20_সম্পাদকীয়_PWM_field_experience_Shamsul_Alam_Bangla.pdf



16 Women's participation in water management

16.1 Background

Water management has always been seen as a male domain in Bangladesh due to the traditional belief that women should not engage in public spheres. In addition, women often expressed more interest in domestic water supply than in water resources management. The government, however, recognised that participatory water management is a concern for men and women; this is reflected in the 30% quota for women as executive committee members of Water Management Organisations as stipulated in BWDB's Participatory Water Management Guidelines of 2000.

A study published in 2014 on WMOs in coastal areas showed that the inclusion of women as executive committee members of WMOs was usually achieved, but on average at the rate of 20% rather than 30%. As the rationale for women's participation in WMOs the study mentioned that *"it can improve the integration of their needs within water management and therefore improve their livelihoods"*. The study also observed that WMO's are especially in charge of the productive uses of water, but rarely consider other uses that are important for women, such as drinking water, bathing, livestock and homestead garden irrigation.

The study referred to earlier project evaluations that found that women WMO representatives were often token members with no real power in WMO decision-making processes. Own FGDs in early 2012 by the study's authors revealed that women were often not notified of, or involved in, water management meetings, although they were formally included in the WMOs. Interestingly, the study found some exceptions on "women's participation as a tokenism" in the two IPSWAM polders included in their study, ie polders 30 and 22. In these two polders, the study writes, *"gender awareness training of both male and female WMO members was perceived to have increased the confidence of women engaging as active executive committee members in the WMOs."*

16.2 Blue Gold approach

The Blue Gold Program had also committed itself to achieve the 30% quota for women in WMO executive committees. The main challenge, however, would be ensuring the active and meaningful participation of women in WMO decision-making, avoiding that women are only member on paper. Apart from the 30% quota, Blue Gold set two internal targets for women's participation, ie 40% women in the general membership of Water Management Groups and at least 5% (later increased to 7%) of the three key positions in WMO executive committees (president, secretary and treasurer).

Various BGP interventions supported the achievement of the above. Over time, such interventions became fine-tuned and/or better focused. Key interventions to promote women's participation were:

- Awareness creation for all community members (M/F) on why participatory water management is important
- Motivating that also women became active WMG members, in meetings and in court yard sessions. With the result that 43% of WMG membership were female by the end of BGP
- Promoting that the best available women were selected as candidates for executive committee members, in particular for important positions
- Gender and Leadership Development training – next to other training such as FFS-, which built (also) capacities of potential women leaders, but also enhancing awareness among men about gender equality and equal opportunities
- Blue Gold staff actively promoting that women in WMGs speak out and take up leadership positions. Over time, when examples and successes of women's participation became visible, staff motivation also increased

Above interventions were implemented as a mix of separate activities (such as the gender and leadership training) and integrated in regular Blue Gold activities (such as motivating women to speak out).

16.3 Why is water management important for women?

At the start of BGP it was still common that women brought up concerns related to domestic water supply when the topic of water was raised in the presence of women. This completely changed over the years. BGP experience demonstrated that once women have gained insight in water management, they also realise that it is also important to them, because:

- Women now understand that good water management benefits agricultural production and hence contributes to increased incomes and economic development
- Women's active roles in agriculture are increasing, hence they better feel the need for water management, see chapter 24 which also discusses feminisation of agriculture
- Women realise that WMG decision-making can also affect their needs and interests
- Water management, especially in-polder, also benefits homesteads, such as reduced risk of flooding and increased access to irrigation water

“When I understood the impact of water for agriculture, I also understood the importance of water management for women” — Monimjan Akter, WMG treasurer, WMA joint secretary and president of catchment O&M committee

16.4 Why are women important for water management?

At BGP's start, there was still some scepticism on why women should be motivated for participatory water management, even though the 30% and 40% quota was adhered to by all. In the course of BGP also practical reasons emerged why women can be important for water management, apart from the principle of gender equality (equal opportunities for women and men). These practical reasons can be summarised as “*more hands on deck for better water management*” or:

- Larger pool of potential WMG leaders
- More diversified leadership, representing better the interest of local communities, including of women polder dwellers, and taking better decisions
- Some women successfully engaged in conflict resolution: more neutral than men, less politically biased
- Women contribute to maintenance -“cleaning water hyacinth”- and to in-polder water management

“Women dig most of the small field channels” — CDF in Patuakhali

Below are examples of women who show commitment to participatory water management, also taking initiatives:

“Souda regularly attends the monthly meetings; before every meeting she identifies the problems of the WMG members (M/F) and the water management situation. Then during the meeting she discusses with other WMG members and take decisions together.” — from case study on Souda Begum, WMG treasurer

“Noyantara, as WMG president, took the initiative to address their water logging problem, motivating the farmers to build seven cross-bundhs. She ensured a contribution of BDT 10,000 from the Union Parishad; benefiting farmers contributed the rest. Now 100 farmers at 200 acres have a second crop.” — from case study Noyantara

“Morjina, as WMG vice-president, well understands that water management is needed for agricultural improvements. She took a lead in realising two box culverts at Amtoli khal as well as a cross-bundh in front of Pokhiapara sluice khal, the latter to keep sweet water available for irrigation. This was jointly financed by the Union Parishad, the WMG, and the benefiting farmers.” — from case study Morjina, polder 47/4

16.5 Results

The explicit attention of Blue Gold to including women in WMGs and promoting their meaningful participation contributed to gradual but significant changes:

- More women holding important positions of president, treasurer and secretary (from less than 5% in the first years to 9% in 2018/19)

“In the first years of BGP there were 1-2 women WMG presidents in (then) 311 WMGs; now 17 women presidents in 511 WMGs. There are now 27 women secretaries and 95 women treasurers. The latter means that 19% of the WMG treasurers are women.”

- Women in Executive Committees are now more active and vocal than at start of BGP

“In the first years of Blue Gold women were selected who did not have any experience and exposure, because such women were not available. But due to training women got knowledge and voice, and became available as candidates. So the recently selected women (executive committee members) are better than in first years of Blue Gold.” — CDF involved in BGP since 2014

- Ample examples of women who have a high level of understanding on water management, which enhances the quality of WMO decisions and initiatives

“She demonstrated a better understanding of water management than many male candidates” — BGP staff member about a woman WMG/WMA leader

- Women are now more often in WMO leadership positions due to their capacities rather than due to quota

Examples: (i) women are also represented in catchment O&M committees, which have no quota; (ii) 10 of the 12 Executive Committee members of Kanchan Nagar WMG (P29) are women, including the president.

- Women also participate in decision-making on CAWM / in-polder water management
- Women’s empowerment: many women who engaged in participatory water management became empowered in several ways:
 - social empowerment, by increased networks, mobility and confidence
 - increased women’s leadership, also more accepted by men; membership of WMO executive committees form a springboard for other leadership positions, such as UP member. In 2016, 93 UP members were selected from among WMO leaders, including 25 women
 - economic empowerment through (in-polder) water management contributing to increased productivity of women engaged in agricultural production and increased wage labour opportunities for poor women

A more elaborate discussion on how BGP contributed to women’s empowerment is in chapter 24.

16.6 Enabling factors and challenges

Factors that enabled or enhanced successful women’s participation in PWM include BGP’s starting point that WMG membership is not limited to one person per household, allowing that also women can join whose husbands aspire membership. The high participation of women farmers in training, such as FFS, contributed to women getting knowledge and insights, also raising their interest to engage with (in-polder) water management. The good proportion of female field staff (50% at the start; later about 33%) functioned as role models.

Challenges remain: Improvements in women’s positions and leadership are not observed equally in all WMGs in all polders. And women remain substantially under-represented in the higher levels of WMO organisations, especially in key positions in WMAs and in Catchment O&M committees. Still, momentum has been created for change.

“Elderly men still want to sit in the front and have the women in the back (during WMO meetings), but it has become more and more common that some women sit also in front rows and are included as speakers” — Zonal staff member.



17 In-polder Water Management

17.1 Context

In the polders of the coastal belt of Bangladesh, the potential to improve income of farmers is large. Compared to other parts of the country, productivity and profitability from its mainstays agriculture and aquaculture are low. To strengthen the economies of the polders, the Blue Gold Program rehabilitates main hydraulic infrastructure, capacitates water management organisations and stimulates the agricultural market system in 22 polders (see chapter 3 for the physical characteristics and for maps). Optimisation of the use of hydraulic infrastructure inside the polder, both small and large, maximises the returns from these interventions. This is called in-polder water management.

17.1.1. Polders

The characteristics of the rivers running across the south western coastal belt of Bangladesh partly control agricultural opportunities inside the polders. In the western part of the coastal belt, in the Satkhira district, reduced fresh water flow from the north results in increased salinization and substantial sedimentation of the rivers. This is turning polder areas into low-lying ‘bathtubs’ in between river beds that are elevated by sedimentation. This results in drainage congestion as well as in seepage, also of saline water, into the polders. This causes production systems to shift to year-round saline shrimp gher. More eastwards, during monsoon, the rivers’ water levels in the central south rise so much so that polders cannot be drained, causing extensive seasonal waterlogging in the Patuakhali and Barguna districts.

Cropping systems are also influenced by topography of the land and the water levels inside the polders. In the Khulna district, within the same polder rice after fish (freshwater gher-boro) and T. Aman-boro cropping systems can be found – where the latter generally occurs on slightly higher lands. Small differences in land elevation have caused these distinctly different production systems. Other areas, such as in Patuakhali district, generally have high lands compared to the Khulna region. Nonetheless, farmers in Patuakhali make a distinction within their polders in high and low lands. A height difference of 30 cm in land topography can make the difference between a waterlogged situation where only local varieties of T-Aman can be grown and a well-drained one where highly profitable High Yielding Varieties of T. Aman are cultivated. All this implies that slight adjustments to the water levels can make a big difference.

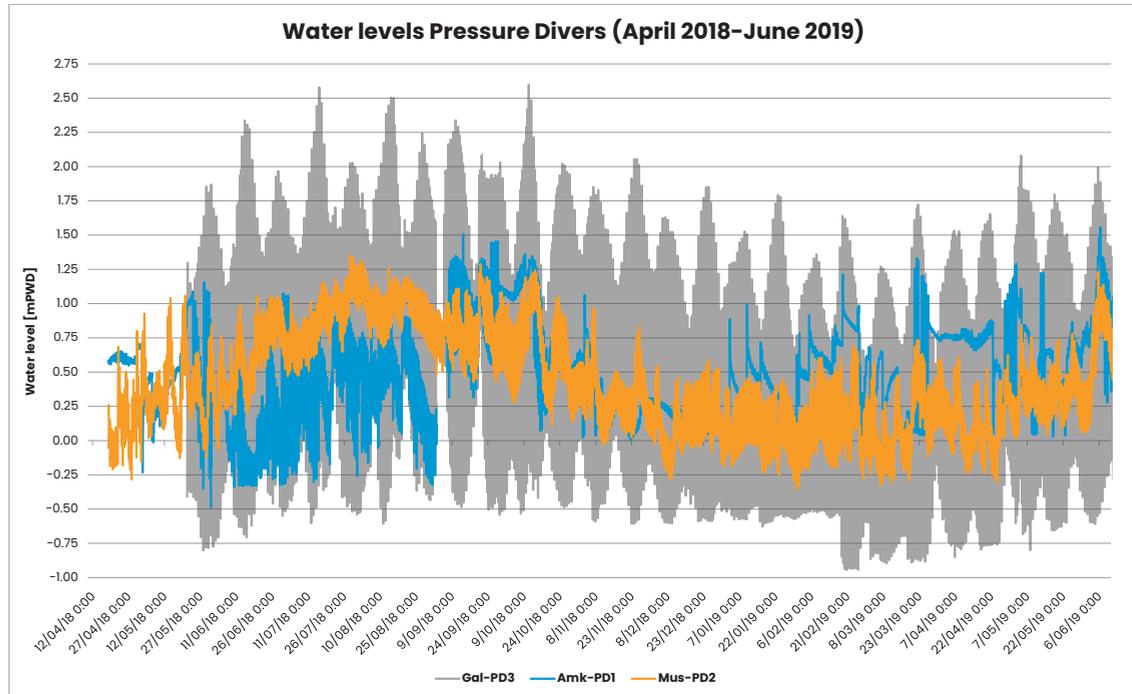
Figure 17.1: External and internal water levels of two sluice catchments

Figure 17.1 shows how sluice operations impact on water levels. It shows water levels at two different locations (blue: near Amkhola sluice; Red: Mushuriaghati sluice) in the period from April 2018 to June 2019. The grey graph shows the water level in the river outside the older. The graph appears to have a large bandwidth due to the diurnal (twice daily) tidal fluctuations. The blue graph shows water levels inside the polder, near the Amkhola sluice. It provides evidence of sluice operation: in the period late May to early September 2018, water was drained as-and-when possible, resulting in a internal water level lower than the average external water level. From September 2018 onwards, the sluice is used to retain water, ensuring an internal water level slightly above the average of the water level in the river. The red graph represents the water level inside Mushuriaghati sluice. As the red line aligns almost exactly to the middle of the tidal amplitude (grey line) it would appear that no management of the interior water level takes place. This is indeed the case, as Mushuriaghati sluice's gates were at the time of the water level recording dysfunctional.

17.1.2. Managing internal water levels

Water levels in the polders can be managed with sluices. Each sluice has its own area of influence (known as 'catchment') and the boundaries of these depend on elevation and the connectivity of the khal system. At the catchment scale, the water levels (managed with the sluice) in the primary or main khals should ideally serve the interests of all stakeholders in that catchment, i.e. farmers, fishermen and others. However, the following challenges occur:

- Many interests need to be catered for. It is difficult to get all interests at the table and it is complex to find a proper modus operandi for the regulator. If operation is not agreed upon, this may result in a weak pursuit of the most common interests and a high likelihood of elite capture.
- Suboptimal sluice gate operation results in:
 - waterlogging and drought;
 - sedimentation of and cross dams in the khal system (reducing the potential of the catchment to serve all interests), and;
 - adapted but marginally profitable production systems.

- At the end of 2019, 50% of the sluices were under control of WMOs. Powerful stakeholders such as shrimp farmers or fishermen may decide when sluice gates are opened or closed – generally not benefitting the larger numbers of farmers or the larger tracts of lands;
- If under control of Water Management Organisations, proper operation and maintenance of sluices often is shouldered by the WMG nearest to the sluice; operating it as they seem fit. Other WMGs have little say over its operation.
- Main khals, serving multiple WMGs, constitute common pool resources, the management of which is often neglected. This results in water hyacinth infestation and widespread sedimentation. As a consequence, large parts of the polders become hydrologically disconnected from the sluice.

At the sub-catchment scale, secondary and tertiary khals transport water to and from the inner parts of the polder. Reduced connectivity and control of the secondary and tertiary khal fails to meet increasing demands:

- Many secondary and tertiary khals have cross dams in place to help to store water for a small group of people (e.g. for irrigation purposes or fish cultivation) living next to the khals. This reduces the connectivity of the sub-catchments and hampers drainage and irrigation for significant portion of lands. Would sluice operation be optimised, it would not have any effect on these more interior areas;
- The construction of new roads is often planned without taking into account water drainage requirements;
- When zooming in at a scale where height differences are small and water management conditions for farmers are more or less homogeneous, there is a lack of infrastructure to retain or drain water in order to harness the production potential of this particular area.

Figure 17.2: Local Water Management Organisations (WMA/WMG/group) and their area of influence

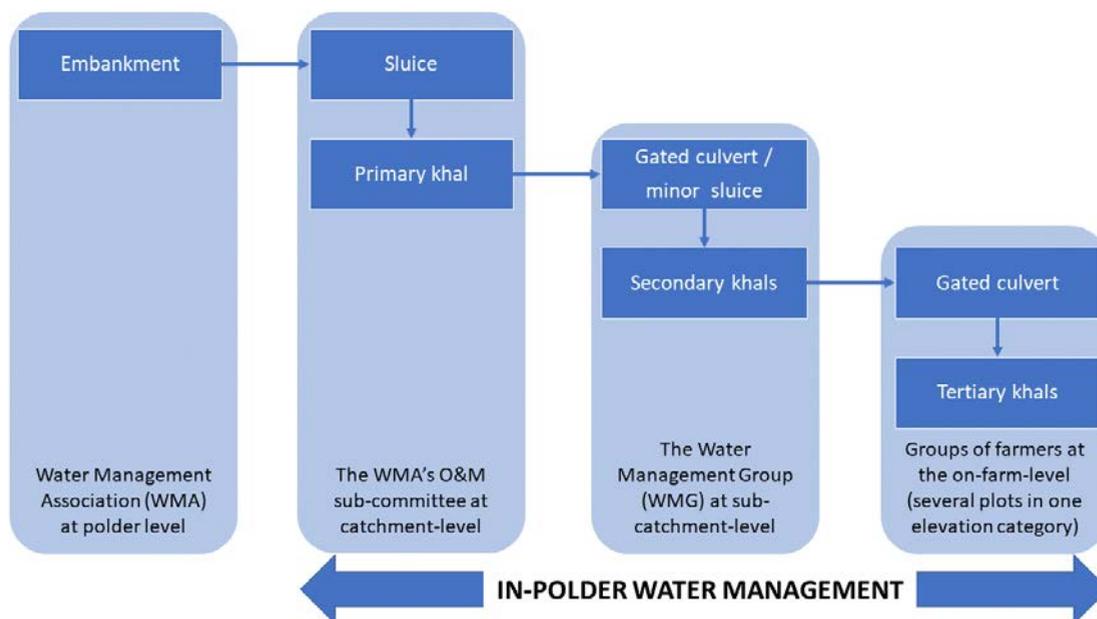


Figure 17.2 summarises this section on context, by showing how the polder and the hydrological subdivisions therein correlate to hydraulic infrastructure and organisational entities. It labels all water management efforts within the polder, including the operation of the main regulators located in the embankment, as ‘in-polder water management’.

17.2 Interventions: a mix to address all scales

In-polder water management (IPWM) is the maintenance, operation and modification of the hydraulic infrastructure inside the polders to facilitate viable and profitable production systems. IPWM helps to increase returns from interventions in primary infrastructure (see Section C) and from involvement and capacity building of WMOs (see *Section D Chapters 14 and 15*) which in turn provides an environment for increased agricultural production (see *Section E*). Since IPWM works on different scales and is context-specific, a mix of approaches has been employed:

1. **Catchment Planning (50-1,000 ha)** – Through coordination between WMGs through a catchment O&M committee, plans were made for improving sluice operation to manage water levels in the catchments, and agreements forged with respect to maintenance and other actions that benefit the catchment's performance;
2. **Intermediate scale infrastructure (50-500 ha)** – Conveying water between primary khals on one hand, and tertiary khals and fields on the other; the polders' secondary khals play a key role in the distribution and management of water. However, secondary khals are hardly ever equipped with control structures. The experience with an intermediate structure in Polder 29 may give insight in the potential of such structures;
3. **A small-scale water management infrastructure (SSWMI) fund (10-150 ha)** – Provision or improvement of water management infrastructure (using a 'hands-off' approach) on tertiary khals (i.e. outside the jurisdiction of the Bangladesh Water Development Board). Sometimes in combination with Demonstration plots (0.2-1.0 ha) to demonstrate the agricultural potential of SSWMI;
4. **CAWM, Community-Led Agricultural Water Management (10-50 ha)** – The optimisation of sub-catchments (10-50 ha), a scale that allows for synchronised cultivation of crops on lands with the similar elevation; for community collective action at a scale that is replicable by other farmer groups. This is used for horizontal learning, and also for further discussion about IPWM.

17.2.1. Catchment planning¹

Within catchment planning, there is clear focus on improving cropping patterns, in order to directly impact the household incomes and have a clear cause and effect between catchment planning and its benefits. Catchment planning concentrates on identifying immediate and doable actions – aiming at optimised water levels for crop production. Planning of operations and maintenance of infrastructure in the catchments is the responsibility of the WMA O&M sub-committees (also known as 'catchment committees'). Every catchment has its O&M subcommittee, comprising of 2 representatives of every WMG in the catchment.

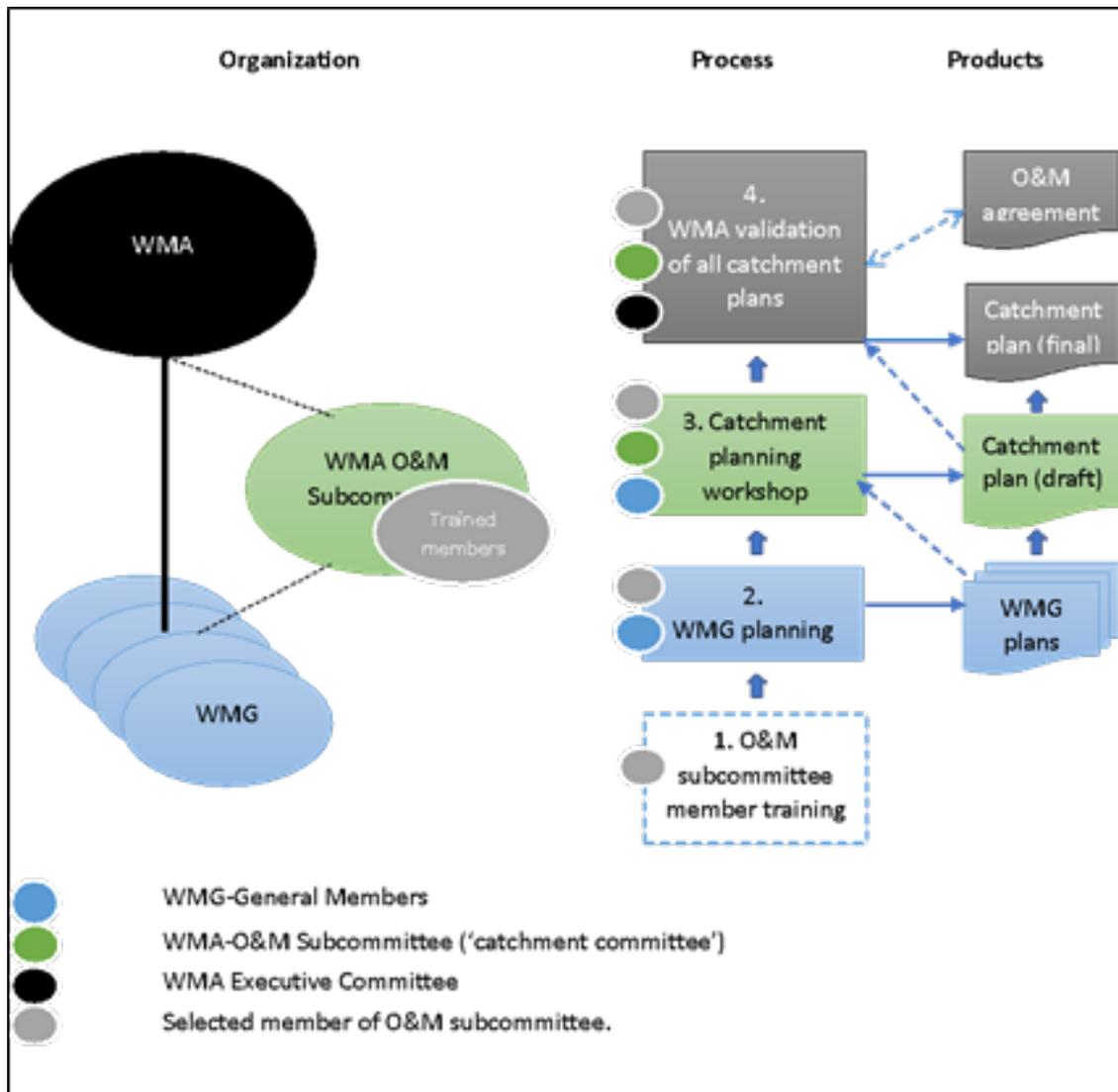
Catchment planning was supported by the BGP TA team from mid-2017 onwards. In 2017 catchment planning was piloted through a 2-day workshop in a few catchments, led by TA staff. By mid-2018 this had evolved into training one or two of the WMO members in the catchment to facilitate catchment planning. In this way, about 15 catchments could be lined up for catchment planning in one training batch.

Figure 17.3 visualises the way the WMGs, O&M sub-committee and the WMA cooperate along the process of catchment planning. To plan proper management of the catchment, one or two of the O&M sub-committee members were trained as facilitators of the catchment planning process (Step 1 in Figure 17.3). This process starts with WMG planning (Step 2), where the trained O&M subcommittee members discuss with WMGs the actions required for improved cropping patterns. In the catchment planning workshop (Step 3), shared issues and required actions among WMGs are discussed. In a meeting with the Executive Committee of the WMA, these catchment plans are validated in front of relevant Union

¹ This section draws heavily on *the BGP O&M Guidelines V5.0* (dated 5 January 2018) and *the BGP Definition of catchment planning 2018 and 2019*

Parishads, in order to also obtain their commitment and support (Step 4).

Figure 17.3: Structure of the catchment planning exercise



Lessons learnt on the catchment planning approach

Every catchment functions in a different way, depending on the physical and socio-economic circumstances. The BGP approach aimed to harness bottom-up initiatives by WMGs to improve water management at the catchment scale. Yet at the same time it obliged WMGs to follow specific steps leading to specific products. Planning is by nature a murky process and it must be structured to ensure it leads to decisions. **Increasing the adaptability of the approach to easily follow the needs of the WMGs and WMA is recommended in future implementation of catchment planning.** Some considerations are given below:

- Before starting catchment planning, develop a toolbox of approaches, together with WMGs and WMA that may suit a variety of contexts.
- Based on the understanding of the WMA, decide, together with WMA, what kind of approach is appropriate for the different catchments.

During the piloting of catchment planning in 2017, completing one catchment planning exercise required about 20 TA person-days (including significant involvement of senior staff), excluding travel time. This

intensive approach would be able to only reach about 10% of the catchments (that is 20 out of 200). This was perceived insufficient and a new approach was developed. In the 'optimised' approach, an O&M subcommittee member (referred to as catchment committee facilitator) would be trained to lead catchment planning. Now all catchments could be targeted as TA involvement was limited to provision of training and to the provision of stimulation and guidance. While most trained O&M subcommittee members were selected for their active role in the community, as well as their intelligence and charisma, without stimulation and guidance from TA staff, not much would happen. This meant that for every catchment about 1-2 person-days of TA staff involvement were required in addition to 1 – 2 person-days per catchment for training. **While the approach is efficient, it is important to continuously monitor and reflect on the workload involved in relation to the likely results.**

Lessons learnt on polder hydrology

The Blue Gold Program had a strong focus on the organisational part of catchment planning, while in general little was known on the actual hydrology of the catchment. Sluice operation or maintenance of main khals might have little effect on the actual waterlogging conditions. In research by Deltares over the years of 2018, 2019 and 2020 in polder 43/2B, it was found that up to 50% of the polder's water levels did not change regardless of sluices being open or closed. These areas are therefore hydrologically disconnected from the main polder infrastructure. This may be caused by, inter alia, the multiple cross-dams constructed inside the khal system. While these ensure local water retention, the water flow within the catchment is completely blocked. Eventually, this becomes a normative catchment condition as other land users will adapt to the situation. **In future catchment planning, we suggest a stronger focus on the restoring the connectivity of the khal network. If so, it is more likely that all catchment inhabitants have prospect for improvement.**

One of the principles of catchment planning is that all stakeholders in the catchment must be consulted. Sluice catchment boundaries are difficult to define as they often overlap – and some areas are more influenced by the sluice than others. This makes it difficult to make sluice catchment planning effective: a good representation of stakeholders is difficult to define. A confounding factor is that a substantial number of WMGs fall within two catchments as their delineation is sometimes based on local community or village boundaries. Some participants in the catchment planning deemed the exercise ineffective, as they had never been part of the catchment. To build stronger water management organisations, their boundaries should be based on a sound understanding of the khal system, informed by local knowledge. **A stronger understanding of the khal system is required, based on local knowledge but also on surveys, monitoring and modelling.**

Start early for partnership development and capacity building

We stimulated WMAs to use their catchment plans as a basis for engaging with Union Parishads and officials from BWDB and DAE, but also with other departments such as LGED and BADC, to petition their support. In many cases these UPs and government departments were able to provide some of the resources at their disposal – be it cash, expertise or influence – to support planned activities. Based on this experience, BGP decided to strengthen the opportunity to petition local governments and government departments by organising Upazila workshops, where WMAs can present their ambitions and plans in a formal setting. Having concise and concrete plans empowers WMOs to solicit support. The importance of the relationships between WMOs and local governments are described in *chapter 18*. **An early start with catchment planning is important so that WMOs have the opportunity to develop this partnerships under guidance of the project and with its financial backing.**

As catchment planning was addressed by BGP only from 2017 onwards, the project has hardly had opportunity to repeat the exercise and to capacitate the WMOs further. Ideally – after the introduction of catchment planning by the BGP TA team – the WMOs would take up recurrent planning henceforth, although this was not explicitly suggested to them. At this stage, it is clear that most of the WMAs or

catchment committees do not update or review their catchment plans a year after the initial planning exercise. Repetition of the catchment planning exercise, would have helped lodge this as a routine within the WMAs. **We argue that, even if a catchment planning approach has not been fully developed, projects should start implementing it as soon as possible and repeat it yearly to improve the plans, the planning process and to build organisational continuity.**

17.2.2. Intermediate-scale infrastructure²

In Polder 29, Gajendrapur Uttar WMG and the surrounding WMGs have planned to retain water to irrigate land at the end of the monsoon season and during the Rabi (dry) season. However, most plots have too little water at the end of the Kharif II (wet) season and during the Rabi (dry) season - and in addition, saline water enters Dholvanga Khal because Telikhali sluice remains open during the dry season to serve the interests of other water users (in this case, fishers). To solve these problems, Gajendrapur Uttar WMG and other farmers campaigned for the construction of a small regulator in the Dholvanga Khal.

Most in-polder water management interventions by Blue Gold had been for a sub-catchment area of a single WMG serving 100 ha and typically requiring some limited amount of khal excavation and a gated culvert. The case presented by Gajendrapur Uttar WMG was of a larger scale (some 500 ha) and involving five WMGs. Given the interest of the five WMGs and their willingness to jointly manage the completed structure, the decision was made to use this as a pilot case from which to extract lessons for future in-polder investments.

In December 2018, a topographic survey was conducted to map the hydraulic system. Subsequently, boreholes were drilled to provide information on soil conditions, and a design was prepared by the TA team. After discussions with the community about the proposed design, the WMGs agreed to adopt the design and proceed with construction. The WMG was contracted to construct the retention structure (also known as a mini 2-vent regulator), with the TA engineering staff providing technical guidance and quality control. A map of the catchment in *Figure 17.4*, shows the location of the regulator as a red block, the approximate catchment boundary with a dashed green line - with a yellow line indicating a possible sub-catchment boundary to the north of which the benefits may be more limited.

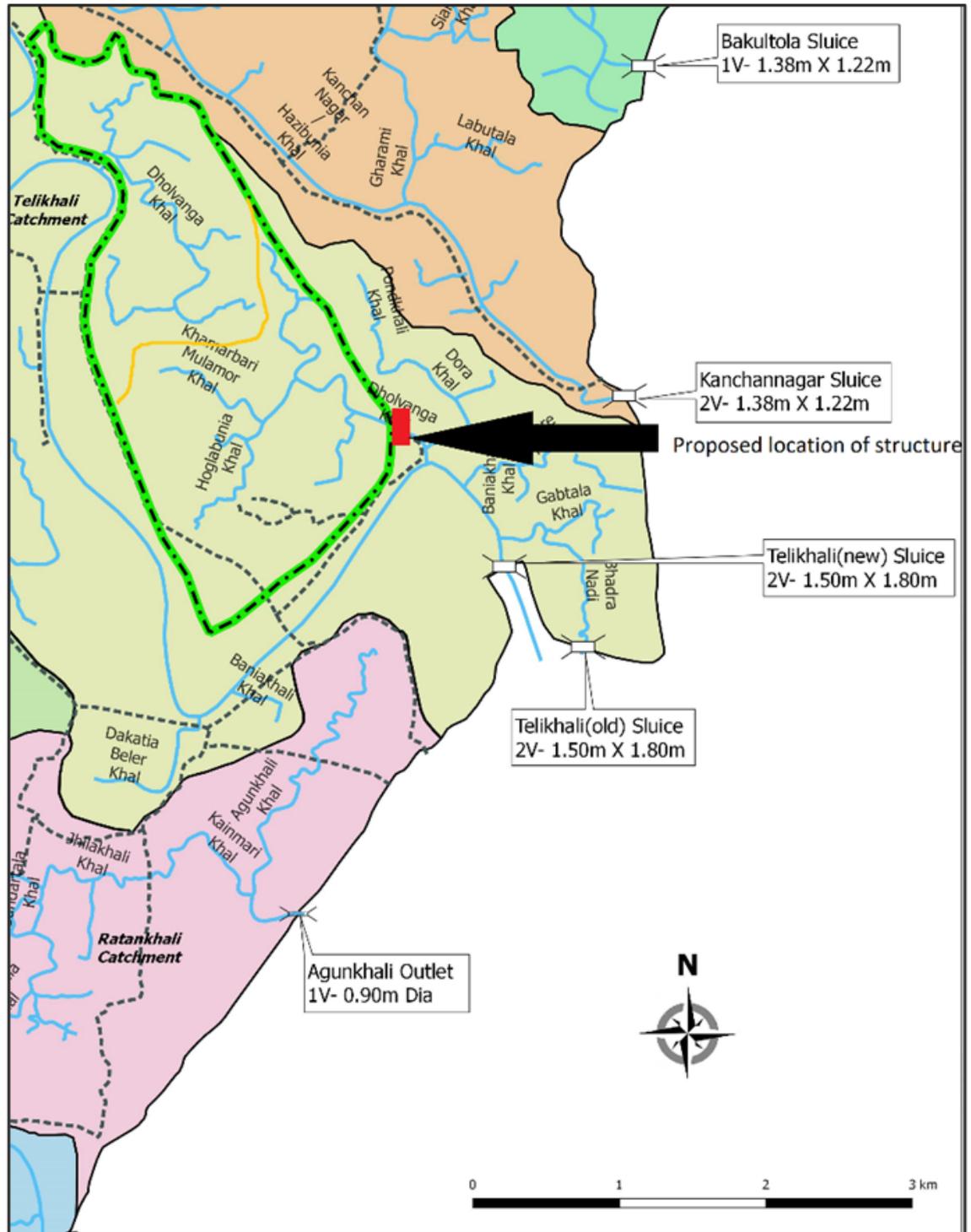
A design report was prepared in March 2020 with a hydrological analysis, design criteria, a stability analysis, structural and hydraulic design, and construction recommendations. A short construction report was prepared after commissioning the structure in October 2020 showing the contract value, start and finishing dates, itemised cost estimate, and a photographic record showing construction activities. A short case study (in Bangla) is available for visitors and neighbours, explains the background and purpose of the regulator.

Lessons learnt on relations with the WMG

The relationship between Blue Gold and the leading representative of the community (Gajendrapur Uttar WMG) has been complex. The following factors shaped this relationship:

- From the start, the WMG leadership has been very convincing. The WMG has received CII and CAWM demonstrations, FFS schools and have consistently identified the need for water retention in Dholvanga Khal. Some would argue that the WMG has received enough benefits from the BGP project. Others see a mature WMG organisation presenting their analysis of their local water management situation and seeking assistance with implementation.
- The type of structure that is required has been the subject of many discussions within the TA team: some have argued for a minimum construction, arguing the hydrological situation is as simple as it gets; others have said that more research was required - which led to delays in decisions.

2 This section draws on: *Design report water retention structure Gajendrapur Uttar V2, 31 march 2020*

Figure 17.4: Gajendrapur retention structure location map

Lessons to be learnt from operating the structure

The success of an investment in a water management structure which is community-operated depends on whether the community can put in place governance systems to serve the wider interest of all users, including rules for opening and closing of the gates, and for maintenance. All five WMGs in the catchment area gave verbal approval to proceed with the structure, but were unable to provide convincing explanations of the arrangements for operating the structure. Further discussions were therefore held with representatives of the five WMGs to obtain their joint agreement to the intervention on the understanding

that the benefits were to be shared amongst the communities in the entire area served by the structure - and not just by the main sponsor, Gajendrapur Uttar WMG. An agreement with all parties was signed. The difficulty here is that there is little experience of joint-management, and - during the design stages - the WMGs were unable to imagine the benefits the structure would bring. Close monitoring of the operating modalities has been difficult during 2020/21 because of the COVID-19 travel restrictions, and because of other commitments of TA staff during the final few months of implementation. Future in-polder interventions should build on the Gajendrapur experience, taking account of how the community has jointly managed the asset for the benefit of all five WMGs.

Lessons learnt on a missing link affecting development of intermediate infrastructure

While polder communities have a history of constructing and modifying tertiary infrastructure, and BWDB has a long track record with polder-level major infrastructure, neither government nor the community has any experience with this type of intermediate infrastructure. It falls into a gap: too small for BWDB but too large for communities. LGED does focus on infrastructure of this type (covering up to 1,000 ha), but the institutional patterns (WMOs, planning processes) set-up for the polders does not link well to LGED's investment decisions. However, a mechanism for investments in this form of intermediate (or secondary) water management infrastructure, similar to Gajendrapur, will be required - to allow the management of water levels in different areas of a polder, thereby enabling the realisation of the cropping potential of land of different elevations.

In addition to the development of intermediate infrastructure in Gajendrapur, Blue Gold has supported action research under the Deltares/IWM Water Management Knowledge and Innovation Program (WMKIP) for field-testing of pumped drainage in Polder 2 in Satkhira. Although the adaptive research experiment is still ongoing, it is hoped that the experience will show that in cases where the river bed is raised so high that natural drainage is impeded, local pumped drainage of agricultural lands may form a viable alternative to large-scale dredging of the river system; or to conversion of cropped land to inland fisheries.

With BWDB focussing on main investments in polder infrastructure, and with polder communities having limited capacity to develop intermediate-scale infrastructure, there is a missing link in the process of realising the full agricultural potential of coastal polders. **There are a number of organisations who could take on this role, including the Department of Agricultural Extension, Bangladesh Agricultural Development Corporation, Local Government Engineering Department, Union Parishad - which will inter alia require staff to develop practical skills and experience in small-scale water management and to put in place mechanisms for coordination between the organisations (as set out for example in Water Rules 2018).**

17.2.3. Small-scale water management infrastructure

A fund to encourage the uptake of small-scale water management infrastructure (SSWMI) was established under Blue Gold in 2018 with the aim of improving in-polder drainage and irrigation conditions.

The improvement of secondary and tertiary infrastructure across the coastal zone will involve a large number of small-scale structures and huge volumes of earthwork. The planning, design, contracting, supervising and monitoring of this small-scale infrastructure would be highly resource-intensive if provided with the same level of involvement as is provided by government engineering departments in large-scale infrastructure. Building on the success of the CAWM schemes (see next section), a fund was made available so that WMOs could plan and implement small-scale water management infrastructure (SSWMI) with a relatively low-level of supervision.

As small structures are beyond the remit of BWDB, the fund for small-scale infrastructure was provided through the TA budget, based on the following assumptions:

- Individual WMGs are eligible to apply for a single scheme (up to a ceiling of BDT 2 lakh, equivalent to approx. Euro 2,000) - assuming that they will choose an application that will maximise their benefits.
- Since the communities have a financial stake and will benefit from a significant increase in agricultural production, the WMG will ensure good quality construction work.
- Communities must make a financial contribution but may also mobilise funds or other resources from third parties such as Union Parishad or BADC.
- Since the SSWMI provides benefits to the community, the WMG will have a direct interest in maintaining the infrastructure.
- SSWMI schemes are to be chosen where the full drainage system is functional ie water from the sub-catchment can be drained through the various channels and khals up to the point of discharge to the outside river or channel via a sluice or regulator
- By involving the WMA in the supervision of the WMG, there is a check and control on the implementation process.

The SSWMI fund adopted the following staged process:

1. During a 2-month period, WMGs are familiarised with procedures and requested to apply.
2. Checks of the WMG's provisional application are made by field-level TA staff.
3. The final application is submitted by WMG to the TA office.
4. The cost estimation is checked using a simplified cost model.
5. For successful applicants, a standard form of contract (in Bangla) is entered into by WMG representatives and with the Zonal Coordinator representing the TA team.
6. Payments are made to the WMGs through their bank account in instalments with the final payment based on a confirmation by the TA field team that all works have been completed.
7. Demonstration plots are developed to show the agricultural potential of the implemented SSWMI to other farmers.

A total of 335 SSWMI schemes were funded through Blue Gold: 167 in 2018/19 and 168 in 2019/20 at a cost of BDT 39.9 million (equivalent to Euro 400,000) or some BDT 1.20 lakh per scheme (equivalent to Euro 1,200 per scheme). An overview map presents the distribution of these SSWMI schemes.

Lessons learnt from the SSWMI Fund

In preparation for the first round of applications for SSWMI funds in 2018/19, a number of steps were taken: (a) application procedures were developed which encouraged participation from as many WMGs as possible and which provided reasonably equitable access to available funds; (b) methods were devised for checking cost estimates prepared by WMGs; and (c) a standard form of contract between Blue Gold and the WMGs was developed.

Approaches to Implementation varied slightly between zonal offices, reflecting the local context. Although this was generally acceptable, the variable quality of small structures was recognised as one specific area where improvement and greater consistency would benefit the durability of the schemes. Although in many areas, there was some experience with the construction of pipe and box culverts from the implementation of CAWM schemes, under SSWMI, communities were left to arrange construction of small structures with very little guidance or direction and without standard design drawings and specifications. One of the main concepts of SSWMI was that responsibility for construction would be delegated to the community who would operate the structure, and would thus be invested in ensuring the structure was strongly-built and functional. Practical experience showed that completed structures were often not well-built and that

essential elements were missing - such as the control gate. For the 2019/20 season, a manual (in Bangla) for the construction of a standard culvert was developed. The manual provides practical guidance, alongside a series of photographs illustrating the steps in the construction process, all written in simple Bangla. **The main lesson from this experience, is that a construction manual should be provided for communities for the construction of simple, functional and durable small-scale water management structures.**

Lessons learnt with respect to polder hydrology

In a short period of around two years, the fund has contributed to the functioning of around 335 small sub-catchments: culverts in road embankments have extended the catchment area served by inter-connected drainage systems, and silted khals have been re-excavated to increase the drainage capacity. Generally, communities are pleased with the investment, and there is plenty of anecdotal evidence that cropping intensities have increased. But there are other uncertainties, about the wider impact - such as whether the improvement causes waterlogging or drought elsewhere. **A review of the impact of SSWMI as a means of promoting investments in tertiary infrastructure would help in further refining the design and outcome of any future SSWMI initiatives.**

Tertiary infrastructure should not be developed in a vacuum. The polders in the southwest are traversed by a fairly intensive network of local roads, constructed by Union Parishads, the Local Government Engineering Department (LGED) or the Roads and Highways Department (RHD). Road embankments often obstruct water flow, so the provision of culverts sized to serve the drainage catchment can be used for local water management if - for example - they are provided with simple facilities for closing off the flow in either direction. Though roads and their structures are not designed with any consideration for optimisation of local water management; their presence provides an opportunity for improving local water management conditions.

Blue Gold focuses on the rehabilitation of primary infrastructure (by BWDB) and - through SSWMI schemes - also on tertiary infrastructure. Field experience has shown that the secondary system - conveying water between the primary and the secondary drainage channels - is often in poor condition. These khals (with widths ranging from 5 to 50 metres) generally serve areas between 100 and 500 ha. As primary and tertiary systems are upgraded through initiatives such as SSWMI, reduced discharge capacity in the secondary system because of siltation or blockages from cross-bundhs or fishing nets can limit the flow of drainage water from the field through the drainage channels up to the point of discharge to the outside river or channel via a sluice or regulator.

Small-scale project interventions such as SSWMI require good local knowledge of the complex interconnectivities required to drain relatively small areas and a sound understanding of the local hydrology to be fully effective. But field experience has shown the importance of **understanding the operations of the related secondary drainage system, allowing where necessary for the secondary drains or khals to be re-excavated and provided with structures to control water flow.**

Lessons learnt with respect to institutional responsibility

We realised that small-scale infrastructure is in high demand by the communities. To ensure a swift implementation, the hands-off fund has mainly been developed by the Technical Assistance team of BGP. Neither the implementing partners nor the Local Government Institutions gained experience in handling the fund.

The Department of Agricultural Extension has expressed its interest to implement a SSWMI-fund across the coastal zone; and has applied for external funding for such a project. The Bangladesh Agricultural Development Corporation - which like DAE is situated within the Ministry of Agriculture - has sufficient engineering knowledge to guide the implementation of such a fund; whereas DAE's SAAOs should be able to reach out to communities to discuss the agricultural benefits and potential negative effects of small-scale

infrastructure. Accountability may, however, be an issue as hands-off funding to community initiatives is a novel concept.

To ensure accountability during the implementation of a small-scale infrastructure fund, it is worthwhile exploring whether the responsibility could be shared with the Union Parishad. They have experience with funding similar structures, are accountable to their constituents and often have close connection to WMOs. They handle their own budget, but don't have sufficient resources focused on water management.

Lessons learnt with respect to matching grants

When making use of the SSWMI fund, WMGs are to make a matching contribution. In case of earthwork this would be 30% of the total estimated value, and in case of culverts 10%. Cost estimates are made using the standard schedule of rates; and costs are split according to the above ratios. The WMGs, however, mobilise the requisite labour from among the local day labourers and rather than paying them the standard daily rate on which the schedule of rates is based; they pay roughly 70% of this rate. In this way, the matching contribution is de facto made by the hired labourers and not by the WMG.

An alternative would have been to insist on an upfront cash contribution from the WMG. WMGs have, however, not been successful in building up capital reserves (e.g. a Maintenance Fund). There are several reasons why building up a reserve for investment in water infrastructure modification, operation and maintenance has not taken off:

- There is a fundamental contradiction between the WMG's voluntary membership – implying that not all beneficiaries of better water management are part of and contributor to the WMG – and the collective nature of the benefits created by water management improvements. Simply put: the members are not eager to develop a capital reserve that is spent on measures that may also benefit non-members;
- In many cases, WMG leaders and members are averse to building-up capital, as it brings along issues of transparency and accounting. Rather than facing possible mistrust over how funds are used and accounted for, WMGs choose to not have capital reserves;
- When building up a reserve, there is an unknown lead time between member contributions and the moment that the collected resources are used, and the time when this generates benefits. People would like to have the use of their money in the intervening period;
- Even when financial resources are there, members could question whether investment in SSWMI is a priority. Purchase of fertilisers would possibly bring more direct benefits; while households themselves might prefer to reserve their resources for investment in education.

Nonetheless, WMGs facing urgent challenges (e.g. when responding to a flood threat) have been found to successfully collect funds for financing emergency works. Often, such fund collection campaigns are organised with or supervised by the Union Parishad (or by its chairman), which could help address concerns over social justice. There are also other rural development programmes that have been able to marshal upfront cash contributions from communities, provided the matching grant is released immediately upon the contribution being made available.

Future project interventions for SSWMI should remain critical on how the matching contribution is actually made and should seek ways to ask the benefitted community of the SSWMI to make cash upfront contributions. The experience of other rural development programmes should be used as reference, while close involvement of the LGIs can be explored as a way to ensure that the contribution is primarily made by those that would benefit from it.

Other lessons with respect to small-scale water management infrastructure

The SSWMI fund provides a rich and diverse experience, and the final word on its value and practice cannot yet be given. Replication and further improvement by further roll-out of such a fund would be

useful. Some practical recommendations, based on BGP's experience, include:

- **Emphasise construction-safety** – An accident during construction made clear that safety instructions are needed for box culverts;
- **Aim to realise the full potential benefit of the small infrastructure by promoting introduction of High Yielding Varieties, high value crops and intensified cropping patterns** – This requires a focus on agricultural commercialisation and on the opportunities within the market system;
- **Investment in SSWMI can also make sense in areas where the primary infrastructure is not (yet) fully functional** – The relatively inexpensive investments helps enhance control of water resources in a sub-catchment. Investment in the tertiary system does not have to wait – as was done in BGP – until the primary infrastructure is largely rehabilitated, but can be incorporated in polder development from its onset.;
- **Monitor operation and maintenance of the small-scale infrastructure** – as the effects, be it positive or negative, of SSWMI are not yet fully understood;
- **Scale-up and scale-out the SSWMI-fund** – The SSWMI investments generated a high demand. The strong desire for improving water control at the sub-catchment is in all likelihood not confined to the BGP project area. Once standards for design, costing, cost sharing and contracts are established, the approach can easily be scaled-up and -out.
- **Consider incremental investment cycles** – WMGs that did well in year one, should be given further opportunity in subsequent years, possibly with different arrangements for sharing investment costs;
- **Make planning for SSWMI an explicit part of the planning cycle of the WMOs** – In BGP, the SSWMI-fund was executed as a stand-alone campaign. In hindsight, it could have been incorporated in the water management planning that WMGs do as part of the catchment planning (see above). In this way, coherence with wider developments (i.e. opportunities offered by development of primary and secondary infrastructure) is sought, and the practice of regular planning and review is more strongly promoted in the new organisations;
- **Discuss operation and maintenance ahead of the investment decision** – Though not always easy, it is important to get the communities commitment to using and caring for the infrastructure. Insist on explicit definition of responsibilities.

17.2.4. Community-led agricultural water management

Community-led Agricultural Water Management (CAWM) aims to improve sub-catchment agricultural production and profitability by an integrated approach. CAWM introduces improved cropping varieties, enhanced crop (and crop-fish) practices in combination with timely and well-coordinated drainage of fields and khals by the involved WMG members. Attention is paid to operational coordination at the catchment level (sluice), as well as conflict management at WMA level to make sure khal blockages are removed and water can drain smoothly. CAWM improves the local situation with respect to water management, and CAWM areas were used to demonstrate the benefits of better local water management, through horizontal learning.³

Within BGP the approach was developed in 2015 and 2016 through a collaborative program led by IRRI[1] with Phultala WMG and Kismat Phultala WMG in Polder 30. A baseline report on the program was prepared in February 2015 by a TA intern (Martina Groenemeijer), and this was then developed into Technical Report 19 'Improved Water Management at the Polder 30 Community Water Management Pilot' in September 2016. This report built on the baseline information, reviewed the current status of the community water management action plan, summarised lessons learnt and made recommendations for disseminating the experience. In order to upscale the work, Blue Gold prepared plans for developing a network of CAWM schemes for 2016/17 and for 2018/19. Over the period 2017 and 2019, CAWM

³ In elevated areas, where waterlogging or late post monsoon drainage is no concern, BGP supported alternative crop choices through the Cropping Intensification Initiative (CII). See *Section E* on the production shift.

schemes were developed at 71 locations, covering 1,480 ha and involving over 4,300 farmers. DAE was responsible for all agricultural extension aspects and the Blue Gold TA team assisted with organisation and investment.

The approach consists of a mix of interventions, largely led by the community:

- Introduction of modern crop varieties, such as early maturing HYV T. Aman and sunflower.
- Farmers field schools (FFS) led by DAE for knowledge transfer to support the introduction of modern crop varieties.
- Improved water management including:
 - Coordination with WMA and catchment level (sluice) for conflict resolution, removal of blockages from khals and smooth and timely release of drainage water;
 - Construction of small-scale water management infrastructure, to regulate water at the sub-catchment (tertiary) level;
 - Hand-dug field canals ('nullah') for better drainage and water retention.

To accomplish and coordinate this, the following steps were taken:

1. Select suitable area (primary infrastructure functional, secondary or tertiary infrastructure can be improved, social coherence, good organisation)
2. Regular meetings with CAWM farmers to inform about process;
3. Regular coordination meetings between BGP TA and DAE-staff;
4. General planning at district level with DAE field staff and selected lead farmers;
5. Specific CAWM sub-catchment planning with WMO and farmers to define the new cropping pattern, decide on water management interventions and improve infrastructure;
6. Farmer Field Days or crop cutting ceremonies to share the experience with neighbouring farmers and LGIs.

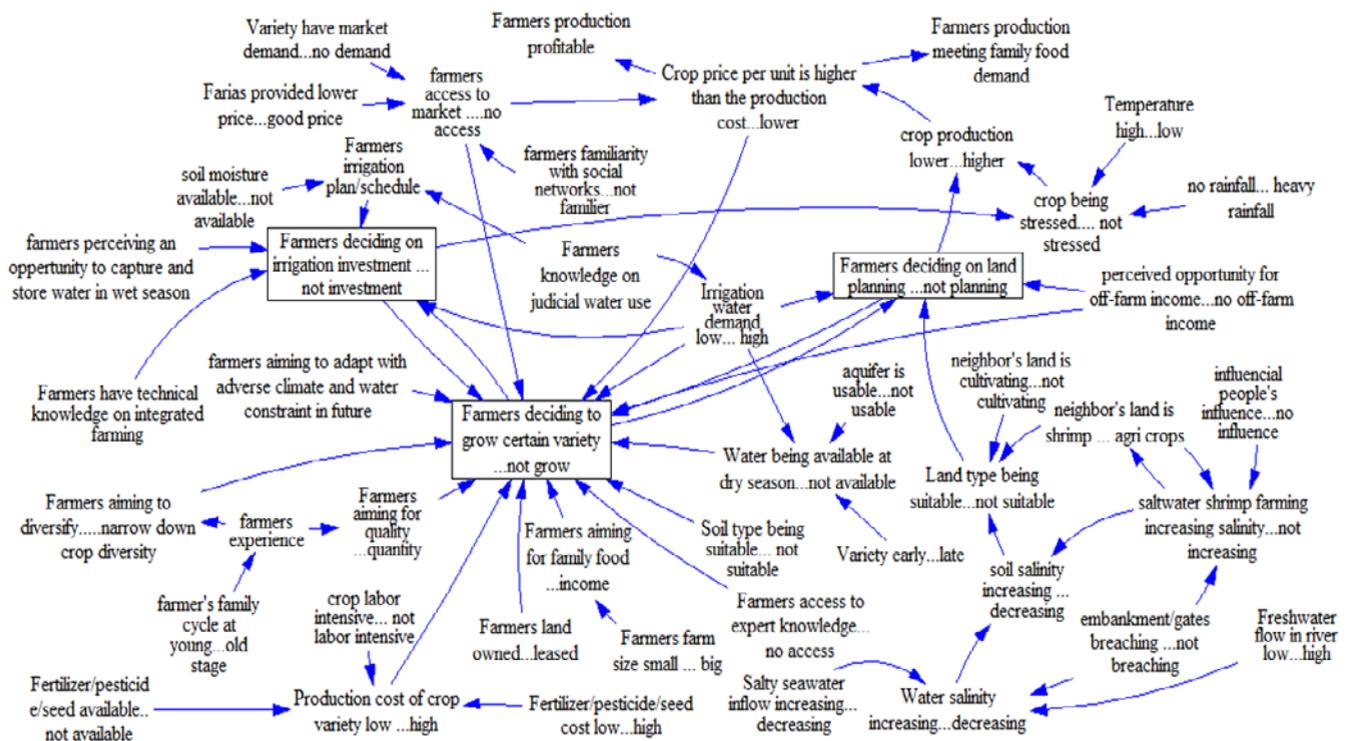
Lessons learnt on farmers' crop choice – convincing all farmers

BGP has stimulated farmers to shift from local T. Aman paddy varieties to modern varieties, which have a shorter duration and produce higher yield. As these varieties mature earlier (usually 4 weeks), they have a different irrigation and drainage calendar from the surrounding crops. To overcome this, CAWM funds seeds and other inputs not for just one farmer but for all farmers in a particular sub-catchment. CAWM also intervenes with FFSs and small-scale infrastructure to ensure the success of the improved T-Aman crop in order to convince farmers to continue growing modern varieties. But is this sufficient to convince farmers?

The cropping system a farmer adopts is dependent on multiple factors (see *Figure 17.5*)[2] that are not necessarily obvious towards implementers of a water management project. In the Blue Gold Program, water management and cropping systems are assumed to be exclusively related. Therefore, farmers' decisions with respect to crop and variety choice need to be well-understood in future CAWM interventions.

CAWM is a uniform package of interventions (infrastructure, FFS, varietal change), while farming requires a broad set of choices grounded inter alia in norms, beliefs, intentions and experiences. While the interventions are well-accepted by the community; this does not mean that the adoption of the varieties propagated by CAWM will be continued. For example, a new rice variety may on the long run not be to the liking of a farmer because of its taste, workload and input requirement, or marketability. It is desirable that all farmer considerations in crop choice are reviewed before determining the cropping pattern that CAWM will support.

Figure 17.5: Factors in a farmers' choice of crop variety



Interventions within CAWM are planned through group workshops. Generally, vocal farmers lead the discussions. When it comes to varietal selection as well as infrastructure interventions, BGP invites lead farmers (together with SAAOs) to make the decisions. These lead farmers are generally well-respected and can create union among farmers. This is helpful, as considerable portions of land become simultaneously cultivated with a new variety (crop synchronisation). This prevents conflicting drainage and irrigation requirements between short duration and local varieties of T-Aman. Smaller farmers however, often grow a substantial amount of their crop harvest for their own consumption and may on the longer run revert back to varieties that have a better taste, size and structure than the modern variety. Future CAWM interventions need to take the numerous small farmers into account by facilitating multiple varieties of rice to be grown.

It is recommended that CAWM increases its option for improving the relation between crop production and local water management. CAWM’s menu presently comprises introduction of the early maturing BR52 T. Aman variety, supported by a field crop FFS (for the Aman season) and the provision of small-scale infrastructure. This narrow menu of choice increases the likelihood that only a small portion of farmers is served well. Expanding the ‘toolbox’, should be considered, by e.g.:

- Ascertaining what aspects of the crop choice are most important to farmers in a CAWM area and explicitly include and address these in CAWM planning exercises;
- Shifting focus from paddy production towards Rabi crops. While early Aman harvest (and therefore drainage) is required for proper Rabi production, it can also be argued that the need for early Aman harvest becomes apparent if more high value crops can be produced in the Rabi season;
- Developing a diversified irrigation and drainage schedule within a CAWM scheme that does not synchronise all water management efforts in the sub-catchments, but streamlines it. A group of farmers would still agree on cultivating the same paddy variety, but other choices are possible.

Lesson learnt on the challenge of an integrated approach

The community-led agricultural water management approach (as set out in TR24 CAWM Strategic Plan for 2018/19) aimed to have a holistic approach towards improving the cropping pattern[3]. A main assumption of CAWM is that higher income at the tertiary scale – i.e. the sub-catchment – can be achieved by improving water management, agricultural practices, crop varieties and marketing simultaneously. This integrated nature of CAWM places a large demand on the capacities and skills of the staff implementing it. Inevitably, staff having a background in say agronomy, are less likely to be confident in community mobilisation. Staff with a background in WMO-organisation are less likely to know the intricacies of rice varieties. The TR24 CAWM Strategic Plan for 2018/19 stated that *“insights coming from Value Chain Analysis (VCA) for relevant crops to be promoted under CAWM, and lessons learnt from BGP’s market orientation activities and market-oriented FFS (MFS) were used too”*. For nearly all staff this is a novel perspective and – while these insights were used to develop a new curriculum for FFS to be used under the CAWM umbrella – BGP and DAE staff often could not make the translation to the activities in the field.

Guiding staff – in this case from the BGP TA team as well as from DAE – in implementing the highly integrated CAWM approach requires a high level of coordination with the local teams and good cooperation with the subject matter experts supporting them. This was done by placing the program under one senior member of the TA team.

While the dedicated high-level attention can be understood from the special, highly integral nature of CAWM; the heavy central hand does not sit easy with BGP’s management philosophy, in which local polder teams play the key role in guiding the. This constitutes a contradiction, which was not solved by BGP:

- In order to upscale the pace of implementation of CAWMs, the lead would need to be vested more strongly in the Polder Team. To facilitate this, the approach would need to be simplified and standardised;
- In order to optimise the impact of CAWM on farmer livelihoods, the approach needs to be more flexible, more responsive to farmers’ diverse crop choices, more innovative and more locally adapted. Doing so, would require close involvement of senior staff.

Lessons learnt on local adaptation of CAWM

CAWM has primarily focussed on the benefits of improved Aman production. In the Patuakhali area, where Aman is the mainstay, the relative impact on income of a better Aman rice variety is high. In Khulna and Satkhira, Boro rice is the mainstay and the relative effect on income by improving Aman is lower. Therefore, 60% of the area covered by the CAWM approach is in Patuakhali; and the CAWM crop choice was replicated by farmers (with some support through extension) to roughly thrice this area. Therefore, it is more logical to continue to implement the current CAWM approach with this crop choice in the Patuakhali area. It is recommended to:

- Expand implementation in CAWM in Patuakhali with the present T. Aman focus;
- Explore crop choice opportunities for the Rabi season (see also the lesson on ‘farmers’ crop choice, above) and include irrigated crop options, by including infrastructure investments for surface or groundwater irrigation;
- Explore other combinations of water management and agricultural products. As an example, within Khulna and Satkhira CAWM could be used to optimise indigenous systems, such as smallholder gheras and cultivation on sorjhon (raised beds).

A further opportunity for CAWM is to include novel agricultural practices. For example, incorporating ideas from Bangladesh’ research institutes. Research institutes often do trials at a small-scale, but innovations in water management will only be truly convincing if tried at the scale of CAWM (about or

above 10 hectares). Inclusion of novel ideas can be achieved by keeping most of aspects of the CAWM approach intact, but changing the extension, input and infrastructure based on the new idea. In this way, CAWM remains a platform for agricultural water management innovation – in keeping with its own origin. **It is recommended to reach out to IRRI, BRRI, BADC or other organisations and to invite them to do trials within CAWM schemes.**

Lessons on the institutional home for CAWM

During the implementation of CAWM, DAE has been involved continuously. In 2020, DAE has taken the CAWM concept further on board as a potential mainstream activity and aims to implement it in the wider coastal belt. This is a big achievement for BGP. Key to this were the following factors:

- DAE initially entered the CAWM approach by supporting it with Farmer Field Schools. This was appreciated and enabled DAE to link its package on crop production to the perspective on water management;
- DAE District Directors, SAAOs and Farmer Trainers (FTs) were involved in the planning workshops for CAWM, so that DAE staff that was not directly involved in BGP also learned about CAWM and water management;
- The obvious synergy between DAE's usual practices – especially farmer field schools (which are aimed at groups) – and the community-oriented CAWM activity made it relatively easy for DAE staff to find their way in the program.

It is recommended that DAE remains a leading party in CAWM implementation. CAWM could provide a testing ground for novel combinations of crop choices and local water management and thereby helps DAE to remain relevant in a changing rural setting.

Lessons on monitoring, reflection and learning

Using the experience of a successful IRRI-led pilot in Polder 30, plans were developed to scale-up and transfer the knowledge and experience across the Blue Gold Program area using CAWM demonstrations. By the end of the 2019/20 season, there were 71 CAWM demonstrations across Blue Gold. Presently, DAE is considering mainstreaming (parts of) the approach. While the potential of CAWM has fuelled such ambitions; the actual benefits may be less than anticipated. A 2019 sample survey of 24 CAWM sites found positive outcomes only in 11 locations.[4] This outcome needs to be qualified by further research and follow-up interviews, and it is difficult to draw many lessons from a one-off survey.

To understand the impact of CAWM, the yardsticks have to be clear. The implementers of CAWM measured its success by the area of BR52 paddy in a polder (which showed a strong upward trend in Patuakhali, where this was assessed); whereas the sample survey focussed on the impact on income. In future, **monitoring staff should be involved in defining the objectives of a project activity, such as CAWM, and help ensure that its outcomes and outputs are clearly established by management.**

Some of the lessons learnt from operating a network of demonstration schemes under the Blue Gold Program over four to five years are as follows:

- **Provide follow-up support** – The CAWM approach was implemented at a particular location over the course of a single year, only. The consensus now is that a 3-year support period is required; the first year to construct new infrastructure, the second year to introduce a new cropping pattern and the third year for further finetuning. It follows that it is recommended that follow-up support is provided to the CAWM locations that were completed in preceding years.
- **Establish SMART targets, outcomes and outputs** – to ensure greater clarity of the respective roles of implementers, partner agencies (DAE) and BGP management.
- **Diversify production choices supported by CAWM** – In Patuakhali, the focus should remain on

short-duration T. Aman in combination with attention to rabi cultivation. However, elsewhere other combinations of product and water management can be supported, such as:

- Low lift pumps (LLPs) or shallow tube wells (STWs) for irrigated rabi crops;
 - Involving BIRRI and IRRI in CAWM activities;
 - For Khulna, introduce other land use such as smallholder ghers.
- **Standardise procedures** – SSWMI cost estimates and designs should be adopted for future CAWM schemes.

17.3 In-Polder Water Management as a step forward

Neither the track record of polder development nor that of participatory water management in Bangladesh is particularly good. Where polders (and other water management infrastructure, for that matter) are caught in a vicious cycle of ‘build – neglect – rehabilitate’; participatory water management has not – or hardly – lived up to its promise of changing the neglect of infrastructure maintenance into lasting care. In fact, only few water user organisations continue to exist beyond the duration of the projects that established them. Nonetheless, polders and embankments are recognised to be an essential part of water security in the coastal zone, as seen by the hue and cry over eroded embankments and defunct sluice gates. Likewise, local water management organisations have proved their worth in pinpointing and addressing water management issues, be it often only for the duration of a project intervention.

While the deeper causes of the above dual problem of failing infrastructure and failing care merit a profound analysis; this section – rather than dwelling on shortcomings – puts forward the strong conviction that in-polder water management has the potential to make the combination of polder development and participatory water management work better.

This assertion is made in the full realisation that BGP started systematically addressing in-polder water management only from 2016 onwards; and that BGP’s initial steps in this arena were cautious and therefore lacked momentum. The conviction that IPWM would help make polder development and participatory water management more sustainable is therefore only loosely based in evidence, and more rooted in the expert judgement of those involved.

Lesson 1: In-polder Water Management adds value to ‘peripheral’ polder infrastructure

Embankments, sluices and primary khals alone help reduce the occurrence of flooding; the inflow of brackish water and sediments; as well as some waterlogging in a polder; but it does little to speed-up drainage of the interior lands, does not help retain water for relatively elevated lands and does not improve conditions of interior areas that are altogether disconnected from the main system. Internal polder water management – which can be defined as establishment of desired local water levels through development of arteries into the polder and the control over the water flows therein – uses the opportunity provided by the main infrastructure to ensure locally-specific optimised combinations of water management and production choices. Primary infrastructure alone cannot serve the interests of all polder dwellers. To improve livelihoods in all parts of the polders, secondary and tertiary infrastructure is needed.

Investments in in-polder water management are relatively cheap, while the increase of income for involved farmers can be high. Payback times of less than one year are no exception. A typical sluice would cost around 200 lakh BDT per catchment, while BGP estimate that with 10 to 30% of this amount, most of the secondary and tertiary infrastructure in a catchment can be constructed, excavated and optimised.

Like the infrastructure of large irrigation systems, the infrastructure of a polder is ‘nested’. This means that there is a local or tertiary level, which sets its water management routines within the possibilities of

the sector- or secondary system; which in turn depends on the conditions determined by the main- or primary system. The interconnectedness of these three spheres of a polder and their coherent functioning, maximises the benefit that can be had from investment in polders. Polder development requires in-polder water management to be developed along and in harmony with the development of the main infrastructure, which is located on the periphery of the polder. This periphery forms the interface between in-polder water management and external river system.

Lesson 2: Actions to improve local water management enhance responsibility for higher order infrastructure

BGP showed that communities are highly interested in water management interventions in their vicinity. They are willing to plan and contribute to infrastructure that creates improved water management conditions as a common good for a group of producers. The ability to better control water in a sub-catchments (a tertiary unit) is likely to encourage the beneficiaries to pursue their water management interests at larger scale as well; i.e. in their WMG and through that in a catchment O&M subcommittee. Similarly, being able to ensure a good performance of a secondary khal through better maintenance or even through development of intermediate infrastructure, would encourage water users to pursue their interests at the level of the polder; and thereby to enhance accountability for proper maintenance and operation of main infrastructure (embankment, sluices and primary khals).

Another way in which the processes at local and catchment level provide a stronger basis of overall management of the polder is that in the development of small-scale infrastructure and of catchment plans local organisations, such as the Union Parishad and government agencies such as BADC and LGED played a supportive role. They reviewed plans, committed support to certain actions and provided financial contributions to maintenance work and even to investments. Of course, there is an element of the local authorities wanting to be associated with beneficial interventions; but these joint activities also forge a partnership between WMOs, LGIs, department and possibly other relevant actors. Such a partnership constitutes an important condition for responsible behaviour of all concerned with respect to the overall performance of a polder and with respect to the integrity of its primary infrastructure, i.e. embankments, sluices and primary khals.

Through Blue Gold, O&M Agreements (examples provided here in Bangla and English) have been used to set out the respective responsibilities of BWDB and WMAs for routine, periodic and emergency maintenance. The main purpose of the agreements is to sustain the benefits arising from bringing land into cultivation – to protect the land from further waterlogging and to bring new land into cultivation. By February 2020, these agreements have been signed for all polders by the respective Executive Engineer of BWDB's O&M Division, and by representatives of 36 WMAs.

To encourage good practice in water management, two versions of a manual for WMO executive members and BWDB field staff were prepared: a 'text-based' manual (in Bangla) for a more literate audience; and a 'picture-based' manual for an audience that is less familiar with text-based advice. During preparation of the manuals, Blue Gold worked closely with field staff, WMO executives and other WMO members and incorporated their feedback to ensure that the manuals serve the needs and interests of farmers and fishermen. Feedback sessions with BWDB zonal staff have been used to establish that all required material is covered. Copies of the manuals were distributed to WMOs during the first quarter of 2021.

Lesson 3: Polder development requires integrated top-down and bottom-up planning and realisation

While the point that polders should be understood as a nested system of primary, secondary and tertiary infrastructure is hardly contested; the traditional approach to polder development would be to work from the outside in; i.e. starting with embankments, sluices and main khals, towards secondary khals and intermediate infrastructure; and on to finish with work at the local, tertiary level. The traditional approach to Participatory Water Management, would have it the other way around: beginning with local

improvements and building-up confidence towards higher order infrastructure step-by-step. Within BGP, this led to an imperfect situation: WMAs were last to be formed and therefore still immature at the time that primary infrastructure was reaching completion; whereas WMGs were established early on, but had a long wait before they were practically involved in water management through activities related to small-scale infrastructure.

In BGP, the realisation has grown that outside-in and inside-out planning are complementary processes, which can and should take place simultaneously and which should be mutually reinforcing. This can be achieved by:

- Include investment categories for main infrastructure, intermediate infrastructure and small-scale infrastructure in the development project proforma; each with appropriate modalities for (co-) investment.
- Start implementation planning by initiating cooperation for the development of the polder between implementing agencies, locally present departments and local governments, with the proviso to expand the cooperation to other relevant actors, including the private sector;
- With the help of local governments and other local actors facilitate the development of new water management organisations from the outside in: I.e. first form a WMA that is responsible to promote user participation in the polder, and then help this lead the process of establishment of catchment committees and WMGs;
- Develop an understanding of the future polder, including its production potential for crops and fish and the hydrological processes underpinning this potential through studies and interaction with the user organisations;
- Run annual planning rounds for the polder as a whole, for each catchment and for each WMG and inform decisions on investments an annual development plans with the outcomes of these rounds. In this way, implementing agencies and the WMOs may be able to improve functionality of a particular infrastructure in conjunction with other infrastructure.

Lesson 4: The significance of a well-performing polder extends beyond higher production only

In the post-independence period, investments in polder were justified by their impact on incremental production. The incremental production largely comprised of higher average Aman yields caused by the reduction of flooding and the exclusion of saline water; although in time there came recognition for the contribution made by other crops and in other seasons and, eventually, for the productive potential of fisheries in a managed water environment.

At present, the coastal zone faces the enhanced risk profile caused by climate change: deeper intrusion of salinity; continued sedimentation of external rivers, higher variability in rainfall and drought, a higher risk for storms and storm surges and continued and intensified unpredictable riverbank erosion. Polder development – combining peripheral works with in-polder water management – enhances the resilience of communities to these effects. This is done by promoting a diverse production system, by building local responsibility towards the integrity of the polders and by enhancing local economic development. Polder development is part of the answer to increased climatic risks.

The significance of a polder also extends beyond the locality. A robust local economic development in the polder helps lessen the migration to urban centres, helps ensure that the urban diet is supported by nutritious food produced that needs not be imported and adds momentum to the wider development of the coastal zone. The new road, rail and port infrastructure being developed in the southwest provides the opportunity for the region to become an agricultural powerhouse for vibrant national economy.

As the infrastructure supports more than just local incremental production, it follows that the responsibility for the primary infrastructure cannot be carried by local organisations only, and requires clear mechanisms for sharing the long-term cost of maintaining such infrastructure.

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18 The Water Management Partnership

The Guidelines for Participatory Water Management^[1] and the Participatory Water Management Rules^[2] provide a legal basis for the establishment of Water Management Groups and Associations and regulate – in considerable detail – their functioning. While a legal basis is important, the new organisations also need to simply prove their worth if they are to be seen as a serious factor in water management. Making a difference by hands-on improving water management conditions, as described in chapter 17 helps; but recognition as being a legitimate player also requires that the new organisations establish cordial working relations with existing, well-established organisations in their locality. Such a partnership is all the more important, as partners help a new organisation achieve goals that are beyond its own limited capacity.

A central relationship, on which WMAs should build their performance, is of course with BWDB. This is not only because the BWDB is the registrar for WMGs and WMAs, but especially so since the BWDB and the WMAs have a shared responsibility towards the upkeep of the polders.

- In the coastal zone proper water infrastructure for flood protection and water management is essential for protection of the polder inhabitants and for their economic development, in particular agricultural production. Any damages, whether due to natural disasters, erosion or manmade, will undermine the functioning of the water infrastructure. The costs for maintaining the infrastructure can be high, even more so when emergency repairs are needed after disasters, such as floods or cyclones.
- The costs for maintenance, repairs and rehabilitation are substantial and the BWDB generally has an O&M budget that is not adequate to meet all the requirements. Local government institutions (LGIs) neither have the mandate nor the budget to take up repair and maintenance costs; and for local communities the required sums would take-up a substantial part of the value added in agriculture, due to the protection offered by the embankments. The fact that the polders protect life and goods of a substantial population and economy, should mean that maintenance is funded to an extent by public resources. Possibly, the LGIs, which are public institutions close to the communities benefiting from well-functioning infrastructure, should have a mandate and budget for such maintenance and/or repairs. The 2018 Water Rules created opportunities for an increased role of LGIs in Integrated Water Resources Management, but this still needs to be elaborated.

- Under Blue Gold, a transitional solution was therefore sought, which comprises of an O&M Agreement per polder signed between the WMAs and BWDB. The purpose of the agreement is to sustain the benefits of the improved water infrastructure by setting out the responsibilities for operation and maintenance. Operation especially refers to operating the hydraulic structures to optimize water management; maintenance refers to routine, periodic and emergency maintenance. A sample O&M Agreement is available in Bangla and in English. The main responsibilities that are spelled out in the agreements are presented in table 18.1.

Table 18.1: Main responsibilities for Operation and Maintenance of water infrastructure as in the O&M agreements signed between WMA and BWDB.

| # | Water infrastructure | Operation | Routine maintenance | Periodic maintenance | Emergency maintenance |
|---|--------------------------|-----------|---------------------|----------------------|-----------------------|
| 1 | Embankments | | WMA | BWDB | BWDB |
| 2 | Hydraulic infrastructure | WMA | WMA | BWDB | BWDB |
| 3 | Channels (khals) | | WMA | BWDB* | BWDB |
| 4 | IPWM infrastructure | | WMA | WMA | |

**Based on the demand of WMA*

By February 2020, O&M agreements had been signed by BWDB's Executive Engineer and representatives of the Executive Committees of 35 WMAs for the 22 BGP polders. Special agreement signing ceremonies (batch 1, batch 2 and batch 3) have been organised, wherein usually also high level representatives of LGIs (Union), BWDB, DAE and BGP were present, to endorse the agreements.

It is as yet too early to draw conclusions whether the agreements are implemented by the parties concerned. However, the WMAs would be well-advised to not rely on only its relationship with BWDB, but to look for partners in their close vicinity to help them play their role in water management for local economic development.

National legislation, policies and development plans and budgets are steadily moving towards a greater role for and reliance on local governance institutions. This provides opportunities for local governments – and especially the Union Parishads to assume more prominence. Inhabitants of the Southwest and especially the poorer segments stand to benefit from local governments that are partner in securing services, and which contribute to the efficiency and sustainability of these services^[3].

At the project's initial stage, the community mobilisation by BGP paid little heed to the role of the Union Parishads vis-à-vis water management; beyond the legal provision that the UP Chairman is an advisor to the WMG. As a follow-on to the study referred to above, BGP prepared in 2015 a sourcebook of examples existing on the ground of constructive cooperation between WMGs and Union Parishads^[4]. This proved that – despite of not being strongly pursued by BGP – support from Union Parishads to WMG establishment and performance is an existing and generally successful practice. Where WMGs are good at articulating the aspirations of communities with respect to water management; the UPs were able to ensure orderly WMG elections; helped resolve conflicts of WMGs with third parties; e.g. in the case of obstructed drainage flows; and provided authority to WMG action such as canal cleaning. Union's moreover showed leadership in emergency response and were helpful in obtaining right-of-way for construction of new embankments.

From this point in 2015, the involvement of LGIs and specifically the Unions with the WMOs and with BGP was pursued more systematically and actively:

- Induction workshops were held with the Unions and Upazila at the time of entry of the program in a particular polder to explain objectives and request active support. Where, in a number of cases, BGP's intervention had already started, this resulted in a degree of initial push-back, fed by the frustration of being involved late in the process; but most of these workshops concluded with commitment by LGIs to the implementation of BGP
- WMGs were more explicitly promoted to build good relations with the Unions; and the quality of their relation with the Union became a criteria in the monitoring system and in the self-monitoring promoted by BGP
- Capacity building events for WMGs and WMAs involved LGI representatives and explicitly paid attention to planning joint activities and building a good relationship
- LGIs were involved in the catchment planning process and were fully informed of the O&M agreement that was developed between the WMA and the BWDB. A logical further step would have been to appoint the LGIs as the third party in the polder-level O&M agreement alongside the WMA(s) and the BWDB O&M Division, but this would have required a lengthy process of adjustment to the BWDB Participatory Water Management Rules
- Once WMAs were established, BGP organised interactive sessions per Upazila where the WMA presented itself and its aspirations to the concerned local governments and the departments that had been decentralised to this level

At the same time, WMGs – and later on also the WMAs – were promoted to engage with other organisations, agencies and companies for the realisation of their aspirations. This often matched with the 'collective actions' undertaken by WMGs or WMG members. When the purchase of inputs was coordinated across a WMG or a sub-section thereof, this led to a stronger relationship with market partners; where co-funding was sought for small-scale infrastructure, relations with e.g. LGED were developed. Experience shows that the legitimacy of a WMO (WMG or WMA) depends on the respect it can gain from its constituents and from other local organisations. A strong focus on networking and partnership must therefore be a core element of building the capacity of new organisations.

The present regulatory framework for the WMOs places great importance on the centralised review of the WMO performance, especially in the field of maintaining basic organisational routines (regular meetings, good note keeping and financial management, timely elections and so on) but does not define how WMOs interact with and depend on their local network. Especially the role of the UPs vis-à-vis the WMGs is poorly defined. The articulation of an explicit role for local governments in the future practice of PWM is an essential improvement that needs priority attention.

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19 Operationalisation of the PWM concept

In the national process of developing guidelines and rules for Participatory Water Management, the broad definition of PWM was focussed and – in effect – narrowed-down¹ (*see chapter 4.1*). The opposite tendency took place in the application of the Participatory Water Management Rules from the onset to the completion of BGP. The experience in BGP shows how, beginning with the project formulation, the PWM-concept took on a wider meaning. This amplification can be described by four trends, discussed in the next sections, followed by a final discussion on the future of PWM ('sustainability').

19.1 Trend 1: 'Water management through business development' or 'business development through water management'

A first and fundamental amplification of the PWM concept took place as early as in the program document. Here, the WMOs were – in line with the then applicable rules – defined as cooperatives and the project document amplifies their role from managing local water resources to business-oriented organisations, specialised in agriculture and with back- and forward market linkages. This amplification justified the involvement of the Department of Agricultural Extension (DAE) as an implementation agency for BGP alongside BWDB; as well as the involvement of the Department of Cooperatives as a partner agency. The justification for the amplification is that a direct link between water management and economic development would result in both a need for timely maintenance as well as in the resources to implement timely maintenance.

To ascertain sustainability, the Program will put more attention on the cooperatives, as driver for economic development, and the productive sector as the main basis for the economic development envisaged.^[1]

¹ In the trajectory from the 2001 Guidelines for Participatory Water Management to the 2014 BWDB Participatory Water Management Rules the ambition vis-à-vis consultation has been toned down and a great deal of flexibility in the constitution of Water Management Organisations was removed. See Section 5.1

For some stakeholders, the ‘role of cooperatives as driver for economic development’ meant that BGP should strive to develop multi-purpose cooperatives, that would work as independent business entities. Others, already at an earlier stage of the project implementation, deemed the establishment of Water Management Cooperative Associations fundamentally flawed, as adhering to collective decisions by a large group of farmers and fisherman, with diverging production systems and wealth bases, would go against human nature. This is especially worrisome as Water Management Cooperative Associations (WMCAs) comprise substantially more members per organisation than what is normal for the agricultural cooperatives registered under the Cooperatives Act; and this was cause for some concerns on their viability in the Department of Cooperatives.

The BWDB, in a move to relieve water management organisations of the obligations associated with registry under the Cooperatives Act, drafted Rules for Participatory Water Management (gazetted in 2014), which introduced Water Management Groups and Water Management Associations under registration by the Office of the Chief Water Management of the BWDB. WMOs no longer had to issue shares to their members and no longer possessed the mandate to be run as a business.

The view that WMOs should work as business entities was, however, resilient and continued to be upheld as an ideal for BGP. This was most clearly expressed by the Mid-Term Review Mission of 2015.

The goal would be for WMOs to develop as multifunctional business entities with O&M of infrastructure and water management as a key task.^[2]

Well into 2017, a community mobilisation expert engaged on recommendation by the 2016 Annual Review Mission argued for:

... developing WMO as a “members’ share-holding entity” so that profits from WMO-managed services and other business would provide additional income to members and enhance share value.^[3]

As said, the legal basis for setting-up WMOs as business entities had by this time already been removed by the 2014 Rules for Participatory Water Management. Moreover, the inherent risks of doing business were perceived as too high and potentially dangerous to the core public function of managing water resources. Community-based organisations generally do not possess the business acumen that the private sector does; and failure of the WMG’s business enterprises could subsequently affect the organisation’s capacity to manage water resources; or even affect its continuity.

The outcome of the protracted debate summarised above is that BGP focussed on improving local water management to support higher production and profits, while stimulating smaller or larger groups within the WMOs command area to undertake collective actions, such as input supply, coordinated marketing and high value crop cultivation.

BGP’s slogan ‘water management for development’ had existed since the project’s inception. By defining the role of water management organisations as concerned primarily with creating conditions for ‘business’; the slogan in earnest became the flag under which BGP would henceforth perform.

19.2 Trend 2: Supporting functional water management organisations

A second area in which BGP's interpretation of participatory water management evolved – and by which the concept was indeed amplified – was in the formation of water management organisations.

In the period 2013 into 2015 BGP, and especially its TA team, assumed a strong focus on the formal establishment of WMGs in accordance to the applicable regulatory framework. Whereas the component was named 'community mobilisation and institutional strengthening'; the focus was clearly on the first aspect and even more so on achieving targets in terms of number of WMGs being registered. This focus was driven by two circumstances:

- The first batch of polders where BGP engaged comprised of polders supported by the precursor IPSWAM project. This meant that WMGs and WMAs had already been established under the Cooperative Act. A survey in 2013 found, however, that of 242 WMGs formed in 9 former IPSWAM polders three-quarters required reorganisation (including over 40% of those being labelled as 'dormant' or inactive).^{[4][5]} Similar percentages apply to the status of 21 WMAs established under IPSWAM. What should have been relatively easy (re-engaging with IPSWAM WMOs) proved to be more work than expected;
- In 2014, when good progress was achieved in re-vamping organisations, GoB published ('gazetted') new rules for BWDB Participatory Water Management. As a consequence of this, the Water Management Cooperative Associations were de-registered as cooperatives and re-registered as WMGs under BWDB's Participatory Water Management Rules PWMR (2014).

The expanded work load resulted in time pressure; under which WMG formation was expedited by emphasising to incumbent members that membership offered a wide range of benefits, including access to earthwork opportunities for landless people; participation in farmer field schools (including the opportunity to get free seeds and fertilisers) and provision (through FAO) of free farm machinery to be jointly managed. As a consequence, there was a rapid influx of WMG members, but the function of the WMG – other than being a conduit for free services – was obscured.

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In the course of 2015, the valid concern was raised whether the re-established WMGs would not face the same future as their predecessors in IPSWAM; i.e. rapidly becoming dysfunctional and 'dormant' upon withdrawal of project support. Substantiated by a review of the frequent and positive relations of active WMGs with Union Parishads, BGP postulated that for WMGs to remain active they should become part of a local partnership with LGIs, line departments, other community-based organisations and private sector agencies^[6] (*See also chapter 18*). WMG actions with respect to water management benefit from the active involvement of and support from Unions; and this relationship is likely to help sustain the WMG.

While promotion of cordial relations with LGIs proved useful, the focus on building organisations that comply to the letter of the regulatory framework remained strong. In the period 2015 – 2017, the BGP TA team took several steps to enhance the focus of the field staff on making WMGs functional:

- A field manual on Participatory Water Management (in English and Bangla) was issued in early 2017, after extensive discussions within BGP and within its TA team. The field manual describes a unified approach, whereby all erstwhile component activities of the TA team were made part of a single work process per polder. No longer was community mobilisation an activity separated from agricultural development or business development. The functionality of the WMG was defined as the outcome of combined actions on organisational strengthening, agricultural transformation and business development;
- While since 2015, WMGs were supported to undertake or facilitate collective economic actions, the focus on actions with an element of improved water management was enhanced. This was best expressed by an approach for stimulating optimisation of water management for an improved cropping pattern, known as Community-led Agricultural Water Management (CAWM). Here agricultural advice and inputs, improvement of local infrastructure and organisation of farmers were combined to introduce short-duration HYV T Aman paddy, followed by early drainage and the production of one or two dry season crops, using residual moisture and sometimes supplementary irrigation;
- Integrated polder teams were formed, designating all erstwhile component field staff as Community Development Facilitators and delegating a greater degree of autonomy to the TA polder teams on how to support the WMGs in their polder;
- Instruments to gauge WMG performance were re-defined using criteria of functionality; rather than criteria that relate to organisational establishment only. Thus, indicators were framed in the fields of partnership, water management and economic orientation.

In addition to gearing the field staff more towards WMG functionality, also WMGs and WMAs were supported to play an explicit role in water management:

- Water management planning was supported through a catchment planning exercise, whereby - based on the aspirations of the constituent WMGs - a priority plan was made for each catchment; which were in turn consolidated at polder-level;
- technical assistance and funds were made available for the development of small and intermediate water management infrastructure by WMGs;
- To set a standard for good practices, **water management manuals** (pictorial version and full-text version) have been developed, in particular for the use by the executive members of WMGs and WMAs. These manuals encourage good water management practices, thereby also serving as source of knowledge and information for future executive members, who did not receive BGP support. Two versions of the manual were developed, both in Bangla: a 'text-based' manual for a more literate audience and a 'picture-based' manual for an audience that is less familiar with text-based advice.

The Water Management Manuals were developed in close cooperation with field staff and representatives of WMGs and WMAs. Their feedback was incorporated in the manuals to ensure that the needs and interests of the communities are served, especially those groups most affected by water management as farmers, fisherfolk and gher operators. Feedback sessions were held with BWDB zonal staff, to ensure that all required topics had been covered. In the first quarter of 2021 copies of the manuals were distributed to all WMAs and WMGs in the 22 BGP polders. The content of the manuals can be summarized as follows:

- Introduction to water infrastructure in the polders
- The reasons why operation and maintenance of infrastructure are required
- How proper water management can increase crop and aquaculture production, and thus incomes
- Responsibilities of WMGs and WMAs for the operation and maintenance of water infrastructure, including the scheduling of sluice operations
- Catchment planning and O&M agreement, focusing on the complementary roles of BWDB

and WMAs, also addressing the required resources for O&M, such as cash and in-kind (labour) contributions, internal decision-making on O&M, and the option of enforcing agreed measures, if occasionally needed.

- Resource mobilization by WMOs (WMGs and WMAs)
- Practical advice on the operation and maintenance of the different infrastructural works in the polders.

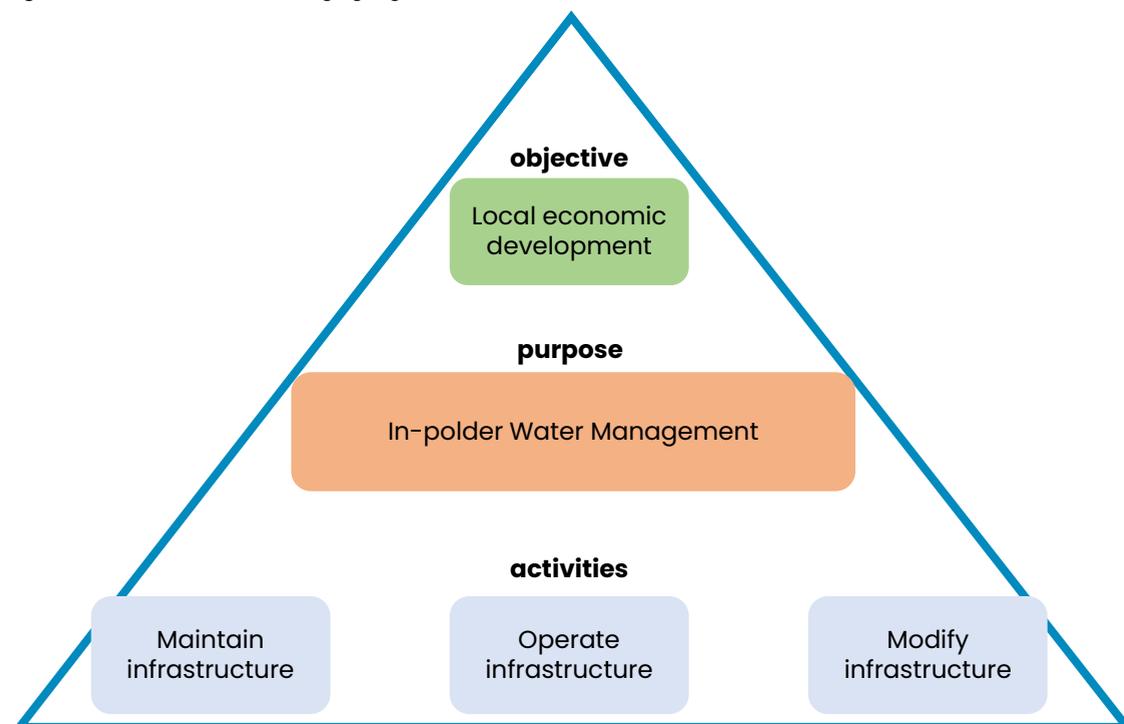
19.3 Trend 3: From O&M to Local Economic Development; from task to mandate

The third amplification of the role of WMOs is the interpretation of the core responsibility of the WMO. The original view, loosely based on the PWMR and explicitly expressed in the TA Inception Report, is that the scope of responsibility of the WMO is operation and routine maintenance of infrastructure (with BWDB remaining responsible for periodic and emergency maintenance). This scoping of the responsibility of the WMG and/or WMA reflects concerns on the sustainable functioning of the infrastructure that is constructed or restored by BWDB. Briefly put: WMOs are formed to keep the infrastructure running. This scope is strongly task-based (operate and maintain) and output-centred (infrastructure in working condition).

Gradually, however, the scope for which the WMOs are established and supported became more comprehensive:

- In addition to mere operation and maintenance, the WMGs and WMAs widened their activities in the field of water management:
 - From 2015 onwards, WMGs were assisted through the Community-led Agricultural Water Management instrument to move beyond operation and maintenance of the infrastructure as is to include actions to modify the water system and its associate infrastructure. New canals were dug and small-scale infrastructure made or rehabilitated;
 - During 2018 and 2019, matching grants were provided for development of small-scale infrastructure by the WMGs. In effect, this provided an added possibility to modify the polder system.
- Both CAWM and the matching grants for small-infrastructure enabled a substantial portion of the WMGs, or sections thereof, to control the water system around them. This was further pursued when, from late 2017 onwards, Catchment O&M plans were developed. Through the O&M catchment sub-committee of the WMA, WMGs in a sluice catchment jointly develop an activity plan for the management of the whole catchment. The focus on keeping infrastructure running changed to a scope on running the water system. The output of WMOs was redefined to 'in-polder water management';
- As remarked already above, participatory water management has in the course of BGP increasingly been placed in a context of economic development. WMOs are not merely there to keep infrastructure in working condition or to pursue in-polder water management; they are there to enable local economic development through water management. This provides a strong justification for their close relation to local governments, line agencies, other community-based organisations and the private sector; but always from the realisation that they are primarily an in-polder water management agent. The scope of responsibility was augmented with an objective at outcome-level (local economic development);

The above argues that the scope of the WMGs has widened to include more activities; and that the initial task-centred scope transformed into a full organisational mandate, covering activities, purpose and long-term objectives.

Figure 19.1: WMG and WMA emerging organisational mandate

Some of the WMGs supported by BGP have indeed progressed to take up a broader responsibility for in-polder water management, thereby striving to create conditions for improved production and subsequent local economic development. Other WMGs still remain focused on basic O&M tasks only, without heeding a wider mandate.

In 2019, twenty-seven of 36 WMAs are assessed to be functional.^{[7][8]} In a self-assessment by WMAs in late 2020, 21 WMAs came out as good, and 14 as medium, while one did not participate in the exercise.^[9] So while the trend for now appears to be positive, it is not guaranteed that the WMAs will be able to hold on to this level of performance. Nor is there much certainty that those WMGs that presently still have a restricted scope will develop into purpose- or objective-driven organisations by their own volition after project completion.

One area of concern for the future sustainability of WMOs is that the regulatory framework, while allowing them to enter into the area of in-polder water management, does little to enable their involvement in planning of major infrastructure. As Bangladesh is emerging on a long-term investment strategy for better water resource infrastructure, this is a remarkable omission.

19.4 Trend 4: Unit of organisation: from pre-defined to pragmatic

The coastal polders that BGP works in range in size from 500 ha to 17,500 ha and are considered to be medium-sized water management systems. The PWMR (chapter 3, clause 5.3) defines three nested tiers of water management organisation:

The coastal polders that BGP works in range in size from 500 ha to 17,500 ha and are considered to be medium-sized water management systems. The PWMR (chapter 3, clause 5.3) defines three nested tiers of water management organisation:

(3) For medium sized projects two- or three-tier Water Management Organization will be formed, as indicated

below:

- a) Water Management Group (WVG) at the primary level;
- b) Water Management Association (WMA) at mid-level; and
- c) Water Management Federation (WMF) at the apex level^[10]

As BGP continued where IPSWAM left off, initial decisions with respect to the scale and relative position of the new entities adhered to the previous experience. This means that WVGs were (re-)established along village boundaries. In five of the nine IPSWAM polders, a single WMA was established at polder level, whereas in two polders two WMAs each were formed. The remaining two polders had each six WMAs, which were either in need of reorganisation or fully inactive.

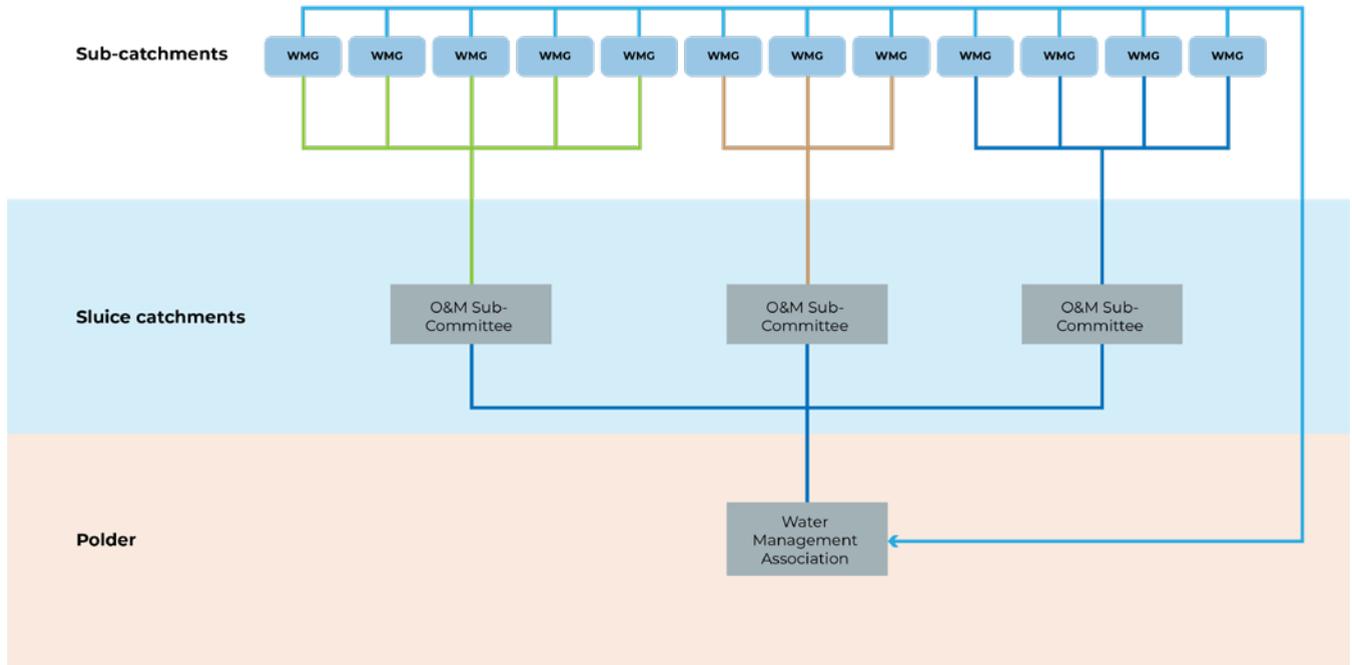
BWDB subsequently stipulated that WVGs were to be formed on a catchment/sub-catchment basis and that each polder would be represented by one WMA.² This decision was applied as follows:

- There has been no retro-active implementation, meaning that the first batch of 9 polders (the IPSWAM polders) remained village-based; whereas the 13 polders taken into the program at a later stage did form WVGs per (sub-) catchment. As a consequence, the average area of cultivable land per WVG in the earlier nine polders is 133 ha, whereas for the later batches the cultivable area per WVG increased to an average of 232 ha. The average number of inhabitants went up as well from 1,150 per WVG to 1,870;
- Delineation of the sub-catchments followed existing roads and other topographic features. Proposals by the TA team were reviewed by the WVGs, sometimes modified and subsequently agreed upon. Given the extremely flat topography, hydrological boundaries cannot be defined otherwise than with a degree of arbitrariness;
- The 'one WMA per polder' decision has been applied with flexibility. Larger polders may have more WMAs, and polders with a history of small WMAs (especially polders in Patuakhali) were allowed to retain more than one WMA for historic reasons. However, only one O&M agreement per polder was signed between BWDB and all WMAs of the polder;
- Each polder has several (2 – 3) main regulators or outfall sluices that control the drainage to the river system, which each serve a catchment. *“However, it is not desirable and possible for the WMA to make detailed decisions in O&M in every catchment of the polder. The formation of a limited number of O&M sub-committees gives the WMA the opportunity to ensure their responsibilities are met through working with these committees. Communication between the O&M sub-committees and the WMA is ensured through including the WMA members in the O&M committees concerned”.*

In this way a three-layered structure of two organisational tiers emerges; shown in Figure 19.2. While the Catchment O&M sub-committee is a sub-committee of the WMA; it is constituted with representatives from the concerned WVGs.

The term 'catchment' that is used for WVG areas and for areas served by a sluice is not a geographically well-delineated unit. In the flat geography of the coastal zone the network of khals is very intricate and often connects an area via several outfalls to the main river. Moreover, due to the flat topography, the 'watershed dividers' separating different catchments are easily overflowed during rainy season inundations.

2 Chief Water Management BWDB, In reference to formation of Water Management Organization in the Polders under BWDB South zone Barisal and BWDB South-West zone Khulna within BGP, Letter 295(11) of 8/11/16

Figure 19.2: Structure diagram of the nested organisation of WMGs, catchment committees and the WMA

19.5 Sustainability – a discussion

Whether a sub-catchment has the prospect of improving its local water management for higher productivity and profitability depends on its topography and on the degree the area is served by the primary polder infrastructure. Especially relative elevation and proximity to a main khal are key determinants for the possibilities of early post-monsoon drainage and of water retention for dry season agriculture. WMGs that presently do not have a prospect to improve their water management will not be sustainable!

Likewise, the prospects of WMG sustainability in sub-catchments where – through WMG initiatives – the water management is optimised, are slim. Once the system is optimally configured and responsibilities for routine maintenance and operation are assigned, there is very little need for regular meetings and recurrent elections. It is not realistic to expect executives to continue their volunteer role once all improvements that could be identified have been realised.

The implication of the above is that WMGs are likely to be temporary organisations, that either become ‘dormant’ between periods of action for water management optimisation, or that need to be revived or re-established once new water management problems or opportunities are to be addressed.

At the same time, water management becomes a more continuous concern if a (sub-) catchment is larger. When a WMG becomes dormant, regular maintenance is ignored. This is not much of a problem if the infrastructure concerned comprises say a secondary khal with little to no annual sedimentation. But silt removal from the outfall of a sluice is, in a large part of the coastal zone, an annually recurring task. The larger the (sub-) catchment, the higher the need for organisations to stay ‘awake’ and to remain alive.

On the basis of the above, one could postulate that WMGs are actually temporary organisations that can be established whenever there is a need to address local water-related problems or opportunities. Once the problem is adequately addressed, the WMG would in all likelihood become inactive and, eventually, dormant. The implication is that in the post-project situation and whenever a new challenge or problem emerges, the WMGs will need to be (re-)established. Relying on OCWM to take this initiative is not realistic, as OCWM cannot be aware of the need for re-establishment. Relying on the Project is likewise not useful, as the Project would have been concluded. It seems therefore prudent that in future, local organisations, such as the LGIs or the WMA are empowered to initiate WMG (re-)establishment.

Secondly, one could postulate that the natural development path for WMGs is to either be short-lived; or to merge into larger units. It is conceivable that in future, a single WMG will coordinate stakeholder interests for an entire sluice catchment, thereby making the formation of Catchment O&M sub-committees obsolete.

Similarly, for those polders where – for historic reasons – there are several WMAs, the likely course of development is a concentration of these entities into one WMA per polder.

For future projects engaging in WMO formation the consequence is that the sequence of the intervention could be reversed. Rather than first building WMGs, then catchment coordination and only then WMAs; a future project could begin with building, hand-in-hand with the LGIs, a WMA at polder level and subsequently engaging it in forming WMGs at catchment level; and in stimulating rather more informal groups at local (sub-catchment) levels to take initiatives for better water management.

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20 Way forward

The story of Participatory Water Management in BGP – but also in Bangladesh as a whole – is one of two steps forward and one step back. Critics could easily argue that the experiment, initiated by the 1999 National Water Policy, failed; while champions for community empowerment could and would quote a long list of success stories. Truth is that there is no alternative to a greater public participation in water management decisions and that, despite promising experiences, Bangladesh has not established a viable modus operandi for participatory water management as yet. With ample experience gained and being gained through several projects, it is time for the implementing agencies and the sector stakeholders to go back to the drawing board.

The 1999 NWPo and the policy and regulatory framework for participatory water management that it helped establish, were a bold step forward towards enhanced public participation in water management. The experiences of BGP – and those gained in other similar projects – now show that it is high time to assess the progress made and to move forwards for taking a next stride.

For BGP, the need for modifications and amplifications in the enabling environment were clear as early as 2016. When articulating the project's Theory of Change^[1] and when devising its exit strategy^[2]; there was a clear and explicit realisation that the sustainability of the project outcomes critically depended on externalities with respect to the performance of WMOs. The question was, however, how the project – being by nature a focussed and clearly contained activity – could contribute to a review of something as wide as the enabling environment.

From 2019 onwards, BGP started pursuing a review of the enabling framework for participatory water management. Points of departure were (i) the modest role that a regional project has in something that is in essence a national debate; and (ii) the inherent national character of such a review, in which there should be little to no role for international consultancy. The way forward comprised the following:

- BGP could use its accumulated experience, network and resources to initiate discussions around participatory water management with stakeholders, policy makers and high-level stakeholder representatives. The resources for organising its completion conference, are therefore dedicated to initiating debate, rather than to the mere reporting of achievements
- The policy review is organised under the umbrella of the Bangladesh's Delta Plan and as such undertaken under the aegis of the General Economics Department of the Planning Commission, with the organisation vested in its 'Support to the Implementation of the Bangladesh Delta Plan' (SIBDP) project, and with Blue Gold supporting those preparations
- Involvement of reputed senior national experts, with support teams, to prepare policy notes on three aspects of PWM: its institutional setting, its financing and its overall approach. These senior experts are to act as pathway leaders for the sector and – although engaged through the TA team of BGP – have a free hand as to what expert advice they would provide

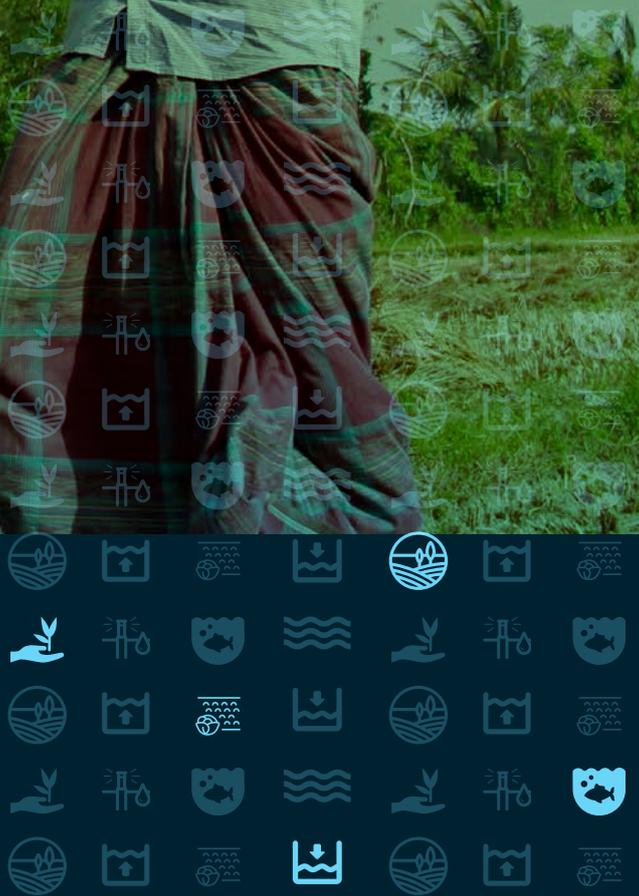
By mid-2020 the pathway leaders have drafted their policy notes, which will undergo a series of review events with stakeholder representatives ahead of the National PWM Conference, held in November 2021.

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Section E Agricultural Development



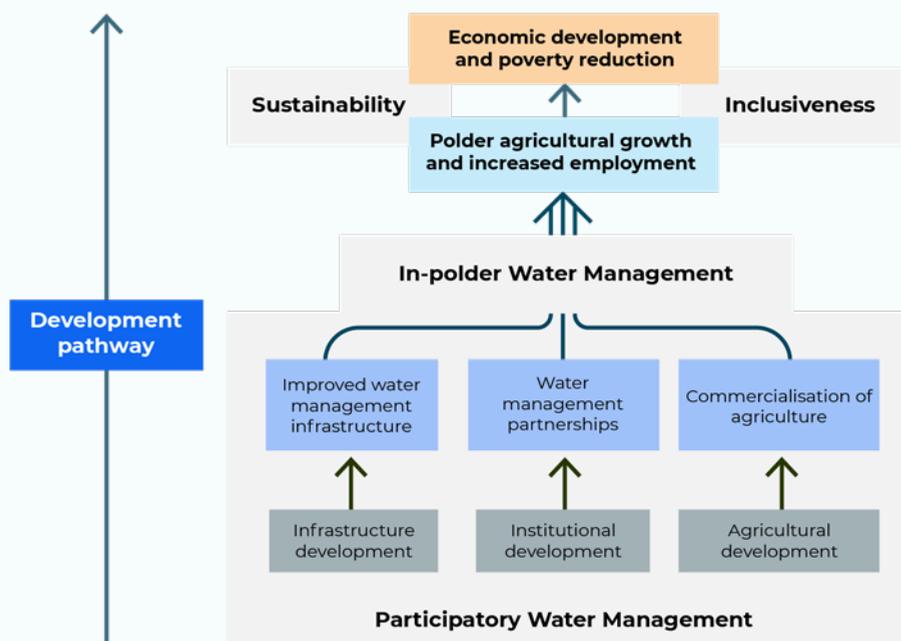
Section E Agricultural Development

Summary

The Theory of Change for the Blue Gold Program (BGP) describes the three main sets of interventions -infrastructure, institutional and agricultural development- as the core elements of Blue Gold’s approach.

This section E focuses on BGP’s agricultural development interventions which sought to enhance the commercialisation of agriculture. These interventions would work in synergy with the rehabilitation of infrastructure and the development of water management partnerships. By enhancing both the productivity and profitability of agriculture and fisheries, polder agricultural growth brings additional incomes and job opportunities.

Figure E.1: Simplified Blue Gold Program Theory of Change



E.1 Original intentions and evolving approach

The Program Document for the Blue Gold Program presented different approaches with distinct responsibilities to improve agricultural production, separating value chain or business development from agricultural development. At the start of Blue Gold, Water Management Groups (WMGs) were required to register as cooperatives, which meant that requirements of the Department of Cooperatives (DoC) had to be met, which to some extent diverged attention from water management. With progressive insight, facilitated by the change in registration of WMGs under BWDB instead of DoC in 2014, the approach towards WMGs evolved, more emphasizing water management as the focus of functional WMGs. Another

insight resulted in market orientation becoming integrated as a crucial element in the curricula of Farmer Field Schools, which formed Blue Gold's main agricultural extension approach. Thus agricultural extension and development became integrated in a Value Chain Development approach involving various market system actors along with producer groups. As households are heterogeneous and benefit unequally from infrastructural and institutional water management interventions, the approach to enhance agricultural production was differentiated as well. The interventions promoting commercialisation of agriculture focused upon those households which see their future in farming, and more particularly in cropping, meaning they have access to land. The focus of this section E is on those households with access to land, either own land or leased land.

BGP's interventions on increasing homestead production focused on landless households. However, also in this intervention, more attention to market opportunities was given from 2018 onwards, including promotion of "farming as a business". This is described in *chapter 25*.

E.2 Content of agricultural extension in coastal zones

The relation between water resources management (WRM) and agricultural extension in the coastal zone is rather particular. WRM in the polders is primarily about drainage of hydrological units, which goes beyond the fields of an individual farmer and thus beyond his/her individual control. Farmers producing in a same hydrological unit are destined to synchronise their production to a great degree, especially in the monsoon season. During the dry season, farmers can more easily differentiate production from one another as they can irrigate individually from available fresh water resources.

Insight in water resources and the extent to which these can be managed across the year is a key boundary condition for agricultural extension, in order to define and advice on improved cropping systems benefiting from aligning the opportunities of WRM to the crops' needs. But extension should also weigh the farmers' commitment to water resources management. Extension can enhance the farmers' motivation to operate the WRM infrastructure by an improved understanding of crop requirements for drainage and/or irrigation.

Water resources management and agricultural extension affect each other at four levels: a) an understanding of the local water conditions to define production potential, be it agriculture or aquaculture; b) taking production to higher levels by infrastructure improvements enabling better water management; c) an enhancement of infrastructure operation in relation to crop requirements to optimise production; and d) enhancing the understanding that the benefits from risk reduction and production improvement outweigh the investments in maintenance, operation and modification of the water management infrastructure.

E.3 Lessons for agricultural extension in coastal zones

Differentiated extension approaches – better targeted attention to those with access to land, and to those with limited access to land. The latter are better served by homestead-focused approaches .

Working with producer groups – cooperation of farmers in groups is required to improve drainage, but working in groups also facilitates collective actions, such as joint input purchase.

Demand driven – leave out what farmers already know, focus on key technologies and skills, and be locally adaptive.

Demonstrations – well defined demonstrations, providing links to other relevant issues through smaller sessions e.g. about the use of market information, improved technology, and the role of backward-forward actors. Thus no blanket approach trying to cover everything, but enabling discussion to identify and subsequently address farmers' practical problems.

Local resource network – lead farmers and Resource Farmers are ahead in their access to markets; they can help other farmers by facilitating market linkages. Since WMGs are established organisations, they should form part of the local resource networks through which farmers can access available resources and skills.

Sources of information – many information sources are available, but not really accessible to farmers, hence they need to become more ‘farmer-friendly’.

Better use Horizontal Learning events – promote learning through events and exchanges where farmers can learn from each other within peer groups or communities.

Involving private sector actors and companies – for example, through actively linking farmers to market actors, demonstrations by companies, and/or training of input suppliers by the agro-input retailers network.

E.4 Outreach and Cost of Commercialisation interventions

Blue Gold’s household-based Phase I Baseline Survey of 2014 in eight polders found a considerable variation in access to land and reliance on farming across all households. The proportion of households with access to crop land and with basic assets to cultivate this land was between 45% and 65% of all the households in the various polders. On this basis Blue Gold estimated that 55% of the total 185,000 households in all 22 BGP polders (which amounts to just over 100,000 households) own or lease crop land and are directly affected by water management interventions for crop production. Blue Gold’s main interventions to commercialize agricultural production were the implementation of 1,358 Farmer Field Schools on field crops, 67 large and 628 small demonstrations, and many Horizontal Learning events, including FFS-related Farmer Field Days, Demonstrations, Melas and Exchange visits.

The combined outreach for commercialization of agriculture, in terms of households reached directly through program interventions and indirectly through Horizontal Learning events, is calculated to be 78,257, based on various assumptions and adjustments for multiple participation as well as for applying the learnings. This means that nearly 80,000 households have been reached, while the potential target group was determined as about 100,000 households. In fact, Blue Gold reached 42% of the all households in the polders with the commercialisation interventions, which compares quite well with the 55% of the households which were estimated to have access to land and as such potentially able to benefit from BGP’s water management and commercialisation interventions.

The total cost of the commercialisation programme amounted to Euro 1,410,000, which covered the actual cost of all individual programme interventions related to the commercialization of agriculture. The average cost of FFS interventions was 40 Euro for each household that was directly reached. Considering the additional households reached through Horizontal Learning, the average cost dropped to 17 Euro per household. In contrast, the less resource intensive Cropping Intensity (CII) demonstrations cost 11 Euro per participant, which is just over a quarter of the FFS costs per directly reached household, and only 3 Euro per household directly and indirectly reached. The CII costs are lower per household than the FFS costs because there are less sessions in the CII approach, whereas the impact appeared similar to FFS.

E.5 Outcomes of Commercialisation interventions

The outcomes of commercialisation can be captured in three ways: changes in land use and crop types, increase in cropping intensity and increase of yields per unit land. The below findings are based on the 2019 WMG survey as presented in Blue Gold’s Technical Report 26.

E.5.1. Changes in land use and crop types

Since the start of BGP there have been significant changes in land use and cropping. In Khulna the biggest expansion has been an increase in the area under fish ghers; the area of paddy went up with more boro paddy being grown in the rabi season. In Satkhira there has been an even bigger increase in area of fish ghers (the area has doubled), and there has also been an increase in boro paddy. There are virtually no fish ghers in Patuakhali and there was little change in the area of paddy, however, there was a significant increase in area of non-rice crops in the rabi season, primarily mung bean.

In all three zones together there were increases in the total area of both paddy and non-rice crops, but the increase in area under fish ghers was greater than the combined increase in paddy and non-rice crops.

In all areas there has been a move towards more productive types of paddy: most boro is now of the more productive hybrid type, whereas there was a switch from local aman and aus varieties to HYV varieties. In non-rice crops there was a shift towards more profitable crops, for example water melon; in Patuakhali mung bean replaced keshari, a local pulse crop.

E.5.2. Increase in cropping intensity

Overall cropping intensity has increased by 41 percentage points, from 187% before BGP to 228% in 2019, with a larger increase in Satkhira of 76 percentage points - largely due to expansion of fish ghers in polder 2. Increases in cropping intensity were reported for 80% of the surveyed WMGs and for all polders, apart from polder 28/2, which recorded a fall of 34 percentage points due to land being absorbed by urban expansion of Khulna city. In the Khulna polders that were also included in the 2018 survey, a further increase in cropping intensity was reported in 2019, but there was little change in cropping intensity in the Patuakhali polders between 2018 and 2019.

On average WMGs with a greater improvement in water management (i.e. more reduction in water management problems) also demonstrated a larger increase in cropping intensity and a bigger increase in area under high yielding and high value crops. However, there is considerable variability in this trend so the relationship is not strong.

E.5.3. Yield increase

There has been a substantial increase in the productivity of paddy. Apart from the significant switch to more productive HYV and hybrid varieties, average yields of each type of paddy have increased by around 10% to 25%. There is a more mixed picture regarding the yields of non-rice crops, with significant falls in yields of some of the key crops in 2019, including mung bean and sesame, whereas the 2018 survey found an average increase of about 35% in mung bean yields. Farmers say that unpredictable weather conditions during the 2019 growing season, both excessive droughts and unexpected and heavy rainfall, adversely affected the yields of non-irrigated rabi crops. Some non-rice crops, however, demonstrated a good increase in yields as per 2019, such as sunflower and chilli.

E.6 Polder Economic Growth Impact

The Blue Gold interventions contributed to growth of agricultural production through increases in yields, cropping intensity and diversification. Along with farm production, incomes and labour requirements have increased, the latter also providing more income to landless households depending on wage labour for their livelihoods. In turn, the increased incomes boosted the demand for goods and services as well as trader volumes, and resulted in more jobs and higher non-farm incomes.

E.6.1. Increase in farm income

The improved cropping patterns and increased yields resulted in increased farm income. Based on model crop budgets for the main crops, net incomes for each crop were calculated for the ‘before project’ and the 2019 situation, demonstrating a net income increase of 89%, with more increase coming from aquaculture than from crops; though the relative increase was higher for crops.

To assess the payback period, the overall increase in net farm income was compared with the total BGP costs, including TA. For almost all Khulna polders the payback period was less than two years, and for many even less than one year. For polder 2 in Satkhira the payback period was calculated as less than two years. For Patuakhali the payback periods per polder were in excess of 5 years, with the exception of 3 polders that had a payback period of 1 – 3 years.

E.6.2. Demand for labour and role of women

The expansion of cropping meant more farm work, both for family labour and for wage labourers. Because much of the available male labour has been absorbed in the non-farm sector, women are now hired more often. Women are undertaking an increasing amount of work in almost all farm operations, including transplanting and weeding paddy and preparation of fish ghers, replacing male labour.

E.6.3. Other benefits and impacts

For the households with access to land, the increased paddy production has greatly reduced or eliminated food insecurity, while high value and other rabi crops provide a cash income. Improvements in agriculture have meant an increased focus on this sector and more income for landless wage labourers. Apart from spending more on food, additional farm income is also spent on children’s education, improved housing and sanitation, as well as on investments in farming – including land leases, livestock and high value crops. People are also saving more.

E.7 Qualitative outcomes of commercialization interventions

- New extension curricula take a cropping system perspective, consider water management conditions and include market orientation topics.
- Cost-effective extension methods, based on demonstrations and Horizontal Learning, are more often undertaken by lead farmers and private extension agents.
- A growing number of farmers, men and women, consider farming as a business and use simplified gross margins, weigh up risks, and involve their spouses in joint decision making.
- Mobile phones provide a virtual access to markets, especially enhancing market linkage opportunities for women farmers.
- Positive and timely response by other market actors to new demands for goods, services and labour, resulting from alternative and/or more intensified cropping systems.
- Reduced transaction costs to both parties evolving from collective actions.
- Along with farm production, incomes and labour requirements have increased. In turn, increased labour demand increased wage incomes for landless households. And increased incomes from agriculture boost the demand for goods and services, increasing trader volumes, which results in more jobs and higher non-farm incomes.
- Cost benefit analyses show that overall returns to cropping system improvements justify large-scale infrastructure investment, and clearly justifies spending on maintenance as a production cost that results in more than enough income from selling the resulting additional produce.



21 Lessons for Agricultural Extension in the Coastal Zone

21.1 Project documents: Expectations and approach at the start

21.1.1. The Blue Gold Program Document

The Program Document of the Blue Gold Program (BGP) considered that *'the entry point of Blue Gold is the participation of the rural communities to the extent that they take up the responsibilities, by organising themselves in primary societies (cooperatives), for stepping out of poverty'*. The core idea was that about 600 cooperatives¹ would be newly established as Water Management Groups (WMGs) in addition to strengthening 250 existing cooperatives / WMGs in the IPSWAM polders; each cooperative would have 250 members on average. The Program Document states: *'The cooperatives will become the drivers of change towards better life'*.

The Program Document expected that *'once the water resources management infrastructure is effectively rehabilitated, the producers can use this to increase their productivity and their production intensity'*. Farmer Field Schools (FFSs) were assigned as the extension approach for farmers to be introduced to innovations in agricultural practice and *'Blue Gold will facilitate this process of information and train the FFS facilitators'*.

Considering "Business Development" as a separate set of activities, the Program Document argued that *'for the cooperatives to be sustainable, it is important that these entities will be organised and operated as private sector entities'*. In addition, it is stated that *'Value chain analyses will be made of a number of selected crops and private sector linkages will be established for well-defined services.'* As a result, *"at least 200 cooperatives will operate as an effective enterprise"*.

¹ At the time the Project Document was developed, Water Management Groups were registered as cooperatives under the Department of Cooperatives. Since the Participatory Water Management Rules of 2014, WMGs were registered in their own right under the Bangladesh Water Management Board (BWDB)

Preliminary Discussion: A major point to note from the Program Document is the separation of principally related approaches over the three program components² of community mobilization, agricultural production and business development:

- The formation of Water Management Groups (WMGs) as cooperatives was assigned to the community mobilisation component. A broad-based needs identification was pursued, aimed at establishing community-based organisations with a broad membership and multiple functions or objectives.
- Agricultural innovation and technology transfer to the farming WMG members was assigned to the production component. Its primary vehicle, Farmer Field Schools, would be organised by the Department of Agricultural Extension.
- The Business Development component was envisaged to analyse eight different crop value chains, with as primary purpose, and thereby recognising the private sector, to define a role for the WMGs to generate income and therewith increase the sustainability of its other functions, in particular water management.

However, one could argue that the above three elements are part and parcel of a comprehensive value chain development approach, i.e. the identification of producer weaknesses and options, of constraints and opportunities in the value chain's market linkages, and the capacity building of any actor required to address these. Ultimately, this could include, but only if necessary, the formation of a producer cooperative.

21.1.2. The DPP with the Department of Agriculture Extension

The DPP (Development Project Proforma) of DAE focused on agricultural extension through the Farmer Field School (FFS) methodology, which was already being implemented by DAE with DANIDA support. The output, included in the revised DPP, was the implementation of 1,492 FFS to transfer modern production technologies for crops, the distribution of a variety of inputs (vegetable seeds, fertiliser, fruit saplings) in 380 (horticulture focused) demonstrations, the general training of DAE staff (75 Departmental Trainers and 150 Farmer Trainers (FTs)), and the financial support to farmer organisations (375 x 20.000 BDT).

The DPP noted that in the selected polders BWDB would organize Water Management Groups (WMGs); DAE would provide crop production technology to these WMGs through a group approach i.e. the FFS approach. The FFS approach had been tested and confirmed by DAE in Bangladesh to be a solid and practical mechanism through which new knowledge, practices and messages can be transferred to farming communities where the literacy rate is low. The FFS approach is successful because the sessions run over the course of an entire cropping cycle during which the participants are encouraged to implement new practices, resulting in overall high adoption rates.

Preliminary Discussion: The DAE DPP sets a strict framework for the implementation of agricultural extension through the Farmer Field School methodology. Farmer groups, belonging to the WMGs, were seen as leaders or core actors of value chains. However, the approach to farmers and to WMGs were not aligned. Any linkages between agricultural practices and water management, as well as linkages between farmers and other market actors were beyond the content of the classic FFS.

Blue Gold's DAE contribution consisted of a small central office to organize the implementation of DAE's FFS. It was expected to work through the lines of the DAE structure, 'buying person-hours and services' in DAE's line operations. In support of implementation (only) the training of field staff was envisaged. Beyond this, there was limited attention to the involvement of the line in the process.

² The Program Document also distinguished a fourth component of Integrated Water Resources Management and a fifth of cross-cutting issues.

21.1.3. The Blue Gold Proposal

The Proposal took the line of the Program Document, making the divergence of responsibilities and approaches even more explicit. Food security and agricultural production stood apart from Business Development. No differentiation of farming households was envisaged in the pursuit of agricultural production. Increasing agricultural production was sought through FFS in a Food Security and Production component, leaving the market linkages to Value Chain and Markets for the Poor (M4P) approaches pursued by a Business Development component. In this way, both components pursued identical results in the logframe but through different outputs. The Food Security component focused its interventions on the producers and Business Development's focus was on the other value chain actors, mainly to carve an enterprise role for the WMGs.

The FFS focused on improving production. They would be implemented by DAE and envisaged to go beyond their traditional focus on rice. Instead of establishing farmer clubs they would work with WMG subgroups. Blue Gold would therein focus on cropping, leaving dairy and aquaculture value chains to CARE and SOLIDARIDAD in the SAFAL project. The outcomes of value chain analyses would serve the drafting of business plans and strengthening capacities. By suggesting Farm Business Groups and referring to the experience of the International Development Enterprise (iDE) with collection points, the expectations regarding the development of Cooperatives, eminent in the Program Document, were tempered.

21.1.4. The Blue Gold Inception Report

In the Inception Report the different approaches, as described in the Program Document and adhered to in the Proposal, were increasingly entrenched in the Project Organisation's Components. In short:

Community mobilisation followed the slightly adapted six step approach to develop Water Management Organisations. This approach originated from a set procedure developed in IPSWAM. The arrangements with the Department of Cooperatives were already under strain though. WMOs, at that time, were village-based and capacity development pursued a CBO (Community Business Organization) type platform.

The Food Security and Agricultural Production Component split the integrated IFMC³ approach that was recently developed at that time. It thereby followed the FFS output targets defined in the DAE DPP and the TA budget. It divided responsibilities between DAE and the Technical Assistance (TA) team, allowing also for the involvement of the Department of Livestock Services (DLS) and the Department of Fisheries (DoF). DAE would implement 1000 FFS focused on crops only.⁴ Initially only rice production was envisaged, but later other field crops were included as well. Blue Gold's TA would implement 200 + 200 FFS focused on livestock and aquaculture, to which later homestead gardening was added. Blue Gold's TA aimed at farmers with less than 50 decimals of land and considered poor. Both types of FFS followed DANIDA's standard curricula. Groups consisted of 25 participants and for the TA FFS a 50% target of female participation was set.

It was recognised that the commodity focus of the IFMC's FFS approach did not address all aspects of BGP objectives. It was thus foreseen that curricula would be reviewed to incorporate new elements or extra sessions to overcome this; and for the FFS to become a vehicle for market orientation and to strengthen the position of farmers in the value chain by the introduction of a new module. Simultaneously a first level of farmer differentiation was foreseen by distinguishing three FFS types, i.e. a first focused on Food Security

3 IFMC refers to the Integrated Farm Management Component, a DANIDA funded program supporting DAE to develop and implement FFS.

4 However, in DAE's approach teams of husbands and wives are selected to participate, with the husbands following the field crop modules and the wives homestead production and nutrition modules.

(the homestead FFS by TA, *see chapter 25*), a second was Production Oriented (crop FFS by DAE) and a third was Market Oriented (MFS by TA).

The Business Development component noted that Blue Gold's area development concept was based on water resource management and aimed to benefit the heterogeneous population of its polders. Both points were found at odds with the traditional value chain approach with market demand as entry point and a more selective attitude to participating farmers. In addition, doubting the cooperative solution as proposed in the Program Document, an open mind was kept to the ideal form of producer organisation. It did not seek to crowd out the budding private sector by a focus on supporting Water Management Organizations (WMOs) to take up entrepreneurial roles and foresaw a slow, needs-based build-up of producer organisations. Finally, it set out to harmonise a value chain approach with the current main stance of providing extension, namely by FFS. The development of a Market Orientation cum collective action module for FFS was the responsibility of Business Development. The content was to be defined by Value Chain Analysis (VCA) wherein producers would take centre stage and opportunities and constraints across the value chain would be taken in consideration, i.e. including other market actors.

Finally, the overall approach of Blue Gold was envisaged and presented as sequential: WMOs would be formed and infrastructure rehabilitated, production would be enhanced, and business development would follow upon the increased production.

21.1.5. In summary: a difficult starting point

The outcome of the above document analysis is that Blue Gold carried - from the start - potentially flawed concepts relevant to agricultural development. Flawed concepts which might prove difficult to resolve within divided responsibilities. In short, the key positions on critical aspects were:

On WMO development

The starting position to WMO development was that the process should follow the guidelines elaborated in IPSWAM. The process was not only very structured and detailed, it was also prescriptive in e.g. membership and leadership, and sought to be multi-functional. It was a foregone conclusion that WMO's should function as cooperatives, because they had to be registered as cooperatives and therefore were envisaged to undertake various business enterprises, with as primary objective to make their function in Operation and Maintenance (O&M) within water management sustainable. Leaving aside the difficulty of making the cooperatives function despite weak management capabilities, this would also mean that fees would be charged to all members to pay for the maintenance of water infrastructure. This however, would also benefit non-members, who tended to be larger landowners. So inherently, the WMOs have the risk of making the (generally more poor) members pay for services from which non-poor non-members would benefit as well. This, of course, would be quite contrary to the intended outcomes.

On pursuing Farmer Field Schools along Value Chain Development (VCD)

Similarly, the FFS approach was set to be the methodology to enhance agricultural production and naturally focused on the agricultural producers. Said to be a tried and tested method over many years, and requiring minimal adaptation, it solidified an obstinate application amongst the practitioners. Meanwhile, these same producers should be part and parcel, if not at the core, of another set methodology, namely Value Chain Development. The result thereof was that VCA-defined interventions involving producers had to be grafted on FFS, while activities with other actors, such as input traders or buyers, required a separate program of interventions. This supposedly included also the association of those same producers in the WMOs, as their cooperatives had to take a central role in the value chains. This was further complicated and solidified by the fact that different project partners, DAE and Blue Gold TA team, were respectively responsible for the attention to producers versus other actors in the market system.

On Value Chain Development's suitability for territorial development

In addition, VCD itself appeared a somewhat ill-fitting predetermined methodology. Value chains generally have end-markets in mind as entry point for specific produce. They thereby primarily focus on particular farmers in a high potential area to produce to the high requirements of this market demand and to supply this as efficiently as possible through the value chain. Meanwhile, the entry point of Blue Gold was the broad increase of production and productivity based upon improved water management, which is defined by a territorial approach, namely hydrological units. Along comes the responsibility to consider the total, or nearly total, polder population and not to become involved in cherry-picking amongst farmers. With this came the understanding that polder households are not homogeneous, not in their livelihood strategies, and also not in their endowments or assets to farm. A differentiated strategy to the heterogeneity of the households should have been part from the start. In addition, with a substantial segment of the polder inhabitants being extreme poor, in a majority of poor, an approach more tilted towards a Markets For the Poor (M4P) approach than towards VCD would appear more appropriate.

21.2 Lines of change during implementation – an evolving approach

Starting off on the above basis, implementation provided progressive insights. These are discussed below and simultaneously cover evolving lines of change and approaches.

21.2.1. The Water Management Group: no longer a Cooperative

As discussed in *chapter 19*, in the course of the Project, the approach to water management groups changed in several ways:

- The legal basis of the WMGs changed from registration as a cooperative, to registration as a water management group under the BWDB;
- The focus of the BGP TA team's support to WMGs shifted from supporting compliance to the legal requirements to support to their functionality .

These changes made it possible to focus agricultural commercialisation on smaller groups, and helped promote optimisation of water management conditions for commercial crops.

21.2.2. Linking Value Chain Development and Farmer Field Schools to commercialise agriculture

The Program Document strongly established the FFS methodology as the approach to pursue production improvements. DAE had long standing experience with FFS through DANIDA projects. A short history of FFS in Bangladesh is presented on next page^[1] in *box 21.1*

As per its DPP, DAE kicked-off with a season-long (seed to harvest) FFS program for groups of 50 participants from 25 household. The locations were selected independently from water management considerations. A small number of FFS were outside the BGP polders. The program primarily focused on rice production and used the standard DAE curriculum of an Integrated Crop Management (ICM) approach. While based on learning from experience (experiential learning) through a participatory learning process the trials focused primarily on technology transfers ranging from land preparation and variety selection to fertiliser and pest management practices. When testing new ideas in field observations, data collection focused on yield comparisons. It lacked the essential financial information to analyse profitability along productivity and to make well-informed farm management decisions. The standard curriculum gave no attention to a farmer's market orientation or the producer's market linkages. DAE FFS implementation came to a halt at some stage following administrative disagreements with EKN.

Box 21.1: A short history of FFS in Bangladesh

The FFS approach was initially developed in Indonesia to educate farmers on Integrated Pest Management (IPM). Also, the first FFSs in Bangladesh (in the mid-1990s) by the Department of Agricultural Extension (DAE) were focusing on Integrated Pest Management with the main objective of reducing pesticide misuse. The 14 weekly IPM FFS sessions were spread out over an entire (rice) cropping season.

Gradually the FFS curriculum shifted to Integrated Crop Management (ICM) with a more holistic view on growing healthy crops, for example by including learning about seed health, soils and fertilizer management. While most FFS were conducted in rice, also some other field crops were gradually included. Another change that took place was that the earlier IPM FFSs had 25 (mainly male) participants while the ICM FFSs included 50 participants of 25 households (1 male and 1 female from each household). These FFS had 20 weekly sessions, usually 11 for crop related topics (male participants), 4 for topics that are of interest to women (homestead gardens, nutrition), and 5 sessions with all 50 participants together to develop a farmers club to sustain FFS activities in the following seasons. In the meantime, the FFS approach was also introduced with assistance from DANIDA in the fisheries and livestock sectors where new training modules were developed for aquaculture, big and small ruminants and poultry. Through collaboration between the two DANIDA-funded projects (AEC and RFLDC, 2007-2013), ideas started to develop to bring the crops, livestock and aquaculture together in one modular FFS curriculum for Integrated Farm Management (IFM). The projects initiated pilot FFSs to test and develop this IFM approach, which from mid-2013 onwards will be used by DAE in the new DANIDA funded Integrated Farm Management Component (IFMC). The IFM FFS consist of 52 sessions divided into different modules (e.g. rice, poultry, small ruminant, large ruminant, fish, nutrition, homestead garden) and works with 25 male and 25 female participants (same household). Many of these FFS will eventually form a Farmers Club.

In the Agricultural Growth and Employment Program (AGEP), implemented in parallel to Blue Gold, DAE and DANIDA pursued the Integrated Farm Management Component (IFMC) wherein they ran a Farm Business School (FBS) alongside a more traditional FFS program. The latter implemented the comprehensive IFM approach, while the Farm Business School approach focused on identifying and implementing business and marketing ideas with mature Farmer Clubs or Farmer Organisations established in previous FFS programs. Farm Business Schools consisted of 20 sessions primarily focusing on value adding and collective marketing. The approach proved to be very demanding in terms of business planning and was subsequently abandoned and replaced with a more down to earth approach involving Business Focal Persons (BFP). The latter was still pursued parallel to IFMC FFS.

Blue Gold TA staff worked closely with IFMC on the Farmer Business School approach. IFMC's Program Document also suggested FBS as an option to pursue the Business Planning of WMOs as Cooperatives. As the registration of WMGs as cooperatives was abandoned in 2014, the focus was on FFS members and Blue Gold pursued the idea of integrating or grafting additional (part)-sessions in FFS and/or adding a Business Development module. The sole participants of FFS being producers, the attention was on business ideas or collective actions by farmers and not on strengthening the capacities of other actors in the value chain.

The crops or produce to which this was to be applied still needed to be defined. This was the outcome of a Value Chain Selection process supported by extensive polder information gathering. From a wide range of crops and produce a selection was made of a few rabi crops which stood to benefit easily from

improved water management, such as mung, watermelon etc. The criteria were not set to define high value crops for specific end-markets but towards creating the most social and economic value from improved water management conditions. Still focused on the aim to embed producer groups within WMGs and an income generating objective, poultry and pond aquaculture were added to maintain contact with the group throughout the year and to be more gender-inclusive.

The next step was the undertaking of Value Chain Analyses for these products (such as mustard, tilapia, local poultry and mung bean). This identified constraints and opportunities across the value chain, covering producers as well as other actors and moving beyond cultivation practices to market participation. The findings were translated into interventions upon feasibility assessment and finally included in a Value Chain Development program addressing the capacity strengthening of multiple actors, in particular crops like sesame, mung and short duration rice.

What remained was linking up with the FFS approach and implementation. Due to the specific design of Blue Gold, the implementation of the VCD program required a rather complex arrangement. The interventions related to the producers were supposed to be implemented through the FFS approach and by DAE. For this purpose, producer-focused interventions were grafted into an FFS curriculum on which DAE field staff were trained along with broader Value Chain concepts. Interventions relating to other value chain actors remained the responsibility of the Technical Assistance team and were implemented through Blue Gold's polder teams, for which they were similarly trained.

For the selected produce, sesame, mung bean, tilapia and poultry, FFS-curricula were drafted fully integrating technology transfer and market orientation aspects. The field trials were devised to demonstrate the agricultural potential if good water management practices were applied. In addition, when demonstrating new varieties, inputs or practices, also the access to those was facilitated along with the opportunity to organise this collectively through a resource farmer. Throughout the sessions, the profitability of innovative practices was put central, and the farmers' decision-making ability strengthened. These fundamentally different curricula were referred to as MFS, or Market Oriented Farmer Field Schools.

As DAE had not restarted its participation in Blue Gold and under pressure from the 2015 Annual Review Mission to start field activities, Blue Gold TA commenced an MFS program. Relating to DANIDA experience this program would work for three years with a same producer group to allow them to mature as a business group. The program started the first year with Mung Bean/Tilapia in Patuakhali and with Sesame/Poultry in Khulna. Each zone started with up to 40 producer groups -each with 25 participants - linked to existing WMGs. In the second year another 40 producer groups were started in each zone. The first groups went into their second year with a curriculum reducing the weight of technology transfer and increasing the attention to farmer entrepreneurship and collective actions.

At this time, it became clear that some of the constraints to the rabi crops could only be overcome by adaptations in the T Aman crop, for example, the need for shorter duration varieties to allow an earlier start of the Rabi crop. Therefore, the MFS program converted from a single crop seasonal focus to a year-round cropping system program. Central to this was the improvement of the productivity and profitability of a cropping system under improved water management conditions. Half-way the second MFS year a rice MFS was implemented. It stripped most of the standard rice FFS technology transfer water management practices to enable a more secure start to the rabi crops. In some places this allowed for further diversification of rabi crops e.g. maize, sunflower and wheat or of further intensification e.g. the introduction of mustard as a third crop. It was the moment that the importance of the local variance in water management conditions was appreciated. In 2016, at the end of the second MFS year, half-way into the first cropping system approach, FFS implementation through DAE was set to commence again. In parallel also CAWM⁵ activities had been started up with DAE implementing FFS along similar lines,

5 Community-led Agricultural Water Management (CAWM) interventions combined short duration Rice crop followed by exploring additional crop where possible, in a cropping year, linking with water management at

for which a specific CAWM FFS module was developed. The MFS program through the Blue Gold TA was discontinued in order to be grafted onto the DAE FFS as originally intended. The DAE field staff were trained on the tested MFS cropping system curriculum. However, implementation along these lines remained a challenge. Besides Market Orientation understanding, it assumed a moving away from facilitating a farmer's operation on the basis of a set curriculum, to facilitating a group more flexibly on the basis of an enhanced understanding of local physical variations and production constraints and opportunities. The combined DAE FFS and CAWM interventions, along with a market system development program, that included capacity development of backward-forward actors, formed the basis of Blue Gold's commercialising agriculture.

21.2.3. Differentiating Households: Maintaining a focus on the poor and reducing poverty

The cropping system interventions related to water management improvements led to a natural bias of interventions towards households with access to land. Understandably possessing such assets, they were often somewhat better off than many others in the polders but nonetheless poor as found in the Household Survey.^[2] It was felt that Blue Gold should focus on the poorest even more. Meanwhile also the ARM called upon BGP 'not to lose the poverty focus' and to attend to the landless.

While the heterogeneity of the households in the polders was noted during Inception, it became better understood through applying the rural transformation framework. Around 2015 UNCTAD, DFID and IOB published strategy papers on rural transformation.^{[3][4][5]} In essence, these papers recognise the heterogeneity of rural households and the need to diversify strategies to lift them out of poverty accordingly. At the core is the categorisation of rural households by Dorward, in households (i) 'stepping-up' (improving farm production), or (ii) 'stepping-out' (i.e. stopping subsistence farming), alongside those (iii) 'hanging-in'.^[6]

For Blue Gold's purposes we recognised that when addressing the water resource management constraints on agricultural development, not all households equally benefit from project interventions beyond the safety offered by embankments. Households have different assets, physical and otherwise, determining the extent they can participate in agricultural production innovations and take advantage of water resource management improvements. Based on the rural transformation framework, we recognised three, not necessarily sharply defined, categories:

- A first category, numbering probably slightly over half of the households, have access to land either through ownership and/or leasing and possessing some other assets (household labour, skills, finance, etc). They are intent on farming as their livelihood strategy but often complement it with some non-farm labour income. Only few of them are really food secure but generally they are poor or oscillate in and out of poverty as most of the polder inhabitants. This group stand to benefit from improved water resource management. It gives them the opportunity to make their farming more 'commercial', to become more market-oriented instead of subsistence focused.
- A second category, estimated at some 25-35% of the households, but varying across polders, lacks access to land in any form and has few other means or skills. They generally are the poorest in the polders and food insecure. Not involved in cropping agriculture, they do not really stand to benefit from water resource management besides through the safety of the embankments and indirectly from increased demand for wage labour, as for many of them such wage labour is a main income source. Roughly the upper half of this group (i.e. 15% of the total population) nevertheless have a homestead plot, possibly some livestock or a small pond, and the minimum labour available in the household of sufficient health to benefit from homestead production interventions.
- A third category, partly overlapping with the two other categories, make use of their labour and skills,

community level with a view to encourage farmers at sub-catchment level more in water management for additional production and income.

and have other means or assets to be actively involved in other activities and sectors. This category includes government service holders, private sector employees, craftsmen, local entrepreneurs, etc. They have opted out of agriculture, even if they own land, and see their future elsewhere basing their livelihood strategy on the labour and skills in the household.

While these categories cannot easily be defined unambiguously and households move from category to category, Blue Gold stood to gain efficiency and effectiveness in its interventions by taking notice of their different requirements. Having the agricultural expertise, linked to water resource management, available to address the first category, this same expertise is able to achieve a measure of inclusiveness by addressing the food security needs of many in the second category. Blue Gold differentiated its approach and targeting of households accordingly, resulting in a dual strategy. The first strategy aimed at commercialisation and is the subject of the remainder of this chapter, and the second strategy aimed at food security on the basis of homestead production described in *chapter 25 of Section F*. Both strategies are based upon the FFS approach and both include market orientation, be it at a more basic level in the homestead FFS. Another distinction is that the homestead FFS relate to short local value chains, whereas the crop FFS relate to long regional or national value chains.

Blue Gold also envisaged a differentiated contribution to the reduction of poverty by both strategies. Through improving homestead production immediate contributions to consumption and nutrition deficiencies in the households could be made, also increasing their resilience. In addition, the increased procurement of inputs, and more regular selling of surpluses and spending of the resulting income, contribute to local economic activities, in turn generating income and employment, though this is relatively limited in terms of the added value of production increase, as compared to the larger direct and indirect contribution to poverty reduction through the commercialisation of agriculture. An increase in agricultural productivity and profitability in the polders - from field crops and homesteads production together - generates more income and employment in farming, but also in the broader agricultural and economic sectors as depicted in *Figure 21.1*.

A more in-depth exposé of 'commercial or market-oriented agricultural development as key driver to reduce poverty' is provided by both the UNCTAD and the World Bank^[517], see *box 21.2*.

The World Bank's Dynamics of rural growth and poverty reduction report of 2016 focused specifically on Bangladesh. It concluded that agricultural growth stimulates non-farm income, more specifically a 10% growth in farm income generates along a 6% increase in non-farm income, making agriculture a key driver in reducing rural poverty, see also *Figure 21.2*. Blue Gold's Working Paper 7 further elaborates how agriculture contributes to income, jobs and ultimately to poverty reduction.

Enhancing agricultural production along the FFS approach and the related business development through Value Chain Development, can best be integrated as both producers and other market actors need to adapt to changing conditions in production, and therefore to changing demand for inputs and changing supply of produce. Agricultural Development and Water Resource Management thereby go hand in hand, as improved WRM is a pre-requisite for agricultural development. At the same time, the Agricultural Development interventions can (i) motivate the need for improved WRM, and (ii) optimize the operationalization of WRM. Therefore the link between WRM and agricultural production must be institutionalised in agricultural extension.

Figure 21.1: Core Growth of Rural Economy

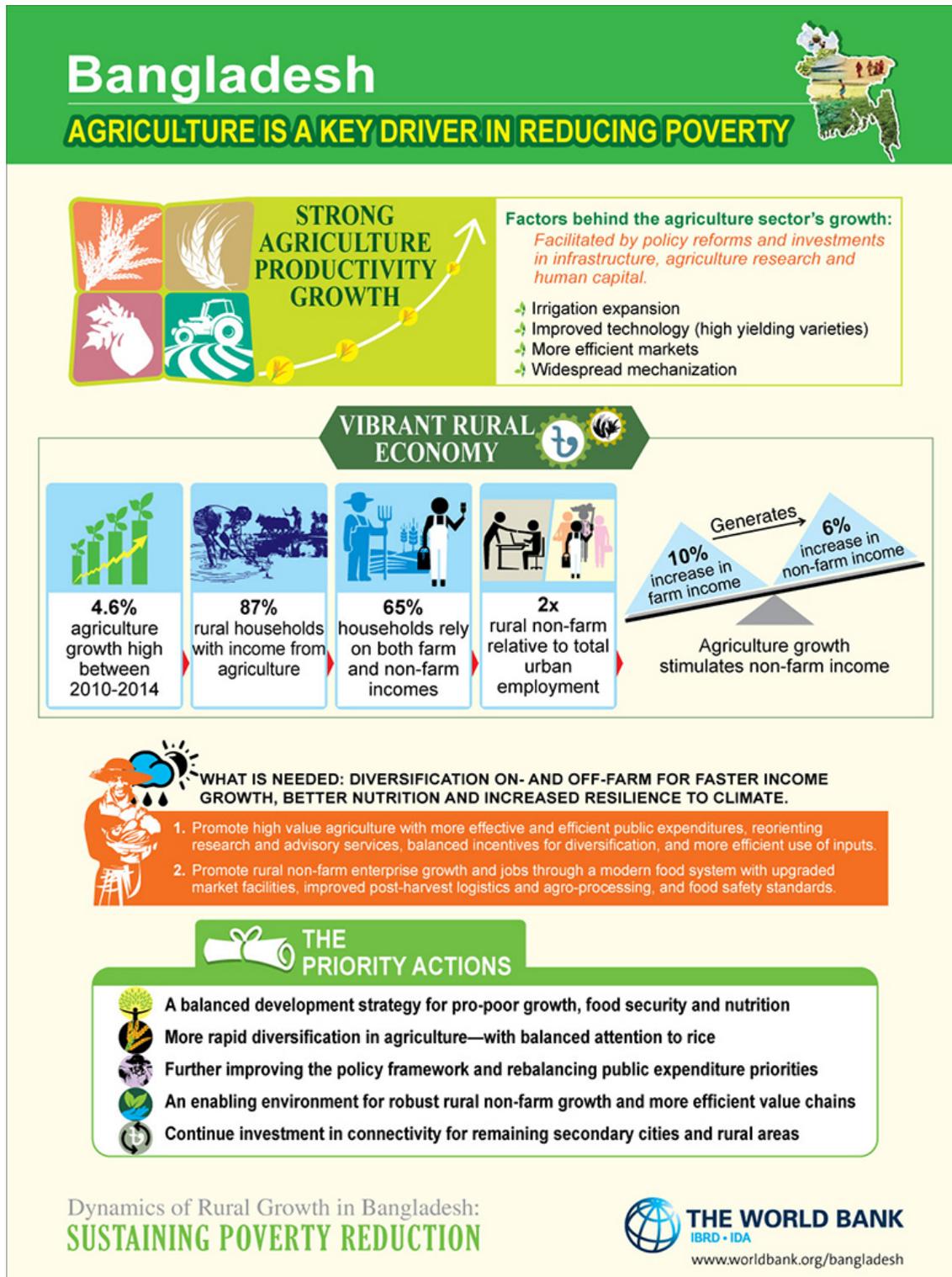


Box 21.2: Commercial or market-oriented agricultural development as key driver to reduce poverty

“The main route out of [rural] poverty is through some combination of market-oriented smallholder farming, non-farm activities and emigration from rural areas,” says the UN Conference on Trade and Development in its Least Developed Countries Report^[5].

The report warns that despite urban migration, many sub-Saharan African countries still have a predominant rural population, which in fact will most likely increase instead of decrease by 2030! Despite efforts from donor communities and regional and central governments to modernize rural economies, several (11) of the least developed countries in the world have seen their agricultural labour productivity declining since the 1990s. But the issue is not just rural, because “agricultural growth, rather than overall economic growth, has been found to be the primary driver of poverty reduction at the national level.” The first step is raising the productivity of commercial smallholders - largely family farmers who grow mainly for the market, or have the potential to do so. This requires higher-yielding varieties, fertiliser, irrigation, and machinery - which can be small machinery such as small pumps and two-wheel tractors. At the same time, rural non-farm business activity should be encouraged, usually linked to commercial farming - input sales, crop processing, equipment rental and repair, construction of roads and irrigation systems. Not only do non-farm businesses create more jobs, but “in African least developed countries in particular, rural non-farm income is usually the main source of cash for agricultural investment.

Figure 21.2: Infographic from World Bank Dynamics of Rural Growth in Bangladesh Report



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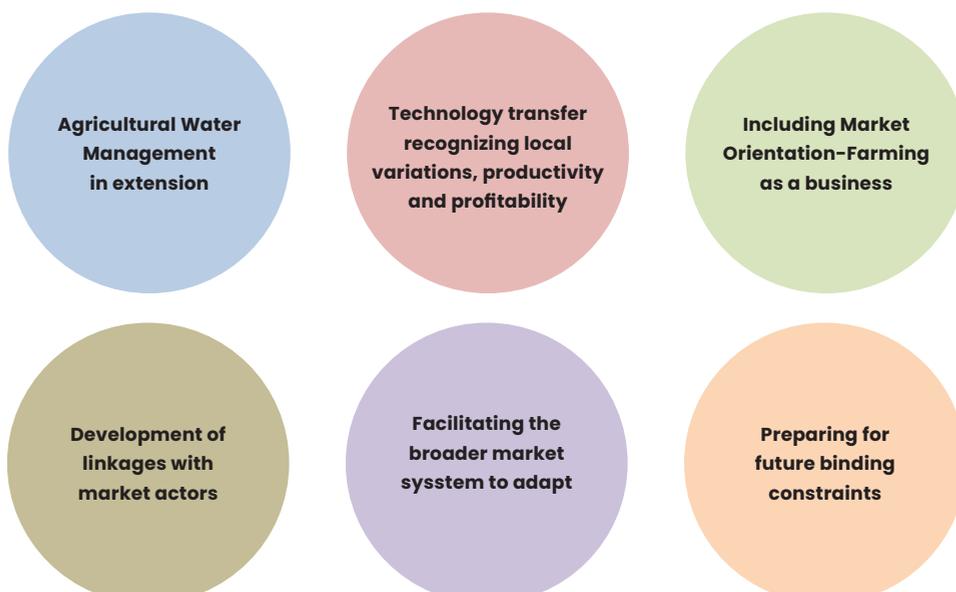
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22 Lessons for Agricultural Extension in the Coastal Zone

The experience with the initial design of agricultural extension interventions in the first years of the Blue Gold Program and from the progressive insights leading to an evolved approach for Agricultural Development, provided valuable lessons for the future of extension in the coastal zone. These lessons focus on both the content for effectiveness and the cost-efficiency of the approach. The content is addressed in the following paragraphs, under six headings, followed by a seventh and final paragraph drawing lessons for the agricultural extension approach. The lessons for coastal agricultural extension offer a comprehensive set of practical recommendations based upon BGP's extensive field experience. It is worthwhile to note that these lessons are largely aligned to the principles expressed in the Draft National Agricultural Extension Policy from 2012.^[1]

Figure 22.1: Improving extension effectiveness by content



22.1 The role of Water Resource Management in Extension and vice-versa

The relation between water resource management (WRM) and extension in the coastal zone is rather particular. WRM in the polders is primarily about drainage of hydrological entities which is beyond a farmer's individual fields and thus beyond an individual farmer's control. A community of farmers producing in this hydrological unit is compelled to follow a degree of production synchronisation, definitely in the monsoon season, in view of production optimization. During the dry season these farmers may differentiate production from one another as they can irrigate individually from available fresh-water resources. This drainage defined WRM and production is in stark contrast to regions where WRM is essentially about applying irrigation. The idea is described in *Box 22.1*.

Box 22.1: Water Resource Management conditions and Production systems

Without program interventions, WRM conditions in terms of infrastructure and operating capability are a given, and farmers are following a production system seemingly in equilibrium with those conditions. Those conditions being poor, particularly of infrastructure, the impact of weather and climate variations is barely mitigated and risks sustain. Not surprisingly, production systems are risk averse, and primarily of a subsistence nature. From that perspective farmers pursue a rational production system. Extension can easily identify a range of technology improvements to this system. If extension promotes suitable technologies, farmers will feel encouraged to adopt these. If the promoted technologies mean an increase in risks without adequate risk mitigation by proper WRM (such as improved drainage), farmers will avoid adopting these new technologies.

The intimate relation between water control and agricultural production has programmatic implications:

- The extent to which an area can control flooding and be drained during the monsoon season will largely determine the cultivation practices of e.g. T Aman. Agriculture extension, especially DAE, must grasp local WRM conditions to define and demonstrate improved production options. Simultaneously, extension must understand crop water requirements and be able to advise farmers how to operate their water infrastructure for optimal production conditions. With very little leeway, farmers must manage water in a synchronised way during the monsoon season. Beside the need to understand WRM for optimal production, extension also plays a motivational role to undertake appropriate WRM by the Water Management Groups and/or sub-groups of WMG members as the financial benefits of improved production become clear, *see Figure 22.2 (below Box 22.2)* with an example of a traditional versus an improved cropping system.
- During the dry season the situation is generally less complex. Extension agents need to understand the extent to which fresh-water resources will be available to define production options and to which extent farmers can maximise these water resources by operating the available infrastructure and using diverse irrigation techniques. Understanding crop water requirements will help to align production planning on a communal basis to water availability. While there is no synchronised crop production required and farmers can make an individual cropping choice, there are some limitations, which extension must help to clarify.

Insight in water management conditions and the options to manage the water resource across the year are a primary input to extension to define and advise on an improved cropping system. But extension should also weigh on the farmer's commitment to water resource management. Extension can enhance the farmers' ability to adequately operate the infrastructure by an improved understanding of crop water-related requirements. Moreover, it can assist in identifying and removing constraints to operating the infrastructure which in turn can enhance production options to the benefit of the farmers. Depending on the complexity of the constraints, this might take the form of small-scale infrastructure improvements largely under the control of the farmers, jointly implemented with Local Government Institutions as Union Parishads, or of much larger investments in in-polder water management in collaboration with e.g. LGED, BADC or BWDB (*see chapter 17*).

Overall, extension is just as needed in planning improved water infrastructure as it is helping farmers to reach higher levels of ambition once the improved infrastructure is delivered. In fact, the relation between WRM and extension plays at four levels: a) an understanding of the local water conditions to define production potential, be it agriculture or aquaculture; b) taking production to higher levels by infrastructure improvements; c) an enhancement of infrastructure operation in relation to crop requirements to optimise production; and d) enhancing the understanding that risk reduction and production benefits require investment in proper maintenance of the infrastructure.

Local conditions and plans will define the expected role from extension and the resulting messages. In Blue Gold, several tools served this purpose, including the participatory planning, catchment planning, unified approach, and small-scale water infrastructure investment program (*see section D*).

22.2 Technology transfer defined by local variation and pursuing productivity and profitability

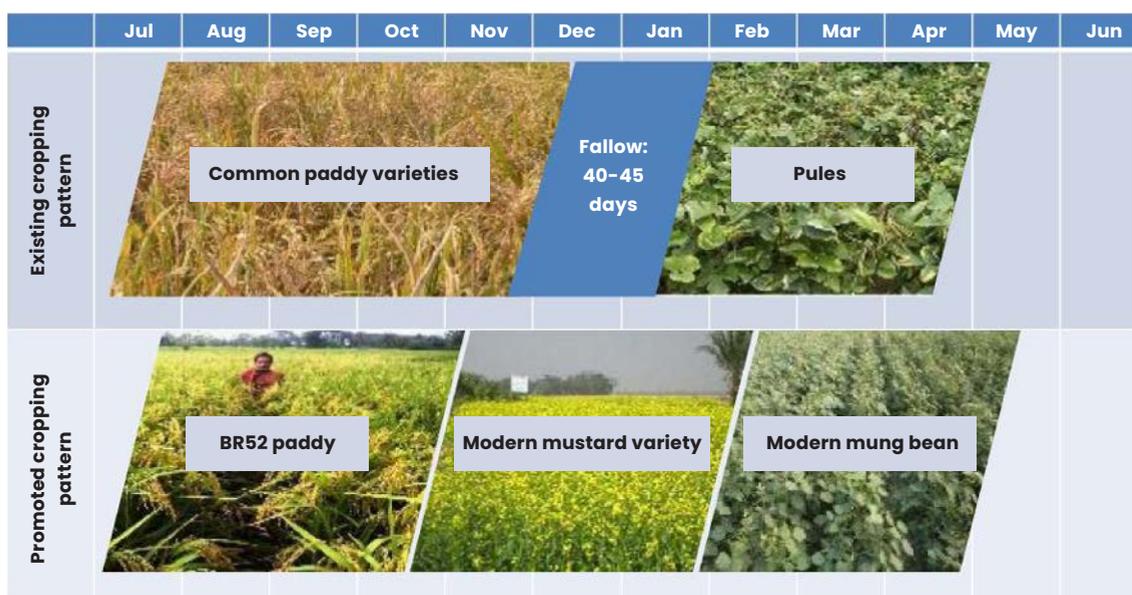
From the previous section it should be clear that technology transfer messages must take cognisance of water resource management conditions and be defined to make the most thereof. In addition, extension messages should take a year-round cropping system perspective. Water management allows production conditions to be changed. Instead of producing in a fully weather dependent way, farmers can increasingly manage water resources across the year. Managing water in one season can impact drastically on conditions in the next season, and farmers doing this diligently can pursue a production system of higher intensification, diversification and profitability.

WRM is considered a binding constraint as a key factor influencing the optimal cropping pattern and optimal production. Altering WRM vis-à-vis altering other factors can contribute most to achieving improved productivity. But beyond water resource management, and therewith the extent of salinity, there are more factors that define an optimal production system e.g. soil type and climate. Combinedly, all these factors allow for extensive local variation in crops, varieties, timing of planting, etc. This implies that variation in the extension content will be considerable and must be developed jointly with the participating farmers and based on findings of applied on-farm research and demonstration plots.

Local understanding is a pre-requisite for agricultural extension field staff; therefore involving staff from the region has a distinct advantage. Still, the required depth of local understanding generally goes beyond that of most extension field staff and they need the support of local research practitioners and institutions. Close relations and involvement need to be facilitated. The general tendency of agronomic practitioners to focus on a single crop and on productivity improvements only, needs to be overcome. Innovations must also consider production system variations and be proven to be more profitable and/or less risky in order to be adopted by farmers, as argued in *Box 22.2*.

Box 22.2: The logic of a crop calendar approach

Blue Gold encouraged in suitable locations the replacement of local aman varieties with a moderately short duration HYV aman, followed by a chance crop of mustard before a winter crop, such as mung bean. To achieve this, we suggested that the timing of T Aman seedling preparation and transplanting was brought forward to the 2nd and 3rd week of July instead of mid-August. In addition, planting dates of each crop were chosen to minimise crop damage from heavy rains and cyclones, especially during early germination and prior to harvesting. See also *Figures 22.2*.

Figure 22.2: Existing and proposed crop calendar

There is a general expectation that improved WRM will be reflected in a higher cropping intensity, but this needs to be refined. Production improvements or potential can be differentiated as increases in yield, in cropping intensity and/or in diversification:

- Yield increases are generally the result from changes in cultivation technologies, including from switching the earlier crops or varieties to higher yielding varieties. Better water resource management, including irrigation, can also contribute to yield increase
- The increase in cropping intensity can consist of a) the expansion of the area under cultivation of crops in the present cropping seasons (less fallow) and b) the expansion of the area under cultivation in an additional growing season, with the combined result of more crop harvests per unit of land
- With diversification is meant the introduction of other crops beyond those presently grown. This is generally unlikely to occur in the T Aman season, but almost definitely in the rabi season and/or when crops are introduced in an additional (third) season. A production improvement through diversification would typically constitute of the replacement of an existing lower value crop with a high value crop

Under given local conditions any of the above productivity changes can be pursued on their own or in combination. Farmers are only interested in increased land productivity if this results also in a higher profitability along with reduced risks, in particular, due to better water management. Production decisions are made from a cropping system perspective and its overall profitability.

22.3 Moving beyond technology transfer – including market orientation

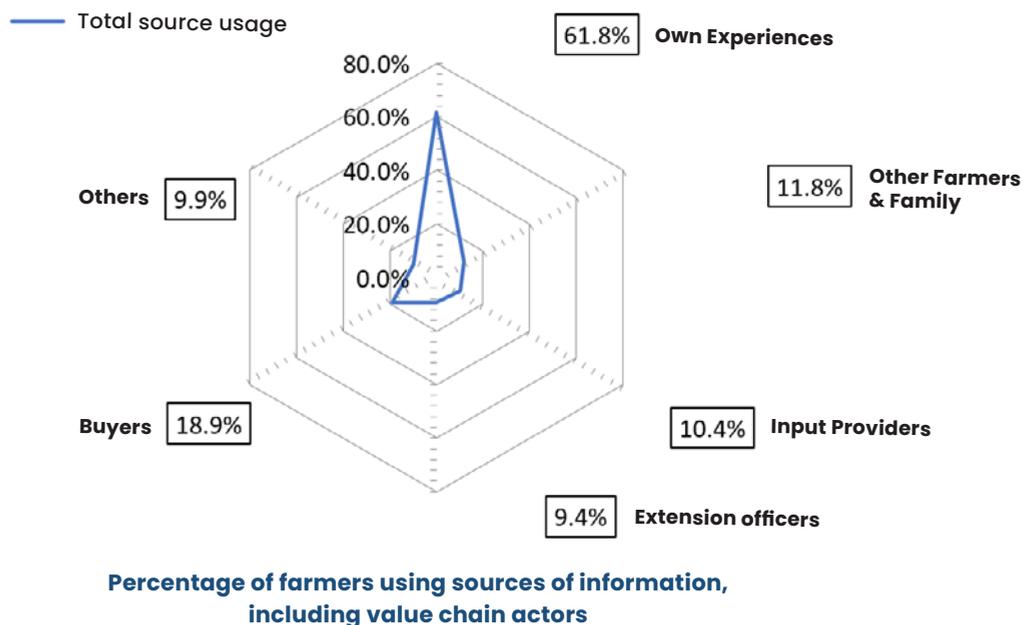
Till recently, agricultural extension had primarily a technology transfer focus. By technology transfer crops and varieties are introduced along with improved cultivation practices that take most advantage from given conditions. An example is the widespread replacement, particularly in coastal Bangladesh, of local aman varieties with BR52 due to its submergence tolerance. It reflects a process of farmers adopting varieties that more closely match their present waterlogged conditions.

However, extension should also support farmers to pursue commercial agriculture, i.e. upgrading their farming operations to viable business enterprises, to reach higher levels of profitability, also as enabled by improved water management conditions. Many farmers are used to operate in subsistence mode, remaining true to the risk aversion instilled in them by failing water resource management and inherent to weather dependent decision-making. To make most of the new opportunities and the reduced risks due to improved water management, and in order to commercialise farmers, extension should go beyond technology transfer and include elements of market orientation.

What can be profitably produced and sold in the market? This requires new and a higher level of skills beyond cultivation practices. A commercial farmer considers farming as a business. He/she produces quality products to satisfy market demand in a profitable way. That requires accessing various sources of information and the careful consideration thereof to make market-based decisions related to purchasing inputs, production and marketing. Extension should make farmers aware that farming is a business and that they should operate their farm as such.

In the Blue Gold polders the information seeking behaviour of farmers was found to be limited (refer to *Figure 22.3*). For most decision-making moments during the production season farmers relied on their own experience or that of family and/or neighbours. This reflects a system in which little new information enters. Generating and accessing information is a first pre-requisite to enhance the ability to respond to challenges and opportunities. The decision-making skills required to farm as a business rely on basic financial literacy, record keeping, gross margin comparisons, identifying good sources of information, investment requirements and an understanding of risks. All these elements were built into BGP’s extension curriculum.

Figure 22.3: Sources of information of farmers



While new technologies and higher investment are shown to increase profitability, they also augment risks and reinforce the need to boost resilience to livelihood shocks. Due attention should be given in the extension messages to enhance farmers' understanding of the additional risks and how to mitigate these, see box 22.3 for an example. This reinforces the importance of strengthening the financial literacy of the farmers. Moreover, because additional investments and related risks have a potential impact on the entire household, the need for joint decision making by husband and wife in the farming households became even more pertinent, and therefore needs to be actively encouraged. Both husband and wife should be involved in the process of commercialising farming operations. This is also important because Blue Gold experience showed that the increase of cropping intensity and of crop yields resulted in an increased and broadened role of women within field crop production.

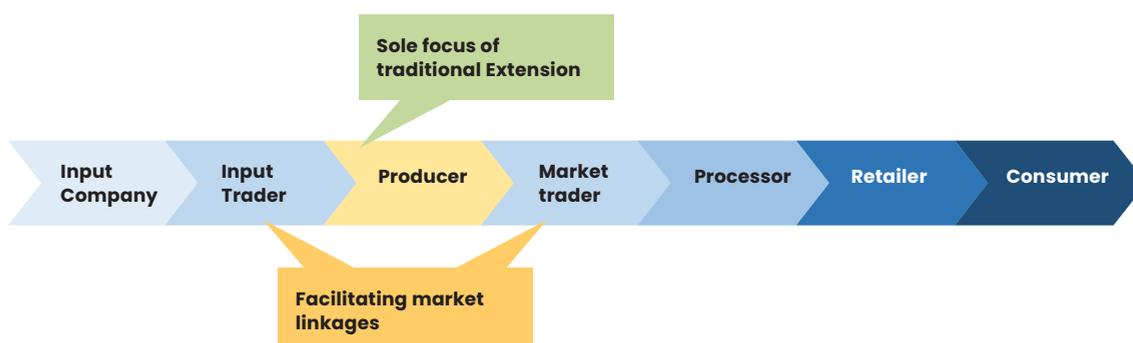
Box 22.3: Farmers, innovations and risks logic

Farmers readily recognise a profitable innovation when they see one. In some areas they saw neighbouring areas making a good profit from watermelon production and followed suit. Similarly, when the price of paddy increased by crop failures elsewhere, farmers suddenly planted boro in areas which never produced this before. The potential profit was recognised but other aspects were less well recognised and were ignored. Some households took loans to purchase expensive watermelon seed but saw their crop wiped out the first season due to heavy rainfall. For boro, farmers failed to understand their joint irrigation requirements and ran out of fresh-water resources. On the other hand, it did not take farmers long to weigh off watermelon profitability to investment in digging water reservoirs for fresh-water storage for irrigation, and so pits emerged all over the area.

22.4 Developing market linkages

Farmers are always part of one or more value chains. Even the most destitute subsistence farmers have some market linkages backward with input providers and usually also forward with buyers. A basic representation of a value chain is given in Figure 22.4.

Figure 22.4: The producer and his/her linkages in the value chain



Commercialisation stimulates opening up to new practices requiring uncommon inputs, new products, new processes and differently timed services. Commercial farming demands better and more varied market linkages with other actors in the value chain or market system, and thereby requires more skills from the producers / farmers. Agricultural extension needs to pay attention to this increased market participation in its curriculum.

Blue Gold introduced networking to enhance information seeking, and to ease access to inputs, services and markets. In practice this meant the identification of input and service providers, traders and buyers. By involving them in FFS sessions, first-contact was facilitated and relations were established to create trust and mutual understanding of challenges. Contact details, especially names and telephone numbers, of all likely persons, organisations and businesses for any activity or eventuality throughout the production and marketing process were shared and stored in mobile phones of the FFS participants.

FFS facilitators taught them to make the most of their mobiles, a tool for both financial literacy and networking. Its calculator app facilitates better insights in transaction costs. Other functions enhance access to the extension officer and the exchange of information amongst themselves. Such use of mobile phones was complemented by improving negotiation skills. Mobile phones constitute market information at farm gate and virtual access to markets, putting middlemen margins under pressure.

The BGP extension curriculum took the development of market linkages one step further. Networking stands to gain efficiency and effectiveness when undertaken by producer groups and making use of their collective bargaining power. When undertaken as collective action for a group, aggregating demand and/or supply can reduce purchase and transaction costs and increase revenues, all contributing to higher profitability. This proved to be of particular interest to the poorer farmers. The BGP FFS facilitators worked through producer groups and built the capacity of Resource Farmers to stimulate collective action where appropriate. This was readily picked up for the purchase of inputs, such as seeds and fertilizer, and also led to several forms of coordinated selling, e.g. aggregating supply at a collection point or organising joint transport, but remained generally short of full joint marketing due to issues of trust or real or perceived quality differences. Moreover, due to local variance in connectivity, such as road systems or market locations, collective actions are not an appropriate solution everywhere. Not everything works everywhere, but the concept is not value chain bound. The underlying principles were readily picked up by the farmers and applied independently in any produce or practice they were involved in, e.g. the collective arrangement of tillage services.

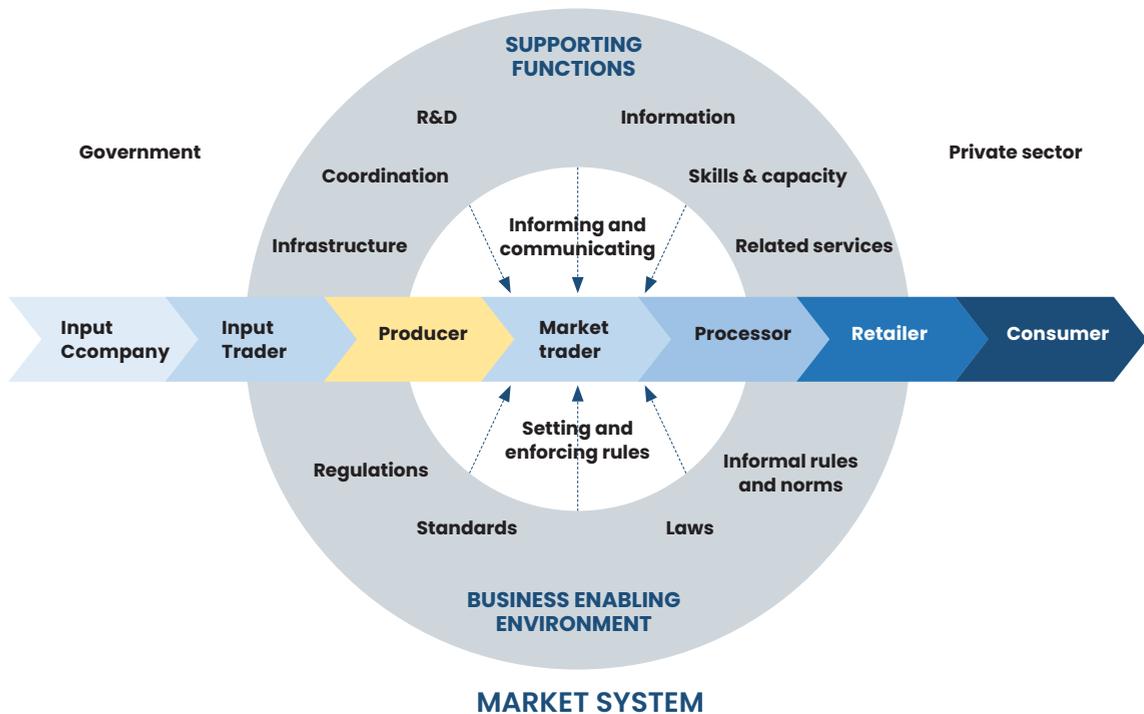
Groups do not specifically have to be formed for this purpose. Due to the drainage requirements, farmers in a sub-hydrological unit already have to manage their water system together. Collective action was found to provide a stimulus to the group dynamics required for WRM. Often Water Management Group members provided necessary leadership or impetus to successful collective actions.

22.5 Facilitating the broader market system to adapt – Market system development

In the above section, the focus was on the farmer and improving his/her production potential but there are more actors and more issues in the business environment at play to support the innovations the farmers embrace. To innovate and improve, agricultural production relies on many providers of inputs, services and information. They belong to the broader market system which needs to develop in line with the farmers' innovations in order to make the changes to commercial agricultural production possible and sustainable by an improved enabling environment.

For example, when agricultural extension recommends new varieties or cultivation practices for which subsequently the seeds or mechanisation services are not readily available from input- and service providers, the farmers' adoption rates of these varieties or practices will be constrained and substantially reduced. When not attending to the market system, the demand for these innovations will only slowly filter through to potential suppliers. It is important to catalyse this alignment process and help the market system to adapt more rapidly to changes in demand. Then not only farmers, but also these businesses will grow more rapidly, contributing to polder economic growth, with agricultural production acting as a kind of flywheel. A generic presentation of a market system is presented in *Figure 22.5*.

Figure 22.5: Value chain and the market system



In Blue Gold, the evolving mixed approach of improving agricultural production and market system development, though confining itself geographically largely to the polders, provided insights in the broader market systems. A limited but practical set of interventions strived to catalyse market system development. While implemented alongside the core FFS approach, their nature is such that they can form part of a broader extension content. The following insights were gained:

- Promoting collective actions:** In thin markets, inputs and services essential to production innovations, are generally scarce, costly to access and/or to obtain. Collective actions by producer groups are one way to partially overcome related constraints. In practice, this requires lead farmers or Resource Farmers to facilitate the contact between the producer groups and other actors in the market system. Blue Gold identified and built the capacity of Resource Farmers. For Resource Farmers (RFs) to negotiate for inputs and services e.g. tillage for a group of farmers, they arrange coordinated sales upon agreement with buyers, and act as a more efficient conduct for extension messages. One, or even better a few, Resource Farmers were selected from each producer group and were given advanced capacity building for collective actions. This included additional financial literacy, market visits and negotiation skills. Compensation of the efforts of the RFs by the members of the producer group was an option, and the fairness of remuneration models were discussed and assessed with the broader group. The role of selected Resource Farmers was expanded to act as local resources or representation to WMOs and other actors in the polder or region
- Linking farmers to other value change actors:** Input- and service providers, buyers and extension agents, public as well as private, and even local authorities were brought together with (resource) farmers across the year during several FFS cycles. While some were already involved in FFS sessions to facilitate linkages, the additional get-togethers took the form of workshops to consider specific common issues, local challenges and opportunities. While always strengthening relations, sometimes win-win solutions in the form of collective actions could be worked out on the spot. At other times it improved understanding of each other's problems and intentions and served to catalyse the market system adaptation process. This often took very simple forms: an input provider who got to know that certain varieties were recommended could better prepare him/herself for a newly arising demand; similarly for a tillage operator becoming aware of changing cropping systems and farmers' land preparation intentions. A more complex example addressed the detested hand-weighing in a sesame market. Through the

arrangement of a (temporary) collection centre with a leading buyer agreeing to use digital scales and corresponding market prices, other buyers felt forced to follow and the hand-weighing practice was done away with, leading to fairer payments and increased trust

- **Improving capacities of input providers:** Blue Gold organised business training to input providers and various service providers, e.g. power tillage operators. The capacity building with the input providers was organised in cooperation with the Agro-Input Retailers Network (AIRN), a network set up by a USAID project. It offered the opportunity to explore the agricultural production trends resulting from the improvement of water resource management, to introduce the concept of collective actions and not to consider it as a threat but to show the mutual benefits thereof, and to direct input providers to on-line sources of information to enhance farmer trust in their advice and services. Upon completion, trainees got certification by AIRN. With respect to the win-win of collective actions: some input providers did not immediately see the collective purchase of inputs as a win-win, as they only saw the discount they would have to give. Others quickly understood the advantage to them of bulk orders and selling volume, where the profit of the enlarged sales volume and the reduced handling costs well outweighed the discount in unit price. Some input providers even started to promote collective action themselves, an example of sustainable change introduced in the market system
- **Promoting coordinated selling:** There was a natural bias by BGP experts on the input side of the value chain while many had rather expected a BGP focus on 'marketing and physical market infrastructure'. However, the improved water conditions generally enabled production increase of those commodities for which marketing channels were already rather mature. For these products there was sufficiently tough competition to keep trader margins low, which was further enhanced by an increase in producers' awareness on fair prices through mobile communication. This may be contrary to expectations, but it was confirmed by Value Chain Analyses. Nevertheless, there appeared win-wins in facilitating properly discussed and negotiated 'coordinated selling' by farmers to buyers, at collection points where necessary, or through organised transport and delivery. Again, much was facilitated through mobile communication and advance negotiating, reducing the need for utilisation of physical market infrastructures. While bulking or aggregating is always of interest to traders, issues of quality remuneration and weighing practices often proved more challenging and needed to be clarified and agreed upon. Particularly farmers were found to be reluctant to pool their produce. There is a lack of trust among them to leave it to a leader to negotiate on their behalf, as well as a strong perception that his or her own produce is anyway of better quality than that of others
- **Expanding access to information:** Farmers are also in need of information beyond what the extension officers can provide but which could be found in the business enabling environment, such as information on fertilizer dose, pest control etc. While many sources of information do exist, most are still unknown to farmers, and/or were found to be too difficult to access for most farmers for technical reasons, by language, and/or by presentation because farmers have limited educational background. Still ICT systems are rapidly developing, also in the rural areas, and instead of farmers others can act as intermediaries in accessing such sources of information at the internet. Blue Gold approached and supported local intermediaries e.g. Resource Farmers and input providers, to play this role. Simultaneously it called upon the information providers, including DAE and research institutions, to make their information sources more accessible to farmers

22.6 Future binding constraints

Blue Gold addressed Water Resource Management as a binding constraint, which means a key restriction to increase agricultural production was (partially) removed. Removing this constraint opens up more production potential ahead of meeting other constraints e.g. agricultural finance. That means that once the WRM constraint is resolved, other constraints to further increasing production come to the fore and become the next binding constraint. Extension should identify and consider these future binding constraints at an early stage and relate them to researchers and/or policy makers. The Blue Gold experience provides some insights.

The increased productivity of the land brings along an increased demand for labour, labour that also increasingly seeks opportunities outside agriculture and the polder. Labour shortages become more often common at peak periods and/or labour costs make some cultivation practice adoption too costly to implement e.g. line sowing in mung bean. Mechanisation appears the next binding constraint but should not be indiscriminately pursued. There is still underemployment during low-demand periods. Mechanisation should seek to resolve peak demand bottlenecks related to specific practices in the first place.

The higher demand for labour due to increasing productivity and cropping intensity has additional consequences. The increased labour demand seeks in the first place a higher labour input from the farming household, i.e. unpaid family labour by male and female household members. If the contribution of women to increased production and income is recognised and explicitly valued, it makes them proud and can empower them by increasing their status and their participation in decision-making. But for many women the increased involvement in field crops also means a risk of becoming overburdened due to the many domestic tasks they have, which are hardly shared with men. Due to the increased productivity, women are increasingly taking up agricultural tasks which were previously the domain of men, including upholding market linkages; this is also enhanced by male migration. Extension approaches should adapt to these changing situations, often referred to as the ‘Feminisation of Agriculture’, see also *Section E, Chapter 24 “Gender Equality and Women’s Empowerment”*.

22.7 Efficiency of the extension approach

While there is an obvious requirement to extend the content of agricultural extension messages, extension resources are scarce and costly. In BGP consideration was given to increasing the efficiency of the extension approach in a variety of ways. These are listed in *Figure 22.6* and discussed below.

Figure 22.6: Improving the efficiency of extension approaches



- **Targeting extension more accurately by a differentiated approach:** The households in the polders are heterogeneous in terms of their labour and access to assets, not least to land. As a result, they have varying livelihood strategies and are best served by differentiated support strategies. An appropriate background to this is the rural transformation framework. This was discussed in chapter 21 in more detail (in the final section on “Differentiating households”). The key point here is about properly targeting the participating households with different needs for agriculture extension. Extension gains efficiency if its messages are directed at those households which can benefit from it, while others receive different support adapted to their household characteristics. Moreover, within a household, specific extension messages should especially reach out to the person(s) who can and will apply the new information. For example, this means that targeting should not be based on traditional gender roles, rather on who in a household is interested and able to take up certain agricultural responsibilities.
- **Interacting with producer groups:** With respect to the households interested in stepping up their agricultural activities in the coastal zone, group formation on a sub-catchment basis is an underlying requirement in order to synchronize production to better benefit from improved water resource management. Also, the advantage in terms of networking and collective action was already referred to, along with the role Resource Farmers can play as contact and conduct for a variety of other market actors. Extension field officers increase their outreach by linking up with producer groups through Resource Farmers and/or Water Management Groups of which the farmers are the core members. Mobile communication adds another dimension to this outreach. It allows the sharing of information and best practices from distance in a broad array of forms, audio as well as visual.
- **Becoming more demand driven:** To enable commercialisation, the classic, single crop, technology transfer focused DAE FFS curriculum was revised by adapting it to take a cropping system perspective, grounding extension messages in local water management conditions, and making provision for market orientation. Nevertheless, most importantly from an efficiency perspective, the technology transfer also needed to be reviewed. The session content was revisited to delete what farmers already know or have sufficient experience with. This went hand in hand with better targeting whereas further efficiency was gained by including only actual farmer needs and focussing on critical technologies. By being demand driven, the number and length of sessions across the cropping system could be held in check. This was also based on experiences from some other projects that successfully undertake Farmer Field Schools with a limited number of sessions carefully directed at actual gaps in farmer knowledge. There is also a second dimension to this. Considering the varying and complex environment of the coastal zone, it is important to identify the appropriate answers to local conditions and integrate these in extension messages to make them location specific. This requires close cooperation and collaboration between DAE and BWDB, LGED, BADC and local government institutions, but also between field extension officers and field researchers or practitioners of regional knowledge institutes, DLS and DoF.
- **Seeking less resource intensive methodologies:** The core of the extension approach is experiential learning. It should be hands-on and discovery-based through demonstrating cropping systems which are more productive and profitable. Within Blue Gold, most extension still took the form of classic Farmer Field Schools (DAE FFS, CAWM, MFS) but increasingly less resource intensive methodologies were pursued, for example, organising the main messages around a sufficiently large demonstration, organised by DAE or by others, including the private sector. An approach to credibly motivate farmers to undertake water resource management and serve as a successful example of an alternative, less resource intensive, extension methodology, were the Cropping Intensity Initiatives (CIIs), see box 22.4. In selected locations large year-long demonstrations were set up with farmers. Around these eye-catching innovations, farmers and other market actors were gathered in a variety of demand driven sessions and workshops.
- **Using local resources:** Extension does not solely have to rely on external resources. Technology transfer and market orientation get additional impetus and gain efficiency from the involvement of properly trained Resource Farmers and Farmer Trainers, as well as from the practical experience of nearby local entrepreneurs, such as certified input suppliers, and farmer role models or lead farmers. They are often prepared to share their knowledge or experience in sessions, serve as demonstration sites, function as resource persons, and/or provide opportunities to access information or markets in various ways.

Box 22.4: Cropping Intensity Initiative

The Cropping Intensity Initiative (CII) is an initiative by the Blue Gold Program to demonstrate the advantages of year-round crop planning to maximise the number of crops grown on one plot, developed jointly by the agricultural extension agency (DAE) and Blue Gold TA staff. CII involves the planting of a short-duration high yielding T Aman variety earlier than normal, thus allowing one and possibly two more profitable crops, eg mustard and vegetables, to be planted during the rabi season, generally increasing the cropping intensity from 200% to 300%. CII motivated farmers to improve their drainage system at field level, also increasing opportunities for irrigation in the dry season. Apart from the increased cropping intensity, yields per unit land also increased, such as paddy yields, due to the use of more appropriate and better yielding varieties. CII also led to increased work opportunities for landless people who depend on wage labour for their livelihoods, for example, because the short duration paddy requires wage labour in November, a period during which hardly any other work opportunities are available.

In areas where the water infrastructure rehabilitations provided under Blue Gold had not yet been implemented, the CII demonstrations were carefully chosen on medium to high land without drainage constraints and close to a source of irrigation water. This allowed farmers in lower-lying areas to witness practical examples of agricultural practices which they could implement when improved water management became possible once water infrastructure was improved.

- **Making sources of information accessible:** Farmers are in need of various types of information. Not all these needs should be met by depending on the accessibility of the (government) extension officer. Many other sources of information exist but farmers find them difficult to access for various reasons. An appeal is made to the providers of such information, in the first place DAE, but also other programs, research institutions and even private companies, to make their information sources more accessible to farmers. Support to farmers to master the ICT technology which they readily have in hand -even many women farmers have own mobile phones nowadays-, would strengthen efficiency gains even more.
- **Making better use of Horizontal Learning:** Blue Gold demonstrated that Horizontal Learning, where farmers learn from each other, can be a very efficient way to spread knowledge and experience to a wider target audience. It has been a general feature of FFS in the form of Farmer Field Days, but there were many more opportunities and forms to achieve horizontal learning e.g. through exchange visits, introduction sessions to demonstrations, information via mobiles, etc. For more details of Horizontal Learning in Blue Gold, see Chapter 33.
- **Involving the private sector:** The direct involvement in the networking by input providers and buyers, including supply companies, opened new avenues for the private sector to act as extension agents and organisers of demonstrations or providers of market information. Public and private sector extension agents willingly cooperated e.g. in demonstrations and horizontal learning. BGP trained local input traders in ethical business and put emphasis on the need for long term business relationship with customers, thus ensuring supply of quality products with a focus on business integrity to safeguard farmers' interests.

References

- [1] National Agricultural Extension Policy. Government of the People's Republic of Bangladesh, Ministry of Agriculture (MOA). 2012. http://dae.portal.gov.bd/sites/default/files/files/dae.portal.gov.bd/page/dd7d2be1_aeef_452f_9774_8c23462ab73a/National%20Agricultural%20Extension%20Policy_%28NAEP%29.pdf



23 Outreach and Outcomes of Commercialisation Interventions

23.1 Impacts of the commercialisation interventions

The information presented in this section on outcomes and outreach of Blue Gold interventions on commercialization has been taken from various documents that documented the economic changes and significant income increases brought about by changes in cropping patterns. In particular the findings of BGP's Technical Report 26 on Improving Productivity – Outcomes of Blue Gold Interventions (of November 2019) are discussed. This report presents the findings of a survey in 2019 gathering data from all WMGs within the 22 BGP polders, comparing the situation before Blue Gold with the situation in 2019. The information on cropping intensity from TR26 is supplemented with similar data derived from satellite images (the Satelligence Report – Earth Observation for Monitoring and Evaluation of Blue Gold Interventions of July 2019), which compared baseline data from 2011-2015 (pre-BGP) with 2017/2018 data.

This section occasionally also refers to Technical Report 25 (TR25), which presented Blue Gold outcome data similar to TR26, but collected in 2018 and among a selection of BGP polders and WMGs.

23.1.1. Changes in land use

The WMG survey results of Technical Report 26 (TR26) show that since the start of BGP changes in land use were significant. The report distinguishes 3 categories of land use: paddy (rice), other or non-rice crops, and fish/shrimp ghers (ponds). The schematic presentation in *Appendix 1* shows the cropping seasons (*kharif-1*, *kharif-2* and *rabi*) and the rice crops (*aus*, *aman* and *boro*) within the Bengali and the Gregorian calendars.

In Khulna, where BGP worked in 11 polders, the biggest change has been the increase in the area under fish *ghers*, with about 5% in the *rabi* season (up to 16% of the available land), and about 10% in both

kharif-1 and *kharif-2* (up to 43 and 40% of the land, respectively). There was also a net increase in the area of paddy because of the significant expansion of boro rice from 28 to 47% of the land, despite a decrease in aman paddy from 57 to 48%. The land used for other crops did not change much. The available land that remained fallow decreased in all seasons, with the biggest reduction in rabi (from 35 to 16%).

In Satkhira, where BGP worked in one polder (polder 2), the increase in area under fish gher was even bigger and the area has doubled. Both in *kharif-1* and *kharif-2* the area used for gher increased from about 25% to over 50%. In Satkhira the area under boro paddy also increased, i.e. from 75% to 85%. Changes in the area under other crops were minor. The land that stayed fallow reduced in all seasons, with the biggest reduction in *kharif-1* (from 68 to 34%).

In Patuakhali, where BGP worked in 10 polders, fish gher are virtually absent. There was a little net increase in the area of paddy, with a small reduction in *aus* paddy land in *kharif-1*, which was compensated with a similar increase in aman paddy in *kharif-2*. The most significant change in Patuakhali was the increase in area of non-rice crops in the *rabi* season (from 53 to 85% of the available land), which resulted in a great reduction of fallow land in this season (from 46 to 12%). In *kharif-1* there was some increase in fallow land (from 75 to 81%); in *kharif-2* some reduction, with less than 1% remaining fallow.

Combining all seasons in the three zones, there have been (net) increases in in the total areas with paddy, non-rice crops and fish gher as per 2019; but the increase in area under fish gher was greater than the combined increase in paddy and non-rice crops. It can therefore be concluded that on average the expansion of fish gher did not mean a reduction in cropped areas. However, in 23% of the WMGs in Khulna and Satkhira (excluding polder 28/2) the increase in the area of fish gher led to a reduction of the cropped area. This suggests that some switching is taking place from crops to fish.

The Satelligence report of 2019, comparing baseline data of 2011-2015 with data of 2017/2018, had similar findings on changes in land use, such as the reduction in fallow land.

23.1.2. Changes in crop types

In all zones there has been a move to more productive types of paddy as demonstrated by the 2019 WMG survey findings. In both Khulna and Satkhira most of the boro is now of the more productive hybrid type, which has replaced much of the HYV boro; in Patuakhali very little boro is grown. The only areas with a significant proportion of *aus* paddy, grown in *kharif-1*, are in Patuakhali, where there has been a sharp switch from local varieties to HYV. Aman is grown in all three zones and there was a clear trend towards HYV, although local aman is still grown in Khulna in Patuakhali despite a substantial reduction: from 72% to 47% of all aman in Khulna and from 84 to 44% of all aman in Patuakhali. In Satkhira already two thirds of all aman was HYV before the start of BGP.

Although the changes in total area of non-rice crops were not big in two of the three zones (Patuakhali being the exception), there were considerable changes in crop types. In Khulna there was a sharp drop in sesame and also in mung bean (though not so much was grown there), against an increase in more profitable vegetables and watermelon, whereby the cultivation of the latter was concentrated in a few polders. In Satkhira non-rice crops were only grown on a small area, which were mainly vegetables (which slightly increased) and jute (slightly declined).

The non-rice crops are most important in the *rabi* season in Patuakhali, where their total area has increased from just over half of cultivable land to 85% in this season. Prior to BGP, the main non-rice crop used to be keshari, a local pulse crop, which had almost disappeared by 2019. It has been replaced by the more profitable mung bean, which now accounts for 70% of the area of non-rice crops. Relatively small but increasing areas of groundnut, watermelon and chilli were also grown, whereas areas under sesame and

sweet potato declined. As compared to the 2018 survey (TR25), the area under mung bean declined somewhat in 2019, whereas the area under watermelon and groundnut increased.

23.1.3. Increase in cropping intensity

Cropping intensity refers to the number of crops from a same area during all seasons of one agricultural year. Within Blue Gold the land used for ghers is also included in the determination of cropping intensity. In Blue Gold polders two crops are possible per year; in some parts of the polders even three crops per year are possible where the situation allows this, e.g. on higher lands and/or near a good source for irrigation water (canals).

The findings from the 2019 WMG survey (TR26) demonstrate that on average the overall cropping intensity in the Blue Gold polders increased by 41% from 187% before BGP to 228% in 2019, but with differences over the three zones. Increases in cropping intensity were reported by 80% of the 511 WMGs and for all polders, apart from polder 28/2, where the cropping intensity fell with 34% due to land being absorbed by urban expansion of Khulna city. On average WMGs with a greater improvement in water management problem scores (i.e. a greater reduction of their problems) also have a larger increase in cropping intensity and a bigger increase in area under high yielding and high value crops. However, there is considerable variability in this correlation, so the relationship is not strong.

In Khulna the average cropping intensity has increased with 38% from 199% before BGP to 237% in 2019 (TR26). This means a further increase in cropping intensity as compared with the 2018 data (in TR25), which were collected in five of the ten Khulna polders, when the average cropping intensity in 2018 was established at 215%. In the 2019 survey 8% of the Khulna WNGs reported a fall in cropping intensity as compared to before BGP, against 14% in 2018. The Satelligence data for the Khulna polders also showed a substantial increase in average cropping intensity (i.e. crops and ghers) of 57% between baseline and 2017/2018 data, though from a lower baseline value, i.e. from 138 to 195%.

The 2019 survey (TR26) showed a considerable larger increase in cropping intensity in Satkhira with 76%, largely due to the expansion of fish ghers in polder 2. The pilot survey of 2018 (TR25) showed a more modest increase of 31% but this was based on only 6 WMGs in the central part of the polder (beel area), which were not representative for polder 2 as a whole. Data from Satelligence, covering the entire polder 2, showed a higher increase in cropping intensity than the data of the 2018 survey, i.e. of 50%, and from a lower pre-project value (130%) to a slightly higher end value in 2017 (180%). It should be noted that at the time that the Satelligence end value data were collected (2017/2018) and the TR25 data (2018), the drainage improvements in Satkhira were not yet completed.

The 2019 survey results (as in TR26) demonstrate that in the 10 BGP polders in Patuakhali the average cropping intensity increased with 31% from 173 to 205%. This end value is somewhat lower than the findings of the 2018 WMG survey (which did not cover all polders) and which showed an overall increase in cropping intensity of 34% from 181% to 214%. The Satelligence data for the Patuakhali polders showed a considerable higher increase of 71%, but from a much lower baseline value (136%) to a similar end value of 207%.

Comparing the cropping intensity data from the two WMG surveys with the data in the Satelligence report, see also *table 23.1*, it can be concluded that the end values in 2017/2018 of cropping intensity found in the Satelligence report are quite close to the end values of the 2018 WMG survey, especially for Satkhira and Patuakhali. The 2019 WMG survey demonstrated an increase in average cropping intensities in all zones from 2018 to 2019.

Table 23.1: Average cropping intensity (in % of available land) before and after BGP interventions for the three zones, based on three assessments

| Zone | TR25 ¹ | | | TR26 | | | Satellience | | |
|------------|-------------------|------|--------|--------|------|--------|-------------|---------|--------|
| | before | 2018 | change | Before | 2019 | change | Before | 2017/18 | Change |
| Khulna | 178 | 215 | 36 | 199 | 237 | 38 | 138 | 195 | 57 |
| Satkhira | 141 | 172 | 31 | 176 | 252 | 76 | 130 | 180 | 50 |
| Patuakhali | 181 | 215 | 34 | 173 | 205 | 31 | 136 | 207 | 71 |

The Satellience study also used comparison or control polders (i.e. non-Blue Gold polders). On average a similar increase in cropping intensity was found for non-BGP polders as compared to the average for the BGP polders, however, with lower values both for the baseline and for the 2017/2018 data.

23.1.4. Crop Yield Increase

There has been a substantial increase in the productivity of paddy as per 2019 data from TR26. Apart from a switch to more productive HYV and hybrid varieties, average yields of each type of paddy increased by between 10% to 25% per unit of land. Differences in yield levels between zones are usually small, with boro yields being slightly higher in Satkhira and HYV aman yields higher in Patuakhali. In general, a higher proportion of the WMGs reported increases in yields of *boro* and *aman* in Patuakhali than in the other two zones.

However, the picture regarding the 2019 yields of non-rice crops was more mixed, with significant falls in yields of some of the key crops, including mung bean and sesame, whereas the 2018 survey had reported significant yield increases for most non-rice crops. Farmers interviewed as part of the 2019 survey said that the unpredictable weather conditions during the growing season (excessive drought, unexpected and heavy rainfall) adversely affected non-irrigated rabi crops. This seems a valid explanation because the 2018 WMG survey (TR25) found a significant increase in mung bean yields as compared to the pre-project situation, i.e. 34% in Khulna and 39% in Patuakhali. This confirms that measuring outcomes of agricultural development based at one point of time after interventions can give a distorted picture of the achievements if the weather conditions were rather exceptional at that time. However, the overall picture was mixed as some non-rice crops demonstrated a good increase in yields as per 2019, in particular sunflower (with 130% increase) and chilli (42%).

The production of fish gher, as reported in TR26, showed a significant increase of about 40% per unit of land in the kharif seasons, the seasons with the largest area under aquaculture.

23.1.5. Feedback from FGDs with farmers on outcomes of BGP interventions

In the Khulna zone better water management, resulting in improved irrigation water supply, allowed increased cultivation of *boro* paddy in the *rabi* season. This replaced sesame, which was previously grown as a main crop in the rabi season, but was risky due to erratic rains prior to harvest damaging the sesame crop and reducing its yields.

In the Patuakhali zone farmers reported that better water management brought more land under cultivation in *rabi* season, and allowed the adoption of HYVs in the aman and aus seasons. Better drainage allowed the expansion of rabi crops; the increased supply of fresh water in khals allowed the irrigation of watermelon and *boro* paddy in some locations.

The 2019 WMG survey (TR26) identified which improved methods and technologies for crop production, introduced and disseminated through the Farmer Fields Schools, were best adopted. These were line

¹ Note that in the 2018 survey, as reported upon in TR25, not all Blue Gold polders or all WMGs were covered

sowing of paddy, improved paddy seedbed management, the use of improved seeds and varieties, and perching branches for birds, all mentioned in at least 21 of the 24 Focus Group Discussions (FGDs) held. Use of light trap, proper seed preservation and balanced fertilizer were mentioned as adopted technologies in half or more of the FGDs.

Adoption rates of improved fish production technologies were generally higher than for most crop production technologies, with the use of improved fingerlings / spawn, balanced feed for fish and liming of fish ponds as the most commonly adopted technologies.

In the 2019 survey farmers were also asked for their most pressing problems, which turned out to be dominated by economic issues such as falling prices of farm products and increased costs of labour and farm inputs. In 2018 farmers had been benefiting from a spike in paddy prices following poor harvest in the preceding year. This encouraged increased paddy production, and the market seemed to become oversupplied; as a consequence farmers interviewed in 2019 no longer thought that paddy was such a profitable crop.

A main production-related problem was identified as pests and diseases, as well as increased damage by rats. Over half of the FGDs also reported that drought had been a problem. But few FGDs reported salinity, water logging and/or excess rainfall as problems, even though there was also reporting that unexpected rains in winter had damaged rabi crops.

23.1.6. Increase in farm income

The increased area of crops, improved cropping patterns and increased yields contributed to an increase in farm incomes. In TR26 this has been calculated based on budgets for the main crops in each zone, also estimating the net income 'before BGP'. The results of these calculations showed that the total net farm income has almost doubled with an increase of 89%. More comes from aquaculture than from crops – and aquaculture contributes over half the increase in farm income. However, in relative terms the increase has been higher for paddy and for other crops. The relative increase has also been higher in Patuakhali zone (with 165% increase), and lowest in Khulna (77% increase); in Satkhira the farm income increase was calculated as 117%.

The overall increase in net farm income was compared with the total BGP costs, including TA, per polder to assess the payback period. For almost all Khulna polders the payback period was less than two years, and for many even less than one year. For polder 2 in Satkhira the payback period was calculated as less than two years. For Patuakhali, however, the payback periods per polder were in excess of 5 years, with the exception of 3 polders that had a payback period of 1 – 3 years.

23.1.7. Other benefits and impacts

Increased paddy production has greatly reduced or even eliminated food insecurity for households with access to land, while the cultivation of high value crops, especially rabi crops, provide more cash income. Although there is a general trend for more households to have non-farm incomes, agriculture remains the major source of income in most villages. Improvements in agriculture even meant a stronger focus of farmers on agricultural production. Apart from households deriving income from field crops, an increasing number of landless households benefited from increased income from agricultural wage labour, as the demand for such wage labour considerably increased.

Apart from spending more on food, additional farm income usually is spent on children's education and improved housing and sanitation, but also invested in farming, which includes land leases, purchase of livestock and investments in high value crops requiring more costly inputs. People are also saving more.

23.2 Household outreach of commercialisation interventions

Blue Gold's initial Household Survey (Baseline study of 2014) across eight polders indicated that between 45% and 65% of the households had access to land and relied on farming for their livelihoods. As a rough estimate, Blue Gold considered 55% of the households in its 22 polders (with 185,000 households in total), corresponding to just over 100,000 households, as households owning or leasing land and therefore directly benefiting from water management interventions through better opportunities for field crop production.

Table 23.2 provides an overview of Blue Gold's cropping system interventions and their outreach. A distinction is made between the 1358 FFS type interventions (984 crop FFS, 142 CAWM FFS and 232 MFS), the 67 large and 628 small demonstrations, and the various Horizontal Learning events including FFS and Demonstration Farmer Field Days (FFD), Melas (farmer fairs) and Exchange visits.

Table 23.2: Blue Gold's cropping interventions and their outreach

| Key activity | # | # participants / activity | Total # of participants | # households directly reached ² | Total # attendants Horizontal Learning ³ | # households indirectly reached and affected ⁴ |
|-------------------------|-----|---------------------------|-------------------------|--|---|---|
| Crop FFS | 984 | 25 | 24600 | 19680 | 4920 | 4920 |
| Crop FFS FFD | 964 | 100 | | | 96432 | 24108 |
| Melas | 8 | 3000 | | | 24000 | 5760 |
| CAWM FFS | 142 | 50 | 7100 | 3550 | | |
| CAWM FFD | | 100 | | | 7100 | 2485 |
| CAWM exchange visits | | | | | 1563 | 1563 |
| MFS | 232 | 25 | 5800 | 2175 | | |
| MFS FFD | | 100 | | | 5220 | 1305 |
| CII demonstrations | 67 | 6 | 402 | 402 | | |
| CII demo HL events | 34 | 100 | | | 3350 | 1005 |
| Small demos | 628 | 3 | 1884 | 1884 | | |
| Small demo HL events | 628 | 20 | | | 12560 | 9420 |
| Total hh = 78257 | | | | 27691 | | 50566 |

With respect to outreach, BGP distinguished between:

- **The number of households directly reached.** These are the households of whom at least one member participated in an FFS (either crop FFS, CAWM FFS or MFS) or was actively involved as a demonstration farmer, either in Cropping Intensity Initiatives (CII) or in smaller demonstrations. Usually 25 households were represented per FFS. After applying a correction for duplication / multiple participation (i.e. when two members of one household participated in any FFS or a same farmer participated in two activities) on the total number of direct participants in FFS and demonstrations, it

2 Adjustments made for multiple participation

3 Horizontal Learning include learning from neighbours, from Farmer Field Days (FFD), Melas, exchange visits and demonstrations

4 Based on assumptions for the proportion of HL attendants likely to apply the improved technologies, depending on the nature of the HL event

was estimated that 27,691 households were directly reached by BGP interventions on commercialization of agriculture, and are applying at least part of the learnings.

- **The number of households indirectly reached through horizontal learning.** These are the households of whom at least one member took up improved practices for commercialization through participating in Farmer Field Days, exchange visits, attending demonstration events and/or learning from neighbours who had been FFS participants. It is estimated that 50,566 households were indirectly but effectively reached. This number was determined by applying a correction factor on the total number of persons who attended Horizontal Learning events; the correction factor depending on the nature and the participants of the HL event. This correction is both for multiple participation and for the fact that a considerable number of participants in Farmer Field Days, Melas and demonstration attended out of curiosity, without being able to apply the learnings.

The combined outreach, in terms of households reached for commercialization of agriculture, directly through program interventions and indirectly through Horizontal Learning events, is thus estimated at 78,257 or nearly 80.000 households, while the potential was established as 100.000 households. In fact, Blue Gold reached 42% of all households in its polders, which compares well with the estimated 55% of the households with access to land. Thus about 76% of the households with access to land and therefore likely to benefit from WRM interventions, were actually reached and affected based on the calculations and assumptions presented in *Table 23.2*.

23.3 Cost of commercialisation interventions

The approximate cost of the commercialisation program Euro 1,410,000 is detailed in Table 23.3 below. It covers the actual cost of the individual program interventions, along with the Horizontal Learning activities and capacity building of field staff, resource providers and private sector actors. The Technical Assistance cost to manage the program is not included.

The cost of the range of FFS based interventions was around 43 Euro per household directly reached. Considering the additional households reached through Horizontal Learning, the average costs dropped to 17 Euro per household. In contrast, the less resource intensive Cropping Intensity Initiatives (CII) demonstrations cost more or less a quarter of the FFS costs per household directly reached (11 Euro) and only 3 Euro per household indirectly reached or affected. A comparison of their effectiveness with the more resource intensive FFS based interventions is difficult. The large-scale, yearlong CII demonstrations focus on a group of farmers within a sub-catchment. A limited number of sessions and workshops were built around the demonstrations, while leaving sufficient room for the expanded content of agricultural extension in the coastal zone, as set out in chapter 19. BGP believes that the effectiveness of the CII approach is likely to be similar to the more resource intensive FFS based interventions, while obviously a lot more resource efficient, in terms of direct costs and staff input.

These commercialisation intervention costs alone do not form an appropriate basis for an outcome based cost/benefit assessment. As argued extensively, Blue Gold outcomes in terms of production increase, are the result of the integration of water infrastructure, water management and agricultural commercialisation interventions.

What these costs do provide is an idea of this type of intervention costs per farmer and/or per household directly and indirectly reached. This can be of use for future programming whereby consideration should be given to the extent that BGP's lessons learned on agricultural extension (see chapter 22) are adopted, particularly those relating to increasing the efficiency of the extension approach. It is felt that, with the adoption of these lessons learnt, intervention costs per farmer could be reduced substantially.

Table 23.3: Cost of Commercialisation interventions

| Key Activity | # | Unit cost BDT | Unit cost € | Total cost BDT | Total cost € | Cost per reached HH BDT | Cost per reached HH € | Cost reached & affected HH BDT | Cost reached & affected HH € |
|-----------------------------------|-----|------------------------------|-------------|--------------------|-------------------|-------------------------|-----------------------|--------------------------------|------------------------------|
| Crop FFS | 984 | 82,600 | €860 | 81,278,400 | € 846,650 | 4,130 | € 43 | 1,669 | € 17 |
| Mela | 8 | 147,500 | €1,536 | 1,180,000 | € 12,292 | | | | |
| CAWM | 142 | 82,600 | €860 | 11,729,200 | € 122,179 | 3,304 | € 34 | 1,944 | € 20 |
| CAWM HL & exchange visits | 13 | 20,000 | € 208 | 260,000 | € 2,708 | | | | |
| MFS | 232 | 28,473 | € 297 | 6,605,722 | € 68,810 | 3,037 | € 32 | 1,898 | € 20 |
| CII demonstrations | 67 | 2,147/acre | | 426,145 | € 4,439 | 1,060 | € 11 | 303 | € 3 |
| CII demo HL events | 34 | | | | | | | | |
| Small demos | 600 | includ materials | 8,160,000 | € 85,000 | 4,331 | € 45 | 722 | € 8 | |
| Small demo HL events | 600 | | | | | | | | |
| Training 150 SAAO, 25 DT, 150 FTs | | | | 21,437,400 | €223,306 | | | | |
| Training 91 SAAO, 700 RF, 125 IP | | | | 4,354,500 | €45,359 | | | | |
| | | Total includ training | | 135,431,367 | €1,410,743 | | € 51 | | € 18 |

23.4 Outcomes of Commercialisation interventions

Commercialisation interventions combined and aligned with the interventions to improve water resources management contributed to the core of Blue Gold outcomes. These outcomes were described in quantitative terms of productivity shifts across the polders on the basis of the WMG surveys, *see also Section B*.

This section presents the direct qualitative outcomes of the commercialisation interventions in relation to extension delivery, farmer market orientation and market systems development. In addition, impacts in terms of polder economic growth are identified.

23.4.1. Outcomes related to enriched extension delivery

- New extension curricula take a cropping system perspective, consider water management conditions and include market orientation topics.
- Cost-effective extension methods, based on demonstrations and Horizontal Learning, are more often undertaken by lead farmers and private extension agents.
- Added impetus to extension sessions by the involvement of Resource Farmers, local entrepreneurs as input suppliers and traders, farmer role models, and private sector companies.
- Increased outreach and accessibility of agricultural extension field officers by contacting groups through their Resource Farmers.

23.4.2. Outcomes related to enhancement of farmer market orientation

- A growing number of farmers, men and women, consider farming as a business and use simplified gross margins, weigh up risks, and involve their spouses in joint decision making.
- Expanded networks for goods, services and information support broadening production options.
- Mobile phones became a virtual access to markets, especially enhancing market linkage opportunities for women farmers.
- Increased farmer bargaining power through producer groups reduces costs and increases revenues.

23.4.3. Outcomes related to market systems development

- Positive and timely response by other market actors to new demands for goods, services and labour, resulting from alternative and/or more intensified cropping systems.
- More accessible and trustworthy input and service providers, growing trade volumes and revenues by offering quality products and services.
- Reduced transaction costs to both parties, evolving from collective actions.
- Upgraded and new market linkages, of higher levels of mutual understanding and trust, constitute systemic changes. Such market linkages make present innovations sustainable and will facilitate future adaptations to changing conditions.

23.4.4. Outcomes related to the impact of polder economic growth

- Growth of agricultural production through increases in yields, cropping intensity and diversification.
- For households without access to land for field crops, but with some homestead land, the improvement of homestead production through homestead FFS (*see chapter 25*) often also meant a critical improvement, as food production increased as well as income from surplus sales.
- Along with farm production, incomes and labour requirements have increased. In turn, the increased labour demand increased wage incomes for landless households. And increased incomes from agriculture boost the demand for goods and services, increasing trader volumes, which results in more jobs and higher non-farm incomes.
- Labour remuneration and land leases have increased with higher land productivity. In some polders the wage gap between men and women labourers decreased.
- Not all farmers adopted (yet) the improved practices with higher productivity and profitability; rather, they continued to cultivate traditional crops or varieties with less investment and less income.
- Cost benefit analyses show that overall returns to cropping system improvements justify large-scale infrastructure investments, and clearly justify spending on maintenance as a production cost that results in more than enough income from selling the resulting additional produce.



Section F Responsible Development: Inclusion and Sustainability

Section F

Responsible Development: Inclusion and Sustainability

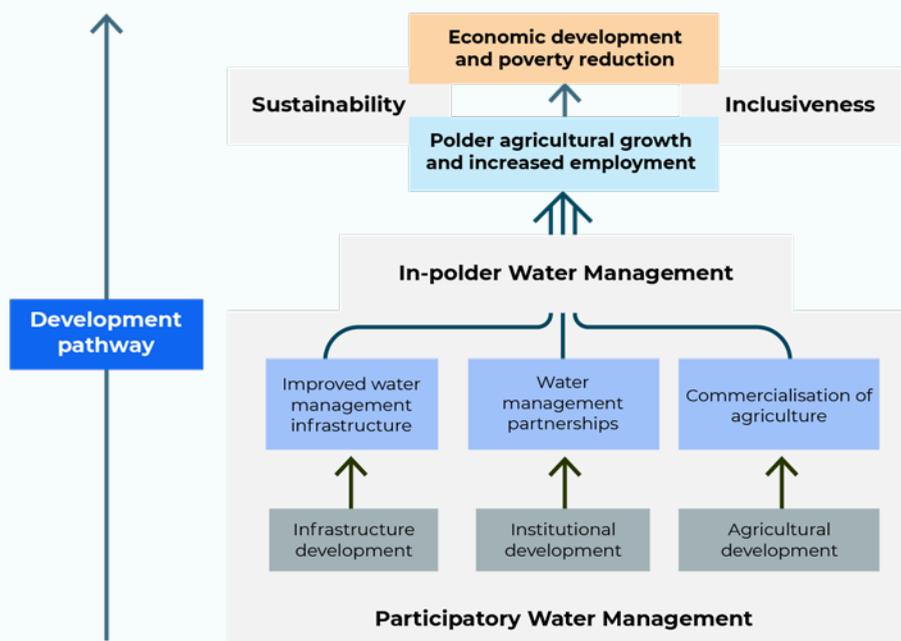
Summary

In the context of the Blue Gold Program (BGP) Responsible Development refers to the two elements in BGP’s Theory of Change presented as transversal aspects in figure F.1 to contribute to more sustainable and fair results.

The first element is ‘inclusiveness’, meaning that all inhabitants in the BGP polders, including women and poor people, should have access to opportunities and benefits created by BGP.

The second element is ‘sustainability’, which reflects Blue Gold efforts to create conditions so that its achievements would be sustained after the program’s completion

Figure F.1: Simplified Blue Gold Program Theory of Change



F.1 Inclusiveness

In practice, inclusiveness meant that landless and smallholder farmers as well as women were also targeted by BGP interventions. This is in line with the central premise of the 2030 Agenda of the Sustainable Development Goals: “leave no one behind”. As the majority of the inhabitants in BGP polders are smallholder and landless farmers, BGP was already a poverty-targeted project at its core. While all households in the BGP polders benefitted from improved flood protection, households without crop land benefitted to a lesser degree from the infrastructural and institutional water management interventions than

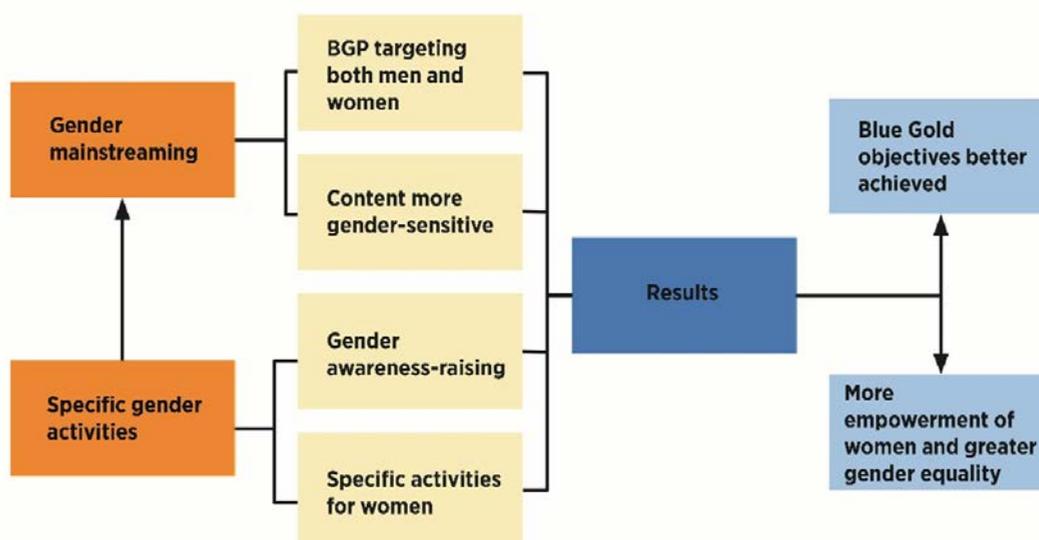
farming households with access to crop land. To broaden BGP's beneficiary base and deepen its outreach to the poor and marginalized, three additional strategies were implemented.

- A gender strategy to improve the inclusion of women in BGP's interventions, aiming at women's empowerment and increasing gender equality (*chapter 24*);
- Poverty reduction by inclusion of the poorest households in enhancing homestead production (*chapter 25*); and
- Poverty reduction by engaging local labour - both men and women - from landless households in construction works through the deployment of Labour Contracting Societies (*chapter 26*).

F.2 Gender equality and women's empowerment

Gender equality means that women and men have equal chances and opportunities; women's empowerment means that women gain more control over their own lives, for example, by increased access to resources and increased participation in decision-making, leading to improved well-being. Within BGP, attention to gender was materialized by gender mainstreaming, complemented with selected specific gender activities, as represented in *figure F.2*

Figure F.2: Gender at a glance – within the Blue Gold Program



The gender approach developed by BGP in the inception phased focused on enhancing the participation of women in BGP activities -next to men-, mostly with quantitative output targets. Over time, there was a shift towards more qualitative and transformative results, for example, by better promoting changes in gender norms.

Gender mainstreaming included:

- **Involving both women and men in Water Management Organisations (WMGs and WMAs):** enhancing women's membership of WMGs (43% achieved); women as members of executive committees of WMGs and WMAs (over 33%); and promoting active participation and influence of women by increasing the proportion of women in important positions (presidents, secretaries and treasurers). Women's leadership and decision-making capacities improved over time.

- **Ensuring women and men acquired and apply skills, knowledge and improved technology**, by including a high proportion of women in all Farmer Fields Schools (62%), especially in homestead FFS (88% women), but also in other FFS categories; gender messages became gradually integrated in every FFS.
- **Encouraging both women and men to develop market linkages and to take collective actions:** Targeting women with market information met a previously unrecognised need of women farmers; integrating market orientation in (homestead) FFS was very successful.

Examples of specific gender activities:

- Gender courtyard sessions (CYS) raised awareness among men and women about gender equality, and emphasised that WMG membership was open to men and women.
- Gender and leadership development training (GLD) encouraged equal participation in work, decision-making and leadership.
- Various specific activities for women, such as specific training on market linkages and women's empowerment.

F.2.1. Results of gender mainstreaming and women's empowerment

- Participatory water management benefitted from the involvement of both men and women, with women becoming valued as WMO leaders, engaging in decision-making for the benefit of the entire community.
- Women contribute to increased agricultural production, not only at homesteads, but also in field crops, taking up tasks previously only done by men; in particular, women often provide all labour for rabi crops.
- Women thus contribute to poverty reduction, improved livelihoods and increased resilience.
- Increased economic and social empowerment of women, as women's access to information, skills and resources increased, their decision-making within the households (and WMOs) improved, and more women became entrepreneur. Women receive more respect, enjoy improved mobility and have wider social networks; they more often engage in leadership roles.
- A gradual change in gender norms was observed, such as less rigid labour divisions, men better accepting women as leaders, and husbands taking their wives opinions more seriously, including some first evidence of men taking up a share of domestic work.

Various challenges remain, such as the need for agricultural extension to refocus on actual women's needs, especially in the light of feminization of agriculture; the heavy and unequal total workload of women; the remaining gap in agricultural wages; and the relatively lower level of women's participation, especially at higher level institutions as WMAs.

An important lesson learnt is that gender mainstreaming and quota worked, especially when accompanied by gender specific activities. This contributed both to greater gender equality and women's empowerment, and to better achieving BGP's overall objectives.

F.3 Poverty Focus: Development of homestead production

The Blue Gold Program distinguished three categories of households in its polders: (1) households with access to farmland, thus potentially benefiting from improved water management and BGP's interventions to promote commercialisation of agriculture; (2) households without access to farmland, but having other means, skills and/or assets, and thus involved in non-farm economic activities; and (3) households without access to farmland, but without means, skills and assets for income generation or employment. About half of the latter category of households – or about 15% of all households in the BGP polders - have some

homestead land. These households were targeted by BGP's homestead Farmer Field Schools (FFSs),¹ enhancing the production of homestead vegetables, fruit trees, poultry (chicken and ducks), livestock and fish (in small ponds).

In the first four years of BGP, the so-called 'bundled' approach was followed, adopted from DAE. This meant that in one FFS cycle several modules were bundled. The two most common combinations were (1) homestead gardening (vegetables), poultry rearing and nutrition; and (2) fish culture, beef fattening and nutrition. Each FFS of the 'bundled' approach covered 25 sessions, with a BGP field staff member as facilitator. Until March 2018, a total of 634 bundled FFS had been implemented from cycle 1 to cycle 10, with 15,850 participants (84% women farmers).

After a recommendation of the 2017 Annual Review Mission, the FFS approach was revised to increase the number of beneficiaries. The two major changes were: (1) FFS would only cover one module, reducing the number of sessions per FFS and (2) Farmer Trainers were recruited and trained to facilitate the FFS, instead of (only) TA field staff. This also led to capacity building of resource persons residing in the polders. Under the new approach many more FFS were implemented per cycle, especially in cycle 11 to 13; however, due to COVID-19 only a relatively few FFS could be conducted in cycles 14 and 15 (2020/2021). In total, 544 single-module FFSs were implemented, with 13,600 participants, of whom 92% were women farmers.

F.3.1. Results of the homestead FFS

Numbers of FFS and outreach

In the 15 FFS cycles, a total of 1,178 homestead FFSs were conducted, delivering 1,806 modules². Of the total number of modules, 41% were on poultry rearing, 25% on homestead gardening / vegetable cultivation, 17% on beef fattening and 16% on fish culture. The total number of participants was 29,450, of whom 25,856 were women (88%). Assuming an estimated 10% multiple participation, a net 26,505 households were assumed to have benefited directly from the FFS training. It is estimated that twice this number (53,010 households) were indirectly reached: by learning from their neighbours and/or by learning from Farmer Field Day demonstrations.

In total, 77% of all homestead FFS participants were from households with less than 50 decimals or 0.5 acres of land, i.e. considered as landless. From cycle 11 onwards, a proxy criterion for poverty was used to define the poorest households, consisting of three sub-criteria: land ownership, participation in wage labour and house structure (single structure thatch house). On this stricter basis an estimated 42% of all homestead FFS participants belonged to the poorest households; extrapolation showed that over 33,000 poorest households in the BGP area benefited directly and indirectly from these FFS.

Increases in homestead production

Overall, the uptake of improved technologies demonstrated during the FFS was high. As a result, there was a significant production increase, as summarized in *Table F1*.

Other changes resulting from the FFSs included: an increase in the use of mobile phones to contact market actors (by both men and women farmers); an increase in collective actions for buying inputs or selling produce; and more joint decision-making by husbands and wives.

1 A Farmer Field School (FFS) is a group-based adult learning approach through which farmers learn how to experiment and solve problems independently. The activities take place in the field during one full production cycle with a facilitator, with groups of 25 farmers, who observe from the trials, discuss, ask questions, and learn together.

2 Due to the multi-modal approach adopted for cycles 1-10

Table F.1: Average production increase as measured by the FFS baseline and endline surveys among all FFS participants

| Product promoted by FFS | Before FFS | After FFS |
|--|------------|-----------|
| Egg production per farmer per month (in numbers) | 46 | 86 |
| Birds (chicken/ducks) sold per farmer/month (in numbers) | 1.5 | 4.5 |
| Meat production per animal (cow) (in kg) | 172 | 236 |
| Fish production per farmer per cycle (in kg) | 40.6 | 135.8 |
| Average # of vegetables cultivated on homestead per farmer | 3.3 | 7.2 |
| Average consumption of vegetables per person (in grams/week) | 941 | 1,625 |

Cost-benefit analyses

The direct costs of all 15 FFS cycles amounted to BDT 55,389,035 in total, or BDT 47,020 on average per FFS, excluding indirect costs, such as salaries of TA staff, costs of monitoring visits and office costs. The direct costs correspond with BDT 1,881 per FFS participant and BDT 697 per household reached directly and indirectly. When comparing the value of the increased production, either per year (poultry) or per season (fish and beef fattening) with the direct costs of the FFS, it can be concluded that the increased production value well outweighs the FFS costs, hence, the return on investments was high.

Main lessons learnt

- The households of greatest need – but with access to a homestead garden - are best reached by poultry FFS, followed by homestead vegetable and fruit cultivation FFS.
- Women's participation in FFSs contributes to their empowerment. Apart from gaining more knowledge and skills and increasing production and income, they increased in confidence, and expanded their social networks and contacts with market actors. The inclusion of a small percentage of men as FFS participants was found to enhance women's empowerment.
- A remaining challenge is to better focus the content of FFS modules on real needs and feasible innovations.

F.4 Poverty Focus: Labour Contracting Societies

Labour Contracting Societies (LCSs) are defined as groups of usually landless people who engage into a contract with an agency to carry out a certain type and volume of earth work within a given time. Deployment of LCS groups is seen as a poverty reduction measure for LCS members for two reasons: higher expected daily incomes than as daily labourers and using savings from LCS income to invest in productive resources in order to generate income after the LCS work has been completed. BGP's annual review missions emphasized the importance of LCS work for poverty reduction.

It was foreseen that at least 50% of the earthwork in the Blue Gold Program would be by LCS groups, in particular the re-excavation of khals and re-sectioning of embankments. Initially the contracts were directly between BWDB and the LCS groups. After PWMR 2014 became effective, the contracts were between BWDB and concerned WMGs, with LCSs as subcontractors to WMGs. Through this arrangement, WMGs were provided with a management fee of 5% of the contract amount.

As of June 2019, 502 LCS groups had worked on Blue Gold contracts, with 31,437 members, of whom 10,766 were women (34%). Some 25% of the total value of earthwork (BDT 3,662 lakh) had been allocated to LCS groups, providing temporary income to its members, usually during one construction season of several months. From the start of BGP, the experiences with the LCS modality were mixed. Procedures were delayed, practical problems occurred and saving income for productive investments was not always feasible as LCS income was needed for daily subsistence and repaying debts. Moreover, the transaction costs involved in setting up and operating LCS groups were high and LCS members, especially women, were inexperienced at earthworks, whereas their performance was often compared against that of contractors. However, there were also successful groups or individuals, who ensured reasonable temporary incomes and invested in productive resources.

Due to the mixed experiences, a study on the impact of LCS work was commissioned, with an added focus on the impact for women LCS workers. The main findings of the study were:

- Consequences of the new LCS modality as per PWMR, 2014, were the reduced contract sum for LCS groups and less responsibility and ownership of the LCS group for the work now that WMGs became responsible. The intermediate role of WMGs may have caused some further delays in work orders. Anecdotal evidence suggested that LCS workers preferred direct contracts with BWDB, rather than with the WMGs.
- Late work orders often resulted in the LCS work not being completed by the monsoon. When heavy rains damaged the unfinished earthwork, workers had to put in extra unpaid hours.
- Some WMGs subcontracted all or part of the work to sardars (skilled foremen who may use machinery), taking away income sources from LCS members.
- Late work orders also resulted in LCS work coinciding with the peak agricultural season; hence the LCS work conflicted with higher paid opportunities for harvesting.
- Disagreements would sometime arise on how much work was done, and the subsequent payment received, whereas payment procedures could be slow.
- In many cases, LCS members were unaware of VAT, taxes and the service charge to WMGs, even though this was announced in the LCS information session. As a consequence, LCS members were often disappointed by the amount of payments for their work.
- There was no established mechanism to address grievances for LCS groups.
- Poverty alleviation was often only temporary. However, the provision of skill training (mainly through homestead FFS) to LCS workers seemed to have motivated their investment in productive resources, such as in poultry.
- Women's groups were often more affected by problems than men's groups. For example, they often had to carry over work until after the monsoon, because many women could only devote half-days to LCS work due to domestic responsibilities. LCS work is harsh, lacks dignity, and has a low social status. But earning income and increasing social networks empowered women to some extent. However, LCS work did not automatically enhance women's voices and leadership, often because male WMG members took charge of managing the female LCS groups.

Considering the many challenges and the limited impact on longer-term poverty reduction, the future of LCS work needs to be reconsidered. LCS work should only be considered in more poverty-stricken areas, and when the modalities are improved, such as an earlier start of the work, better training and explanations, and easing the payment process (e.g. by bank transfers). Using a given budget for infrastructure improvements only by contractors increases the volume of work that can be realized, hence leading to more benefits for the broader population in a project area. An exception is turfing, a task that cannot be done by machines, and can be done during the slack season for agricultural work, in particular by the poorest community members, without other employment options.

F.5 Sustainability

The Blue Gold Program Document of 2012 implicitly assumed that organizing community members into Water Management Organizations would be adequate enough to ensure that the Blue Gold outcomes would be sustained after the closing of the program. This turned out to be overoptimistic, as demonstrated by the large proportion of Water Management Groups, which had been established and supported under the IPSWAM program (2003-2008), and had become inactive by the time BGP was starting up in 2013. Over time the understanding of sustainability within BGP evolved: from sustaining the WMGs and WMAs to sustaining the productive use of the improved water management system. Chapter 27 discusses sustainability in five areas: the physical environment, coping capability, the capability to maintain and improve water management, network services and risk management, also addressing the impact of disasters and resilience.

- **Physical environment:** By the end of BGP the physical status of the 22 polders has been substantially improved through rehabilitation of major infrastructure along the periphery (embankments and sluices) and an improved drainage network for internal polder water management. Whether the present status can be preserved and even expanded upon, depends on the capacity to organise water management and maintain water management infrastructure.
- **Coping capability:** Many households achieved a better income base due to increased agricultural production of field crops and/or increased homestead production. The more robust role of women in productive activities increased the resilience of their families.
- **Capability to maintain and improve water management:** The structure of WMGs and WMAs as community-based organisations enhances the voice of people in decision-making on water management, including small holder producers and women farmers. BGP made efforts to create better conditions for sustaining improved water management by:
 - More emphasis on WMAs, also in their role of keeping WMGs active;
 - Strengthening the relationship between WMOs and Local Government Institutions, relevant departments and agencies as well as relevant private sector actors;
 - Strengthening the relationship between WMOs and BWDB, e.g. by O&M agreements.
- Some of the linkages mentioned above depend on the success of relations between the WMOs and other organisations. And these relations are sometimes determined by events outside the control of the concerned individuals – for example, the relationship with BWDB, including OCWM, was adversely affected by BWDB’s manpower and budgetary limitations. Such concerns are not specific to the Blue Gold area alone: they are to be addressed through the Bangladesh Delta Plan.
- **Network of services:** Good services from local government institutions, departments as DAE, DoF and DoL and the private sector (input suppliers and traders) enhance sustainability. In its last years BGP gave more prominence to networking with such institutions and market actors. The capacity of especially DAE field officers (250 SAAOs) was strengthened; farmer trainers and resources farmers were promoted as a local cadre of trained resource persons for agricultural extension.
- **Risk management:** WMOs and LGIs have started to cooperate in addressing pressing risks, as illustrated by instances of joint prevention of embankment breaches during the recent cyclone Amphan in May 2020. However, a more structural approach to support disaster preparedness and climate change risks was not part of BGP’s interventions and mandate.
- **Impact of and resilience to disasters:** The COVID-19 pandemic and the Amphan cyclone caused a negative impact on the Blue Gold area, undoing achievements of the earlier years: infrastructure was damaged and production and/or income levels dropped. Apart from flooding, reasons included the drop in farm gate prices and transport problems due to the lockdown measures. Migrants returned to their home villages, increasing the supply of wage labour, thus decreasing the wages, especially for women, who also experienced more domestic violence and were often more affected by shortages. But also

signs of resilience were observed, such as joint awareness actions of WMGs and LGIs on COVID-19 measures, whereas increased relations with LGIs and department staff as well as the diversified (homestead) production also turned out to be helpful.

Available evidence showed that conditions for long-term sustainability of the polders and of the 'water management for development' practice improved, though it may not be enough. A future project in the coastal area therefore should from the start:

1. Support improvements in the overall water sector governance;
2. Promote local action for better water management and climate smart agricultural transformation; and
3. Link BGP's 'water management for development' experience with the development of policies for better water sector governance, under the aegis of the Bangladesh Delta Plan.



24 Gender Equality and Women's Empowerment

24.1 Rationale and approach

The rationale for addressing gender equality issues and women's empowerment in the Blue Gold Program has always been twofold:

- Gender equality is a basic human right, also embedded in policies of the Government of Bangladesh. Blue Gold therefore aimed to contribute to more gender equality and women's empowerment, also ensuring that both men and women benefit from its interventions
- Paying attention to gender equality and women's empowerment was foreseen to contribute to better achieving Blue Gold's overall objectives

Gender equality is the equal enjoyment of women and men of socially valued goods, opportunities, resources and rewards. It does not mean that women and men become the same, but their opportunities and life chances should be equal.

Women's empowerment is the process that women get more control over their own life, distinguishing three dimensions:

1. Access to resources, including productive, human and social
2. Ability to participate in and influence decision-making, including about one's own life
3. Improvements in well-being resulting from the above

24.1.1. Barriers for women's empowerment

The Blue Gold Program aimed to empower all polder inhabitants, both men and women. Hereby empowerment is seen as the process to enable people to make own choices and to convert these into desired actions and results. By doing so, people take more control over their own lives, improve their own position, set their own agenda, gain skills, solve problems and develop self-sufficiency. The reason that Blue Gold gave special attention to women's empowerment is because women face more barriers than men to get empowered, such as:

- Women are seen as housewives and are not recognized as farmers. The traditional women's tasks in agricultural production, such as post-harvest work and homesteads production, are often seen as part of women's domestic work rather than as productive work
- Women have less access to information, knowledge, and resources than men, because women are more confined to their homes, have smaller social networks, and are less targeted by information providers, such as agricultural extension
- Decision-making on farming and income expenditure, maintaining market linkages, and speaking in public are commonly perceived as male domains
- Women are often taken less seriously than men, for example, women get structurally lower wages -as wage labourer- even if they do the same amount of work as men do

Domestic and care work (= reproductive work) are not recognized as work nor hardly shared with male household members. Especially if women also engage in productive work, they are overloaded and have time poverty. See the below box 24.1 for an example.

Box 24.1: Women's estimated time use (based on data from 12 women from 3 Blue Gold polders, February 2019)

- reproductive work: 8.9 hours
- productive work: 4.9 hours
- personal care, including prayer: 2.5 hours
- leisure: 0.5 hours
- training / studies: 0.4 hours
- sleep and rest: 6.7 hours

The Blue Gold Program Document (2012) identified gender as one of the important cross-cutting themes aiming to improve the socio-economic position and status of women in the polders by integrating gender in all BGP components. The Program Document referred in particular to experiences of the IPSWAM project (women LCS groups), to DANIDA (women benefiting from FFS) as well as to BWDB's Guidelines for Participatory Water Management (GPWM 2000) and BWDB's Gender Strategy 2006-2011. BGP's original Logical Framework included several gender (sensitive) indicators such as women as LCS beneficiaries and women as beneficiaries of IGA training (both with targets of 40,000). The staffing schedule included a full-time national gender expert and a part-time international gender expert.

The Inception Report of Blue Gold included a section on gender as part of the cross-cutting themes, whereas gender concerns were also integrated within the four components that were distinguished at that time. The gender approach was much based on IPSWAM experiences, which had been considered successful; Blue Gold's national gender expert at that time had also been involved in IPSWAM. In practice

the focus was on including both men and women within Blue Gold interventions, applying quota or targets for women's participation. Examples are the 30% quota for women as WMO executive committee members (from the GPWM), the 40% quota for women as WMG members (internal to Blue Gold); 50% women as FFS participants and aiming for 50% female Community Organizers. This meant that Blue Gold's focus was on empowering women and reducing gender inequalities through including both men and women in its interventions.

Box 24.2: Evidence of IPSWAM's gender approach being effective^[1]

A study of 2014 in coastal areas in Bangladesh -in 5 BWDB polders and 4 LGED projects- where Water Management Organizations had been formed under different projects, learned that about all WMO executive committees included women, though not always the required 30% as per GPWM. However, in practice these women were mainly executive committee member on paper, as they were often not involved in the WMO meetings, sometimes even not being notified. This study found several exceptions in two polders, 22 and 30, which were IPSWAM polders, attributing the better involvement of women to the gender awareness training by the IPSWAM project of both male and female WMO members, which was perceived to have increased the confidence in women engaging as active executive committee members in the WMOs.

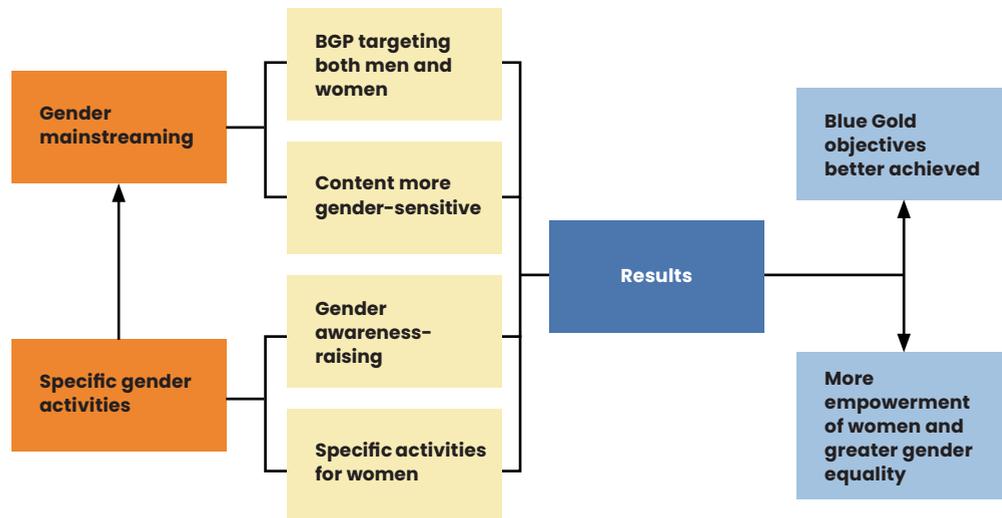
At the start of Blue Gold two specific gender activities had been foreseen: (1) the gender and leadership development (GLD) training for all male and female WMG executive members, plus several female general WMG members with potential to become leaders, as well as (2) the update of BWDB's Gender Action Plan 2006-2011, which had been developed with IPSWAM support.

24.1.2. Evolution of the gender approach

In the course of the Blue Gold Program the gender approach considerably evolved. Main reasons were (i) the transformation of the Blue Gold approach as an IPSWAM+ program with four components to a more integrated and decentralized approach for participatory water management, also requiring an adjusted gender approach; (ii) a shift in focus from quantitative "outputs" (such as proportion of women participants) to more qualitative "outcomes and impact", such as women's empowerment; (iii) increased insights in the situation and constraints of the (female) polder inhabitants; and (iv) lessons learnt from Blue Gold implementation in the first years. Such insights included the lesson learnt that many women are willing and able to take up activities that are not traditionally considered as female tasks, next to the need for (more) gender specific activities to complement and reinforce gender mainstreaming. The transformation of Blue Gold interventions also meant that the earlier foreseen Polder Development Plans, to be developed for all Blue Gold polders, were replaced by new approaches, which also meant that the development of polder specific Gender Action Plans (GAPs), a main means of implementing BGP's gender approach as foreseen in the Project Document and Inception Report, was no longer pursued.

The following sections first present the gender approach and activities as they have evolved over the years within BGP, first discussing gender mainstreaming, followed by the gender specific activities. Results and impact are discussed thereafter, and the challenges and lessons learnt are presented. The below diagram, figure 24.1, presents how gender has been addressed in the Blue Gold program, contributing both to Blue Gold's overall objectives and to women's empowerment.

Figure 24.1: Addressing gender in the Blue Gold Program



24.2 Gender mainstreaming

Gender mainstreaming means that gender issues are taken into account in the core activities of a program. For Blue Gold this meant that both men and women were targeted for inclusion as participants in BGP activities, whenever relevant. It also meant that the content of certain activities was made (more) gender-sensitive.

Gender mainstreaming is the process of systematically recognizing and taking into account gender issues (such as differences between the conditions, roles and needs of women and men) within core activities of projects and programs, covering design, implementation and Monitoring & Evaluation.

At the start of BGP, the focus was on including women and men as participants in BGP activities; this was measured by gender-disaggregated monitoring. Examples of such “output” data are included in the following sections. Over time, when also gender awareness within the polder teams gradually increased, more attention was given to gender sensitive content of certain activities. Gender mainstreaming also became supported by specific gender activities, which are discussed further below.

24.2.1. Gender mainstreaming in Participatory Water Management

In the context of the institutional development of Water Management Groups, polder teams always targeted men and women for information provision and as potential members of WMGs and executive committee members. The 40% target for women WMG membership motivated polder staff to persuade both men and women community members to join WMG membership, explaining that water management is in the interest of all. Gender courtyard sessions reinforced the message that also women could become WMG members. In conservative areas, where it was difficult to achieve this 40% quota, the national gender expert supported the polder staff by holding motivational talks. By 2019 43% of the membership of all 511 WMGs were women. WMAs had 25% women members, as the rules required that one out of four WMG representatives had to be female, which was usually understood as the need to have 3 male representatives.

The 30% quota for women as executive members of WMOs made that potential women for leadership positions were searched for. This quota was always achieved, usually with 4 women within the 12 executive committee positions. In the first years of BGP women were often included just to achieve the 30% quota, but over the years it became easier to find suitable and capable women to fill such positions, for example, women who had participated in some BGP training which had triggered their interest and talent. As a result, there are now also WMGs with more than 4 female executive committee members.

A special example is the Executive Committee (EC) of Kanchan Nagar WMG in Polder 29 in Khulna. In the 2017 elections 10 women were elected out of the 12 EC members. The president is also a woman now, as well as the secretary, vice president and joint secretary. Only the cashier and one general member are male. The women say this happened because they got various training from Blue Gold since 2013, such as FFS, GLD, gender courtyard sessions, etc. and learned many things about water management and agriculture; therefore they started to actively participate in the WMG for different activities.

BGP also promoted more women in WMG key positions (president, secretary and treasurer), using at least 7% as a target. In 2015 this was 6.4% for Khulna and Satkhira (no data available for Patuakhali), which had increased to 10.2% for these two districts in 2018/19; or to 9% for all 511 WMGs in the three districts. The proportion of female presidents is still small (17 out of 511); women are better represented as treasurers (95 of 511, or 19%).

In their regular contacts with WMGs, including when coaching or participating in WMG meetings, BGP polder staff were expected to encourage the meaningful participation in decision-making of both men and women WMG members; not only the elite. In practice, the extent that this happened depended on the persons of the polder teams, including their awareness and motivation.

Women's participation was also promoted within in-polder water management; experience learnt that once women understand the importance of good water management for agricultural production -and hence for the family income-, they become more motivated to be involved in water management.

Illustration: "Women dug most of the small channels here" – CDF in Patuakhali about the role of women in improving in-polder drainage.

In O&M Subcommittees also women became involved, even though there is no quota for this; of the subcommittee members who received training, 6.4% were women. WMGs reported that of the 25,520 members involved in O&M activities, 17% were women. They were mainly involved in cleaning khals (20%), the excavation of field channels (18%) and in repairs of embankments (17%).

In infrastructure development the emphasis of gender had been in ensuring that also (poor) women got the opportunity for income generation through membership of female LCS groups (Labour Contracting Societies). By 2019, in total 10,766 women had participated in LCS work, corresponding with 34% of all LCS group members, thus achieving the BWDB quota of 30% as per PWMR2014.

Chapter 16 of Section D provides a more comprehensive oversight of women's participation in water management; chapter 26 provides more information about women and LCS.

24.2.2. Gender mainstreaming in improving and commercialization of agriculture

Women participation in Farmer Field Schools

In Blue Gold's agricultural development interventions both men and women were targeted for acquiring and applying new skills and improved technology. BGP's main approach was the Farmer Field School

methodology, which covers the entire production cycle of crops or animals. The FFSs were complemented by other extension approaches, such as Horizontal Learning and demonstrations, for example, Farmer Field Days and the Crop Intensity Initiatives (CII), alongside interventions bringing various actors of the value chain and support functions together.

The set-up of Farmer Field Schools (FFS) favoured a high rate of women's participation:

- The crop FFS as implemented by DAE included 25 couples of husband and wife in each FFS group, whereby the men usually attended the field crop related modules and the women the modules on homestead production and nutrition. This ensured a 50% participation of men and of women but addressed them in rather stereotype roles. This model excluded the participation of single women in FFS groups, women of landless households and/or women with husbands who are otherwise not engaged in field crops, e.g. due to off-farm work
- The homestead FFS as implemented by the TA of Blue Gold were meant as pro-poor interventions as described in chapter 25, especially targeting the (near to) landless households with homestead land, aiming to improve homestead production such as poultry rearing, livestock production, vegetable cultivation and fish culture. These FFSs were in principle open for those household members who were most likely to actually apply the new skills and the improved technology. Because homestead production is traditionally done by women, these homestead FFS attracted a high proportion of women (88%), but without excluding men (12%)

Following value chains analyses, BGP also implemented a number of market-oriented FFS (MFS) in 2015-2016 (see chapter 21) on selected cash crops, such as mung bean, also addressing commercialization and marketing, topics which were at that time not (yet) included in regular FFS, which only addressed technical skills and improved technologies. The below box 24.3 presents gender related lessons learnt from the original MFS approach.

Box 24.3: Lessons learnt on women and MFS

Because the MFS were meant for farmers with access to sufficient land for commercial crops, Blue Gold staff originally expected that only male farmers would be interested; consequently only men were initially approached as participants. However, soon also women showed up as MFS participants, usually replacing husbands who were unable to attend due to off-farm employment. The de facto women's participation in these MFS thus became 15 to 25%.

When developing the curriculum on financial topics, such as on the need for investments and higher labour inputs, the importance to involve the wives of the male participants in decision-making on these subjects was recognized, because of the consequences of growing cash crops for the entire household. As a result, separate sessions for wives of (male) FFS participants were organized to enhance the women's insight in the opportunities and challenges of agricultural commercialization, thereby facilitating better joint decision-making on-farm production.

These MFS experiences learnt that (i) expectations on male household heads as the only MFS participants were not in line with actual needs among beneficiaries; (ii) there are also women farmers who are interested in commercial crops and financial aspects; and (iii) joint decision-making in the household, and the necessary base skills for this, is important, even more in case of commercial farming.

As a consequence, BGP also organized in 2015/16 MFS cycles on production systems in which women were more involved, such as tilapia production, with a high participation of women, usually the wives of male MFS participants. This resulted in an average involvement of 39% women in all MFS. Importantly, the MFS experience reinforced the need to include information on commercialization and marketing in all homestead FFS, which materialized from 2018 (cycle 11) onwards.

Gender issues in content of FFS: The content of the standard FFS curriculum was not particularly gender sensitive. It included nutrition as a module but this was largely meant for the women FFS participants. Under the Blue Gold Program the field staff facilitating FFS were expected to apply basic good practice concepts, such as treating male and female participants equally and avoiding gender stereotyping. Though the integration of gender issues in FFS modules had been occasionally discussed from the start of BGP, it was especially in the second half of BGP, when revising the FFS modules' content, that also several gender messages were actually incorporated. These messages concerned motivating women (and men) to maintain market linkages, including contacting traders by phone, and emphasizing the importance of women's involvement in joint household decision-making and in input management. When in 2018 the gender flip charts became available (see the below section on gender specific activities), FFS facilitators were also oriented on their use and they were encouraged to actually use them during the FFS sessions.

Farmer Trainers, Resource Farmers and Community Animal Health Workers

It had always been the intention of BGP to include both men and women in these positions to provide opportunities for men and women, to make use of male and female talents, and to create role models.

- Farmer trainers are well-performing farmers who received ToT training to become FFS facilitators themselves. Of the 215 trained FTs (trained by DAE and TA), 94 (44%) were women. Gender issues were part of their training
- Resource Farmers were selected from each homestead FFS group to act as a contact person, e.g. to buy inputs. Of the 679 Resource Farmers of cycle 10 – 13, 484 were women, i.e. 71%. This high percentage can be explained because of the high proportion of women participants (88%) in these homestead FFS
- Two categories of Community Animal Health Workers (CAHWs) were trained: Community Poultry Workers (CPWs) and Community Livestock Workers (CLWs). All 60 trained CPWs were women; of the 40 trained CLWs only 2 were women; 38 men. However, the 2 female CLWs are not active anymore as livestock workers

Horizontal Learning and demonstrations

Alongside the FFS various forms of “Horizontal Learning” were promoted to further promote the replication of the new skills and technologies, such as field days and FFS exchange visits, attracting 58% and 56% female participants, respectively. The Crop Intensity Initiatives (CII) demonstrated options for crop intensification, and mainly involved male farmers, with 6% female farmers. However, the CII field days presenting the results draw a more balanced mix of men and women.

24.2.3. Collective actions and market linkages

The Blue Gold Program aimed to increase the benefits for all farmers (M/F) by promoting collective actions such as jointly buying inputs, jointly selling produce and/or jointly acquiring market information. Training on market linkages, now mostly integrated in FFS (see above), became increasingly important under BGP. BGP also targeted women here, and as a result about 15,000 women received training on market linkages. About 25,252 women WMG members became involved in collective actions for economic activities, corresponding with 29% of all WMG members involved in collective actions, thus benefiting from better prices for produce and/or inputs.

Illustration: Lipika sold eggs at BDT 8 before she learnt about marketing and collective actions from a FFS. She now collects her own eggs along with those of other farmers to collectively sell them at BDT 10.

24.2.4. Innovation Fund

Several Innovation Fund projects (see section H) especially focused on women as (main) target group, thereby promoting women's empowerment. Some of these IF projects were more successful than others, contributing to a varying extent to women's empowerment. Examples of such projects are:

- **Ecopond project on fish production in homestead ponds** (2015-2016) by women, implemented by WorldFish. 60 women farmers were trained in establishing and managing small household ponds stocked with several varieties of fish. Through the learning sessions, the women gained knowledge and better understanding on natural habitats and fish production. As a result, the role of these women to support their household changed: the pond became an important source of fish for household consumption and women's increased knowledge enhanced their participation in decision-making, especially in their family. Women also got more recognition of (male) household members and their self-confidence increased

Illustration: "It is the first time I came out from the premises and talked in front of outsiders and actively participated in the learning sessions," - a participant from Sajiana, quoted in the Final Report of WorldFish

- **Improving pig rearing for the kawra community** in Batiaghata, Khulna by Nice Foundation. Kawra people are Dalits, in particular, a minority of pig rearers. The IF project aimed to improve pig rearing by increasing hygiene and production, also addressing social barriers and targeting women. In total 8 pig rearing FFS were conducted, with 167 women among the 200 participants (84%). As a result, improved and more hygienic practices increased pig production and improved the attitude of the wider community. The project raised gender awareness among women, but the resulting impact on actual empowerment was quite mixed, as illustrated by the below case study. This confirms the need to also address men to enhance awareness on the advantage of improved technologies (in this case: keeping at least 2 pigs) and to change gender norms

Illustration: One woman participant planned for 2 pigs at her house by constructing a hygienic pig shed. She managed money but her husband did not allow her to have 2 pigs because he is only interested in one pig as then it is easier for him to collect roughage. In the FFS sessions the facilitator had informed the participants that keeping 2 pigs is more profitable than one, but this woman could not exercise her voice even after getting training on pig rearing and gender issues. She said: "I do not need gender training but my husband needs such training, then he may change his attitude." – Final report Nice Foundation

- **Establishment of four Women's Business Centres (WBCs)** by United Purpose, an INGO, in polder 28, Khulna. This project (2018-2019) established four WBCs, each run by 5 selected and trained women entrepreneurs, increasing rural women's access to services and improving several value chains women are working in. The new women entrepreneurs are now communicating with a broad range of market actors; they are able to make more decisions and there is more mutual respect in their families

24.3 Specific gender activities

Specific gender activities are designed to complement and enhance gender mainstreaming. They aim to contribute towards changing mindsets in men and women, resulting in reducing gender gaps and promoting more equal participation for everyone in all aspects of their lives. A few specific gender activities, in particular the Gender and Leadership Development training and the update of BWDB's Gender Action Plan, had been foreseen from the beginning of BGP. However, their actual implementation

started only a few years later. Reasons for this slow start of specific gender activities were various, but they include the high turnover of the national gender expert in the first years and the increased insights over time in the need or opportunities for specific gender activities. Hence various specific gender activities were initiated and designed based on needs identified in the course of BGP. In this sub-chapter the scope and scale of the main specific gender activities of BGP are presented, sometimes illustrated by examples of their use and/or outputs.

“Specific gender activities are as lubricants, enabling changes together with other activities”
– zonal staff member of BGP

24.3.1. Gender Courtyard Sessions

These gender courtyard sessions (CYSs) are single informal sessions to increase the gender awareness among community members (M/F) in the Blue Gold polders. They were initially designed to enhance overall gender awareness and to especially motivate (also) women to become WMG member, but over time their focus became broader. Now these CYs promote the more active participation of women in WMGs, including the inclusion of women in important WMG positions, they discuss women’s role in agricultural production and income generation, and address gender issues such as sharing domestic work. These sessions are held by the CDFs, who received an orientation to do this. There are usually 15 to 20 participants in such informal and ad hoc sessions, mostly women but men are also targeted. Until the end of 2019 2283 such CYs had been held with just over 39,000 participants, of whom 69% were women.

Although no structural assessment of the impact of such CYs was done, there is enough anecdotal evidence that these sessions were effective. In particular, field staff mentioned that CYs led to more women as WMG members, whereas interviewed women often mentioned that participating in a gender CY was a first eye-opener to them.

Illustration: *When BGP started in her polder (P47/3) Beauty attended a gender court yard session. This made her realize that she -as a woman- could work to generate income for her family, even more now that her husband suffered from ill health. She then took a loan from BRAC (10,500 taka) and bought 5 small goats. This was the start of income generation for her, as well as taking up a leadership position. Beauty: “BGP was an eye-opener and made women more aware that they can act for themselves.”*

24.3.2. Gender and Leadership Development Training

The GLD training aimed to increase gender awareness and promote women’s leadership. In 2016-2017 the GLD training was mainly based on the IPSWAM approach, but with adjustments in the curriculum. It was a 3-day training, reaching 61 batches of mainly WMG executive committee members (male and female) of 122 WMGs, complemented by women WMG members showing potential for future leadership. The training was conducted by an external service provider. In total 1789 participants were trained, 47% of whom were women. By the end of 2017 a quick impact assessment of the training was conducted by an external consultant. She concluded that the GLD training was highly valued but that actual changes remained quite small in scale. Continuation of the GLD training was recommended but by an adjusted approach (see box 24.4), which was subsequently elaborated and implemented.

Box 24.4: Why changing the GLD training modality

- The external service provider, though qualified as trainers, had not sufficiently internalized the gender messages and tended to present the curriculum in a rather top-down manner

- The training was conducted over a period of 3 consecutive days involving mainly WMG executive committee members. There was hardly evidence of further dissemination of the newly acquired knowledge among other WMG members
- Any follow-up by relevant BGP field staff was very limited, as they had hardly been involved in the GLD training, apart from arranging logistics
- Though the participants still valued the training, the cost-effectiveness was not considered adequate due to the set-up of the training

The main changes in the training modality were:

1. the new GLD training was provided by BGP's own field staff (CDFs), who received ToT for this and were supported by the national gender expert. BGP's field staff easily related to the training participants and provided follow-up as part of their regular interactions with WMGs
2. instead of 3 days formal training, the new approach GLD training consisted of 5 more informal court yard sessions spread over a period of several months
3. the participants were WMG / community members and not (only) executive committee members; and
4. the Blue Gold gender flipcharts, see below, were used as an important tool

Until December 2019 well over 10,000 WMG members, of whom two-thirds were women, had been trained in at least 1 session, but often in all 5 sessions.

A quick assessment of the new GLD approach in March 2019 had learned that the new approach GLD training was seen as useful and effective by both the GLD participants and CDFs.

Illustration: *Hosneara Rina attended various sessions of the Gender and Leadership Development training. During these sessions she actively participated in the discussions due to her own interest because she realized that women's leadership and joint decision-making in the family and WMG are very important for all women. She is now the Secretary of Amkhola WMG in Patuakhali.*

24.3.3. Gender Flipcharts

To achieve a better understanding of the gender messages, gender flipcharts (on gender awareness and women leaders in agriculture) were developed to illustrate and visualize gender issues. These flipcharts consist of artistic drawings depicting real life situations at one side of a page for the audience, with background information and discussion issues on the backside for the facilitator. The following topics are addressed: basic concepts on gender equality; decision-making; women's economic empowerment, including as contributor to agricultural production; sharing domestic work; women's leadership; food and nutrition; and domestic violence. Some drawings depict the traditional situation, to help the understanding on gender inequality, but most drawings reflect a more equal situations, to which the participating women tend to refer to as their "dream" situation. The above mentioned quick assessment of the new approach GLD training also looked at the flipcharts and their use.

Illustration: *The CDFs all liked the flipcharts very much, in particular because it combines pictures with messages, which is considered more effective than a verbal message alone. The pictures well reflect the local situation. Also the FGD participants appreciated the flipcharts. The picture with all family members (MIF) engaged in domestic work was their favourite (their "dream"). – From assessment report of new approach GLD training*

The gender flipcharts, in two volumes, were published in 750 copies each and distributed to all TA staff, relevant BWDB and DAE staff, all Farmer Trainers, EKN, etc. In particular the field staff and Farmer

Trainers (FTs) received an orientation (ToT) about the use of the flipcharts, including to better understand the messages. The flipcharts were used until the end of BGP as the main tool in the GLD training and in the gender CYS.

Illustration: *“The CYS, GLD and use of the gender flipcharts are very useful, as also easy to understand.”*
- zonal staff member of BGP

In addition, CDFs and Farmer Trainers, who facilitate FFS sessions, were also trained and motivated to integrate gender messages into their FFS sessions, also using the flipcharts. In 2019 such gender sessions were held in 340 homestead FFS groups, reaching 8500 participants, about 86% of whom were women.

Illustration: *A CDF in Patuakhali who facilitated 12 poultry FFS groups in 2018-2019 reported that the number of poultry houses constructed during the FFS cycle was proportionally much higher than in previous poultry FFS cycles, i.e. in 81 of the 300 concerned households. The CDF explained that it was the gender session on the importance of women’s involvement in productive work which motivated many more women participants to actually apply the learnings from the FFS.*

24.3.4. Gender training to zonal and polder staff

In September and October 2017, all BGP zonal and polder staff participated in a two-day gender training, conducted in four batches, with 111 participants in total, of whom 84 men and 27 women. The lead trainer was a senior gender expert from CARE, who well managed to create more knowledge and enthusiasm on the topic. The training also promoted team building and mutual respect among BGP staff. Participants reported that the training provided insight in what gender actually is, including that gender does not concern women alone. The training motivated and helped them to better integrate gender perspectives into their work. Several participants spontaneously mentioned that the training also had effected their personal life.

Illustration: *A male CDF reported that the training helped him to do his work better, especially in conducting GLD training. But it also impacted his personal life because it convinced him that his wife should continue her job, instead of stopping with her work after their marriage.*

Illustration: *A female CDF reported that after the training several male colleagues supported her better.*

24.3.5. BWDB Gender Action Plan

The National Women’s Development Policy of the Government of Bangladesh 2011 confirmed that ministries and other government bodies such as BWDB need to have their own gender policy and gender action plan. With support of the IPSWAM project the gender strategy for BWDB was developed in 2006, which included a Gender Action Plan (GAP) for 2006 – 2011. In its Inception Report, BGP had committed itself to support the update of BWDB’s Gender Action Plan. After BGP and BWDB had jointly developed Terms of Reference, a senior national gender consultant with experience in developing Gender Action Plans for other GoB institutions, started in January 2017 with the updating of BWDB’s GAP, in close cooperation with BGP Gender coordinator, the office of the PCD and the BWDB Gender Equity Committee. Information was collected on gender issues within BWDB, including on the status of the implementation of the 2006 GAP, both in Dhaka as well as in zonal offices. In September 2017 the findings and first suggestions for a GAP were presented to BWDB in an inception workshop. After having incorporated the feedback from this workshop, the consultant submitted a draft GAP to PCD. In several rounds feedback from PCD’s office and a few other BWDB officials was provided and incorporated. In early 2018 the update of the Gender Action Plan had been completed, and was ready for approval by BWDB’s Director, however, this has not yet been materialized (spring 2020).

Box 24.5: Selected issues from the updated Gender Action Plan of BWDB

- Gender in BWDB data and information; gender in M&E
- Gender issues in Human Resources, such as recruitment, posting, women / family-friendly HR policies and social safety and harassment
- Welfare of women staff, such as promotion, posting and transfers, accommodation and facilities
- Gender and training, both by including gender topics in BWDB (induction) training and ensuring that also women staff benefit from training for their professional development
- Gender-sensitive organizational culture
- Gender concerns within projects implemented by BWDB

Activities to enhance women's empowerment

Several specific activities were developed by BGP's gender coordinator to empower women. Apart from empowering the participating women as a main objective, the activities were also meant as learning events for the participating institutions (e.g. the Union Parishads), as lessons for Blue Gold (women also interested in market linkages) and to change attitudes of men towards women.

- **Training on market linkage development and women's empowerment** was a 2-day training, targeting selected women as participants, as well as a few men. A main selection criterion was that the women were WMG member involved in crop production and had potential for marketing. This training stressed the importance of linkage development and networking with market actors (traders and input suppliers), provided information about markets and how to bargain, and discussed the importance of women's empowerment. Up till February 2020, 8 such trainings were conducted for 205 participants, of whom 172 were women and 33 men, usually all WMG members. For the women this training acted as an eye-opener, as it was often the first time that they learned how markets work

***Illustration:** We all liked the training very much, especially the subjects of joint decision-making, market linkage development, women's empowerment and market analyses. We all have a cell phone and can call traders. Examples of changes are buying inputs by myself (one woman) and more joint decision-making with my husband (another woman). There is more spending by women on their own. Now we produce cash crops (water melon), we get more respect. The training was very useful; even our husbands would need such training on marketing, women's empowerment and joint decision-making. – Women from the CAWM Women's Group of Dokhin Shonakhali WMG*

- **Joint 1-day workshops with Union Parishads and BGP on women's empowerment** to enhance women's economic empowerment. The participants of these workshops were poor or destitute women WMG members, who did not had earlier opportunity to participate in BGP activities such as FFS, but do have access to at least a small piece of homestead land. The UP chairman and/or another UP member spoke on opportunities and services they can offer for women, and the UP financially contributed to the workshop, such as providing free vegetable seeds based on the needs of the women. Apart from BGP staff, other speakers included the Upazila Women Affairs Officer and an input supplier. At the end of each workshop an action plan for the use of the vegetable seeds was made, and BGP CDFs provided follow-up by giving practical advice. As a result the women produced vegetables, part of which was sold. Up till March 2020, 4 workshops were held, with about 25 - 30 women per workshop and several men

Illustration: *The women said that they learned many new things, including that they are a human being in their own right (“manush”) like men, and not only someone’s daughter, wife and mother, and they also have the right to take decisions. They realized that they can do things for their own, which is also to the benefit of their family and country - From the report on the Fingri workshop, Satkhira*

- **Horizontal Learning** events with a main focus on women’s empowerment: Various HL events were held with the main objective of sharing experiences related to women’s empowerment. Examples are the HL event in Chinguria village (in Patuakhali) about sharing experiences on poultry rearing and a special HL event at another location on women’s empowerment
- **Observation of International Women’s Day** by organizing rallies and discussion sessions in the BGP zones and/or at the Dhaka office (in 2017, 2018, 2019, 2020 and 2021) to enhance awareness on gender equality and women’s rights

Initiatives by polder teams especially benefiting women

Also BGP staff at polder or zonal level took initiatives to support women, such as for income generation benefiting poor women who had little own resources, but also supporting women who demonstrated good potential for entrepreneurship or leadership. Examples of such initiatives are:

- Basok leaf collection in Satkhira benefiting poor, landless women, see box 24.6

Box 24.6: Basok leaf collection as earning opportunity for women in polder 2, Satkhira

BGP’s business development experts identified basok leaves as an income earning opportunity. Pharmaceutical industries use basok leaves to produce medicines such as cough syrup. In polder 2 basok trees are found as fencing along roadsides. After reaching an agreement with Square Group Ltd as a buyer, BGP organized the collection and drying of basok leaves. In 2018 285 poor women from 7 WMGs were involved in leaf collection, selling these to collectors at BDT 5 – 7 per kg of green leaves, depending on the quality. Three women collectors developed the collection and drying as a profitable business, selling dry leaves at BDT 40 to Square, with 1 kg of dried leaves being equivalent to 4-5 kg of green leaves. In 2018 9.5 MT dry basok leaf were sold, corresponding to BDT 380,000. The Union Parishad of Fingri cooperated in providing collection point facilities. With basok trees also being useful as erosion protection of embankments, there is good scope for expanding the business, ensuring more income for poor women.

- Vegetable sales centre for women in Satkhira (article in the Barta magazine)
- Marginalized and destitute women collectively cultivating climbing vegetables along re-excavated khals and on dykes
- Climate smart vegetable cultivation at homesteads in water logged area (in bags)
- Collective vegetable cultivation by women’s groups during the COVID-19 crisis
- Mentoring individual women: Blue Gold polder staff supported individual women with potential in establishing an income generating activity or business, such as poultry rearing, duck rearing or vegetable cultivation, by giving them technical advice and information on inputs and sales

Illustration: *Alia Begum in polder 47/3 now runs a business of 500 ducks that gives good income to her and her family. She learnt this from coaching by the polder coordinator, who saw opportunities to mobilize her resources and talent. - from field visit*

Cooperation with DAE

With DAE as an implementation partner in the Blue Gold Program, regular contacts on gender issues were maintained and mutual support provided when opportunities arose. For example, Blue Gold's national gender expert contributed to the curriculum for the Farmer Trainer (FT) training module on the importance of women in agriculture; she conducted various training sessions on gender and women's economic empowerment as part of DAE's training programs for FTs and SAAOs, DAE's agricultural extension officers at field level. The topic of feminization of agriculture was also discussed with DAE, exploring the option for a study on this topic with special attention to refocusing agricultural extension services to address the implications of feminization of agriculture. However, due to COVID-19 this study -planned for early 2020- could not be realized.

Feminization of agriculture is the phenomenon that the importance of women's role in agriculture is increasing, whether measured as the ratio between men and women working in this sector or whether reflected in the higher proportion of women whose main employment is agriculture. It is a global phenomenon, most pronounced in Africa and Asia, including in Bangladesh. Common reasons for feminization of agriculture are men taking up non-farm employment locally, male out-migration from rural areas to urban areas or abroad, poverty, and/or women's economic empowerment (e.g. through skill training by NGOs).

There have been regular contacts of BGP's gender team with gender experts of other -similar- projects to exchange information. In the first years several gender network meetings were organized, bringing gender experts of water management and food security projects together. In later years interactions with (gender) experts of especially IFMC, the DANIDA funded FFS project, and the Bangladesh Office of the Gender and Water Alliance were maintained, which were useful in view of learning from each other's experiences.

Studies and reports

The gender team initiated, facilitated and/or conducted various studies, quick assessments and/or elaboration of reports, such as:

- Working Paper 9 on the Gender Approach of BGP in the first years (September 2016)
- Study by four students from Patuakhali Science and Technology University (PSTU)
- Study by Dr Sharmind Neelormi on the impact on poverty reduction and women's empowerment of Labour Contracting Societies (LCSs)
- Article "Earning money is key to women's empowerment" prepared by Dhaka-based journalist Hilde Janssen which was published in two national newspapers
- Rapid Assessment on impact of GLD training by Mouri Nishad Chowdhury
- Quick assessment of women's workload
- Quick assessment of new approach of GLD training
- Impact assessment of horizontal learning event on poultry rearing
- As part of communicating successes, also a slide deck and a thematic brochure were prepared on gender equality and women's empowerment, as well as case studies on specific gender related success stories (2-pagers; 8 up till September 2021)
- Booklet with 26 case studies on women who became empowered through their WMG membership, participation in BGP activities and/or the improved enabling environment for women (2021)
- Quick survey on the impact of COVID-19 in BGP polders, with a special focus on women

Gender related issues within the project organisation

- Female field staff: Blue Gold started well with 50% female field staff (Community Organizers and FFS facilitators) in the first year; however, all Producer Group Facilitators (PFs) recruited in the second year were men. As a result, when all field staff were merged and designated as “Community Development Facilitators” (CDFs) the proportion of female staff reduced to 33%. Female field staff were important as role models
- Among the professional / technical staff at the zonal offices, excluding admin and support staff, the proportion of female staff was always low; this even became nil towards the end of BGP for various reasons. At the Dhaka office the proportion of female technical staff fluctuated around one third, and included several women engineers
- In 2015 an anti-harassment policy was established for BGP staff, also addressing sexual harassment, and orientations for staff on this policy were organized. At all offices “information boxes” (complaint boxes) were placed, where staff could leave a message for the gender coordinator in case she or he felt uncomfortable in the working place. Last but not least, the gender coordinator regularly fulfilled the role of a person of trust for colleagues. Box 24.7 presents suggestions for creating a more harmonious working environment in future projects, based on lessons learned by the Blue Gold Program

Box 24.7: Suggestions for improving creating a harmonious working environment in future similar projects, based on lessons learned by the Blue Gold Program:

1. The anti-harassment policy should be based on a zero tolerance approach and include effective and swift complaint procedures
2. Setting an example by dismissing senior staff members found guilty of (serious) misconduct and/or (sexual) harassment helps to reduce negative behaviour towards female and junior colleagues
3. During the recruitment of new members of staff, the importance of creating a healthy working environment should be emphasised, as well as the consequences of any form of harassment
4. Equal treatment of male and female ‘offenders’ should be ensured by adopting the same standards for punishing the same misconduct by male and female offenders in the same situation, instead of being more lenient towards male misconduct - as is sometimes considered more ‘normal’ in society
5. Include working environment issues as a standard agenda item in team meetings; and ensure follow-up on any agreements for improvements
6. Gender equality training and workshops for program beneficiaries, WMO leaders and TA team members was found to be crucial for awareness raising - especially since women became more aware of gender equality and women’s rights, thereby becoming less tolerant to discrimination and more eager to raise their voice. It also led to improved attitudes by men
7. Ensure basic facilities (also) for women in the project area, such as a place to rest in remote polders (with access to a rest room); and a (temporary) restroom and resting place for women LCS workers, eg for breastfeeding
8. Contractors implementing infrastructure works should be held to account concerning labour conditions, including payment of agreed wages. Relevant standards for this are in place, eg IFC Performance Standard 2 (on Labour and Working Conditions)
9. Ensure that where special poverty reduction initiatives are taken for marginal, landless groups -such as employing them through labour contracting societies (LCSs)- they are properly and timely paid

24.4 Results: outputs, outcomes and impact

24.4.1. Outputs and reach-out

Outputs: Information on the participation of women and men in BGP activities and in terms of holding positions has -to some extent- already been included in previous sections, often in numbers and/or proportions (percentages). BGP monitoring data show that the participation or representation of women in BGP activities was often one third or more. In a few cases, such as the key positions in WMOs (president, secretary and treasurer) and the position of Community Livestock Workers, women are barely represented. But in other cases it is the men who were under-represented, for example, in homestead FFS and as Community Poultry Workers. Both male and female farmers were involved as plot owner in all kind of trials and in adopting all kind of modern technologies, though certain technologies were mainly adopted by men (86% of adopters of line sowing were men); others mainly by women (92% of users of hajols were women). Other modern technologies, such as the use of hybrid vegetable seeds, are about equally adopted by men and women farmers. Such data show that labelling a technology or agricultural tasks as only for men or only for women (gender-stereotyping) does not anymore reflect the actual situation.

The outreach of BGP to women has been quite huge, when defining this in terms of women who participated in BGP activities or events. For example, activities as FFS (all categories) had 55,137 women participants, representing nearly 30% of all households in BGP's polders. Field days draw an even higher number of the women as attendants (see box 24.8).

Box 24.8: Exposure of women to field days as attendants

Over 222,000 persons attended, of whom 128,000 (or 58%) were women. If all women attendants only participated once in a field day (and one woman per household), women of 70% of all 185,000 households in the BGP polders would have been reached. However, the actual percentage will be lower, as part of the women will have attended 2 or more field days, and therefore are double counted.

In the section on women's empowerment -further below- an estimate is made of the number of women who became empowered, making adjustments for double counting.

24.4.2. Outcomes and impact

There is ample evidence that the effects of Blue Gold's gender mainstreaming and specific gender activities, including targeting men and women, are twofold: (a) Blue Gold's overall objectives are better achieved and (b) women's empowerment and gender equality are enhanced. The following sections of this report elaborate on this. Because hardly outcome-level indicators for measuring gender related impact were included in the baseline and endline surveys, the findings on outcomes and impact are mainly based on interpretations of quantitative output data and qualitative information from FGDs, observations, informal quick assessments, and information from field staff. However, the amount of the qualitative anecdotal evidence is overwhelming, and such achievements cannot be doubted; only their precise scale remains uncertain, although an attempt to estimate this is done.

Blue Gold's objectives better achieved

Illustration: "If Blue Gold would not have paid attention to women, it would not have achieved its objectives so well" – CDF

Participatory water management benefits from "all hands on deck", i.e. involving men and women:

- With men and women as WMG members, the support for participatory water management among local communities is enhanced
- This also led to a larger pool of potential WMO leaders, with examples of strong and valuable women leaders, who were chosen due to their capacities, taking initiatives benefiting male and female WMO members. The fact that also women became members of O&M subcommittees, which do not have quota for women, demonstrates that they are also elected due to their capacities and potential

***Illustration:** Monimjan Akter is joint secretary of Boshkhali WMA and was elected as president of a catchment O&M committee because she demonstrated better understanding of water management than many men.*

- With also women in WMO leadership positions, there is better representation of the interest of all polder dwellers (M/F), enhancing inclusivity within WMO decision-making
- Women are usually more “neutral” and less politically biased than men, also contributing to better decision-making, and in some cases to more successful conflict resolution
- Women also contribute to in-polder water management and maintenance, for example, by participating in cleaning water hyacinth

Women contribute to increased agricultural production in various ways:

- Women are the main drivers to **increased homestead production**. This especially concerned women who participated in homestead FFSs, but also women who learnt about improved technologies through Horizontal Learning events and/or from neighbours or relatives. BGP staff observed that women are often more cautious in applying learnings than men

***Illustration:** “Women are very committed and concerned to well apply the learnings from training as they feel this empowers them. They feel that trainers take them as equals, also because the trainers stop men dominating, ensuring that women get attention as well. Then the women feel proud and extra committed to apply learnings. Men are less serious in applying.” – BGP staff member.*

***Illustration:** Her neighbour’s success (in poultry rearing) inspired Fatehma to also take up poultry rearing, learning from her about good rearing practices. – Impact report poultry rearing HL*

- The below box 24.9 provides an example of production increase due to FFS participation (cycle 11 in 2018), showing that average homestead production roughly doubled from before FFS to after FFS

Box 24.9: Increase in homestead and fish production of cycle 11 FFS participants (2018)

- Average **egg** production: from 32 to 71 eggs/month (98% female FFS participants)
- Average production of **chicken or ducks**: from 1.5 to 4.5 per month (same)
- Average number of different **vegetables**: from 3.4 to 6.3 (100% FFS female participants)
- Average **fish** production from 49 to 123 kg/season (78% female FFS participants)

- Women’s engagement as family labour in field crops increased, thus contributing to the increased crop production that has been realized under BGP. Though no hard quantitative data have been measured on women’s input as family labour, there is ample evidence for this trend, both reported by field staff and by FGDs with women’s groups. Now that field crop production became more intensive, both in term of yield increase and number of crops per year, also more labour is required. Women tended to especially provide labour for non-rice crops, but their engagement in paddy fields has now become more common. Moreover, the role of women in day-to-day farm management, either on their own or jointly

with their husbands, is increasing, in particular when husbands are involved in off-farm employment or are otherwise not able to work, such as in families with a disabled husband. Women's increased responsibilities in field crops was often enhanced by BGP training, see the next example

Illustration: *Layli's husband is disabled, and therefore she does almost all work in the field crops, such as in watermelon, a crop promoted under BGP. She sold the watermelons to a trader accepting the offered price. After she participated in BGP's Market Linkages and Women's Empowerment training, she felt more confident and took more responsibilities. For example, she now bargains about the watermelon price after first checking the prices in Khulna, Jhasore and Dhaka by phone. The wholesaler now pays her a higher price than before.*

- Women's participation in wage labour work significantly increased because of the increased demand for wage labour due to increased cropping and because much of the available male labour is already absorbed in the non-farm sector and commercial agricultural enterprises. As a result, women are now hired at a much larger scale and for almost all farm operations replacing part of the male labour, whereas before women were mainly engaged in a limited number of tasks such as post-harvest work. Though this is a general trend, variations in the pattern over the BGP project area were observed

Illustration: *6 of the 14 women reported to be engaged in wage labour. Since the Blue Gold Program opportunities for such work increased considerably. They estimated that the number of days of wage labour work increased from 15 to 90 on an annual basis - From a FGD with women members of Tolna WMG in polder 25 in February 2019*

Women contribute to reduce poverty and improved livelihoods

Women's increased involvement in agricultural production also means that they contribute to increased household income, reduced poverty and improved livelihoods. This applies to most socio-economic categories of households:

- In households with access to crop land, women's contribution to field crop production -both as family and as wage labour- enabled increased production and farm income. Where women work as family labour in field crops, they reduce the need for wage labour, hence reducing production costs
- In households without access to crop land, but with homesteads, women were key in increasing homestead production, contributing to more household consumption of produce as vegetables, eggs, poultry and/or milk or fish, enhancing nutrition and/or reducing the costs for buying such food items. In addition, many households with increased homestead production sell (more) surplus production, enhancing the households income
- Women who engage in wage labour work, usually from landless, poor households, now contribute more to the household income as they have considerably more opportunities to be hired. Overall, due to the increased demand for labour, daily wages increased since the start of BGP. Even though women's wages often doubled, while male wages went up with about 50%, women's wages still remain lower than men's wages. NB: In 2020, due to COVID-19 restrictions and lockdowns, wages dropped again, though probably only temporarily. This was because the supply of labour increased because men who used to be engaged in migrant labour (such as the brickfields near Dhaka) returned to their village
- Women grabbed income generating opportunities created under BGP, such as by engaging in LCS work, as community poultry workers, and as entrepreneurs
- When women have own income, they often have a say about the spending. Women use their income for the well-being of their family, spending it on food, children's education, clothing, medicines and house repairs, but also use it as investments in assets and productive resources

Illustration: Morjina participated in a Horizontal Learning program about poultry rearing. Now she has 90 chickens and 14 ducks; before only 4 ducks. Per month she now sells for BDT 5000-7000 taka birds and eggs. She spends her income on child education, food, house repair, clothes, other household expenditure and entertainment, also saving some money. She is widow with a son and a daughter. With the income she can maintain her family. – From the impact assessment report of the HL poultry event

More gender equality and women's empowerment

Blue Gold contributed to more gender equality and reduced inequalities, and improved women's empowerment and well-being. This has been mainly assessed by qualitative methods, such as through FGDs, interviews and observations, but this is also reinforced by the interpretation of quantitative output data. In addition, 4 students from the Patuakhali Science and Technology University (PSTU) conducted in December 2017 a study comparing women's situation in 2 new and 3 old polders of BGP, see Table 24.1 with the summarized findings:

Table 24.1: Findings from a study by PSTU students comparing women's situation in 2 new and 3 old polders of Blue Gold collected through Focus Group Discussions among female WMG members in December 2017

| Determinative | New polders (BGP just started work) | Old polders (BGP working for 3-4 years) |
|---|--|--|
| Participation of women in WMG meetings | 30% | 53% |
| Active participation in decision making process of women who participate in WMG meetings | 25% | 68% |
| Women's involvement in income generating activities (such as crop farming, homestead gardening, livestock or poultry) | 39% | 78% |
| Husbands contributing to household activities, such as fetching water during cooking and child care | 13% | 48% |
| Women involved in decision-making within the household | 19% | 62% |
| Women's mobility | 27% | 81% |
| Women reported to have savings | 20% | 79% |
| Women's leadership | Low; misconception about the possibility of women's leadership | Higher than in new polders; more accepted by men |

Below the various aspects of increased gender equality and women's empowerment are discussed, in particular women's economic empowerment (WEE), social empowerment and increased confidence, changes in gender norms and the process that lead to empowerment.

Increased economic empowerment of women

Economic empowerment refers to the capacity to participate in, contribute to and benefit from economic growth by becoming more involved in productive work. Women's economic empowerment increases women's access to economic resources, such as inputs, financial services and assets, to skill development and market information. It also means that their decision-making power, e.g. on purchasing inputs and spending income, is increased.

Women's economic empowerment under BGP is manifested in several ways:

- Women acquired and applied new knowledge and skills. As a consequence, more women are now involved in productive work, they increased the time spent on productive work, and/or they now apply improved technologies, which increased their productivity
- Women got more or better access to economic resources, such as inputs, assets, as well as to markets. BGP interventions, such as FFS, were often key in getting knowledge about market linkages; increased income from production enabled some women to acquire more own assets
- Women generate more income and have more decision-making power, both on production and on spending the income: jointly with their husbands or on their own

***Illustration:** Josna Begum participated in a horizontal learning exchange about poultry rearing. Before she had only one chicken; 1.5 years later 40 chicken and 16 ducks. She sells birds and eggs for BDT 5000 monthly. Recently Josna used part of her income to buy land in the name of herself and her husband. Now she can take decisions in her family – From impact study HL poultry event*

***Illustration:** On average, women now have more money to spend on their own – CDF on the impact of FFS*

- Women also earn more due to new or expanded opportunities for work: more wage labour work, construction work in Labour Contracting Societies (LCS), from new opportunities such as vaccinators, and as entrepreneurs

Box 24.10: Examples of women as new entrepreneurs

- Women upscaling subsistence production into a real business (eg Alia with 500 ducks) or expanding field crop production (Layli with 240 decimals watermelon)
- Women using earnings, e.g. from LCS work, to establish a small shop or rice hotel
- Women taking up key roles in organizing collective actions (such as Binita Roy)
- Women venturing into bigger business such as certified input supplier (Shebika Biswas selling agricultural inputs for BDT 1 lakh monthly)

Social empowerment and changes in gender norms

Women's social (or socio-cultural) empowerment refers to the capacity of women to have their own identity, a positive self-image and social status. Gender norms refer to the existing ideas about how men and women should be and act.

Changes in the traditional positions and roles of women could be increasingly observed in the course of BGP, as well as in norms about what women (and men) should be and behave. Some of such changes, such as women's WMG leadership, were directly promoted by BGP interventions; others, such as women becoming more respected, were as a consequence of BGP interventions. Major elements of social empowerment and changed norms observed in BGP polders are:

- Increased self-confidence of women, either as a consequence of being taken as equals in training and workshops, and because of being proud on contributing to increased production and income. Many women also became more respected by their husbands, relatives and within their community

Illustration: *“Amra meye manush na, amra manush” (“We are not just females, we are human beings”) – realization of women after attending the training on market linkage development and women’s empowerment.*

- Women’s mobility and social networks increased, e.g. due to participating in BGP interventions, such as court yard sessions or FFSs, by attending WMG meetings or participating in activities organized by WMGs, such as collective actions. The increased emphasis on promoting that also women can maintain market linkages helped to further expand women’s networks, even if they maintain market contacts by using their mobile phones
- More women took up leadership positions; and more women in leadership positions are capable and speak out. Women use their experience as WMG leader to be candidate for local government elections (Union Parishad)

Illustration: *In the 2016 Union Parishad elections in total 25 women WMG executive committee members were elected as UP member; more women had stood as candidates.*

- Evidence of gender norms gradually changing:
 - Labour division became less rigid; women now are found to be engaged in almost all farm tasks, including those that used to be considered as typically male

Illustration: *The BGP database includes data on adopters of modern technologies. It shows that all categories of technologies, also those considered ‘male’ such as line sowing or using HYV rice, include women farmers as adopters. – WMG tracking report*

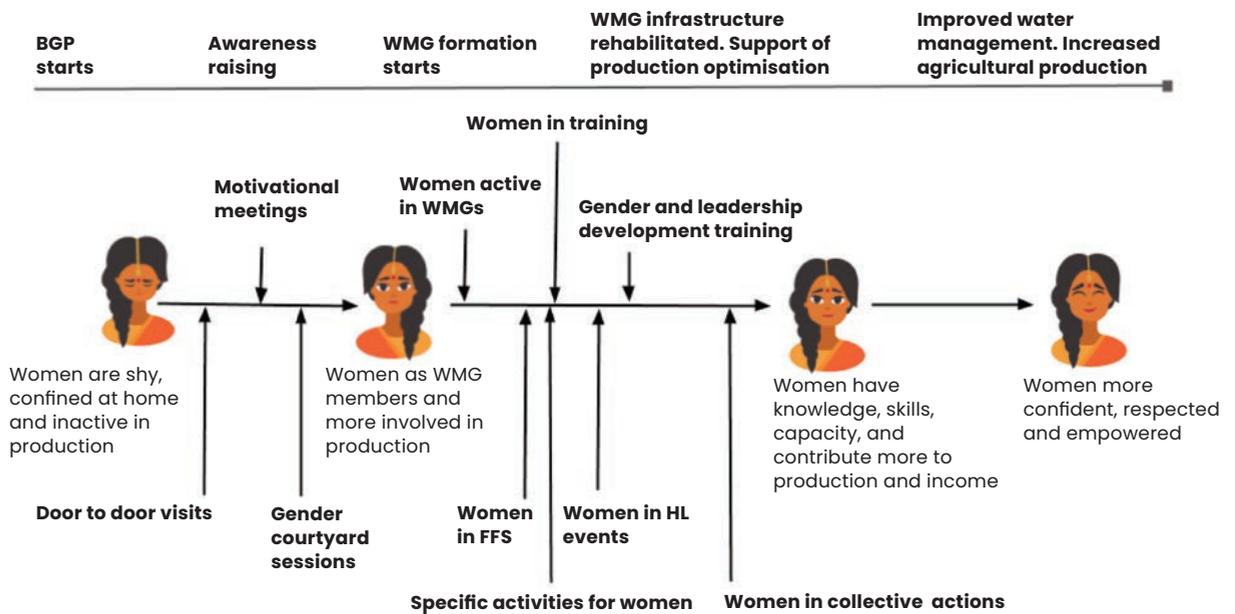
- Men now more accept and value women leaders; men are also more prepared to elect a woman candidate who has the required capacities
- An increasing number of husbands have more trust in their wives and take their opinion more seriously

Illustration: *A (male) farmer reported that after his wife got knowledge about agriculture due to participating in a FFS, he now discusses farm decisions with her, as she now better understands these matters. – FGD in Polder 25, Khulna*

Process of empowerment within BGP

The underlying processes that seemed instrumental for increasing women’s empowerment are presented in the following diagram, also linking the empowerment process to the developments within BGP.

Figure 24.2: Process of women’s empowerment as linked to phases in the Blue Gold Program



The diagram (Fig. 24.2) shows that at the start of BGP women generally were shy and confined at home. They did not much contribute to (agricultural) production; if so, it was often limited to low-key homestead activities and/or post-harvest work. Field staff observed that the 40% target of BGP for WMG members to be female prodded them to make extra efforts to mobilise also women for WMG membership. This, in turn, was instrumental to get women out of their house and get them interested in participation in BGP activities, such as FFS. And the participation in such activities lead to increased knowledge and skills of women, including more motivation to engage in productive activities. When women realized that they were taken seriously in trainings and were able to play a role in increasing production and household income, their self-confidence increased, they became proud of their achievements, and they also became more respected by husbands and the community. These processes were enhanced by gender awareness raising (e.g. through court yard sessions, GLD training or women’s empowerment workshops) and because an increasing number of women took up leadership roles and thus acted as role models for other women.

The above process description is rather simplified, also because other interventions than by BGP are taking place in BGP polders, which may also contribute to the empowerment of women, such as MFIs issuing loans to women and other projects that also target women (such as IFMC and Max WASH). Still, the relatively intense coverage of the concerned polders through BGP, resulting in having 511 WMGs covering all communities, created opportunities for almost all women in the targeted polders to somehow participate in or benefit from BGP activities, at least, if interested.

Estimate of the number of women empowered due to BGP

The number of women who became empowered due to (participating in) BGP activities cannot easily be assessed, also because some same women may have participated in more than one BGP activity, such as in a FFS and in a GLD training. Still an attempt has been made, based on criteria and assumptions that are derived from insights in the field situation. For each potentially empowering activity in which women participated two assumptions were made: (i) the proportion of women who became empowered due to that activity; and (ii) the overlap with other activities, i.e. the extent of multiple participation. Several rather

passive activities, such as becoming WMG member or attending a Farmers Field Day are not considered to lead to empowerment, and were excluded from this assessment. The activities that potentially empower women include the FFSs, gender and women's empowerment training, being a WMO EC member or participation in collective actions. This exercise led to the conclusion that an estimated 68,173 women have been empowered due to BGP, at least to some extent.

With about 185,000 households in the 22 BGP polders, it is estimated that women in about 37% of the beneficiary households may have been empowered by BGP. It is important to realize that the proportion of women who actually benefited from BGP is considerably higher than this 37%, because also many women benefited without (evidence of) becoming empowered, e.g. from reduced poverty.

24.4.3. Increased well-being of women and their families

Women's empowerment is only genuine if it also leads to increased well-being of the women, including more control on their own life. Increased well-being, both of the women and their families, is found to be a consequence of the outcomes achieved by BGP. Various aspects of improved well-being are noticed: some can be deducted from quantitative data (such as the reports on FFS cycles), whereas others are observed and/or reported in FGDs or interviews with individuals (qualitative findings). Examples of improved well-being are:

- Improved quality of life because of increased incomes and reduced poverty

Illustration: *“My quality of life has changed very quickly with the help of Blue Gold.” - Zakia*

- Increased social status, including new opportunities for entertaining guests

Illustration: *“We get more honour in the family than before.” - Rashida Begum*

Illustration: *Apart from spending her increased income on food, child education, clothes and medicines, Halena Begum can now also spend on entertainment and socializing. – Report on impact of Horizontal Learning event on poultry*

- More opportunities for better health, due to increased (homestead) production that is partially used for own consumption (e.g. vegetables, eggs, chicken, milk and/or fish), more attention to nutrition, increased mobility of women improving their access to health services, and increased affordability of medicines due to increased incomes
- More investments in children's education, as many beneficiaries mention this as the first or second objective to spend increased income on
- Improved and more equal position of women, enabling women to more engage in decision-making, also on choices influencing their own life
- More peace in the household due to reduced poverty and more joint decision-making, and reduced domestic violence due to more mutual respect

Illustration: *The financial position of her family was not good and her husband used to beat her. Now that she is involved in productive activities and contributes to the family's income, her husband respects her and does not beat her anymore. – Manjuma Begum*

24.5 Analysis, challenges and lessons learnt

24.5.1. Analysis of how BGP's gender approach evolved over time

There was a clear learning curve over the duration of the Blue Gold Program in addressing gender issues. In the first years of Blue Gold, the focus was on achieving quantitative targets of women's participation, such as WMG members, FFS participants and as LCS workers. Attention to achieving and measuring more qualitative results, going beyond output level, remained limited, even though various ideas were in place, for example, for addressing gender norms. This applies especially to the Gender and Leadership Development training, which was already foreseen in the inception phase, but was only realized since 2016. Based on first years' experiences, including the need to work more towards outcomes and impact than only outputs, BGP's gender approach evolved, including by paying more attention to making content of Blue Gold activities more gender sensitive. In practice this meant that gender messages became better integrated in several core Blue Gold interventions (gender mainstreaming) and that more specific gender activities were initiated to complement and support gender mainstreaming.

However, this did not mean that including women as beneficiaries as per targets was not useful to empower women. As already mentioned, targeting women for WMG membership and as FFS participants enabled women to overcome confinement at home and get exposure to opportunities. The implementation of gender specific activities, such as the gender court yard sessions and GLD training, were found to both strengthen gender mainstreaming and to directly enhance women's empowerment. But it is due to gender mainstreaming, including targeting women, that Blue Gold has reached and empowered such a huge number of women.

The reasons for the slow start of making content more gender-sensitive and for starting-up gender specific activities were various, but includes the high turnover of the national gender consultants in the first years. It was only since January 2016, with the appointment of the fourth national gender expert since BGP's start (who continued until September 2021), that more continuation came in the planning and implementation of gender (sensitive) activities.

Another reason for increased attention to gender issues over time was that TA team members gradually gained more awareness on gender, including more insight in the need for and advantages of (also) targeting women. The gender training for zonal and field staff in 2017, way later than originally planned, turned out as quite instrumental. However, also the observation that working with women could be very rewarding in terms of achieving successes, caused that many field staff became keener on working with women beneficiaries, of course, next to male beneficiaries. The emphasis on joint decision-making on an equal basis (vis-à-vis autonomous decision-making by women only) proved appropriate: not only more acceptable to staff and beneficiaries, but also more in line with the fact that farming is a family business, where husband and wife form a team, rather than two autonomous farmers. The message that joint decision-making is good for a peaceful family was often embraced by female and male beneficiaries.

Apart from the high turnover of the national gender experts in the first years and limited attention to gender mainstreaming in terms of making content more gender-sensitive, looking back with hindsight learned that also in a few other respects BGP's work on gender could have been better. For example, no gender analysis had been done at the start; at that time assuming that enough insight in the gender situation in the polders was still available as many of the key BGP staff had also worked in the IPSWAM project, which used to have quite a good gender component. However, in the course of Blue Gold, the absence of a gender analysis was felt as a miss, though many insights in gender-related gaps and needs were gradually acquired by interacting with (women) beneficiaries during field visits, from FGDs and in meetings. In this context it should also be mentioned that the baseline survey of BGP collected only limited data that could be used as a proxy to measure empowerment; suggestions for including better gender indicators in BGP's monitoring (eg to measure women's active involvement in WMG meetings) were not always taken up.

Apart from a budget for gender expertise, Blue Gold's original budget did not include special budget lines for gender activities. Within Blue Gold this was hardly a problem because gender activities could be funded from broader budget lines, for example, gender training from the training budget or a gender study from a budget for studies. In the second part of BGP, annual budgets for gender activities were prepared and approved.

The proportion of women as professional staff within the TA team was always quite low, and rather decreased over time, especially in the zonal offices. There also remained room for improvement in the working environment of women staff, despite the anti-harassment policy, even though the presence of this policy reportedly contributed to some improvements.

24.5.2. Challenges

At the end of the Blue Gold Program various gender-related challenges remained:

- The phenomenon of feminization of agriculture, with women playing an increased role in agricultural production, requiring an adjusted focus and approaches of agricultural extension services, including women-friendly technologies and/or mechanization
- The increase of women's total workload due to their increased involvement in productive work combined with their responsibility for domestic work, could be seen as a "negative" impact of BGP, as also impacting their health. Still, women feel proud on contributing to increased production, and they do not consider reducing their role in production as an option. Rather, the idea of sharing domestic work with their male household members, as part of BGP's gender messages, was welcomed by all women. In practice first evidence of some men gradually contributing more to domestic and care work was observed, but the difference in total worked hours per day by men and women remained significant
- Women's wages remained structurally lower than men's wages, even for doing the same or similar tasks, although some first signals of reducing this gap were reported

Illustration: Women are almost always paid less than men – typically being paid between half and 80% of the male wage. Some FGDs reported that the differential between male and female wages has narrowed, at least in relative terms. – Technical Report 26 Outcomes of BGP interventions, November 2019

- Women's representation in key positions in WMOs remain low, even more in higher level organizations, such as WMAs and Catchment O&M committees. At the same time, in all categories of positions, even if there are no quota, at least a few women can be found
- Women doing LCS work meet many problems. For example, the late issuance of work orders make it more difficult for them -as part time workers- to complete the work before the monsoon rains start. If conditions not improve, it can be wondered whether LCS work for women still should be promoted

24.5.3. Lessons learned and recommendations for future projects

Many lessons can be drawn from Blue Gold's work on gender equality and women's empowerment. They also confirm recommendations of existing guidelines for good gender mainstreaming¹. Without being exhaustive, major lessons learned, also as recommendations for future projects or programs, are presented here:

- Conduct a gender analysis, either as a stand-alone study or as part of a broader situational analysis. The findings from the gender analysis should be used as input for project design, or -if conducted during an inception phase, for making adjustments to project design to allow to address causes of gender inequality and contribute to more equality and empowerment

¹ See the minimum criteria for a "gender significant" project according to OECD-DAC gender marker system: <https://www.oecd.org/dac/gender-development/Minimum-recommended-criteria-for-DAC-gender-marker.pdf>

- Gender mainstreaming in core project interventions, both in terms of targeting women and men and making content more gender-sensitive, is important to ensure women's empowerment at a robust scale
- Apart from gender mainstreaming, a package of gender specific activities is essential to support and complement gender mainstreaming, for example, by addressing changes in the mindset of men and women towards changing gender norms
- Quotas can work, but they should be accompanied by other measures, for example activities to create gender awareness, address gender norms or to support development of women's leadership
- Make sure that indicators are identified that allow measuring women's empowerment, including to assess the scale of their empowerment, instead of only using estimates based on anecdotal evidence
- Realise that terms such as "farmer" and "entrepreneur" include both men and women. Blue Gold learned that gender-stereotypical roles, such as typical male or female tasks, can rapidly change, and therefore gender-stereotype approaches should be avoided. This means, for example, that in principle all training should be open to both men and women. This also creates more opportunities for the inclusion of female-headed households
- It is important to pay attention to women's workload to avoid that they become overloaded with work. However, not including women in project interventions is no option; rather, sharing of domestic work and time-saving technologies should be promoted
- Gender expertise in the TA team is crucial for support in gender mainstreaming, as is gender training of the staff. Female (field) staff is important, also as role models. Attention needs to be given to a women-friendly working environment; this sometimes may require some special practical arrangements for women staff from an equity point of view. When promoting staff, explicit efforts should be made to ensure that assessment criteria do not favour male staff
- The commitment of project management towards gender equality and women's empowerment is found to be a major success factor. This is even more so when a project's budget does not include budget lines for specific gender activities, as then project management needs to approve the budgets for proposed gender activities

References

- [1] Dewan, Camelia; Buisson, Marie-Charlotte; Mukherji, Aditi (2014). "The imposition of participation? The case of participatory water management in coastal Bangladesh". *Water Alternatives*. 7 (2): 342–366. https://www.researchgate.net/publication/281554817_The_Imposition_of_Participation_The_Case_of_Participatory_Water_Management_in_Coastal_Bangladesh



25 Poverty Focus: development of homestead production

25.1 Introduction

25.1.1. Household categories in Blue Gold area

An overall objective of Blue Gold Program (BGP) is to improve agricultural production systems to increase the income and food security of polder dwellers through improved water management. When addressing the water resource management constraint on agricultural development, not all households equally benefit from project interventions beyond the safety offered by embankments. We identified that households have different assets, physical and other, determining the extent they can participate in agricultural production innovations and take advantage of water resource management improvements. On this basis we recognised three, not necessarily sharply defined, categories of households (HH).

A first category, probably slightly over half of the households in the BGP polders, have **access to land** either through ownership and/or leasing, and possess some other production related assets, such as household labour, skills, finance, etc. They are intent on farming as their livelihood strategy, but may complement it with other income, such as non-farm labour income or income from homestead production. Only few of them are really food secure, but generally they are poor or oscillate in and out of poverty as most of the polder inhabitants. This category stands to benefit of improved water resource management. It gives them the opportunity to make their farming more 'commercial', to become more market-oriented instead of subsistence focused.

A second category, estimated as some 25-35% of all households, but varying across polders, **lacks access to land in any form** and has few other means, assets or skills. They generally are the poorest in the polders and food insecure. Not involved in cropping agriculture as farmers, they do not really benefit from water resource management besides through the safety of the embankments, and indirectly from increased demand for wage labour, as for many of them such wage labour is a main income source. Roughly the

upper half of this group (i.e. 15% of the total population) nevertheless have a homestead plot, possibly a few livestock assets or a small pond, and labour available in the household of sufficient health to benefit from homestead Farmer Field School interventions.

A third category of households, partly overlapping with the two other groups, **make use of their labour and skills, and have other means or assets** to be actively involved in other activities and sectors (e.g. government service holders or engaged in the private sector, either as (small) entrepreneurs, craftsmen or employees). They have opted out of agriculture, even if they own land, and see their future elsewhere basing their livelihood strategy on the labour and skills in the household.

While these categories cannot easily be defined unambiguously and households migrate in and out of a certain category, Blue Gold stood to gain efficiency and effectiveness in its interventions by taking notice of their differing requirements. In Section E the focus was on the first category of households and Blue Gold interventions facilitating the commercialisation of their farming. In this Chapter 25 the focus is on Blue Gold's activities to promote homestead production, including livestock and fisheries, and its contribution to food security and poverty reduction targeting those households of the second category that have a homestead plot.

25.1.2. Origins of Homestead Farmer Field Schools

Farmer Field Schools (FFS) is a group-based adult learning approach through which farmers learn how to experiment and solve problems independently. The activities take place in the field, essentially around a core set of trials and are, as such, sometimes called “schools without walls”. In FFS, groups of twenty-five farmers meet regularly during one full production cycle with a facilitator, observe from the trials, discuss, ask questions, and learn together.

Farmer field schools as an approach was first developed about 30 years ago by FAO to promote integrated pest management (IPM) techniques in rice farming. Since then it has developed into a group-based experimental learning process to increase knowledge and skills in (organic) agriculture, animal husbandry, and even non-farm income generating activities such as handicrafts.^[1]

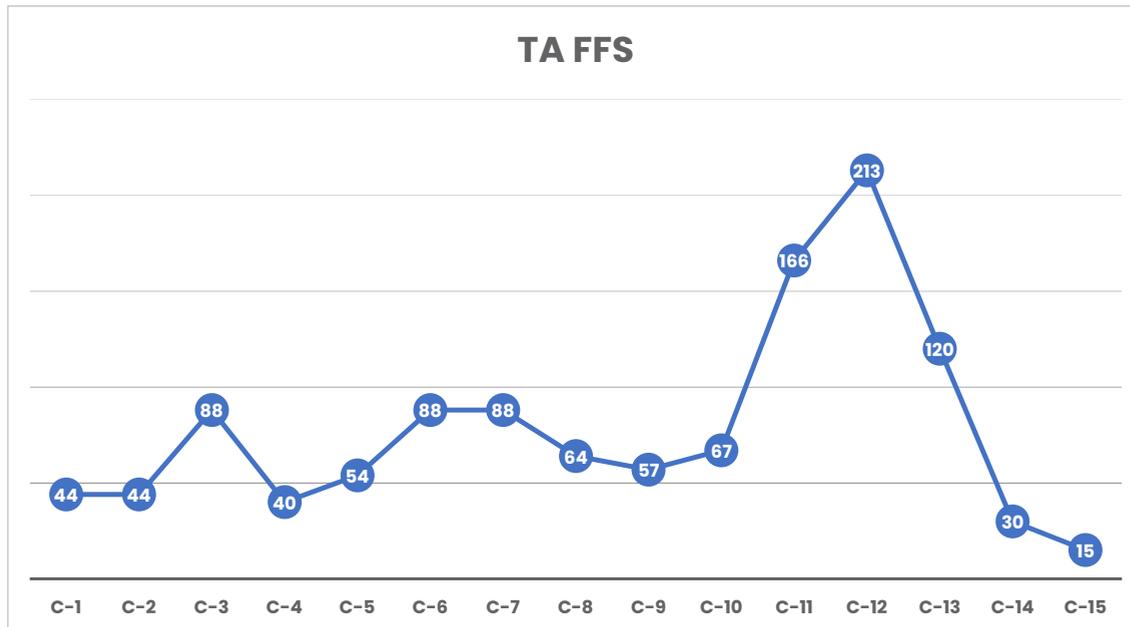
For DAE the FFS methodology is central to its agricultural extension approach. Apart from in Blue Gold, DAE applied FFS in DANIDA supported programs, such as its Integrated Farm Management Component (IFMC) program. In IFMC farmers with access to crop land participate in FFS modules on rice production, complemented by sessions covering homestead production including vegetable gardening, poultry and livestock and nutrition. These latter sessions are aimed primarily at the women in the participating husband and wife teams. Farmers with only a very small land holding, usually also husband-wife teams, get a fully integrated homestead FFS program covering poultry, homestead gardening (focus on vegetable production; but also fruit tree management), beef fattening, dairy and goats, and nutrition.

It is the latter approach that Blue Gold took over for its homestead FFS. The DAE Blue Gold component focused on crop FFS as discussed in Section E, working with groups made up of husbands and wives, with the men participating in crop modules and the women in homestead and nutrition modules. This chapter 25, however, does not report on the women of DAE's husband and wife teams who participated in homestead modules, rather it focuses on the homestead FFS implemented by Blue Gold's technical assistance team. These 'TA' FFS entirely aimed at increasing homestead agricultural production, including poultry, livestock, fisheries, vegetables and fruits. These FFSs had no link with field crop production as they targeted participants who had no or limited access to crop land.

25.1.3. Homestead FFS in Blue Gold

The primary objective of implementing homestead FFS was to achieve food security and improve the nutrition uptake of otherwise resource starved households with a view to increase their living standard. The approach focused on improving vegetable production, fruit tree management and poultry and livestock rearing, utilizing the limited homestead land available as well as the adjacent small ditches or ponds for fish production. In combination the household’s nutrition status could be enhanced.

Figure 25.1: Number of Homestead FFS per cycle



Blue Gold’s technical assistance team implemented a total of 1,178 homestead FFS, involving 29,450 participants across 22 polders in 15 cycles from mid-2013 till mid-2021; 88% were women. Each year 2 “cycles” were implemented with the content depending on the production opportunities of the concerned season. The number of FFS per season remained largely stable for the first ten cycles, see figure 25.1. Thereafter a different approach was followed in order to enhance the number of FFS (as in cycles 11 to 13). The sharp reduction of FFS per cycle in cycle 14 and 15 was due to the COVID-19 limitations. The two different approaches are described below.

25.2 Homestead FFS – Cycles one to ten

The first ten cycles, or a total of 634 FFS, were implemented from the end of 2013 till early 2018. The approach largely stuck to the DAE practices. The homestead FFS followed the fully integrated curriculum, or bundled module approach, as implemented by DAE for households with small land holdings as described above. In general, the FFS during one cycle would contain modules on homestead gardening (mainly vegetables), poultry rearing and nutrition while the FFS during the following cycle contained modules on beef fattening, fish culture and again nutrition. Up to early 2018 these two bundles of FFS modules were delivered annually.

The final composition was seasonally determined. Poultry could be implemented any time of the year but beef fattening was linked to Eid-ul-Azha, i.e. the festival during which Muslims sacrifice animals and demand for beef is high. Similarly, fish modules were mainly linked to the monsoon season while the homestead gardening/vegetable modules could be undertaken in both winter and summer seasons.

Participants for homestead FFS were selected with the support of the Water Management Groups (WMGs). While the bundles were not defined by local demand, participants could choose the specific bundle they opted for, earlier or later in the year. WMG executives shortlisted interested households accordingly for the relevant season and project staff selected a final 25 participants after further scrutiny. In order to be a participant at FFS, a farmer needed to be a WMG member, a permanent resident of the polder, relatively resource-poor but already active in some homestead production, motivated to apply the learnings, within a certain age bracket, and possessing the required attitude.

Selected participants had to be from households who stood to benefit in terms of food security and nutrition as a result of attending FFS. In practice, households were aimed at owning less than 50 decimals of land. A group of FFS participants could be mixed, all females, or all males, depending on their interest, ensuring to include the household member who was likely to best apply the FFS learnings. The target was that at least 50% of all homestead FFS participants in Blue Gold would be women; in practice it was the large majority: 24,856 of the 29,450 participants of the 15 cycles, or 88%.

All FFS covered season-long production (seed to harvest, egg to egg, etc.) and were based on learning from experience (experiential learning) through a participatory learning process. The first FFS bundle was a combination of 20 sessions focused on transferring improved technology on homestead gardening-poultry-nutrition. The first two sessions were preparatory sessions, used for group formation and assessment of participants. Technical sessions started from session three. Next seven sessions were for vegetable production and fruit tree management including manure preparation, harvesting and result analysis. Poultry sessions commenced thereafter and continued for the next seven sessions covering poultry management, proper housing and biosecurity management. The four last sessions discussed nutritional aspects of food, infant care, safe food, food preparation and ways of preserving nutritional value. At last, a farmer field day (FFD) was organized to share the learnings of the FFS with a wider range of interested people. Technical Note 10 presents a report on a Farmer Field Day organised at the end of FFS cycle 6 in Patuakhali.

The second FFS bundle, covering the fisheries, beef fattening and nutrition modules, also consisted of 20 sessions. The first session, a preparatory session, was used for group formation and assessment of participants. Technical sessions on fish culture started from session two and continued till session nine. These eight sessions covered pre- and post-fingerling stocking management, disease management, harvesting and result sharing. The next five sessions were focused on the cattle fattening process, sharing experiences on cattle housing, deworming, feeding management, diseases prevention and biosecurity. There was one session on marketing the cattle, followed by four sessions on nutrition. Nutrition sessions address malnutrition, 1000 days (on healthy nutrition between a woman's pregnancy and a child's 2nd birthday), safe food, food security and preparing balanced food. The last session was again a farmer field day (FFD).

The number of FFS that could be implemented depended on the number of available FFS facilitators. These facilitators were, upon completing a cycle, moved to a different polder for the implementation of the next cycle. Recruited from the DAE pool, these facilitators had a few years of experience and were given additional training by Blue Gold in session facilitation and hands-on implementation activities. During the first cycle, two facilitators were engaged per FFS, but from the second cycle onwards, one facilitator was responsible for all the sessions in an FFS. Thereafter, facilitators were gradually given more and more responsibilities and the number of FFS facilitated per season increased to four per facilitator. Ultimately 22 FFS facilitators were conducting FFS sessions four days a week and utilizing the remaining days to follow up participants in support of the actual implementing of the demonstrated improved technologies. Thus the highest number of FFS implemented by facilitators in a cycle was 88.

The facilitators were responsible to implement FFS in different polders during different cycles. For this purpose, they had to relocate to polders where a specific cycle had to be implemented in accordance with their expertise. From time to time they were included in capacity enhancement trainings. Usually before

initiating new cycles, refresher trainings were organized by experts. They were also given training on value chain development and market orientation issues. Moreover, they attended review meetings, initially weekly and later monthly, to discuss issues related with session facilitation, and conducted mock sessions to fine tune their skills.

An overview of the module bundles over the first ten cycles is presented in *table 25.1*. The key technologies promoted in each module are summarised in *Table 25.2*.

Table 25.1: Homestead FFS in Cycles 1-10

| Sl. no | Cycle | Duration | Module | FFS | Male | Female | Total |
|--------|----------|-----------------------------|---|------------|-------------|--------------|--------------|
| 1 | Cycle-1 | November 2013- April 2014 | Homestead gardening-Poultry-Nutrition | 44 | 83 | 1017 | 1100 |
| 2 | Cycle-2 | April 2014 - November 2014 | Fish-Beef fattening-Nutrition | 44 | 595 | 505 | 1100 |
| 3 | Cycle-3 | October 2014 - March 2015 | Homestead gardening-Poultry-Nutrition | 88 | 234 | 1966 | 2200 |
| 4 | Cycle-4 | March 2015 - September 2015 | Homestead gardening-Poultry-Nutrition | 40 | 123 | 877 | 1000 |
| 5 | Cycle-5 | May 2015 - November 2015 | Fish (Tilapia)-Beef Fattening-Nutrition | 48 | 204 | 996 | 1200 |
| 6 | Cycle-5 | June 2015 - December 2015 | Rice Fish-Nutrition | 6 | 125 | 25 | 150 |
| 7 | Cycle-6 | October 2015 - March 2016 | Homestead gardening-Poultry-Nutrition | 88 | 244 | 1956 | 2200 |
| 8 | Cycle-7 | April 2016 - November 2016 | Fish-Beef Fattening/ Dairy-Nutrition | 88 | 388 | 1812 | 2200 |
| 9 | Cycle-8 | September 2016 - April 2017 | Homestead gardening-Poultry-Nutrition | 64 | 108 | 1492 | 1600 |
| 10 | Cycle-9 | April 2017 - September 2017 | Fish-Beef Fattening-Nutrition | 57 | 285 | 1140 | 1425 |
| 11 | Cycle-10 | October 2017 - March 2018 | Homestead gardening-Poultry-Nutrition | 67 | 129 | 1546 | 1675 |
| | | | Total | 634 | 2518 | 13332 | 15850 |

Table 25.2: Key Technology in the Different Modules of Cycle 1 to 10

| Bundle of Modules | Module Type | Key Technologies Promoted |
|---|-----------------------|--|
| Homestead -poultry-nutrition | Vegetable production | Production planning and production technology: raised bed, pollination, pest management, farm yard manure production |
| | Fruit Tree management | Planning, plantation, pest management |
| | Poultry rearing | Poultry housing, laying & broody hen management, hajol, separation of chick, vaccination, bio security |
| | Nutrition | Balanced diet & malnutrition, care for infant & mother, safe food preparation, safe water & sanitary |
| Fish-Beef fattening (BF)-nutrition | Fish | Pre and post stocking of fingerling and management, disease management |
| | Cattle fattening | Housing, selection & deworming, feeding, fattening, disease management and bio security |
| | Nutrition | Balanced diet & malnutrition, care for infant & mother, safe food preparation, safe water & sanitation |

Annual Review Mission call ‘Do not lose the poverty focus’

The Annual Review Mission of 2017 called for BGP not to lose the poverty focus. Recommendation 5.4 of ARM 2017 called for the continuation and systematic implementation of homestead FFS in all polders, even in shortened versions, and where possible updated with new elements. As before, the ARM emphasized a targeting on the landless, both as direct participants and as Horizontal Learning beneficiaries.

This recommendation led in January 2018 to a review of Blue Gold’s experience with FFS, also to better align with FAO’s core FFS principles.^[2] The aim was to refresh and realign the remaining homestead FFS cycles from April 2018 onwards. The key objectives of the refreshed FFS approach were:

- To target the poorest more adequately
- To make the content more demand driven/needs based
- To reach more households
- To ensure increase in production and sale of surplus is pursued, alongside food security and nutrition
- To integrate homestead FFS in BGP’s wider interventions related to local networks
- And to also address homestead agriculture as a business as well as market linkages and gender issues.

As part of this process the incidence of poverty in relation to landownership was reviewed. This served to refine the targeting criteria and to define a realistic outreach for homestead FFS. The outreach target number of households for the homestead FFS program was formulated as follows. With 50% landless in

the total population of 185,000 Blue Gold households, there are about 92,500 households belonging to the landless category, of which again 50% are estimated to be poor, or 46,250 households. Some of these households, that are involved in leasing land under different practices, will benefit from increasing the productivity of their land and labour assets in Blue Gold's commercialisation program. Another relatively small percentage of the landless households lack the minimum assets required to gain from Homestead FFS participation or already use their labour elsewhere, including in non-agricultural sectors, to earn a decent income. On this basis a target of 30,000 households (16% of all households) for homestead FFS was considered a fair and realistic assessment.

In order to achieving a higher outreach, already in 2016 a process had started to expand the number of available facilitators for Homestead FFS. 150 Farmer Trainers (FT) had already been selected and trained by DAE to support field crop FFS, 50% men and 50% women. These FTs are energetic, enthusiastic, relatively young, and motivated individuals with at least a basic education, comparatively good farming knowledge and some FFS experience. This initiative sought to build local resource capacity; BGP TA followed this example in order to expand the capacity to conduct homestead FFS sessions and ensure the availability of resources persons in the polders, also after the end of the Blue Gold Program.

Thus 74 FTs were selected and trained by the TA team, 40% of whom were women. These additional homestead FTs were selected from the polders in which they would work to take advantage of their local knowledge and limit their travel requirements. Blue Gold trained these 74 FTs on FFS session facilitation, also including market orientation elements. As a result, these FTs could also promote collective actions for either input collection for FFS participants or output sales in groups for better prices and lower transaction costs. Later 21 FTs were added, who received a shorter training, bringing the total of TA trained FTs to 95.

25.3 Homestead FFS – Cycles eleven to fifteen

The 74 new FTs had been employed as apprentice under Community Development Facilitators (CDFs) during cycle 9 and 10. After completing their apprenticeship, they were given full responsibilities to implement FFS on their own from cycle 11 onwards, when the new FFS approach of single modules replaced the multi-module or bundled approach. The CDFs supported the FTs in preparing and implementing the FFS. Each FT implemented 1 to 4 FFS per season, bestowed upon them according to their ability. On average they implemented 2 FFS sessions per week, the better FTs did more, others less. This increase in number of FFS facilitators from 22 TA field staff with 74 FTs, combined with applying the single module approach, enabled Blue Gold to increase the number of FFS per cycle from an average of 63 to 109 FFS, but with an average of 166 for cycle 11 to cycle 13; cycle 14 and 15 had a reduced number of FFS due to the COVID-19 situation. As a result the Homestead FFS program reached substantially more households in the last cycles, especially in cycles 11 to 13.

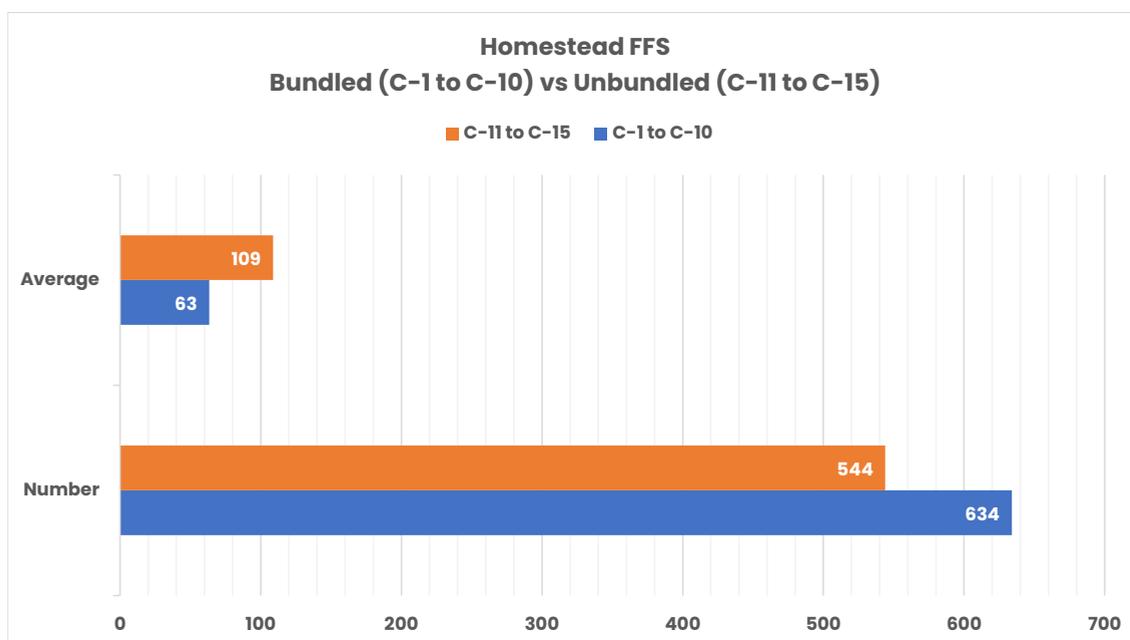
As mentioned, from cycle 11 onwards the homestead FFS also became “unbundled” and covered a single module, instead of combining 2 to 3 modules on several topics in one cycle. This meant that the number of sessions per cycle was reduced from about 20 to 6 - 9.

The selection of an individual as participant for a specific FFS was based on the available household assets to improve the concerned production and the potential interest of the concerned household member in applying the new knowledge. Both, the use of local FTs and the conversion to a single module approach, contributed to increasing the number of homestead FFS per cycle. From cycle 11 to 15, 544 single module modified homestead FFS were implemented by mid 2021, bringing the total with the 634 of the first ten cycles to 1178 homestead FFS in the Blue Gold area.

Six modules were retained for continued implementation; namely poultry, fish culture, beef fattening, homestead vegetables, dyke vegetables and fruit production. Simultaneously the content of the modules

was revised to become more needs based and better focused on key technologies. The nutrition session was retained and the market orientation content was expanded. Some relevant gender issues were integrated, such as addressing joint decision-making and emphasizing market access also for women. The market orientation focused on facilitating market linkages and collective actions and improving decision making by basic financial literacy and record keeping. The number of sessions per module varied from 6 to 9. The better alignment of the modules to the available household assets and to the actual knowledge needs, resulted in a more meaningful participation of the beneficiaries. An overview of the modules implemented from cycle 11 to 15 is presented in *table 25.3*. The key technologies promoted in each module are summarised in *table 25.4*.

Figure 25.2: Homestead FFS Bundled (C-1 to C-10) vs Unbundled (C-11 to C-13)



Market orientation issues were included in the FFS sessions, because there was clearly a demand and need for such information among both male and female FFS participants. Market orientation took the FFS content beyond technology transfers. Even at homestead level, producers require quality inputs and increasingly have surplus for sale. Market orientation also helped them to see their homestead production as a business (a micro-enterprise), requiring basic record keeping to ensure an actual benefit is obtained. It also provided the skills to access market actors as input providers and traders, and focused on lowering costs or increasing revenues using mobile phones and collective actions exploiting a group's bargaining power. To embed market orientation, questions were asked in the benchmark survey (at the start of each FFS) and end line survey (at the end of each FFS) also on record keeping, networking, use of mobile phone for contacting market actors, collective action, etc.

Instead of being treated as stand-alone groups, the homestead FFS groups were linked to other actors e.g. CAHW groups, vaccinators, resource farmers (RFs), extension agencies and other input and service providers to explain their business model and develop trusting relations. Resource Farmers (or group leaders), of whom 71% were women, received additional training on market orientation, e.g. how to organize collective actions. They were also taken on familiarising market visits and were introduced to different input suppliers and buyers. Thus, Resource Farmers can communicate with market actors and engage in face to face discussions to build or strengthen market linkages. The involvement of other actors in the FFS sessions served also another important purpose, namely the introduction of local resource persons, such as Resource Farmers and Farmer Trainers, into the network of the Water Management Groups (WMGs). *Box 25.1* provides the example of Community Animal Health Workers as service providers.

Table 25.3: Description of Single Module Homestead FFS Cycles

| Sl. no | Cycle | Duration | Module | FFS | Male | Female | Total |
|--------|----------|----------------------------|----------------------|------------|-------------|--------------|--------------|
| 1 | Cycle-11 | April 2018 - November 2018 | Poultry | 80 | 57 | 1943 | 2000 |
| 2 | Cycle-11 | April 2018 - November 2018 | Beef fattening | 25 | 144 | 481 | 625 |
| 3 | Cycle-11 | April 2018 - November 2018 | Fish | 38 | 165 | 785 | 950 |
| 4 | Cycle-11 | April 2018 - November 2018 | Homestead vegetables | 7 | 1 | 174 | 175 |
| 5 | Cycle-11 | April 2018 - November 2018 | Dyke vegetables | 9 | 39 | 186 | 225 |
| 6 | Cycle-11 | April 2018 - November 2018 | Fruit | 7 | 15 | 160 | 175 |
| 7 | Cycle-12 | November 2018 - March 2019 | Poultry | 158 | 58 | 3892 | 3950 |
| 8 | Cycle-12 | November 2018 - March 2019 | Homestead vegetables | 55 | 180 | 1195 | 1375 |
| 9 | Cycle-13 | April 2019 - November 2019 | Poultry | 67 | 40 | 1635 | 1675 |
| 10 | Cycle-13 | April 2019 - November 2019 | Beef fattening | 40 | 183 | 817 | 1000 |
| 11 | Cycle-13 | April 2019 - November 2019 | Fish | 13 | 191 | 134 | 325 |
| 12 | Cycle-14 | June 2020-November 2020 | Poultry | 30 | 3 | 747 | 750 |
| 13 | Cycle-15 | Feb,21-Jun,21 | Poultry | 15 | 0 | 375 | 375 |
| | | | Total | 544 | 1076 | 12524 | 13600 |

Table 25.4: Key Technology and Additional Topics at Single Module FFS

| Module | Key Technology Promoted | Additional Topics | Comments |
|--------------------------------|---|--|--|
| Homestead vegetable production | Production planning, production technology-raised bed, pollination, pest management, farmyard manure production | Market orientation and networking, integration of relevant gender messages | Promoted collective action for input purchase, collective sale using Resource Farmers |
| Fruit tree management | Planning, plantation, pest management | Market orientation and networking, integration of relevant gender messages | Collective sale of fruit |
| Poultry rearing | Poultry housing, laying & broody hen management, hajol, separation of chick, vaccination, bio security | Market orientation and networking, integration of relevant gender messages | Use of mobile phones for price information on feed, day old chicks, egg and hen. Collective action for feed purchase and sale of egg and hen |
| Fish culture | Pre and post stocking of fingerling and management, disease management, | Market orientation and networking, integration of relevant gender messages | Collective action for lime, fingerling purchase and sells of fish |
| Cattle fattening | Housing, selection & deworming, feeding, fattening, disease management and bio security | Market orientation and networking, integration of relevant gender messages | Use of ICT for price inform |

Box 25.1: Developing sustainable service for poultry and livestock homestead FFS participants

To be successful in poultry and livestock farming through homestead FFS, access is required to essential services like vaccination. With the active participation and support from the Department of Livestock Services, Blue Gold identified and trained 100 community animal health worker (CAHW) as micro-entrepreneurs. Of these CAHW, 60 are Community Poultry Workers (CPW) (all women) and 40 Community Livestock Workers (CLW) (38 men). They fulfil an essential role, as sustainable animal health service providers, and overcome a critical gap in the market system. Both CPW & CLW were linked with homestead FFS participants to encourage quality and timely vaccination services. For the practical organisation of vaccination campaigns they were linked to the WMGs. Only such access to sustainable animal health services can enable FFS participants to enjoy the economic benefit from poultry and livestock rearing.

For the cycles 11-15 both the WMGs and FTs were involved in the selection of the modules and the participants. WMG leaders were asked to choose specific FFS modules suitable for their area and based upon local needs. It was emphasized that the objective of the Homestead FFS program was to reach the poorest households. The base selection criterion for FFS participants thus was to be a member of the poorest landless households (owning < 50 decimals of land), but with sufficient assets to meaningfully participate in the chosen module. In particular, the participation of women was sought as most modules would have high relevance for women's empowerment and often women are in charge for homestead production. The local FTs provided additional insights to this selection process of including the really-needy.

Box 25.2: FFS training modules and booklets on FFS messages used in BGP's homestead FFS

- On homestead vegetable gardening: FFS Training Module (Bangla); FFS booklet (Bangla) and key FFS messages in English
- On fruit farming: FFS Training Module (Bangla); the above mentioned FFS booklets on homestead vegetable gardening also include messages on fruit tree management.
- On poultry rearing: FFS Training Module (Bangla); FFS booklet (Bangla) and key FFS messages in English
- On fish cultivation: FFS Training Module (Bangla); FFS booklet (Bangla) and key FFS messages in English
- On beef fattening: FFS Training Module (Bangla); FFS booklet (Bangla) and key FFS messages in English
- On nutrition: FFS booklet (Bangla) and key FFS messages in English
- On Market Orientation and Value Chain Development: FFS Training Manual

25.4 Results of the homestead FFS

25.4.1. Number of homestead FFS and modules

Of the 1178 Homestead FFS implemented in total during 15 cycles, 130 FFS were in Satkhira, 543 in Khulna and 505 in Patuakhali. About 54% of FFS were implemented in a bundled way and the rest in the single module approach.

By implementing 1178 FFS, a total of 1806 modules were completed. The number of modules is higher than the number of FFS because in the first 10 cycles the FFS consisted of bundled modules. Khulna

had the highest number of modules (805), followed by 787 modules in Patuakhali and 214 modules in Satkhira, as represented in *figure 25.3*.

Of the implemented modules, the highest number of modules was on poultry (741), followed by homestead gardening / vegetable production (469), fish culture (323) and beef fattening (273), see *table 25.5* for more details. From the total participants, 41% took part in the poultry module, 26% in homestead gardening / vegetable production module (27%), 18% in fish culture and 15% in beef fattening.

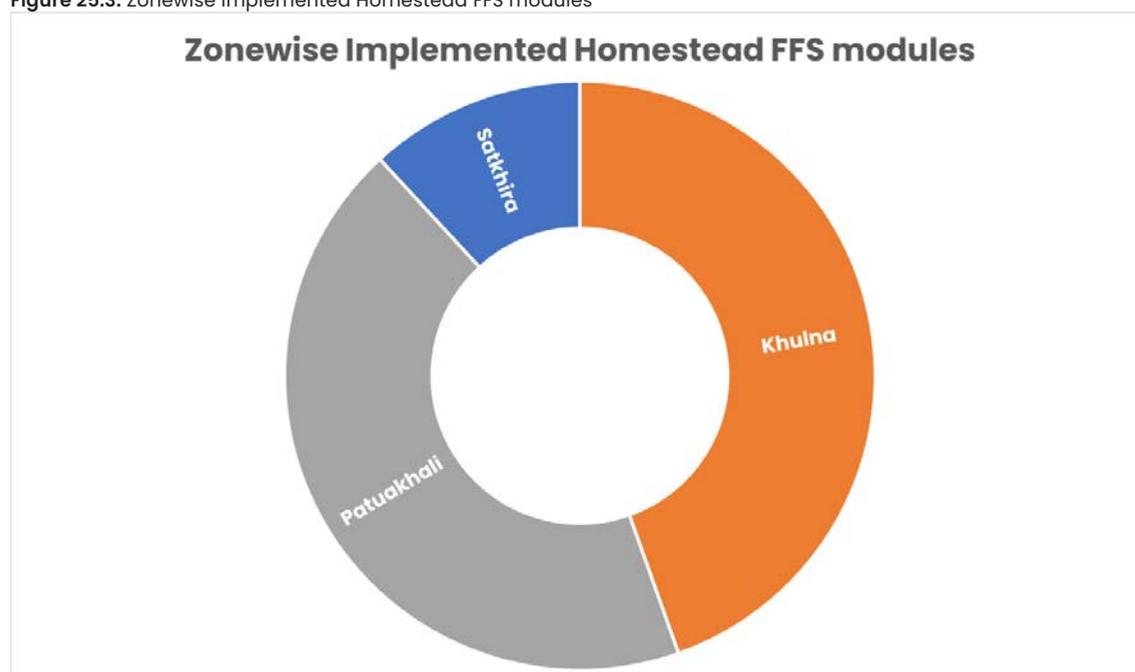
Table 25.5: Numbers of implemented homestead FFS modules per zone and per subject

| Zone | # of homestead FFS | # of modules | | | | Total modules |
|--------------|--------------------|--------------|--------------------------|------------|----------------|---------------|
| | | Poultry | Homestead vegetables [1] | Fish [2] | Beef Fattening | |
| Khulna | 543 | 355 | 221 | 125 | 104 | 805 |
| Patuakhali | 505 | 306 | 178 | 162 | 141 | 787 |
| Sathkira | 130 | 80 | 70 | 36 | 28 | 214 |
| Total | 1178 | 741 | 469 | 323 | 273 | 1806 |

[1] This includes 9 modules on dyke vegetable cultivation and 7 modules specifically on fruit tree management

[2] This includes 6 Rice-Fish modules in Khulna; the other modules concern fish cultivation in small ponds

Figure 25.3: Zonewise implemented Homestead FFS modules



25.4.2. outreach and Targeting

The number of FFS participants in all cycles (1-15) amounted to 29,450, of whom 25,856 were women (88%). Correcting for an estimated 10% of multiple participations, Blue Gold reached 26,505 households directly with the TA homestead FFS program. In addition to this, it also reached other households in two indirect ways. Firstly, there is a standard request to all FFS participants to inform two other households of what was learned in the sessions. Especially women have a high propensity to share their learnings with neighbouring women. It is assumed that on average each FFS participant effectively shared new knowledge with at least one other household, i.e. 26,505 more households. Secondly, most FFS (90% or 1060) arranged a Farmer Field Day (FFD) to which the wider community was invited and where all

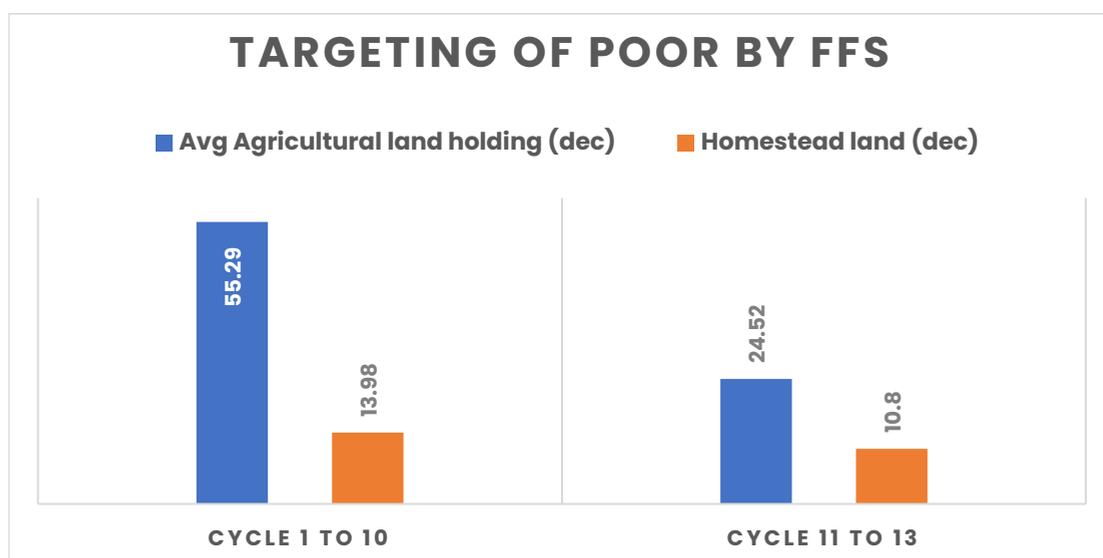
the experiences were disseminated in various ways. While on average each FFD drew about 100 visitors, it is assumed that about 25 FFD visitors were truly interested, also having the means to implement the improved technologies, also amounting to another 26,500 households more. Based on these rather conservative estimates, 53,010 households have been indirectly reached. The total of households reached directly and indirectly therewith reaches 79,510 or 43% of the total Blue Gold target population of households, see the below table. It should be noted that households reached through other horizontal learning activities, such as exchange visits, have not been included here.

Table 25.6: Household (HH) outreach of homestead FFS interventions

| Activity | # | Participation | Total # of participants | Assumptions | # HHs effectively reached by the activity |
|--|------|---------------|-------------------------|---|---|
| Homestead FFS | 1178 | 25 | 29,450 | 10% multiple participation | 26,505 |
| Neighbouring households learning from FFS participants | | | | One FFS participant informs one neighbouring HH | 26,505 |
| Homestead FFS Farmers' Field Days | 1060 | 100 | 106,000 | 25 FFD visitors / FFD effectively reached | 26,500 |
| Total # HHs reached by homestead FFS | | | | | 79,510 |

The targeting on the actually poorest was constrained by several factors. Despite efforts, the proportion of actually poor households reached was substantially lower than 100% of the participants. Originally the main selection criterion for FFS participants was to belong to landless households with less than 50 decimals or 0.5 acres of land. However, the average land holding of FFS participants across all modules of cycles 1 - 13 was 54.5 decimals, with an additional 14.9 decimals of homestead land. In total 77% of all participants belonged to households that had less than 50 decimals. The other 23% of the participants were from households holding more than 50 decimals of land, but these were mainly participants of cycle 1 – 10, see figure 25.4. From cycle 11 onwards, more emphasis was given to truly selecting participants from poor households. As a consequence, participants from FFS cycles 11 – 13 had only half the agricultural land ownership compared to that of cycles 1 to 10. Similarly, the average homestead area was about 22% less in cycle 11 – 13 than for participants in cycle 1 - 10. *Figure 25.4* does not include the data for cycle 14 and 15, but these are similar to those of cycle 11 to 13.

Figure 25.5: Targeting of poor by FFS



A limited landownership is not automatically correlated to belonging to the poorest households. Following the ARM 2017 call to better focus on the poorest, BGP decided to use -from cycle 11 onwards- a broader proxy definition to assess the extent to which potential participants belonged to the program's target households. This proxy criterion for poverty used three sub-criteria, namely i) land ownership, ii) participation in agricultural wage labour and iii) house structure. More specifically, the prospective FFS participants from the poorest households in rural areas would be agricultural wage labourers, residing in jhupri or single structure thatch houses, owning up to 0.5 acres of land. According to the conducted FFS surveys in cycle 11 - 13, and depending on the module, between 45% and 65% of the participants fell within the proxy poverty definition of our target population. With an average of 55% for the last five cycles (assuming that data for cycle 14 and 15 are similar to those of cycle 11 to 13) and assuming a 30% participants of the first ten cycles meeting the poverty criteria, a weighted average across all cycles results in an estimated 42% of the homestead FFS participants belonging to the poorest households in the Blue Gold polders.

Applying this 42% to the 79,510 directly and indirectly reached households by the homestead FFS (refer to table 25.5 above), means that over 33,000 poor households in the 22 BGP polders have been reached. This corresponds with 18% of the total population and compares well with the original estimate of the proportion of households eligible for homestead FFS of 15% -or about 30.000 households- of truly needy households, virtually landless but still with the necessary assets to participate.

The 57% of the households reached by homestead FFS that did not exactly meet the above mentioned poverty criteria -but still are relatively poor- also clearly benefited. The increase of their homestead production often led to both the increase in own consumption and the increase in sales of surplus, hence improving their income and nutritional status. Improved homestead production also contributed to income diversification and increased resilience, reducing the risk that households that are just above the poverty line fall back under this line once they meet some setbacks; oscillating in and out of poverty is a common phenomenon among a large part of the polder inhabitants.

25.4.3. Monitoring and Evaluation results of key modules

Each cycle was monitored and evaluated based on benchmark and end-line surveys. A semi-structured questionnaire was used for the data collection; for each cycle an M&E report was prepared. Below the FFS results per module are presented, focusing on the adoption of improved technologies and production increase, and covering M&E data for cycle 1 to 13.

A follow-up survey, conducted in September 2019 among FFS participants of cycle 9 and cycle 10, found that improvements measured by the end line survey, had been maintained across the board. Some results had further improved over time (such as the numbers of chicken and eggs monthly sold and the number of fruit trees at the homestead); a few results, however, had dwindled somewhat, such as the percentage of poultry FFS participants having their chicken vaccinated, the latter due to the availability of vaccination services still being a problem locally.

Poultry (18,525 FFS participants – up to cycle 15; 94.2 % women farmers)

The M&E results of the Poultry FFS modules from cycle 1 to 13 revealed that the average number of birds per FFS participant, mostly chicken and/or duck, increased from nearly 7 before the FFS to nearly 19 at the end of the FFS, which is an increase of almost 165%. The use of hajols to hatch chicks was an important key technology promoted; its use increased from 4.5% to 97.1% of the participating farmers. Chick separation after one week increased from 1.0% to 82.2% and after two weeks from 0.6% to 14.4%. After FFS 98.6% of the farmers were candling eggs to assess hatching potential, compared with a 4.3% benchmark. By creating awareness of the need for vaccination, 82.6% of the farmers have now their chicks vaccinated compared with 7.3% before.

As an indication of the overall impact of the poultry FFS, egg production increased on average from 46 to 86 eggs per farmer per month. The average production and/or sale of chicken and ducks also increased; in cycle 11, for example, this was from 1.5 to 4.5 birds per farmer per month.

Table 25.7: Adoption of improved technologies for poultry production as average of all FFS cycles

| SI No. | Key Technology | Adoption rate (% of FFS participants) | |
|--------|-------------------------------|---------------------------------------|----------|
| | | Benchmark | End line |
| 1 | Use of <i>hajol</i> | 4.5 | 97.1 |
| 2 | Chick separation after 1 week | 1.0 | 82.2 |
| 3 | Chick separation after 2 week | 0.6 | 14.4 |
| 4 | Egg candling | 4.3 | 98.6 |
| 5 | Regular vaccination | 7.3 | 82.6 |

Beef Fattening (5650 FFS participants; 74% women farmers)

The M&E results for all beef fattening modules show that participants' understanding of the importance of proper housing substantially increased. The assurance of ventilation increased by 69.5%, the provision of a gutter for drainage improved by 78.7% and the practice of daily cleaning of shed improved by 63.9% amongst the participants.

Table 25.8: Adoption of improvements in cattle housing for beef fattening as average of all FFS cycles

| SI No. | Key Technology – Cattle housing | Adoption rate (% of FFS participants) | |
|--------|---------------------------------|---------------------------------------|----------|
| | | Benchmark | End line |
| 1 | Ventilation | 29.2 | 98.7 |
| 2 | Gutter for drainage | 16.5 | 95.2 |
| 3 | Shed daily cleaning | 30.9 | 94.8 |

Before the FFS, the participating farmers had little knowledge about proper feeding of their cattle. After the FFS, the farmers were more aware of the need for balanced feed, as illustrated by the shift in the use of feed ingredients: 64.5% of farmers were now feeding their cattle with a proper combination of roughage, concentrate and straw compared with only 9.2% before. Only 2% of farmers used to grow Napier grass, recommended because it is nutritious and easy to grow, but after the FFS 48.3% cultivated this forage. In total 96% of farmers are now feeding Urea Molasses Straw (UMS) to their cattle versus 1% before. About 99% of participants now know how to measure cattle body weight and now deworm regularly. And nearly 68% of the farmers make now use of the cattle health service, either always or sometimes, versus the benchmark of 14%.

Due to the FFS beef fattening intervention, meat production per animal increased with 37.2%, or on average from 172 kg to 236 kg per animal fattened. There was a slight increase in the number of cattle in the households of the FFS participants, from 3.3 animals before the FFS to 3.5 animals at the end.

Fish culture in small ponds (7200 FFS participants; 74.6% women farmers)

The average pond size of participants in all the FFS fish modules was 11.4 decimal; nearly 80% of the ponds were perennial. The number of cultured fish species increased from 3.8 at the benchmark to 5.9 at the end line. In total 97.3% of the participants are now aware of proper pond preparation compared to 2.7% at the beginning of the FFS. Farmers' knowledge about production technology, e.g. fingerling selection, use of supplementary feed, knowledge on stocking density, natural feed testing and fish sampling, increased significantly from less than 5% to over 98% (see table 25.9).

Table 25.9: Adoption of improved technologies for fish culture as average of all FFS cycles

| SI No. | Key Technology – Fish module | Adoption rate (% of FFS participants) | |
|--------|---|---------------------------------------|----------|
| | | Benchmark | End line |
| 1 | Know proper pond preparation | 2.7 | 97.3 |
| 2 | Fingerling selection knowledge | 1.2 | 99.0 |
| 3 | Use of supplementary feed | 13.4 | 98.0 |
| 4 | Knowledge on stocking density | 1.3 | 99.1 |
| 5 | Knowledge on natural feed test | 1.8 | 99.7 |
| 6 | Knowledge on sampling | 3.7 | 99.8 |
| 7 | Average number of cultivated fish species | 3.8 | 5.9 |

After implementing fish FFS, the production of fish increased from 3 kg per decimal to 10.6 kg per decimal per fish culture cycle season of about 4 months, which is an increase of 253%. Correspondingly, average fish production per farmer increased with 234%, or from 40.6 kg to 135.8 kg per fish culture cycle. The proportion of farmers selling roughly half of their fish production, next to consuming the other half, increased from 5.7% in the benchmark to 43.9% in the end line survey.

Vegetable production (11,550 FFS participants; 90.1% women farmers)

The types of vegetables grown among FFS participants increased from 3.3 to 7.2; the use of fertilizer increased with 21.8%. The number of farmers following IPM increased by 70%, thus reducing expenditure on pest management on average with Tk. 51 per crop cycle, despite more vegetables being grown. Finally, 84.5% and 91% of farmers are now familiar with the pit method and the bed method of vegetable cultivation, respectively.

Table 25.10: Adoption of improved technologies for vegetable production as average of all cycles

| SI No. | Key Technology Vegetables | Adoption rate (% of FFS participants) | |
|--------|---|---------------------------------------|----------|
| | | Benchmark | End line |
| 1 | Average number of different vegetables grown (in nos.) | 3.3 | 7.2 |
| 2 | Homestead locations used for cultivation (in nos.) | 2.3 | 7.1 |
| 3 | Fertilizer use for vegetable cultivation (% of FFS farmers) | 73.8 | 95.6 |
| 4 | Follow IPM for pest management (% of FFS farmers) | 3.2 | 73.2 |
| 5 | Average money spent for pest management (Tk. per cycle) | 154.6 | 103.5 |
| 6 | Follow proper pit methods (% of FFS farmers) | 7.5 | 92.0 |
| 7 | Follow proper bed methods (% of FFS farmers) | 7.0 | 98.2 |

Fruit tree management (10,150 FFS participants; 89.3% women farmers)

During cycle 1 - 10 fruit tree productions was included in the bundled homestead FFS (in homestead gardening) with 9,975 participants; in cycle 11 separate fruit production FFSs were implemented, with 175 participants. After participation in a fruit tree module, the number of fruit trees had increased by 14% in the homestead area of the FFS participants. The use of fertilizer for fruit cultivation increased from 4.2% to 98.9% amongst these FFS farmers. After attending FFS, 97% of the farmers followed pruning techniques, whereas they had no such practice at benchmark. Before the FFS farmers had no idea about propagation, but at the end 99% of the farmers were aware about propagation.

Due to the nature of fruit production, one FFS cycle did not allow to properly measure the increase in fruit production, although there was evidence that the better technologies resulted in such an increase. At the start of the FFS, 10% of the farmers were found to both consume and sell fruits; this had increased to 39% at the end of the FFS, implying a positive impact on nutrition and income.

Nutrition (15,850 homestead FFS participants; 84% women)

In the bundled module approach, as implemented during cycle 1 to 10, also a nutrition module was included, which addressed the “1,000 days dietary approach”, along with proper cooking practices, dietary needs etc. The proportion of FFS participants who were aware of proper cooking practices, focusing on reducing losses of nutritional value, increased from 6.5% at the start of the FFS to 86.6% at the end. The inclusion in daily meals of the very nutritional moringa leaves, well available in the polders, was promoted during cycles 8 to 10, especially for children under the age of 5 years. After attending FFS, 47.2% of the participating farmers are now aware of the nutritional value and had actually tried moringa leaves.

The end line surveys of all cycles show positive changes in the nutrition uptake scenario of FFS participants. The consumption of eggs in the households of the poultry FFS participants increased considerably over the FFS period, with a consumption of 10.6 eggs per week per household after the FFS compared to 5.1 before FFS. Alongside, also chicken consumption increased with these households, consuming before the FFS on average 0.8 chicken per month per household, reporting a consumption of 1.9 chicken per month after the FFS. Similarly, vegetable and fruit consumption increased, especially in the households of participants of vegetable or fruit FFS modules. An increase of about 50% in fish consumption was observed for households that took part in the FFS fish culture.

Table 25.11: Improvement in Nutrition Situation

| Sl No. | Key Issues | Benchmark | End line |
|--|--|-----------|----------|
| Nutritional value (% FFS participants): | | | |
| 1 | Fully knowledgeable of cooking procedures (cycle 1-10) | 6.5 | 86.6 |
| 2 | Knows and has eaten moringa leaves (cycles 8-10) | 1.6 | 47.2 |
| Dietary changes (all relevant cycles) | | | |
| 3 | Meat days per week per person (only for poultry FFS participants) | 0.6 | 1.2 |
| 4 | Fish days per week per person (only for participants in fish FFS) | 2.1 | 3.4 |
| 5 | Egg days per week per person (only for poultry FFS participants) | 1.4 | 2.4 |
| 6 | Fruit days per week per person (only for participants of FFS that addressed homestead fruit tree management) | 1.1 | 2.2 |
| 7 | Vegetable consumption in grams per week per person (only for participants in homestead vegetable FFS) | 941 | 1625 |

Table 25.11 above demonstrates that the consumption of homestead produce in the household of the FFS participant often increased with 50 to 100%; this is in addition to a varying increase in the sale of homestead produce, enhancing household income, which also has the potential to increase food security.

Market orientation (13,600 FFS participants (C11-C15); 92% women famers)

The inclusion of market orientation in the FFS curriculum of all modules in cycle 11 to 15, motivated farmers to consider 'agriculture as a business'. Farmers are aware of the potential income of homestead production and consider market demand when deciding on production. Farmers learnt to keep basic records of their expenses and income. FFS participants were found to communicate more often with input suppliers and buyers; they also sought price and quality benefits by working together. As individual farmers, they only require small input volumes and have relatively little surplus quantities to market. They learned to act collectively by jointly buying inputs, jointly selling produce and/or jointly acquiring market information, and thus to exploit their bargaining power. *Table 25.12* shows improvements in terms of key market orientation practices across the modified modules which covered market orientation issues.

Table 25.12: Adoption rate of Market Orientation topics as average of cycle 11-13 FFS

| SI No. | Key Topics | Adoption rate (% of FFS participants) | |
|--------|---|---------------------------------------|----------|
| | | Benchmark | End line |
| 1 | Agriculture is a business | 18.6 | 73.7 |
| 2 | Record Keeping | 3.4 | 99.2 |
| 3 | Use of mobile phone, often or sometimes | 3.8 | 58.8 |
| 4 | Collective selling sometimes | 3.3 | 74.4 |

Across all modules, the M&E results show that 99.2% of the participating farmers have adopted simple record keeping compared to only 3.4% at benchmark. Nearly 59% of the participating farmers are now using their mobile phones to collect information on supplies and markets, or to get advice. Nearly 75% of the farmers are now -at least sometimes- working in groups to collect inputs or to sell surplus produce. These changed attitudes reflect the enhanced business sense of these FFS participants. At end line 73.7% saw their 'production as a business', a huge shift from the 18.6% in the benchmark.

Box 25.3: More details on market orientation impact in the poultry and beef fattening modules

Poultry module – Farmers are now keeping records of their expenses and revenues in a basic format with a view to understand their net income from poultry production and selling. Before FFS, only 4.1% of the farmers who participated in the poultry module kept records but after FFS 95.6% farmers reported to keep such information. 56.6% of farmers now use their mobile phones to get information on poultry rearing compared to only 3.0% at the beginning. Collective action as a means to reduce cost or getting a premium price among farmers is taking root and 96% of the poultry rearing farmers got involved compared to only 0.7% before attending FFS. Farmers are producing more eggs, consume also more and increasingly sell surpluses to the market. They are now selling on average 20.9 eggs per month compared to 5.7 eggs before. Farmers are also selling more chickens to the market after household consumption: now 21.4 chickens on average on an annual basis compared to only 4 before.

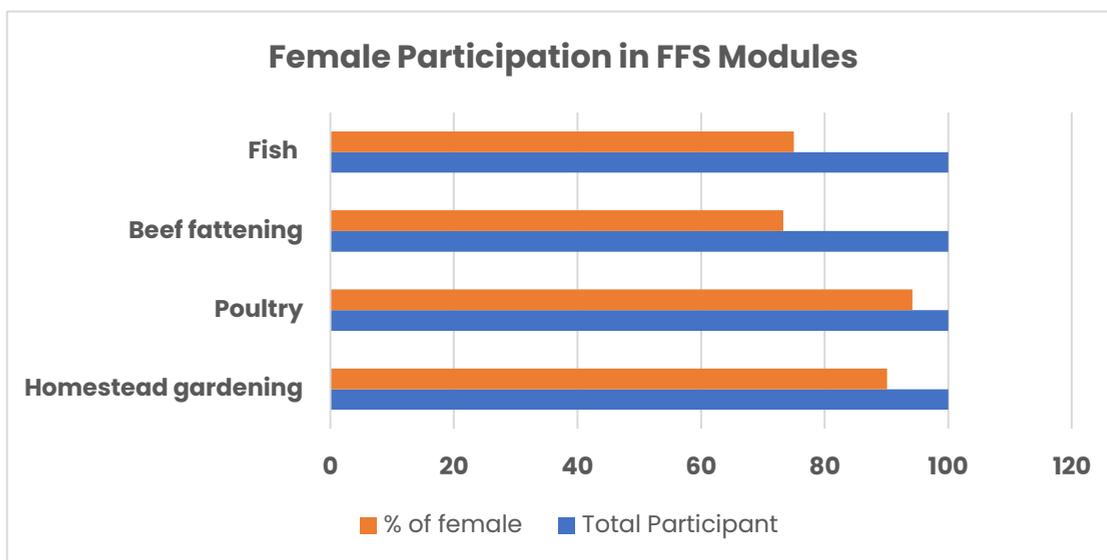
Beef Fattening module – Farmers taking part in this module needed to invest in cattle, improved cattle housing and improved feed and recover these investments by adhering to good beef fattening practices. To grasp the financial impact, basic record keeping was promoted. The end line survey shows that 98.9% farmers kept records of their expenses and income compared to only 6.1% at the benchmark. Farmers are now using mobile phones for accessing market information and to communicate with service providers. 58.5% of the farmers reported to seek information or services via their mobile phones after the FFS compared with only 1.7% at the beginning. It is not easy to sell cattle collectively, but farmers have adopted collective actions for procuring inputs. About 46% of the farmers are now engaged in collective input purchasing and/or collection of information, something which was non-existent before FFS.

Women's empowerment

By implementing the Homestead FFS approach, Blue Gold aimed at increasing inclusiveness by targeting the functionally landless while the 'Commercialisation of Agriculture' approach focused on those farmers with access to land for field crops. With homestead production largely undertaken by women, homestead FFS offered opportunities to contribute to women's empowerment in the polders.

During cycles 1 to 10, on average 84% of the homestead FFS participants were women. By increasingly targeting women, this percentage increased to 92% in the last five cycles bringing the overall average to 88%, well ahead of the original 50% target. The variation over the modules can be seen in *figure 25.5*.

Figure 25.5: Female participation in FFS modules



The poultry and homestead vegetable modules contributed more to women's empowerment than the beef fattening and pond aquaculture modules for the below reasons. These same reasons also allowed that the most needy households better applied the learnings from the poultry and vegetable modules as compared to beef fattening and fish production. The reasons are:

- Poultry and homestead vegetable gardening allow more easily that women undertake all purchase, production and marketing activities by themselves.
- Income from surplus selling of eggs and vegetables can traditionally more readily be retained by women. However, in case of beef fattening by women, often the husbands sell the animals and keep the money. The same applies, but to a lesser extent, to fish production.
- The use of mobile phones provides virtual access to markets for goods, information and services and is easily accessed by women, as an increasing proportion of women nowadays have an own mobile phone. Homestead FFS complemented this by capacity strengthening of female Resource Farmers and arranging physical market visits especially for them and other interested women, including establishing first contacts with traders.
- Households living together in the same or adjacent yards benefitted from one's participation. Women were found to more readily share learnings with other women by horizontal learning, thereby enhancing the impact of the modules.
- Including a small percentage of men and/or women of slightly better-off households in the FFS membership mix, appeared to benefit both learning objectives and women's empowerment, especially by enlarging women's social networks beyond the poorest socio-economic classes.

The M&E results from the benchmark and end line surveys provided additional insights. Efforts to link female farmers with other value chain actors, e.g. input retailers, extension agents, service providers and buyers, has shown encouraging results. 56.5% of the female farmers of FFS groups had contact numbers of market actors at the end line survey, compared to only 3.8% at the benchmark. The percentage of female farmers actually engaged in communicating with market actors, by phone or in person, has increased to at least 60%.

Another indicator of women's empowerment is their increased participation in decision making. The female farmers played a bigger role in homestead production planning after their participation in an FFS. At end line 77.3% of the farmers indicated that decisions on production were influenced by a female member of the household, compared to only 19.2 at benchmark. In addition, 75.6% of farmers indicated at the end of the FFS that input purchase decisions were taken jointly compared with only 29.4% before the FFS.

Table 25.13: Women's Empowerment in FFS

| SI No. | Key Women's Empowerment Issues | Adoption rate (%) as average of modules of cycle 11-13 | |
|--------|---|--|----------|
| | | Benchmark | End line |
| 1 | Women have market actor phone number | 3.8 | 56.5 |
| 2 | Networking by women with market actor - sometimes | 18.5 | 80.7 |
| 3 | Decision on utilization of homestead production by women on their own | 41.2 | 8.6 |
| 4 | Decision on utilization of homestead production jointly | 19.2 | 77.3 |
| 5 | Decision on input management jointly | 29.4 | 75.6 |

The reduction of the proportion of women who make decisions on their own, as shown in table 25.13 above, may look like a negative achievement. However, in practice this means that decision making by women based on traditional low-value production practices have been replaced by more intelligent decision-making by husband and wife, combining their joint expertise on higher value production.

Next to the above findings based on changes measured by the FFS benchmark and end line surveys, a wealth of anecdotal information exists of how women changed from shy and not speaking out during the first FFS sessions to more confident and vocal participants towards the end. The women feel that trainers take them as equals, because trainers tend to stop men dominating. Women are often more committed and more serious to well apply the learnings from the FFS training than men, and feel proud to contribute to production and income increase of their household. This leads to more respect from their husbands, relatives and other community members. Men report to involve their wives more in decision-making now that the women have knowledge about improved technologies and contribute to increased production. Some men added that joint decision-making leads to better decisions, and to more peace in the household. Among women there was reporting of some reduction in domestic violence. Such findings are in line with research findings from Kenya on the impact of FFSs on gender relations in Kenya, demonstrating that mixed FFS groups contributed to improved gender relations.

A remaining challenge is women's increased workload due to their increased role in productive work in addition to their domestic and care tasks. There were some first indications that men became aware of this. Such first changes in norms and attitudes were also pursued by the use of the gender flipcharts (on gender awareness and women in agriculture), see also *chapter 24 (on Gender Equality and Women's Empowerment)*, also as integrated in some of the FFS sessions in 2019 and 2020/21.

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A remaining challenge is women's increased workload due to their increased role in productive work in addition to their domestic and care tasks. There were some first indications that men became aware of this. Such first changes in norms and attitudes were also pursued by the use of the gender flipcharts (on gender awareness and women in agriculture), see also chapter 24 (on Gender Equality and Women's Empowerment), also as integrated in some of the FFS sessions in 2019 and 2020/21.

25.4.4. Cost-benefit or efficiency considerations

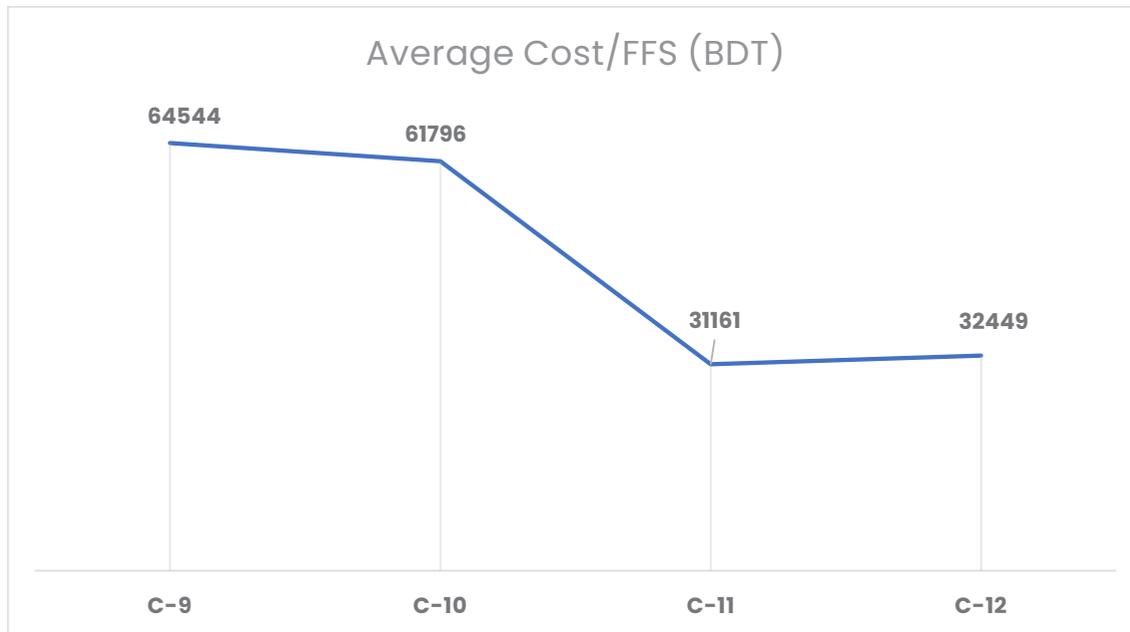
The Blue Gold homestead FFS program is believed to have well reached its target population of households amongst the poorest, which realistically benefited by participation. The modification of the approach in terms of reducing the number of sessions per participant increased the number of households benefiting from FFS without having had a negative impact on the effectiveness of the program. Below the cost and efficiency considerations are highlighted.

Blue Gold has spent Tk. 55,389,035 or Euro 553,890 for implementing the FFS cycles 1 to 15, covering the direct costs. The salaries of the involved TA staff and supplementary costs, such as the costs of monitoring visits and related office costs, are not included. Of the total expenditure on FFS, 45% was done at Patuakhali, 44% was at Khulna and 11% was at Satkhira.

The total cost amounts to an average cost of BDT 47,020 per FFS or 470 Euro. It reached therewith 29,450 participants at an average cost of BDT 1881 or Euro 19 per participant. The average cost per FFS was considerable higher for the bundled approach of cycle 1 – 10 than for the single module approach thereafter. The average costs per cycle reduced from over BDT 60,000 for the multi-module approach in cycle 9 and 10 to about BDT 32,000 in cycle 11 and 12 (see figure 25.6). This means that the modified homestead FFS approach by Farmer Trainers with the reduced number of sessions reduced the costs per FFS substantially. The latter costs correspond with BDT 1280 or Euro 13 per participant. When considering Blue Gold has reached 79,510 households directly and indirectly, the cost per reached household is in fact only BDT 697 or Euro 7.0.

The average FFS cost of BDT 47,020 includes the costs of capacity building of the facilitators, Farmer Trainers and Resource Farmers, along with all direct costs of FFS implementation. The single module FFS were run by FTs, the FTs' wages are included in the module expenses. The difference in figures illustrates that the modified approach adopted by BGP from cycle 11 onwards was more cost-efficient compared to multiple module approach of consecutive cycles 1 to 10, whereas reaching out to more households per cycle.

Figure 25.6: Average cost per FFS



Cost-Benefit Analysis of Poultry FFS

A total of 738 poultry FFS were carried out in different zones (up to cycle 13), at the cost of BDT 47,020 on average per FFS. In order to assess the efficiency of BGP poultry FFS Polder 55/2C was selected for this analysis, which was conducted by an external consultant. The total number of households in polder 55/2C amounts to 10,173; BGP conducted 43 poultry FFS till cycle 13 with 1075 participants, thus directly reaching 1075 households. The total costs for poultry FFS in polder 55/2C were BDT 2,021,860. The income from poultry was calculated at BDT 3,036 per month per FFS participant at the end line, whereas income from poultry at benchmark was BDT 1,179. This resulted in an income increase by BDT 1,857 per month per farmer or household. This means an annual income increase of all participating farmers together of BDT 23,955,300 from poultry rearing at polder 55/2C, which is over 10 times the direct FFS costs involved. The return on investment (ROI) of BGP for poultry FFS is significant and high considering the increased production and profit of the participating farmers. If including the increased income of households reached indirectly through horizontal learning, the return on investments would be much higher.

Cost-Benefit Analysis of Beef Fattening FFS

For conducting all 226 beef fattening FFS in the BGP polders, with 5650 participants in total, BGP spent a total of BDT 10,626,520. The M&E reports show that meat production per head of cattle increased by 64 kgs on average over all the cycles, usually achieved within a 3 months period. Thus, cattle owning farmers would achieve an additional gross income of BDT 32,000 per head of cattle after participating in a beef fattening FFS; corresponding with about BDT 96,000 per farmer considering that on average they have at least 3 animals. If 50% of the participating farmers continue to engage themselves in beef fattening using the improved technologies, the accumulated additional income together would be BDT 256,800,000, also well outweighing the direct costs of the beef fattening FFS, also after the additional costs for the farmers are deducted.

Cost-Benefit Analysis of Fish FFS

The expenditure of establishing and running one FFS by BGP was BDT 47,020. A total of 288 FFS were carried out, with 7200 participants, at a total cost of BDT 13,541,760. An independent consultant found that the average fish production during one fish culture cycle was 2,964 kg per hectare (12 kg per decimal)

for FFS participants and about 1,976 kg per hectare (8 kg per decimal) for non-FFS members. Considering that the average pond size is over 11 decimals, the FFS households had increased the value of their fish production with about BDT 7,000 per fish (or EUR 73) culture cycle of 4 months as compared to that of the control village households. Considering the cost per FFS participant of BDT 1881, this means that the ‘investment’ in households through fish culture FFS is paid back in less than a year after FFS has been completed.

25.4.5. Lessons learned and further insights

- The most-needy of the households, but with access to a homestead, are best reached -in terms of easy adoption and increase of income- by the FFS module on poultry, then vegetables and fruits, subsequently pond aquaculture and lastly by the beef fattening module.
- The shortlisting of 35-40 households as potential FFS participants (i.e. one member per household) by the WMGs should not be influenced by personal interests, in particular by including relatives and/or extended family members of WMG leaders. Also module choice should be genuinely based on the needs of the participants avoiding personal bias from WMG leaders.
- More can be done to ensure the module content is focusing on real needs and feasible innovations. There is a trade-off between limiting the number of sessions (to limit the costs) and maintaining group dynamics, requiring more sessions.
- FFS participation by women contributes to their empowerment. Apart from learning to apply improved technologies, women also increased their confidence, social networks and contacts with service providers. In particular, the poultry module contributed more to women’s empowerment than any of the other modules.
- Farmer Trainers who facilitate FFS in their neighbourhood often also get opportunities to develop themselves as local resource persons or service providers
- Including a small percentage of men and participants of slightly better off households in the FFS membership mix, supports empowerment and learning objectives, also contributing to broader social networks of the FFS participants from the poorest households.

References

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- [2] FAO Farmer Field Schools Implementation Guide (PDF). Farm Forestry and Livelihood Development. 2011.



26 Poverty focus: Labour Contracting Societies

26.1 Development objectives

“Labour Contracting Societies” (LCSs) - also termed “Landless Contracting Societies” within projects managed by LGED - are defined as groups of usually landless people who engage into a contract with an agency to carry out a certain type and volume of earth work within a given time. The rationale for contracting LCS groups for earth work, instead of contractors, was that LCS work was expected to lead to higher daily incomes for its workers as compared to wages they would receive as workers hired by contractors¹. In addition, it was always assumed that the savings from the income from LCS would be invested in productive resources to generate income after the LCS work has been completed. The deployment of LCS groups is therefore seen as a poverty reduction measure.

The origin of LCS work in Bangladesh dates from the early 1980s, when various government and non-government agencies provided LCS groups with maintenance responsibilities for rural roads, embankments, canals, and for the re-excavation of derelict tanks or ponds. Over time, the rehabilitation and construction of earth work items were contracted to LCS groups - by both the Local Government Engineering Department (LGED) and the Bangladesh Water Development Board (BWDB). For LGED, the deployment of LCS groups became a core activity, distinguishing maintenance and construction through LCS.

The deployment of LCS groups by BWDB is usually for one construction season, and is based on the Guidelines for Participatory Water Managements (GPWM) of 2000 and the Participatory Water

¹ This is assuming that contractors would locally hire unskilled labourers. In practice, however, contractors usually bring in labourers from outside, as they prefer to work with known labourers with whom they have earlier worked with. Moreover, nowadays contractors use machinery, reducing the need for (unskilled) labour.

Management Rules (PWMR) of 2014. LCS work by BWDB is limited to projects with funding from development partners. For BWDB projects funded by the Government of Bangladesh (GoB) alone, contractors are engaged for all kinds of works, and there is no scope for engaging LCS groups.

In the Blue Gold Program the deployment of LCS groups was foreseen from the design phase, referring to the positive experiences with LCSs of the IPSWAM project. Blue Gold's Program Document 2012 foresaw that infrastructure improvements would be implemented by both contractors and LCS groups, in which contractors would do the structures and part of the earthwork and LCS groups would get at least 50% of all earthwork. As per GPWM, at least 30% of the LCS workers would be women. Poverty alleviation was the main rationale for deploying LCS groups; the Program Document expected that the daily income of LCS workers would be much higher than of labourers working for contractors. The expectations were high, as demonstrated by the logical framework which included the following indicator: "40,000 women benefiting from LCS". The Program Document stressed the importance of vocational training to LCS group members, suggesting that LCS workers could subsequently be engaged in construction of minor structures and repair of main structures.

The Program Document stressed the importance of women LCS groups, indicating that earthwork by women groups would address their "practical need" for income, while "their regular participation in discussions in meetings would raise their social position and develop their decision-making authority". LCS members were to be encouraged to save part of their LCS income, and provided with training in possible income generating activities (IGAs). LCSs were intended to be an important contributor to poverty alleviation, as acknowledged by logical framework indicators: "40,000 women trained in IGA" and "40,000 people earning from income earning occupations".

The Inception Report of Blue Gold reiterated similar intentions towards the deployment of LCS groups, thereby indicating a target of 40% women LCS members, but reducing the numbers to a more realistic target of 7,500 women, similar to the IPSWAM project. Training of LCS groups was foreseen, addressing topics such as construction management but also savings and effective investments in IGAs. LCS women were explicitly mentioned as one of the target groups for homestead Farmers' Field Schools (FFSs).

26.2 Implementation of LCS approach

Within Blue Gold, the LCS approach has followed agreed guidelines: at the start of Blue Gold in 2013, the guidelines of the predecessor project IPSWAM were applied; and after the introduction of PWMR 2014, these guidelines were adjusted, see box 26.1.

Box 26.1: Development of the LCS Guidelines into the LCS Guiding Note

When the LCS approach was introduced in 1987-88 in the Early Implementation Project (EIP) under BWDB, LCSs started as "D" class contractor enlisted with BWDB, and were supported by the Technical Assistance team (TA) under the umbrella of the donor, i.e. the Netherlands Embassy. Gradually the LCS approach became internalized in the BWDB procedures. LCS guidelines were developed, modified and updated over time, resulting in standard LCS guidelines that were approved by BWDB. Usually the different projects adjusted the LCS guidelines in line with their objectives and activities. In 2003 IPSWAM had started, applying the LCS guidelines of EIP with some modifications, which were approved by BWDB.

When the Blue Gold Program started its LCS activities (2013-2014), the IPSWAM guidelines were used. These were modified on 15 February 2015 to include the new directions indicated in the Participatory Water Management Rules of February 2014. These modified LCS guidelines changed the status of LCS from “D” class contractor to subcontractor, while the WMGs became the main contractor.

The Aide Memoire of the Annual Review Mission (ARM) 2018 suggested further modifications to the LCS guidelines - under the theme ‘LCS - maintain the poverty focus’, aiming to obtain a commitment that 50% of earthworks contracts would be allocated to LCSs, work orders would be issued to LCS groups no later in the season than end-February and that excavators and outside workers would not be permitted in LCS contracts. As a result, an advisory note for LCSs was developed and sent by EKN to BWDB’s ADG (Western Region) on 3rd March 2019, with a request that the note should be adopted as an update to the earlier LCS Guidelines of February 2015. Subsequently, Blue Gold’s Program Coordinating Director (PCD) issued the document as a **Guiding Note** to all BWDB offices.

The Guiding Note describes the steps of the LCS approach and the responsible authorities for all steps, from site and reach selection at the start to the final payment at the end. Steps also included training for the LCS members and the opening of a bank account of the group so that payments by cheque to the LCS group could be cleared through a bank account and cash then withdrawn to pay the LCS members. Payments to individual members are always in proportion to their level of engagement, based on their time input.

In Blue Gold, LCS groups were involved in the re-excavation of khals and re-sectioning of embankments. In the first two years of Blue Gold before the introduction of changes under PWMR 2014, the LCS groups were registered with BWDB, and contracts were directly between BWDB and the LCS group. The groups were organized by the concerned Water Management Groups (WMGs) supported by TA field staff. After PWMR 2014 became effective, earthworks contracts were between BWDB and the WMGs, rather than to LCSs directly. The role of LCSs as sub-contractors to WMGs, created some dissatisfaction within the LCSs since a number of deductions reduced the amount agreed under the contract. Under PWMR 2014, 5% of the work value (bill amount) is withheld by the WMG as a service charge, of which 1% is paid to the Water Management Association (WMA), 2% is to Operation and Maintenance (O&M) fund of the WMG and 2% to their General Fund. In some situations 1% is paid to WMA, 2% is to WMG O&M fund, 1% to 12 WMG Executive Members and the remaining 1% to all WMG members, based on the decision of WMG. The contractual obligations of the WMGs include quality control, overseeing the progress of the work, and pursuing bills and payments to the LCS. It also became apparent that in practice additional direct costs incurred by the WMG, for example in travel to banks, were deducted from the bill amount, thus reducing the amount available to the LCS members.

After consultation with the WMGs, arrangements for the allocation of suitable earthworks to LCS groups were discussed and agreed in meetings attended by representatives of WMAs, BWDB and Technical Assistance (TA) staff. A main criterion was that the work allocated to LCS groups should be in the vicinity of their village, especially for women LCS groups. No tendering process was required, since the contract between BWDB and the WMG was based on BWDB’s “Schedule of Rates”.

In order to ensure that LCS groups were ready for the construction season, LCS formation started from October with the aim of completion in January/February. LCS group members were selected during a general WMG meeting, including representatives of BWDB and TA, using the following criteria:

- At least 18 years but less than 50-55 years of age; and physically fit to do earthwork
- A member of the WMG and resident in the work area
- Poor, landless and/or destitute
- Priority given to members from female-headed households
- Willing to join LCS and to carry out the earth work assignment, with priority given to female members with previous experience in earth work

During the WMG general meeting, explanations were given about the location and type of earthwork covered under the contract, the contract value including tax and VAT, the 5% service charge payable to the WMG, and the modality for paying through three 3 instalments, after making a 10% deduction as a security deposit. The first instalment (of 33%) was paid for mobilization at the start (usually 3 to 4 weeks after the start of the work); the second instalment (33%) was paid after 50% of the work is completed; and the third instalment (24%) after completion of the work. The remaining 10% was kept by BWDB as a security deposit, to be paid 6 months after the completion of the earthwork.

During BGP some 25% of the total value of earthwork (BDT 3,662 lakh) was allocated to LCS groups (refer to Table 13.3), of which BDT 2,527 lakh or 69% of the value of LCS work was contracted to male LCS groups and BDT 1,135 lakh or 31% to female LCS groups. Until June 2019, 502 LCS groups with 31,437 members worked on Blue Gold contracts, of whom 10,766 were women (34%). This proportion of women was higher at the start of BGP (38 to 40%). Over the years, annual review missions emphasized the importance of LCS work for poverty reduction, recommending expansion or at least maintaining the targets for LCS work, “with a preference for women LCS”.

In the early years of Blue Gold, LCS groups received a 2-day training, mainly on the technical parts of the LCS work. The training included a 30-minute module on health and environment and another 30-minute module on Savings and Income Generation. The first one addressed topics as making safe drinking water available at the site and arranging for a temporary bathroom and a first aid box. The second module discussed the importance of saving LCS income for investing in income generating activities for a better future. However, after training of about 12,000 LCS workers (40% female) in the first years of BGP, this more formal training was discontinued after the 2016-2017 fiscal year because of the difficulties to mobilize LCS group members for training. Because of the delay in the start of the LCS work, many of the LCS workers had become busy with other temporary work. Moreover, they did not receive training allowances, only lunch and snacks; this meant foregoing two daily wages, which were critical for the survival of poor people. For this reason, the formal training was replaced by on-the-job-training, counted as working day and payment was made accordingly.

In the first semester of 2015 the M&E staff of BGP conducted an evaluation of the performance of LCS groups and of contractors, focusing on their progress and effectiveness in doing earthwork. Box 26.2 presents selected findings from the evaluation report.

Box 26.2: Selected findings of the Evaluation of the Performance of LCS and Contractors involved in earthwork

- Work orders of BWDB issued (too) late. All LCS groups were behind schedule; and 9 of the 14 groups were 50-55% behind
- LCS members were often not satisfied with the payment schedules, many complained on the second instalment (not paid yet); some didn't even receive the first instalment (and hence could not buy the required equipment)
- LCS workers were found to lack knowledge provided in the LCS training course; several groups did not follow-up BWDB instructions. Sometimes landowners were reluctant to give land for excavation (for re-sectioning of embankments) or for depositing land (in case of re-excavation of khals) effecting the progress and quality of the works
- In several LCS groups the members were not the landless and extreme poor. In one group landowners were member
- Some workers indicated to prefer daily payments as is common in wage labour work. A contractor paid Tk 350 to male workers and Tk 250 to female workers; in one LCS group daily payments of Tk 200 were reported. In one of the visited female LCS groups only 8 of the 60 workers were present due to other being involved in mung bean harvesting ("earning daily and more")
- There were complaints on the temporary / seasonal nature of the work by female LCS members ("What will we do when this work has been completed? How will we maintain our family when we have no works in our hands?")
- BWDB engineers considered LCS work of better quality than contractor work; female groups were more sincere in following-up specifications than male groups
- The report recommended that billing procedures become more daily-labourer friendly and that refresher training is provided to the LCS members

The above findings illustrate that from the start of BGP the experiences with the LCS modality were mixed. The mixed experiences were in addition to certain weaknesses that are inherent to the LCS approach, such as the high transaction costs involved in setting up and operating an LCS, usually for a single contract, and the higher unit rates applied per volume of earthwork by LCS as compared to earthwork by contractors. Moreover, LCS members, especially women, are often inexperienced in doing earthworks, so taking more time and requiring more instructions to properly start up the work, whereas their performance is compared to that of contractors with very few concessions made to the poverty alleviation objective of LCSs.

Apart from delayed procedures and practical problems as reported above, field staff reported that saving LCS income for productive investments was not always feasible. Instead, such LCS workers used their LCS income for daily subsistence, repaying debts, and maybe for some house repairs or child education, not leaving money to invest in any productive resources.

Box 26.3: Temporary relief for the members of the Noyoun LCS group

Like many people in their community, the 50 (male) members of the Noyoun LCS group in polder 55/2A used to take loans with high interest rates to meet the needs of their family and to buy agricultural inputs. But in 2018 this was not necessary, due to the LCS work they did, earning up to BDT 15,000 in total per person, corresponding to BDT 300 – 350 per day. For them this opportunity to generate income was a blessing, as they did not need to take a loan. However, due to the temporary nature of the LCS work, most LCS members had to take loans again the next year.

There are also examples of other LCS groups, where members did manage to invest (part of) their earnings in income generating activities. Such investments varied from buying a few ducks, chicks or a goat to buying land or investing in a shop or a rice hotel. See the below example in box 26.4.

Box 26.4: Successful LCS group in Jialtola WMG in Polder 25

In April 2018 a group discussion was held with 13 women of a female LCS group (Jialtola WMG) that had been earlier involved in 200 m khal excavation. The women said that it was a difficult task, but by working hard they could complete. Some men had discouraged them to do the work, but they had replied “we can do it like you”. Many of the present women had used part of their LCS earnings for productive resources, sometimes inspired by their FFS participation, for example:

- Radi Rani bought a pig, sold it and used the money to buy 37.5 decimals of land
- Another woman bought a tv (BDT 6000) as dowry for her daughter, spent on the education of her children and bought poultry. She has now 25 chicken, whereas before she had 1 or 2
- Sika Rani spent BDT 15,000 for her poultry farm and BDT 10,000 for her son’s education
- Bitika spent most LCS income for her son’s MA in Dhaka (!), but also invested in the kitchen for the tea stall she is running with her husband
- Jhondra invested in a “rice hotel” (small restaurant) together with her husband
- Another woman bought 68 chicken and 7 ducks, which, together with her home garden and rice hotel, give a good monthly earning
- Some women also reported that due to their LCS work experience, they are now regularly asked to do earth work for the local government

The above examples illustrate that during the implementation of BGP mixed signals were received about the effectiveness of LCS as a poverty reduction instrument, also because alternative employment opportunities increased: more agricultural wage labour work for men and women, and increasing off-farm employment opportunities, mainly for men.

The many encountered challenges and mixed success of LCS approach as poverty reduction instrument led to the commissioning of a study on LCS experiences, with a special focus on the impact of LCS on the empowerment of women, also to draw conclusions for LCS work in the future, see the below section.

26.3 Findings from the LCS study

This section provides the findings of a study on LCSs commissioned by Blue Gold. Dr Sharmind Neelormi, an independent consultant, was contracted to assess: (i) the extent - and under what conditions - LCSs are successful as a tool for poverty reduction², and (ii) the contribution of LCSs to the economic and social empowerment of members of female LCSs. This study also assessed the effects of the changes in LCS related procedures due to PWMR 2014, in particular concerning the new role of WMGs. Apart from presenting the main findings from the LCS Study report of June 2020, this section includes some information from TA sources, either for illustrative purposes or for clarification.

26.3.1. Changes in LCS modality due to PWMR, 2014

The main change due to the new PWM rules of 2014 was the formalized role of the WMGs in the LCS process, in particular, their role as the responsible entities towards BWDB for the completion of the work. Main consequences:

- The contract sum available for the LCS workers was reduced, at least with the 5% service charge the WMGs can keep, but often by also deducting actual costs made by the WMG

Illustration: 5% of the service charge are put into the WMG bank account; of the remaining 95% the WMG takes all actual costs they make, e.g. for phone calls, copies and travel costs (often with several -up to 5 or 6- people) e.g. to the bank, which costs can add up to another 13 to 20%, leaving about 75 – 82% of the total contract value for the LCS members. – personal communication by the author of LCS study

- It is not clear to what extent the intermediary role of WMGs caused a further delay of the work order reaching the LCS group, see paragraph below ‘Late work orders leading to extra work’
- The responsibility of the WMGs for the timely completion of the assignment could be a reason for having all or part of the work being subcontracted by them, see below. In other cases, WMGs may hire a professional overseer (‘sardar’) to guide the technical implementation of the work; the concerned costs are also deducted from the contract amount
- BWDB held the view that the responsibility and ownership for LCS work was higher when LCS groups were directly contracted (ie by BWDB)
- There is ample evidence that BWDB’s technical guidance helped the LCS group to understand technical aspects of construction. Because of their many other responsibilities, BWDB were not able to monitor LCS activities regularly. WMGs were better placed to address the day-to-day local challenges

The study report does not explicitly describe the opinion of LCS group members, however, anecdotal evidence demonstrates that LCS workers also preferred contracts directly with BWDB.

Illustration: Begum was involved in 5 LCS groups as group leader, under IPSWAM and BGP. She has experience in LCS contracts directly with BWDB and with the WMG. She thinks that contracts directly with BWDB were the best. - case study on Begum, LCS group leader

2 Though there are many aspects to poverty, up till now the Blue Gold Program defines this as “households below the poverty line”.

26.3.2. Work measurement and extra work due to erosion

The pre-work measurement should be taken in presence of WMG and LCS representatives before the estimation of the work by the BWDB. This formed a baseline document to be used for the design and costing of the work. The relevant documents should be handed over to the WMG and LCS, but the study found that WMGs often did not have such documents. The study found that pre-work measurements were in most cases taken just before the start of the work, or even after the start, obviously after the issuance of the work order. In addition, instances were reported where BWDB declared their earlier measurements as “not correct”.

Illustration: *The pre-work measurement was not taken correctly and this was communicated to the WMG/LCS members by BWDB just before the payment of the 3rd instalment. For this mistake of BWDB, after finishing the work on time, they received much less than the contract amount. – From Box 3 of the study report, case study on LCS groups of Pashchim Shovna (Dakshin) WMG*

The study also found that in a significant number of cases WMG and LCS members had reservation regarding the post-work measurement. Despite the regular visits of the TA engineer and periodic work advancement measurements, it was often wondered how the post-work measurement could deviate significantly from what was expected and contracted for. Such confusion on pre- and post-work measurements led to lower payments than expected. LCS groups lacked the strength to complain against this, also because any grievance addressing mechanisms were missing.

Confusion related to the profiling of the work was also found, i.e. related to detailed specification of the work, the filling and cutting charts. Usually the work site was marked with objects like a red cloth or flag on trees or bamboo poles to direct the LCS members and to make them aware of the magnitude of the work. However, cases were reported of profiling only after the LCS group had started its work. Documentation on the profiling with the WMGs and LCS groups was usually absent. In addition, moderate to high wind speed (75 km/hour or more) destroyed the marks, as also moderate or heavy showers did. This constrained the work efficiency of the LCS groups.

26.3.3. Late work orders leading to extra work and missing peak season wages

The study found that (detailed) work orders to LCS groups were frequently issued by the WMGs only in late April or early May. The corresponding work order documents by BWDB were usually dated mid-March, which is already late, and was explained being due to lack of manpower at the BWDB offices. However, the study suggested back-dating of the latter documents.

The timeframe for the usual earthwork, re-excavation of khals and re-sectioning of embankments, is in the months prior to the start of the monsoon rains. When the work orders are issued late, and the works cannot be completed before the monsoon, the remaining work is carried over to after the monsoon. When earthwork is left partially done, the rains damage the unfinished work, especially by erosion of work on embankments and silting-up of partially excavated khals. This meant that the LCS group had to put in un-paid time and labour to undo the damage caused by the rains, increasing the number of labour days, reducing the efficiency of their input and their average daily remuneration.

Such delays and ‘wrong time-lines’ forced the LCS members to utilize time in late-November and December to complete the work, time which otherwise could have been invested in the agricultural peak season, such as harvesting of T Aman, when labour-days could be sold at a much higher rate than they earn from LCS work. This means that delayed work orders could lead to extra unpaid work for these poor LCS workers while refraining from higher paid alternative work.

26.3.4. Contract and contractual amount

BWDB determined the contract amount according to its 'rate schedule'. BWDB officials reported that such rates were regularly updated; however, the rates did not vary seasonally. There was no room for negotiations for the WMG or LCS group. The contract did not include provisions for third party settlement; there was no Grievance Response Mechanism mentioned in BGP's LCS Guidelines; in some other BWDB projects such provisions had been created.

In the WMG meeting in which the LCS members were selected, also the approximate contractual amount was announced; at that time the contract between BWDB and WMG was not yet signed. The announced amount included Tax, VAT, the 5% WMG service charge and the 10% security money (to be paid six months after completion, if the quality of the work remained satisfactory). Despite an explication that all these charges would be deducted from the total contractual amount, the study found that a great majority of the WMG and LCS group members did not understand this. It was the total (gross) contractual amount that attracted poor people as LCS members, having a higher expectation of their envisaged income than what was realistic. Moreover, there was neither a clear understanding of how payments were determined. It was found that LCS members may drag the number of working days with the expectation to earn more. Considering that the LCS modality is a 'business', i.e. a form of contracting, with the idea that also profit can be generated, it was found that the 'business model' was insufficiently presented and explained to the LCS members, either in meetings or during any training.

26.3.5. Payment modality

All payment transactions for the 3 installments and the security money needed to go through banks. The WMGs and LCS groups opened and operated their own new bank accounts for LCS payments. After achieving certain milestones of the work, BWDB gave payments in checks to the WMGs, not through bank transfers. WMGs subsequently issued checks for the LCS groups, deducting the 5% service charge and any payments for costs they made, if applicable. The LCSs then deposited the check received from the WMG in their bank account and withdraw cash to pay the members of their group, in proportion to the number of days each member actually worked (as per attendance register).

The first installment of 33% of the contract value ("mobilization money") was meant to be paid right at the start of the work, sometimes also to be used to buy equipment. In practice, this payment was often received 3 to 4 weeks after the start of the work. For many LCS workers, who by selection belong to the poorest sections of the community, it was difficult to provide for the basic needs of their family during this first month without daily income. A common option was taking a loan, which was usually against a high interest rate, but the example below also shows that LCS members may take up a second job as wage labourer next to their LCS work. This, however, can be particularly difficult for women, especially with young children.

Box 26.5: Examples of two different approaches for overcoming the first weeks of LCS work before the first instalment is paid

Bithika Rani (50) is a widow, with one daughter married and a son enrolled at the local college. She became group leader of Shornali LCS (2017-2018) in Polder 31 part. She used to work half days in the morning as a LCS member and as wage labourer in the afternoon, the latter in ghers, water melon or paddy fields. The half day wage labour work earned her between 50 and 200 taka, which allowed her family to survive, especially in the weeks before receiving the first installment for LCS work. She then used the first installment of 2000 taka to buy a goat.

Beauty Mondal (29) is the only earning member in her family as her husband is sick; she has two young children. She also worked half days as member of Shornali LCS group, but needed the rest of the day for domestic work and child care. To survive those first weeks without LCS income, she took a loan from a local money lender. She used her first installment of 2000 taka to repay her loan.

LCS groups often have to make special efforts to get their payments, especially the third installment and the 10% security money. Several visits of WMG and LCS members to the BWDB office may be needed, e.g. because the concerned officer may not be available to issue the check. There was also anecdotal evidence of the need to “manage the BWDB” by making payments to get the check.

***Illustration:** For taking a loan of 10,000 taka as advance payment for ‘managing BWDB’, they incurred an additional 2000 taka as interest. – From box 3 of the LCS study report*

***Illustration:** Begum also faced much struggle to get the checks each time, but she didn’t take a step back, rather she worked hard and convinced SO and XEN of BWDB and got the payments without giving any sort of bribe. – Case study of Begum, LCS leader*

In addition, going to the BWDB office to negotiate on the payments always involved costs, which were deducted from the payments, thus reducing the net earnings of the LCS members. This also applied to costs made to go to the banks for depositing the checks and withdrawing cash.

26.3.6. Training and basic facilities

In the first years of BGP formal LCS training was provided to the LCS groups in line with BGP’s LCS guidelines. However, this often did not work well because it was difficult to mobilize the LCS group members for a training for which they did not get paid, especially at times when well-paid alternative work as wage labourer was available. The study suggests that formal training would have been better viable if conducted in the lean season, when little alternative work is available, which, however, required earlier issuance of the work orders. Instead of the formal training, on-the-job training was provided. It included some general briefing on management; role of WMGs, role of LCS, payment system, stipulated technical issues, technical demonstrations (profiling, removal of vegetation, dug bailing, stepping for earth dumping, cambering) and finally construction of a model section. The study report observed that LCS members often did not see this as training, as they reported not to have received any training.

The curriculum of the formal training included health and environmental issues; the on-the-job training apparently did not address such issues. But in all cases facilities such as a temporary toilet (even indicated as performance indicator in the guidelines), a shelter (e.g. for breastfeeding), drinking water and/or a first aid box seemed never or seldom present in practice. Female LCS members reported that they used to go to the toilets of neighbouring households, after first asking permission.

26.3.7. Subcontracting

The two main reasons for subcontracting were both related to late issuance of work orders. Late issuance of work orders meant that the mobilization of LCS groups was difficult because the groups were formed several months before and LCS members got involved in other economic activities in the meantime. Such groups might have become dismantled and the work was subcontracted. Another reason is that even when the LCS group was mobilized but the work started late, the completion of the work before the start of the monsoon would not be possible. This applied more for women’s groups that usually work half days due to women’s other responsibilities. WMGs -as well as the communities- did not want to have the work postponed until after the monsoon, and therefore resorted to subcontracting of the work to ‘Sardars’

(skilled foremen), who were able to complete the work in time because they are more skilled, can hire external experienced labourers and may use machinery. Although subcontractors usually did not employ LCS members, there are instances for 'token participation' of some of the LCS members for a number of days or for the whole period of the activities.

The consequence of subcontracting was that the concerned LCS group members were not -or to a lesser extent- involved in the earthwork, and hence did not earn from LCS work or earned less. For the community, however, having the earthwork completed in time meant that they benefitted quicker from the improved infrastructure and improved water management.

26.3.8. LCS as a poverty reduction instrument

The study reported an average daily income per LCS member of BDT 354 for the 167 women and 36 men who had been interviewed. The average number of days worked was 63.3, which corresponded to an average income from LCS work of BDT 22,408 per LCS member. However, case studies often reported lower total or daily incomes and it seems that the survey respondents had over-reported their LCS income. Calculating the income per LCS worker based on the total value of LCS work also leads to a considerable lower income, see box 26.6.

Box 26.6: Calculating approximate LCS income for individual LCS workers

The total contract value of all LCS work up till the 2018-2019 construction season was BDT 3,662 lakh. After deducting 5% for WMG service costs and a further 5% for ad hoc costs (eg for hired labour), an estimated BDT 3,296 lakh remains for the 31,437 LCS workers, or BDT 10,484 per individual. Given that the average number of working days is around 63, this corresponds to an income of BDT 166 per day.

The calculation in Box 26.6 confirms that LCS income is often lower than agricultural wages, certainly in peak seasons, when daily wages range from BDT 400-500 for men and BDT 300-400 for women - and often higher when labour is scarce.

LCS as a poverty reduction instrument' is based on the assumption that surplus income from LCS work is used to purchase productive resources for more permanent poverty reduction. The study found that under the conditions as described in this chapter, the LCS modality as permanent poverty reduction instrument often does not work as usually only temporary incomes are provided.

***Illustration:** "Investing LCS earnings in IGAs is often not realistic, as many LCS members have pending debts, such as from shops or micro-credit, to repay as well as urgent needs, such as house repairs, the purchase of clothes or medicines," – Zonal staff member in Patuakhali*

However, there are also examples of LCS groups and/or individual members who successfully used savings from LCS income for investments in income generating resources, see Box 26.4 above.

The survey among 167 women LCS members (as part of the LCS study) found that investments in poultry, vegetable production and livestock were most common. But it was difficult to attribute successful income generation after earning from LCS work (entirely) to the LCS income, because also other (BGP) interventions may have promoted such investments. For example, 74% of the surveyed LCS women had participated in some 'IGA training', which supposedly is mostly the agricultural skill training through BGP's Farmer Field Schools. These FFS actively promote investments in productive resources as poultry, vegetables and livestock; hence it is difficult to assess to which extent LCS income was instrumental in increased production and income.

26.3.9. Gender issues and women's empowerment

The survey among 167 women and 36 men LCS members also aimed to identify gender issues. The findings show that female household heads were over-represented in female LCS groups, with 14% female household heads as LCS members against 3.6% female headed households in BGP's baseline survey. This confirms that female headed households are relatively poorer than male headed households, and that female household heads are comparatively more in need for work than women from male headed households.

On average women and men spent about the same number of days on LCS work (63 and 66 days, respectively), but female household heads spent more, i.e. 73 days on average. Because female LCS workers often only spent half days on LCS work (especially the mornings), female LCS groups needed a longer period of time to complete their LCS earth work, increasing the likeliness that they cannot complete the work before the monsoon rains start. This means that they were more often affected by the extra work to repair monsoon related damages after the rainy season; it also means that WMGs more often subcontracted LCS tasks of women's groups to subcontractors. However, in contrast to agricultural wages that show quite a huge gender gap (women often earning 60% of men), the average LCS earnings reported by men and women were quite similar, i.e. about 350 BDT/full working day. Decision making on spending LCS income was usually joint, i.e. by husband and wife.

LCS working conditions were comparatively hard due to the nature of the earth work, and could even involve working while standing in water, especially when re-excavating khals. For women the absence of a (temporary) toilet near the work is a bigger issue than for men; often women could not attend the work during their menstrual period.

Illustration: *“It was not an easy task; the work was very hard and difficult and it sometimes made us sick. However, after one week we got more used to the work.” – female LCS group members in polder 25*

In terms of empowerment, the study found that LCS work contributes to increased social networks and to increased income, even if temporary, thus to some level of social and economic empowerment. But the study also found that female LCS groups were usually managed and monitored by (male) WMG executive committee members, such as for opening and managing bank accounts, going to the regional BWDB office to take the checks and maintain the labour attendance register and master roll. WMGs may also employ male LCS members from nearby groups and/or sardars to supervise women's groups. This means that LCS work by women's groups left little options for self-management and thus for further empowerment; few women LCS group leaders therefore gained management skills and women's agency was hardly created. But there are exceptions, such as demonstrated by the following examples of two women:

Illustration: *Priobala combines being a WMG executive member and leader of the local women LCS group: ‘I take my responsibility as a leader, I know I can, because people appreciate me.’*

Illustration: *Begum was involved in 5 LCS groups as a leader, of which twice during BGP, building up leadership capacities and inspiring other women. Now people want her to become UP representative in the next elections.*

The survey also found that 7 female LCS members out of 167 (4%) were approached to participate in the local election as potential female UP member. The survey results do not reveal, however, to which extent their leadership capacities were developed due to LCS membership.

26.3.10. Cost-efficiency of LCS work

BWDB uses two separate costing calculations for earthwork by LCS groups and by contractors, whereby the rates for contractors are approximately 35-40% less for the same volume of work than for LCS groups. This is because contractors can work more efficiently as they have bigger volumes of work under one contract and can use machinery. This makes the deployment of contractors not only more cost-efficient, but it can also lead to better quality of the work.

This means that earth work by LCS groups can only be justified if the poverty reduction impact exceeds the extra costs of the LCS work and/or LCS deployment can be otherwise justified. Investing in LCS work means that less earthwork can be done given a certain budget. The below box demonstrates that about 20% more earthwork-based infrastructure could be developed or rehabilitated with a same budget if only contractors are deployed as compared to equally sharing the volume of earthwork between contractors and LCS groups.

Box 26.7: Extra infrastructure when only using contractors

It is common practice in externally financed projects that 50% of the earthwork is given to LCS groups and 50% to contractors. If contractor work costs 40% less than work by LCS groups, this means that 41.7% of the total budget goes to contractors and 58.3 % to LCS groups.

If all budget would be entirely used to hire contractors (and no LCS groups), this means that either for the same amount of earthwork less total budget is needed (17% less); or more earthwork can be developed using the same budget (20% more).

26.4 Lessons learnt from BGP's LCS work and the way forward

The main lessons learnt from BGP's involvement in LCS work, including from the LCS study, are:

- The current LCS approach and timing were disadvantageous for LCS group members, including for the timely completion of the work, often leading to carry-over work after the monsoon season. This also led to extra (unpaid) work, as monsoon rains caused damages to the unfinished works. To avoid this, WMGs tended to subcontract the work to experienced 'sardars', ensuring timely completion of the works, but taking income earning opportunities away from LCS groups
- The late issuance of work orders made that LCS work coincided with peak demand for agricultural wage work, which offers considerably higher wages than what can be earned from LCS work
- There was insufficient explanation to and training of LCS workers: about the contract conditions, the net incomes they could expect and about managing their group; technical training was often considered insufficient, which could lead to misunderstandings related to pre- and post-work measurements and profiling, and thus to less efficient labour outputs
- The involvement of WMGs, as a third contractual party between BWDB and LCS groups, was often not seen as an improvement as compared to the situation before 2014 when LCS groups were directly contracted by BWDB, also because it reduced the contract amount available for the LCS group members

- There is room for improvement in communication between BWDB and WMGs/LCS groups (e.g. to ensure timely payment of instalments), and in some respects also the role of TA could have been enhanced. It is illustrative that BWDB only deploys LCS groups in donor funded projects, not in projects which are only funded by GoB
- LCS work contributed to some poverty reduction, but often temporary, as income is first used for immediate needs (food, house repairs) and debt repayment. It seems that especially when LCS work was combined with other interventions, such as including LCS workers in agricultural skill training (FFS), investments in productive resources were enhanced, increasing chances for a more permanent lifting out of poverty
- Women appreciated certain features of LCS work even though the work was hard, but women also meet many challenges, including the absence of a grievance addressing system. LCS work brought some benefits to women, as increased income and more social networks, but its contribution to women's agency and real empowerment was often limited

With many challenges and no automatic impact on longer-term poverty reduction, the future of LCS work needs to be faced. The continuation of BWDB LCS work under the circumstances as described above, e.g. with late working orders and the related tendency to subcontracting, seems not recommendable. Moreover, the need for LCS work as a poverty reduction measure also becomes less urgent now Bangladesh is moving towards becoming a middle-income country with less poverty and more employment opportunities. This may mean that LCS work only should be considered in more poverty-stricken areas, and when the modalities are improved, such as an earlier start of the work, better training and explanations and easing the payment process (eg by bank transfers).

It should also be realized that using a given budget for infrastructure improvements only by contractors increases the volume of work that can be realized, hence leading to more benefits for the broader population in a project area. This means that eventually the use of machinery by contractors is likely to phase out earthwork completely done by manual labour, also leading to higher quality of the works.

An exception is the turfing (planting and maintaining a grass cover on the slopes of embankments to protect the bank from erosion or gullyng by rainfall), which is a task that cannot be done by machines. Engagement of LCS groups, especially involving the poorest community members with few other employment options, for such work in August-September will allow the annual re-fixing of minor embankment damages during the rainy season, which is a slack season for agricultural work. Such contracts for turfing therefore are suitable as a poverty reduction instrument.



27 Sustainability

The Theory of Change, see *figure 30.4* in *Chapter 30*, postulated by BGP to guide future interventions in the coastal zone under the aegis of the Bangladesh Delta Plan assumes that local economic development based in collaborative actions by community-based water management organisations, technical departments, local governments and local businesses is ‘responsible development’. When communities, leaders and experts work together there would be a tendency –or maybe better put: an opportunity– to shape actions in such a way that long-term sustainability is enhanced and that outcomes contribute to the livelihoods of different classes of people. Such an integral approach to water management and agricultural transformation would produce results that are more inclusive and gender-responsive, and more sustainable. This section presents how BGP enhanced inclusiveness and sustainability and reviews the evidence for the claims of ‘sustainability’.

As discussed in *chapters 24, 25 and 26*, ‘inclusiveness’ was given explicit attention through BGP’s focus on women’s empowerment, gender equality and poverty alleviation. ‘Sustainability’ was assumed to be achieved especially by organising communities into Water Management Organisations (WMOs), however, with a less explicit operative focus.

The Project Document presented the mobilisation of communities into WMOs in the legal form of cooperatives¹ -i.e. as independent business entities- as a precondition for sustaining improved water management practices, thereby sustaining the ensuing livelihood improvements. Promoting the productive use of water management infrastructure by the WMOs was mentioned as a second factor promoting sustainability. Sustainability in terms of sustaining BGP’s expected outcomes after program completion was, however, not elaborated upon.

In line with the cursory guidance of the Project Document, implementation initially strongly focussed on reactivating, establishing and strengthening WMOs, with much attention to ingraining the internal

¹ At the time that the Project Document was elaborated (in 2012) the only option for legal registration of WMOs was as a cooperative under the Department of Cooperatives. Since the PWMR of 2014, however, registration of WMOs under the Office of the Chief Water Management, BWDB, became the standard.

management processes (elections, record keeping, conducting stipulated meetings). With time, attention shifted to promoting the productive use of the improved water management infrastructure, thereby emphasizing community involvement in establishing water management practices that enable and support improved farming practices. The concept of sustainability was not incorporated in the M&E framework of the project.

The assumption in Blue Gold's Theory of Change that an integral and participatory approach to water management for development inherently produces outcomes that are more sustainable than sectoral and centrally implemented programmes was based on anecdotal and indirect evidence. In particular, it was assumed that communities and their local governments would take steps to modify existing water management systems, often benefiting the elite, to systems that are more conducive for their long-term production aspirations and benefiting a broader section of the community. Examples are the pursuit of a retention structure at Gajedrapur Uttar in polder 28 and the establishment of a pumped drainage system in Polder 2 extension. Observed actions to remove conditions causing drainage congestion and water logging and early response to damage to infrastructure have also encouraged the conviction that the participatory approach towards water management inherently adopts a long-term perspective.

While examples, such as the ones above, do suggest an inherently more sustainable nature of 'water management for development', confidence in this claim can be bolstered by a more comprehensive analysis of the admittedly scant evidence for enhanced sustainability. The following sections look at sustainability in five areas: the physical environment, the household capability to recover from shocks; the capacity to organise actions to maintain and improve water management; the community's access to services and support; and risk management. In addition, the impact of the COVID-19 pandemic and the Amphan cyclone is presented.

27.1 Physical environment

At the moment of writing this chapter (November 2020), a good proportion of the 22 polders have been adequately rehabilitated so that the primary flood defences and the main drainage networks are ready to deal with flood and rainfall extremes that occur roughly once in twenty years;² in the remaining polders the works have been completed within 2021. Embankment sections vulnerable to erosion have either been protected or have been retired further inland.

As per its design, BGP initially only invested in improving main infrastructure. But based on perceived needs, also in-polder water management (IPWM) was addressed. Small-scale works have increased the potential of intensified cropping in sub-catchments, whereas excavation of khals and minor drains have removed drainage congestion from many areas, thereby intensifying crop production and improving living conditions. However, roughly half of the main sluices were in 2020 not yet under community control, which is needed for proper IPWM. This implied a risk of continued unsustainable water use practices by influential individuals, such as khals being closed off for fish production and saline water being let in for shrimp cultivation.³

By the end of BGP the physical status of the 22 polders has been substantially improved through rehabilitation of major infrastructure along the periphery (embankments and sluices) and an improved drainage network for internal polder water management. Whether the present status can be preserved and even expanded upon, is discussed under the capacity to organise water management and maintain water management infrastructure.

2 Climate change considerations, in particular sea level rise, were knowingly not taken into account; rather, embankments were rehabilitated back to their original design situation. It was considered not yet needed to extra raise the embankments, because over time –and after future erosion– new rehabilitations will be needed.

3 Shrimp cultivation usually refers to saline water production; prawns to fresh water.

27.2 Coping capability

From what is known at this point in time through outcome surveys and beneficiary interviews (see chapter 6 and/or chapter 23), agricultural production has significantly increased and includes a greater volume of high value crops. The demand for agricultural labour has also increased. Many households now have a better income base.

The increase in production and income was especially boosted by the high volume of skill training on improved agricultural technologies provided by BGP through FFS, both for field crops and homestead production, complemented by orientation on market linkages and strengthened service delivery. The homestead FFS activities have resulted in more diversified and higher incomes for especially poorer and landless households, as discussed in *chapter 25*. Many of these activities have specifically enabled women to enhance their production and income, improving nutrition and reducing poverty.

And as discussed in *chapter 24*, empowerment of women, through FFS and other activities, exceeds their economic empowerment and decision-making on production and income, also covering increased self-confidence, more female leadership, increased mobility and larger social networks. Gender norms and roles gradually started changing, with women more often taking up tasks previously only done by men, whereas decision-making on production became more joint by husband and wife. This more robust role of women increased the resilience of their families.

Many Water Management Groups have enhanced the availability of affordable credit for their members, with so far Tk 34 million being invested in income generating activities through issuing small loans. Collective saving for making small loans available at concessional rates is significant: households in polder 30 have been able to invest in the development of freshwater ghers and could thereby diversify their income base. Availability of micro finance is an important factor in helping smallholder households to take part in the transformation to commercial agricultural. It is a point of discussion whether support to micro-finance and savings & credit operations should be left to specialised agencies (such as Micro-Finance Institutions and/or banks) and/or people's own initiative, rather than incorporating savings and credit operations into the Water Management Groups (WMGs). Within BGP the practice of actively promoting savings and credit operations by WMGs was discontinued over time as (i) the WMGs were re-registered under the BWDB legal framework, which unlike the Cooperative Law, does not require and support a savings and credit practice; and (ii) as savings and credit operations sometimes became the main focus of a WMG at the detriment to their primary focus on water management, laying claims on scarce management resources and also carrying an inherent risk of mismanagement.

27.3 Capability to maintain and improve water management

BGP helped mobilise over 70% of the beneficiaries of the 22 polders into a nested structure of Water Management Groups and Water Management Associations (i.e. the WMOs), with hands-on experience in planning and undertaking water management actions at sub-catchment, catchment and polder level.

This structure for community-based organisation of water management enhances the voice of people in decision-making. This is especially important as the WMOs tend to represent smallholder producers. Their priorities e.g. for timely and full drainage during and after the monsoon, are better represented than in situations of absence of WMOs when the interest in retaining water of absentee owners engaged in fish and shrimp cultivation tend to dominate.

Within the WMO structure, women have a better voice in decision-making. Around 43% of the WMG members is female, and at least a third of the executive board positions in WMGs and WMAs are taken up by female leaders. With an active female membership, the pool of potential WMO leaders is larger and the diverse interests of communities are better represented.

However, experiences from the previous projects that supported WMOs showed that many did not sustain as active organisations beyond a duration of five years after project completion, apparently due to lack of capacities, activation and/or support. Therefore efforts have been made within BGP to create better conditions for sustaining the practice of maintaining and improving water management:

- Though maintaining the focus of WMGs on water management, also complementary roles have been supported, such as taking initiatives towards collective actions and playing a role in information dissemination and disaster preparedness; such roles tend to enhance the sustainability of WMGs.
- More emphasis has been put on establishing and/or strengthening Water Management Associations under the assumption that these would have more permanence and that – if the need arises – these can take the initiative to support and reinvigorate their constituent WMGs, including by conflict management if and when needed.
- For the same reason, the relationship between WMOs and Local Government Institutions (LGIs) has been fostered, in particular, with Union Parishads, but also with Upazila officials. LGIs are permanent institutions mandated to promote local economic development and, as such, stand to gain from active and constructive community-based organisations for water management. Many WMOs now cooperate with LGIs, especially in improving local water management, such as constructing cross-bundhs (small dams) or culverts. WMOs also have proved to fill the gap between the lowest level LGI and the communities, e.g. as demonstrated during the COVID-19 pandemic, when WMOs conveyed hygiene messages in cooperation with UPs, and the Amphan cyclone, when WMOs played a role in warning and in mobilising manpower to quickly repair damaged embankments.
- BWDB and the WMOs have a relation, as the former registers and oversees the latter. The relationship has however been made more robust through promotion of personal contacts and by developing a polder-level O&M agreement between each WMA and BWDB that governs their complementary responsibilities towards ensuring the sustained integrity of the polders.
- In a break with the thinking in the Project Document (and in the Guidelines for Participatory Water Management), BGP realises that WMGs and WMAs alone cannot ensure sustainable water management in the polder. They need to cooperate with the aforementioned local governments and with concerned departments, agencies and private sector actors to develop a dynamic and progressive link between water management, commercial agriculture and local economic development. BGP therefore helped WMOs present themselves to the stakeholders around them and stimulated them to develop robust networks with others, both within the government (DAE, DoL, DoF, etc) and in the private sector.

While the network established for better in-polder water management is a prerequisite for a more sustainable polder, it must be admitted that this linkage itself remains vulnerable:

- The linkage to the Union Parishads, though very important for undertaking small works, for cleaning of khals and for obtaining control of the sluices, is highly reliant on personal relationships between Union and WMG leaders. This is a rather vulnerable basis for long-term cooperation;
- The relation of BWDB to the WMAs is governed by the O&M agreement, but BWDB does not have the manpower and budget to keep up its part of the bargain. Moreover, the O&M agreements are particular arrangements for a particular project and they are not automatically a universal pact between BWDB and water users after BGP completion;
- The BWDB Office of the Chief Water Management, which is responsible for supporting and overseeing WMOs, is severely strapped for resources and does not have an adequate local presence. Any effective backing of WMOs by BWDB therefore is not realistic.

The above concerns are not specific to the BGP area, and a better partnership between communities, BWDB, LGIs and others on local water management priorities would partly depend on the improvement of water sector governance in Bangladesh. This is one of the concerns that is to be addressed under the wings of the Bangladesh Delta Plan.

Longevity of infrastructure also presupposes that resources for maintenance, operation and modification are or can be mobilised. This is an area of concern. BWDB, in its responsibility for periodic and emergency maintenance, lacks a budgetary reserve for this and would need to go through a standard requisition procedure for obtaining funds for specific investments. The process is lengthy and ill-suited especially to emergency works. At the same time, WMOs and their communities – despite having been able to mobilise funds and labour for maintenance and small works – often with LGI support – have very limited ready-at-hand liquidity to invest in immediate maintenance and repair needs beyond small repairs, and have as yet not developed robust procedures for resource mobilisation across all beneficiaries of the water infrastructure.

27.4 Network of services

A community is more resilient, and its endeavours are more sustainable, if that community can rely on good services from local governments, departments, private sector and NGOs; and if it has an adequate voice in the public decisions affecting them. Roughly from 2017, when BGP launched its exit strategy ‘sustainability from the start’, it has been giving more prominence to networking by WMOs and to the development of constructive partnership relations with key stakeholders. This is partially discussed in the above section on sustaining water management, but here the discussion focusses on services in the realm of commercial agriculture.

Agricultural extension aimed at creating adaptive capacity. Producer capacity was enhanced to make the most of the production potential arising from infrastructure rehabilitation and developing water management abilities. The focus was on business and decision-making skills of both male and female farmers to pursue increasing levels of production ambitions and create the ability to adapt to changes in the business environment, be it water management, technological, market or climatic changes, while considering risks. Many producers expanded and established better relations with other actors in their value chains and in support functions. Key to this were building networks and networking skills to facilitate access to goods, services and information, boosted by the use of mobile phones and stimulated by Horizontal Learning. In the process, the outreach of DAE, DoF and DLS were expanded alongside the engagement of the private sector. The bargaining power of producer groups was enhanced through Resource Farmers organising collective actions. Also 125 local input providers and traders were introduced to collective actions so that systemic change evolved as both sides increasingly appreciated the win-win potential hereof and the practice spread on its own.

Besides the capacity strengthening of 250 DAE’s Sub-Assistant Agricultural Officers (SAAOs) and Departmental Trainers, there is a cadre now of around 1000 trained local resource persons, who the community can revert to for technical advice. This includes in the first place some 700 Resource Farmers (70% female), with an enhanced networking capacity and information seeking behaviour, an ability to lead collective actions, and a reflex for Horizontal Learning and involving local model farmers. In addition, there are 225 Farmer Trainers (40% female), 60 Community Poultry Workers (all female) and 40 Community Livestock Workers (nearly all male), as well as people trained in catchment planning processes. Awareness of these local resources was facilitated by stimulating that resource persons’ networks became linked to WMOs and access to these resource persons was enhanced by stimulating the use of mobile phones, the latter also enabling farmers to enter into contact with market actors.

The outcomes in terms of agricultural growth and the commensurate rise in incomes and demand for labour in the polder economy are encouraging but sustainability would be further enhanced:

- by the implementation of the lessons from agricultural extension in the coastal zone, both in terms of content and approach;
- by attention to the future binding constraints emerging from the improvement of water management

- and increasing production, such as labour shortages and feminization of agriculture; and
- by striving towards more pluralistic agricultural extension, using the capacities of various service providers, both public and private, in partnership.

27.5 Risk management

During the most recent cyclonic storm (Amphan, May 2020), WMOs and local governments worked in many instances together to prevent embankment breaching or to implement emergency repairs. This suggests that communities and their institutions are ready to address the risks facing them.

While the above is very encouraging indeed, from the perspective of overall risk management a few reservations need be made:

- Union Parishads and Upazila's have been given extensive responsibilities for disaster preparedness. This goes beyond the reactive approach seen in the aftermath of Amphan as the responsibility – when fully addressed – constitutes comprehensive and proactive disaster management. However, barring a few incidental supports, BGP did not avail of the opportunity to address risks facing the polders' sustainability by supporting the disaster preparedness responsibility of the Union Parishads with materials, capacity development and/or a specific linkage for this activity to the WMOs;
- While BGP helped reduce the destructive force of water and helped harness its productive potential, the focus has largely been on the present situation. Risks to the polders' sustainable performance that relate to processes augmented by climate change were not part of the mandate of BGP and were not incorporated during its implementing period. This relates specifically to the enhanced sedimentation of rivers, especially in Satkhira and Khulna; to the deeper intrusion of saline water into the Delta; and to the greater variability in weather conditions paired with longer spells of drought or high rainfall.
- Finally, little thought has been given to larger socio-economic risks affecting the project area. This relates to the consequences of substantial out-migration for local development and the somewhat related phenomenon of feminisation of agriculture. These two may combine to a shift to (saline) ghers and/or a regression to lower value subsistence agriculture, in particular if there is shortage of labour and/or if agricultural extension fails to better target women farmers. Such lower value agriculture may not create enough surplus to support the main polder water management infrastructure, whereas owners of saline ghers are not interested.

Although BGP did not explicitly pursue risk management of the polders, the fact that the WMOs and LGIs do cooperate in addressing pressing risks, shows that a participatory and integral approach to water management for development tends to pay attention to sustaining its outcomes.

27.6 Impact of disasters and resilience to face them

The year 2020 brought two major disasters that -at least temporarily- impacted BGP beneficiaries, negating some achievements of the preceding period of BGP supported development: the COVID-19 pandemic, which continues to be a threat; and the Cyclone Amphan, which hit several polders on May 20 and 21. Most impact of COVID-19 is related to the drastic measures that were imposed by the government in March 2020 to minimize infections by the virus. These measures included a lockdown, urging people to stay home and maintain social distancing. It meant that almost all transport was stopped and businesses, markets and educational institutions were closed. This had an immense impact on the communities in the BGP area.

27.6.1. Agricultural production and farmers' income

Farmers experienced severe difficulties selling their produce because traders stayed away and fish export had stopped. Farm gate prices fell, leading to lower prices for almost all produce, such as milk, eggs, poultry, vegetables, fish and various rabi crops. Vegetables rotted due to lack of buyers. On the other hand, prices for inputs, such as seeds and feed, increased due to shortage in supply. On top of this, the Amphan cyclone caused floods and water logging, destroyed crops, made fish ponds overflow, and flooded homesteads, affecting field crops, fish and homestead production. As a result of the two disasters, the increases in agricultural production and/or income observed during the years of BGP interventions were often undone as a result. For Blue Gold's endline survey this meant that production and income data were collected for the three agricultural seasons preceding COVID-19, i.e. for 2019, rather than for 2020.

27.6.2. Income from agricultural wage labour

In the first period of the lockdown, wage labourers were reluctant to go out to work, resulting in loss of income for them and labour shortage for crop farmers. The closure of many businesses and markets country-wide resulted in many migrants returning to their home villages, where they were idle and without income. When lockdown measures were somewhat relaxed and wage labour work picked up again, there was over-supply of labour, and wages dropped. As male labour was available at rates previously paid to women labourers, farmers mainly hired male labour; women labourers being disproportionately impacted. In particular women headed households, with the woman as only breadwinner, fell back to a situation of hardly any income. This was a big reverse from the positive developments in recent years, with the increasing demand for wage labour and increased wages, also for women workers.

27.6.3. Infrastructure

The COVID-19 meant a temporary stop or slowdown of the implementation of infrastructural works, as contractors were not interested or able to work during the lockdown and (skilled) labour returned to their home villages. Gradually work was taken-up again, also aiming to speed up the works such as khal re-excavation and sluice construction. The Amphan cyclone caused damages and breaches of embankments. WMGs -often in coordination with Union Parishads- did emergency repairs to limit the damages due to flooding. The scope of ongoing BWDB contracts with contractors was extended to include emergency work. However, proper quality control at critical stages was sometimes lacking as visits by TA quality control engineers were not always possible, especially due to the COVID-19 situation.

As much as possible, work on the in-polder water management infrastructure continued, such as CAWM field channel (re) excavation and the SSWMI works, i.e. works implemented by the WMG members themselves.

27.6.4. Socio-economic impact

In addition to the dwindling incomes from agriculture, also other categories of workers saw their incomes lost or reduced. Migrant workers lost their jobs and returned home to their villages; entrepreneurs with small or bigger businesses saw their revenues decrease. Overall, many households fell back into poverty and food insecurity, and food intake was reduced. As is common, such situations affected women most, as they were the first to skip a meal, or taking less food per meal. WMG members stopped saving with WMGs; rather people had to take more loans from money lenders.

The situation of women also changed due to husbands and children staying home most of the time, which not only led to more domestic work (demands of husband and responsibility for hygiene), also domestic violence increased as well as early marriages. The reduced family income also contributed to an increased demand for dowry, whereby married men put pressure on their wives -also by beating- to demand her family for new dowry payments. Reduced access to health services was another negative impact of the

COVID-19 situation; for example, there was an increase in home deliveries. In addition, loss of assets and damages to housing were caused by the Amphan cyclone.

27.6.5. Resilience

Signs of resilience, enhanced by BGP interventions, were also observed. WMGs – often hand-in hands with Union Parishads – helped raise awareness about COVID-19, including about protection measures such as hand washing, social distancing and mask wearing. WMGs played a role in issuing warnings for the upcoming cyclone. Some beneficiaries were even able to use the cyclone information to sell their watermelons quickly through collective action before the cyclone hit their land. WMGs also were instrumental in mobilising labour to protect and repair damaged embankments, thereby minimising losses. Their closer association with government officials, as build up with LGIs, DAE and others during BGP, enabled farmers and communities to better obtain support. Households that had diversified and improved their homestead production proved to be more self-reliant. And empowered women were more likely to take initiatives to address their situation; they were also more able to stand up against the (increased) domestic violence.

Figure 27.1: BGP's contribution to increased climate resilience⁴

How did BGP increase climate resilience?

Most components of Livelihood Vulnerability Index strengthened, such

- Livelihood strategies enhanced
- Social networks expanded
- Food production increased
- Better water management
- Health (indirectly) improved, incl. nutrition
- Reduced risks for natural disasters



By the end of 2020 the situation was gradually returning to normal, as more transport and market activities were possible, and more shops and businesses have opened again, despite still people being affected by the virus. The second lockdown in 2021 again affected polder inhabitants, with more families personally affected by COVID-19; but with less strict lockdown measures, e.g. private transport remaining available. Still many people remained without work and income; or incomes remain lower, e.g. due to less work for (women) wage labourers and lower wages. By the end of BGP it therefore cannot be predicted to which extent the impact of the two disasters remains felt in the coming years.

⁴ Source: Slide from the presentation “Empowering Women for Economic Development and Resilience” at the Gobeshona6 International Conference on Climate Knowledge of January 2020

Figure 27.2: Women's empowerment resulting in increased climate resilience⁴

Empowered women enhance climate resilience through:

- Increased social networks and mobility
- Increased understanding of agriculture and water management
- Increased access to information / resources
- Contribute to improved livelihoods and poverty reduction
- Women leaders ensure that interests of women are also taken care of
- From victims to change makers!



27.7 Conclusion

The evidence available shows that conditions for long-term sustainability of the polders and of the 'water management for development'-practice have improved; resilience to face disasters improved as well. At the same time, one may wonder whether this is enough. The country framework for water sector governance is weak; and local good water management practices are still in their initial stages. A future project intervention design for the coastal area would do well to:

- Support improvements in the overall water sector governance from inception onwards;
- Promote local action for better water management and climate smart agricultural transformation from the start of the project; and
- Link BGP's experience with harnessing water management for local economic development with the development of policies for better water sector governance, as undertaken under the aegis of the Bangladesh Delta Plan.



Section G

Project Management



Section G

Project Management

Summary

Earlier sections in BGP's lessons learnt report have consistently demonstrated how the project concept evolved from complementary interventions in community organisation, water security, agriculture and markets into an integrated approach aimed to drive local economic development, inclusiveness and sustainability in the 22 coastal polders where the project operates. The evolution of the approach required the project management to adapt and refine the organisational structure of the team to meet the changing priorities, and a willingness of team members to operate in multi-disciplinary teams and to refocus on delivering tools for community leadership in agricultural water management with relevant information and access to resources. Mechanisms for project coordination were employed and augmented. Planning evolved from a one-off effort at the project's onset to a recurrent field of attention. Monitoring and evaluation moved towards a position of analysing and reflecting on project survey data to inform project management on implementation progress and impact, with lessons on 'what works' and 'what doesn't work'. And finally, the project's fresh outlook on local economic development changed its communications with beneficiaries and stakeholder; a change that is reflected in training and extension approaches.

G.1 Project coordination – a point of attention

The design of Blue Gold, as set down in the GoN Program Document and the BWDB and DAE Development Project Proformas (DPPs), sets out arrangements for Implementation through complementary interventions by BWDB, DAE and the TA team, with mechanisms for coordination to ensure coherence. In addition to dedicated management teams for each implementation unit, a program coordinating director was assigned; steering committees for the BWDB and DAE activities were put in place; and the project performance was externally reviewed each year. Recognising the benefits of working-level coordination of activities, regular meetings were instituted between the BWDB Project Coordinating Director, the DAE Project Director, the TA management team and the Embassy of the Kingdom of The Netherlands. Mechanisms were proposed for coordination at zonal and polder levels, but in practice, this continued largely through ad hoc meetings.

Future project interventions in the coastal zone would be well-advised to incorporate arrangements for strong cross-sectoral coordination. This would include a close association with existing coordination structures – especially with government line agencies, Union and Upazila Parishads and local private sector and NGO representatives – complemented by agile structures for strategic coordination at national level.

G.2 Planning – sustainability from the start

The two separate Development Project Proforma (DPPs) – one with BWDB for investments in flood control and drainage infrastructure, and the other with DAE for the transfer of agricultural technology – were complemented by a substantial Technical Assistance (TA) team with workplan and budget.

The TA team had a budget and organisation structure that could adapt with more flexibility to the changes in the project concept. While the two separate plans for the main implementing agencies existed throughout the project duration; the TA team was able to do away with its component structure and to plan its work in a more integrated way.

A future integrated 'water management for development'-project should seek to maximise the flexibility of the DPPs of the line agencies (e.g. through block allocations) and should explicitly use technical assistance resources to strengthen coherence between local ambitions expressed by WMOs and LGIs; and line agency plans.

G.3 Monitoring & Evaluation – An evolving Theory of Change

The M&E system derives from the project plan, and more specifically from its Logical Framework. The indicators of the M&E system had to be adjusted in keeping with the changing project approach. While output indicators were largely unchanged and reported in a monthly Tracker Report, outcome indicators had to be adjusted to the changed view on WMG performance. More emphasis was given to self-monitoring by the WMGs, complemented with in-depth surveys on their performance. Triangulation between data sources provides a deeper understanding of processes – and weaknesses – and helped move the M&E function from 'recording' to 'reflection'.

The impacts of some changes in the project concept can only be partially reviewed, as no baseline is available for these changes. Thus, impacts on inclusiveness and sustainability – which are seen as important by-products of the integrated approach to local economic development – could not be fully captured by BGP's M&E products.

Future projects are advised to use M&E from the onset as a key management tool for reflection by using diverse data and information sources and by a focussed and strongly independent analytical function.

G.4 Communication – new perspectives on training and extension

The change in project concept pursued local initiatives with respect to water management and agricultural change. Rather than having a central message and disseminating this as efficiently as possible; the project stimulates its intended beneficiaries to use opportunities in water and agriculture in ways appropriate to their specific locality.

Centrally purchased capacity building courses (for leadership, gender and accounting) were replaced by facilitated local planning processes for water management. Such plans develop from an initial replication of a standard WMG plan, to a cascading planning process from sub-catchment, to catchment to polder with particular emphasis on mobilising own resources and obtaining additional support through association with local governments, departments and private sector.

The approach for agricultural extension broadened: in addition to farmer field schools for field crops and for homestead production; use was made of horizontal learning between communities and local resource farmers were mobilised and trained. The field crops FFSs were reviewed to include attention to opportunities in the year-round cropping cycle, to the potential of improved water management in sub-catchments and to farming as a business. Homestead FFSs were split into short and specific courses.

To support a change from dependency on external project-support to local initiative for economic development; future projects must employ a diverse set of communication interventions, which help people take action; rather than simply telling them to take action.



28 Project Management Arrangements

28.1 Introduction

This section of the report aims to set out the arrangements for implementing the Blue Gold Program, covering a range of issues:

| | | |
|----|---|--|
| 28 | Project management | Formal agreements, project committees, review missions, coordination meetings, progress reports and work plans |
| 29 | Technical assistance | TA contractual arrangements and services |
| 30 | Evolution of the TA organisation | Organisational arrangements from program document to redrafted theory of change, decentralisation, exit strategy |
| 31 | Capacity building | Large-scale capacity building, the move to customised training, refocused TA FFSs, vocational training |
| 32 | Agricultural extension methods and communication | Approaches and instruments |
| 33 | Horizontal learning | Farmer-to-farmer learning and its evolution |
| 34 | Monitoring and evaluation | Baseline and endline surveys, WMG surveys, DAE data, remote sensed imagery, WMG tracker |
| 35 | Management information system | Polder dashboard and post-project data management, trend watcher |
| 36 | Environmental due diligence | Environmental impact assessments and modalities |

Whilst the technical content of these subjects is covered elsewhere in the report, the purpose of this section is to set out the managerial and organisational arrangements for delivering the project.

28.2 Implementing Modalities

The Administrative Arrangement signed on 20th February 2013 between the Minister for Foreign Trade and Development Cooperation for the Kingdom of the Netherlands and Economic Relations Division (ERD) for the Government of Bangladesh (GoB) sets out the broad arrangements for the implementation of the Blue Gold Program. The following amendments were agreed:

| | |
|-------------|--|
| 11 Feb 2014 | First Amendment to Administrative Arrangement |
| 29 Dec 2016 | Second Amendment to Administrative Arrangement (extend to 31 Dec 2020, increase financial contributions to BWDB (to €27.32 million) and DAE (to € 1.495 million) |
| 21 Oct 2020 | Third Amendment to Administrative Arrangement (extend to 31 Dec 2021, no payments after 30 Jun 2021, final reports by 31 Mar 2022) |

A further Arrangement (known as the ‘Contribution Arrangement’) - signed on 4th December 2013 by the same two parties - expands on the Administrative Arrangement to provide specific start and end dates, responsibilities of BWDB and DAE, details of arrangements for transfers of funds by instalments, requirements for progress and financial reports, final reports, and annual audit reports, arrangements for evaluations of the program. The following amendments were agreed:

| | |
|-------------|--|
| 11 Feb 2014 | First Amendment to Contribution Arrangement |
| 29 Dec 2016 | Second Amendment to Contribution Arrangement |

Under both of these Arrangements, the Embassy of the Kingdom of the Netherlands (EKN) represents the Kingdom of the Netherlands. And grant funds are contributed by EKN for administration by BWDB, DAE and a technical assistance (TA) team through direct contracting with EKN. Also through TA funding, support is provided to the activities of the Department of Cooperatives (DoC), Department of Fisheries (DoF) and Department of Livestock Services (DLS).

With respect to the GoB implementing organisations, separate Development Project Proposals (DPPs) for BWDB and DAE set out the aims and objectives of the project, its financial and physical scope, intended objectives and benefits, and proposals for monitoring and internal and external audits.

Working arrangements between BWDB and the Department of Livestock Services (DLS) and Department of Fisheries (DoF) were set out in Memoranda of Understanding (MoUs). Both DLS and DoF come under the administration of the Ministry of Fisheries and Livestock.

The Department of Cooperatives (DoC), under the Rural Development and Cooperatives (RDC) Division of the Ministry of Local Government, Rural Development and Cooperatives (MoLGRDC), was an early partner in the formation and registration of water management groups (WMGs). After the publication of the Participatory Water Management Rules (PWMR) of 2014, BWDB was mandated to form and register WMGs, and the arrangement with DoC was discontinued.

The collaboration between MoWR and MoA has been an important ingredient for success, communicating that the overall focus is on increasing agricultural production and empowering WMGs to be the main drivers of development, rather than on the traditional focus on infrastructure alone. But increased agricultural production is only possible when improved infrastructure provides safety from flooding to all polder communities and the main framework for water management to control waterlogging; and only then are farmers prepared to invest in high value crops and higher cropping intensities. Thus, infrastructure and agriculture are inextricably linked and co-dependent.

Although there was no formal agreement in place, the collaboration between the Ministry of Water Resources (MoWR) and Ministry of Agriculture (MoA) has been a well understood critical relationship, fostered by a close BWDB/DAE partnerships at District level, and the attendance of BWDB representatives at DAE steering committee meetings and other workshops and conferences.

Local Government Institutions (LGIs) were not formally included in either of the BWDB or DAE DPPs, but – as will have been seen from Section D of this report – it will be important to do so in the future.

28.3 Development Project Proformas (DPPs)

Through the DPP, GoB organisations set out their intentions to invest in a development project, seeking approval for the investment and, if successful, a budget allocation. The DPP follows a prescribed format, including the project's financial and physical scope, benefits, and proposals for monitoring and internal and external audits. The approval of a development project proposal follows a number of stages:

- **Formation:** a project often starts with preliminary studies of its desirability in terms of national needs, with likely costs and benefits
- **Formulation:** the project scope is developed in greater detail and supported by economic studies so that decision-making bodies can evaluate and then approve, postpone or reject the project
- **Scrutiny:** executing agencies and concerned ministries scrutinize the DPP, and when convinced that the case is well-argued, submit the DPP to the Planning Commission
- **Appraisal:** Sector Divisions of the Planning Commission appraise the DPP
- **Recommendation for Approval:** If appraisal is successful, a Project Evaluation Committee (PEC) meets to review the DPP and, if positive to recommend it for approval
- **Minister/ECNEC Approval:** Approval of the DPP is made by the Minister for Planning (up to BDT 50 crore, equivalent to €5 million) or the ECNEC (over BDT 50 crore)
- **Inclusion in Annual Development Plan (ADP):** When approved, a budgetary allocation for the project is made through the departmental annual work plans and budgets, centralised in the Annual Development Plan

28.3.1. BWDB DPP and Revisions

The BWDB Development Project Proposal (DPP) for Blue Gold was prepared in November 2012, recast in March and May 2013 and formally approved in the ECNEC meeting of 30th July 2013. Table 11.1 sets out the budget heads for investments from the original DPP approved on 30th July 2013, the Revised Development Project Proposal (RDPP) approved on 21st June 2018 and the re-adjusted budget heads approved on 1st September 2020.

28.3.2. BWDB RDPP First Revision (June 2018)

The process for revising the DPP started in September 2016, when EKN confirmed to DG BWDB their interest in overcoming the shortfall in the DPP budget, by adding to their funding for Blue Gold. In turn, on 27th October 2016, a letter was sent by the Ministry of Water Resources (MoWR) to the External Relations Division (ERD) asking them to process EKN's offer. The RDPP was finally approved at a meeting of ECNEC 21st June 2018. The ECNEC approval took 20 months from the MoWR letter dated 27th October 2016 notifying ERD of the additional funding offered by EKN.

28.3.3. BWDB RDPP Extension and Re-Adjustment (September 2020)

On 3rd December 2019, a meeting of the Inter-Ministerial Steering Committee (IMSC) agreed that the project should be extended to end-December 2021 to allow for an additional full construction season in 2020/21 and to allow the subsequent processing of final payments to contractors, and also authorised a no-cost re-adjustment between budget heads to maximise the project impact. The readjusted budget and supporting papers were submitted by DG BWDB to MoWR in February 2020, and finally approved by Minister MoWR on 1st September 2020.

28.3.4. DAE DPP and Revision (October 2018)

The DAE DPP for Blue Gold was prepared in November 2012 and recast in May 2013. The DPP was revised to incorporate the additional funds provided by EKN and to extend the period to end-December 2020. The DAE RDPP was approved by the Pre-ECNEC Committee (PEC) meeting in the Planning Commission on 16th October 2018.

28.4 Project Meetings

There was no single committee which provided joint coordination of all project activities. However, steering committees and project management committees (PMCs) were established in BWDB and DAE.

28.4.1. Inter-Ministerial Steering Committee (BWDB Component)

As per the provisions of the Development Project Proposal (DPP), the MoWR constituted an Inter-Ministerial Steering Committee on the Blue Gold Program (BWDB Component) with the following officials:

Chair - Secretary MoWR

Member Secretary - Project Coordinating Director Blue Gold Program

Members include representatives from MoWR, MoA, MFLS, ECNEC Planning Commission, ERD, IMED, BWDB, DAE, with EKN and TA as observers.

28.4.2. Inter-Ministerial Project Steering Committee (DAE Component)

The DPP sets out the membership of the PSC as follows:

Chair - Secretary MoA

Member Secretary - Project Director Blue Gold Program

Members include DG DAE, Joint Chief and Deputy Chief Planning MoA, and representatives from Ministry of Finance, MoWR, IMED, ERD, Planning Commission (Crop Wing), and Additional Director Planning and Evaluation Wing DAE.

28.4.3. Project Management Committees

BWDB Project Management Committee

As per the provisions of the Development Project Proposal (DPP), a Project Management Committee as the central decision-making body for the implementation of the Blue Gold Program (BWDB Component). The following officials were appointed:

Chair - Project Coordinating Director Blue Gold Program

Member Secretary – TA Team Leader Blue Gold Program

Members include representatives from MoWR, Planning Commission (Irrigation Wing), IMED, DAE, DoF, DLS, DoC, and Executive Engineer DP-3.

DAE Project Management Committee Technology Transfer for Agricultural Production (TTAP)

The DAE DPP sets out the membership of the PMC as follows:

Chair – Director General DAE

Member Secretary - Project Director Blue Gold Program

Members include Director Field Services DAE, MoA, and representatives from IMED, Planning Commission (Crop Wing), Additional Director Planning and Evaluation Wing DAE, Additional Director Barisal Region DAE, Additional Director Jessore Region DAE, Assistant Director Finance DAE, and M&E Officer Blue Gold Program.

28.4.4. Coordination Meetings

From 2016 onwards - although not officially mandated - informal project coordination meetings were held regularly between project-level representatives of the main implementing agencies: EKN, BWDB, DAE and TA team. These provided an excellent forum for discussing progress, identifying constraints to implementation, and suggested mitigating actions.

Memoranda of Understanding (MoUs)

Memoranda of Understanding (MoUs) were signed between BWDB and the Department of Livestock Services on 30th April 2014, and between BWDB and the Department of Fisheries on 25th November 2014. These MoUs set out the scope for collaboration and mandated the appointment of a focal point in each organisation to coordinate activities with Blue Gold.

28.5 Review Missions

Five review missions took place over the eight-year lifetime of the project. The broad objective of each of the missions was to secure and where possible further enhance the relevance, efficiency, effectiveness and sustainability of the project. The third mission was designated as a mid-term review mission and resulted in a significant revision to the TA budget.

| | |
|----------|---------------------------------|
| ARM 2014 | 23 August to 4 September 2014 |
| ARM 2015 | 27 September to 12 October 2015 |
| MTR 2016 | 18 to 29 September 2016 |
| ARM 2017 | 24 November to 4 December 2017 |
| ARM 2018 | 9 to 19 November 2018 |

ARM: Annual Review Mission

MTR: Mid-Term Review Mission

Given that the project was due to end in December 2020, and that the main focus in 2019 would be on arrangements for the completion of water management infrastructure, a single-focus review was planned after the results of the 2018/19 construction season were available. After internal discussions with BWDB, EKN agreed with BWDB that planning for the 2019/20 and 2020/21 seasons would be better served by engaging BWDB and TA teams in setting ambitious targets aiming to complete as much infrastructure as possible by the revised end of construction at end-June 2021.

Copies of the Aide Memoires of the five missions are available in the File Library, along with three collections of position papers prepared by the TA team for MTR 2016, ARM 2017 and ARM 2018.

28.6 Annual Work Plans

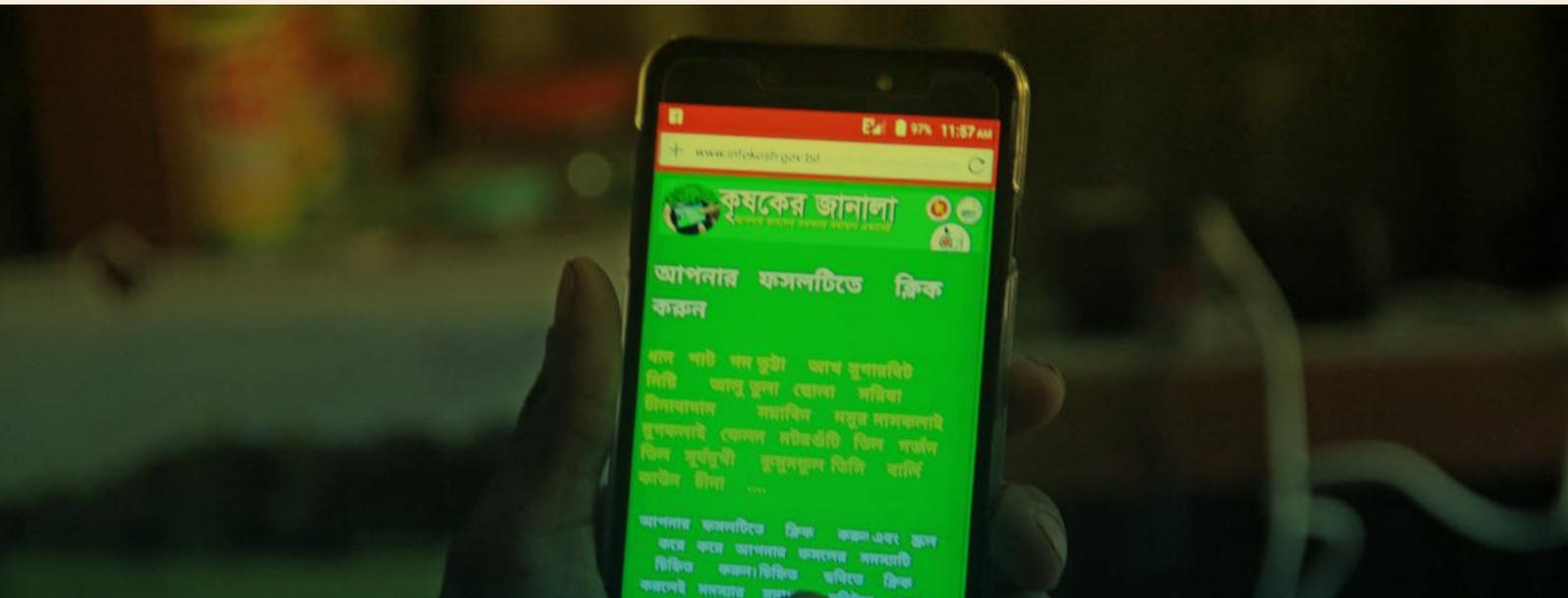
Annual Work Plans (AWPs) set out the activities planned for the year ahead and the associated budget requirements. The first two AWP's covered the calendar years 2014 and 2015. So that the documents could be aligned with the Government of Bangladesh planning cycle, AWP's were reformulated to cover the Financial Year (July to June) from July 2015. AWP's were prepared and submitted to EKN: 2014 (24 June 2014); 2015 (24 December 2014); 2015/16 (14 July 2015); 2016/17 (30 September 2016); 2017/18 (15 June 2017); 2018/19 (1 August 2018); 2019/20 (10 July 2019) and 2020/21 (18 September 2020).

28.7 Polder Development Plans

Polder Development Plans (PDP's) present an integrated analysis and planning for a specific polder covering community mobilization, water management, agriculture, business development, environment, gender and institutions. PDP's were prepared for all 22 polders.

28.8 Progress Reports

Progress reports were prepared by all three implementing organisations. For the TA team, the first progress report covered the six-month period from April to September 2013. Thereafter, from October 2013 to June 2015, quarterly progress reports were prepared by the TA team. At the request of EKN, half yearly progress reports covering the GoB financial year (July to June) commenced from July 2015 and continued throughout the remaining life of the project.



29 Technical Assistance: Context, Scope, Contractual Arrangements and External Service Contracts

29.1 Context and Scope

This section of the report sets out to provide the context within which the EKN-funded technical assistance (TA) team operated, and the reasons for its wide remit.

The TA team included international and national experts who were charged with supporting all aspects of the program and guiding and facilitating development within the polders. The Program Document (EKN 2012) recognised the crucial role that community facilitators, and Farmer Field School (FFS) trainers would contribute to the achievement of objectives, and the importance of providing training and guidance to the field level staff. The next chapter (Chapter 30) sets out how the TA team evolved away from a component-based organisational structure to give greater autonomy to polder-level staff who were responsible for community mobilisation and the coordination of project activities with WMGs.

The design of the Blue Gold Program broadened the thematic coverage of the most recent EKN-funded investment in the coastal zone, through the Integrated Planning for Sustainable Water Management IPSWAM (2003 to 2011) by introducing livelihoods training for water management groups (WMGs) through the Department of Agricultural Extension (DAE), Department of Fisheries (DoF) and Department of Livestock Services (DLS), and focusing attention on choice of cropping patterns best suited to the local environment (the soils and water) which maximise profitability for the farmer.

Starting from 2015, DAE-led Community-led Agricultural Water Management (CAWM) schemes brought a package of measures including cropping patterns suited to local conditions, investments in small-scale water infrastructure to allow farmers greater control over water levels so, for example, water could be drained before harvest, and a focus on farming as a business, including record keeping and collective actions in input purchase and bulk sale of produce. CAWM farmers then introduced the lessons they had learnt from this integrated approach to cropping, water management and the business of farming

by hosting visits from surrounding WMGs. And in due course, an initiative to expand investments in small-scale water management infrastructure (SSWMI) has broadened the awareness and practice of water control within polders.

Whilst the role of local government institutions (LGIs) was recognised in EKN's Program Document, the strengthened role of Union Parishads (UPs), in particular, has evolved over the latter years of Blue Gold. Union Parishads have provided the initial point of contact with proxy representatives of communities before the establishment of WMGs, as well as assistance to WMGs in realising their collective objectives for economic development, and resolving community disputes, especially over shared water resources.

Over the course of Blue Gold, investments through the innovation fund (refer Section H) have resulted in a range of positive and practical outcomes for farming communities.

29.2 Contractual Arrangements

An advertisement inviting proposals for Technical Assistance (TA) services to the Blue Gold Program was published on 31st August 2012. Technical and financial proposals were submitted to the Netherlands' Ministry of Foreign Affairs (MoFA) on 15th October 2012, six weeks from the date of advertisement. After evaluations of the submitted proposals, contract negotiations commenced with Euroconsult Mott MacDonald BV on 17th February 2013, and a contract agreement was signed between EKN/MoFA and Euroconsult Mott MacDonald BV on 20th February 2013. The TA team was considered to have mobilised with the arrival of the Team Leader in Dhaka on 15th March 2013.

Four addenda to the contract between EKN/MoFA and Euroconsult Mott MacDonald BV were issued, as follows:

| | |
|--------------------|--|
| 18 Nov 2013 | Addendum 1: changes to invoicing period (6m) and amount of advance. |
| 10 Dec 2014 | Addendum 2: changes to invoicing period (3m), amount of advance and schedule for reporting |
| 20 Jun 2017 | Addendum 3: changes to contract ceiling and inclusion of inflation adjustment after Year 3 |
| 24 Nov 2017 | Addendum 4: project completion extended from 15th March 2019 to 31st December 2020, contract ceiling changed, and delivery date for final narrative and financial report fixed at 30th June 2021. |
| 5 Aug 2020 | Addendum 5: project completion extended from 31st December 2020 to 31st December 2021, contract ceiling changed, and set delivery dates for 2020/21 Annual Plan and narrative, financial, audit and final financial and final narrative reports. |

29.3 TA Service Contracts

Arrangements for service contracts were made through sub-consultancy agreements. This section provides an overview of the types of work that was undertaken. It does not include the 50+ agreements for the Innovation Fund projects which are covered in Section H of this report.

29.3.1. Environmental Impact Assessments

Because of the proximity of the environmentally sensitive area of the Sundarbans, environmental clearance certificates from the Department of environment (DoE) are required before the commencement of any construction work. The process of obtaining this clearance involves the preparation and submission of environmental impact assessments (EIAs) for each polder.

| | Firm | Title | Contract Date |
|---|-------|--|---------------|
| 1 | CEGIS | Environmental Studies | 5-Mar-14 |
| 2 | CEGIS | Environmental Studies | 4-Dec-14 |
| 3 | SCL | Environmental Impact Assessments Phase 1 | 16-Apr-19 |
| 4 | SCL | Environmental Impact Assessments Phase 2 | 9-Jan-20 |

29.3.2. Digital Elevation Models (DEMs)

DEMs provide the base polder maps showing land levels, khals, roads, villages, embankments and regulator locations and drainage catchments

| | Firm | Title | Contract Date |
|---|-------|--|---------------|
| 1 | IWM | Preparation of DEM for Polders 2, 26 and 31-part | 29-Apr-15 |
| 2 | CEGIS | Development of Digital Elevation Model 55/2A,55/2C | 16-Sep-15 |
| 3 | CEGIS | Development of Digital Elevation Model 7 Polders | 21-Mar-16 |
| 4 | CEGIS | Development of Digital Elevation Model 2 Polders | 1-Aug-16 |
| 5 | CEGIS | Development of Digital Elevation Model 8 Polders | 2-Oct-16 |
| 6 | CEGIS | Development of Digital Elevation Model 34/2 | 22-Jan-18 |

29.3.3. Arrangements for Communications, Extension and Horizontal Learning

A key responsibility of the TA team has been to provide open communications with all stakeholders, for monitoring and evaluation, and reporting. Formal reporting arrangements are covered in *Chapter 28*. The most important communications, however, were directed at the coastal communities who were to be the driving force of development - and the mechanisms we used for communicating with them are covered in *Chapters 32 and 33*. In the latter years of the project - from 2019 onwards – the lessons learnt by Blue Gold were presented to a wider and more sophisticated audience using a combination of videos, high quality brochures and case studies, and a wiki report.

| | Firm | Title | Contract Date |
|----|-------------------------|--|----------------------|
| 1 | Mass Line Media Centre | Piloting dissemination through Lokbetar | 1-Jul-14 |
| 2 | Aditi | Popular Theatre for Mela (fair) | 18-Dec-14 |
| 3 | Ashek - E - Elahi | Supervisor of Mela (fair) | 18-Dec-14 |
| 4 | Tareq Mahamud | Consultancy Support for BARTA Newsletter | 5-May-15 |
| 5 | Prekha Greehoo | 2D Animation to promote WMO/LGIS collaboration | 3-Mar-16 |
| 6 | Tareq Mahamud | Consultancy Support for BARTA Newsletter | 5-Jun-16 |
| 7 | Agro-Insight | Evaluation of Extension Methods for Blue Gold | 29-Jan-18 |
| 8 | AVCOM | CAWM video documentary | 24-May-18 |
| 9 | R & B creatives studio | Blue Gold LOGO creation in Motion Graphics | 27-Sep-18 |
| 10 | Big Blue Communications | Design of Communication Materials | 22-May-19 |
| 11 | Big Blue Communications | Design and Management of wiki LLR Database | 14-Feb-20 |
| 12 | Aowlad Hossain | Call for Action translation | 9-Mar-21 |

29.3.4. Capacity Building

In the first years of the Blue Gold Program, a number of WMG capacity building programs were outsourced to external training organisations, for example for Gender and Leadership Development (GLD), Accounts Keeping and Audit System (AKAS), and Organisational Management (OM). Over time, the limitations of this form of training were recognised (refer for more details to Chapter 31), capacity building was refocused to learning-by-doing to encourage WMGs to take control of their own activities. During 2017/18, therefore, courses run by training organisations were closed, and a refocused approach to WMG capacity building using polder teams was adopted.

| | Firm | Title | Contract Date |
|---|---------------------|---|----------------------|
| 1 | Khairuzzaman Khokon | Organizing management (OM) Phase-1 | 10-Sep-14 |
| 2 | Shushilan | Community DRR Volunteer | 18-Dec-14 |
| 3 | Gopi Nath Saha | Management of Agricultural Machineries (MAM) | 12-Jan-15 |
| 4 | MATRIX | Savings and credit | 16-Apr-15 |
| 5 | SUS | Organizing management (OM) Phase-2 | 11-Nov-15 |
| 6 | KNKS | Gender and Leadership Development | 6-Mar-16 |
| 7 | AIRN | Agricultural Input Retailer Training Services | 29-Aug-17 |

29.3.5. Monitoring, Reflection and Learning

Data collection for baseline, endline and WMG surveys has been sub-contracted to specialist organisations to ensure there is no conflict of interest. In developing databases and MIS systems, specialist assistance has been obtained. A report on agricultural changes from 2013 to 2021 by reconfiguring DAE Block-level data to represent polder-level figures is being carried out by an independent consultant. An analysis of satellite mapping was carried out by specialist firms in 2018 and 2021. An evaluation of CAWM demonstrations was terminated when the contracted organisation was unresponsive for an extended period.

| | Firm | Title | Contract Date |
|----|---------------------|--|----------------------|
| 1 | Abdullah Al Shakib | Socio Economic Baseline Survey Phase I | 12-Apr-16 |
| 2 | BRAC RED | Impact Evaluation of CAWM | 16-Nov-16 |
| 3 | Mpower | WMG Tracker: Database and MIS development | 2-Mar-17 |
| 4 | Mpower | MIS Development: Service Level Agreement | 19-Mar-17 |
| 5 | LSTSCL Consortium | Socio Economic Baseline Survey Phase II | 11-Apr-17 |
| 6 | Socioconsult Ltd. | 2018 WMG data collection | 16-Aug-18 |
| 7 | Satelligence | Earth Observation Mapping | 6-Feb-18 |
| 8 | Socioconsult Ltd. | 2019 WMG data collection | 13-Jun-19 |
| 9 | Mpower | WMG/WMA Self-Monitoring | 9-Jan-20 |
| 10 | LSTSCL Consortium | 2020 Endline Impact Assessment data collection | 25-Feb-20 |
| 11 | LSTSCL Consortium | 2021 WMG Survey data collection | 12-May-21 |
| 12 | Md Ashraful Islam | Updating TR22 on agricultural changes | 17-May-21 |
| 13 | Terrasphere Imaging | Satellite Mapping | 19-Apr-21 |

29.3.6. Miscellaneous

A mix of international and national individual consultants were contracted as members of the review missions, reporting directly to EKN. A number of high-level specialists were recruited to prepare a of papers on participatory water management (PWM) for presentation at a national conference.



30 Evolution of TA organisational arrangements

After providing the scope of the technical assistance (TA) team as conceived in the Program Document and describing early arrangements for the TA organisation, this chapter sets out the reasons behind the organisational changes to the Technical Assistance (TA) team over the eight year life of the Blue Gold Program. In the final section, it explains how the practical exposure to developing and building water management organisations helped to identify the key elements for sustainable participatory water management.

30.1 Scope of technical assistance in the programme document

"The set objectives are indeed very challenging and require a capable and effective TA consultant, but also more consultants than under the previous EKN funded programs. The number of international experts is relatively high but is proposed as to ensure the highest quality of outputs and the outcomes for the longer-term perspective."

The Program Document (quoted above) established a sizeable Technical Assistance (TA) team under a direct contract with the Embassy of the Kingdom of The Netherlands (EKN), and considerably larger than other recent and current EKN-funded programs such as the Integrated Planning for Sustainable Water Management (IPSWAM) and the ongoing Char Development and Settlement Project (CDSP).

The allocation for Technical Assistance amounted to 66% of EKN's contribution to the program¹ and 57%² of the overall projected expenditure. Roughly half of this was allocated to staff costs and the other half to equipment, training, operations, contracted services and an Innovation Fund. In addition to the Blue Gold

1 The 66% (i.e. € 33.1 million out of a total GoN contribution of € 49.8 million) is based on figures from the Administrative Arrangement signed on 20th February 2013. Over the course of the 7+ year life of the programme, revisions to the TA contract, reduced the percentage allocated to the TA team to 52% (i.e. € 32.4 million out of a total GoN contribution of € 61.2 million).

2 The total original budget allocation was € 57.7 million (GoN €49.8 million and GoB € 7.9 million). Under the BWDB DPP (recast March 2013), GoB allocated a total equivalent budget of € 7.499 million (€ 1.349 million for the revenue component and € 6.150 million for the capital component) was allocated, and under the DAE DPP, GoB allocated a total equivalent budget of € 0. 356 million).

TA team, EKN also contracted BRAC and Max Foundation for a separate WASH program and engaged Solidaridad to implement an agricultural value chain program, all in the south-western coastal region but not necessarily in the polders eventually selected by Blue Gold. Good contact was established and maintained between the various projects, but actual cooperation was limited because of the different focus of the projects and because the different teams were not always working in the same polders.

The Blue Gold Program had a large TA team responsible for a substantial share of the project activities including community mobilisation (with resources for the Department of Cooperatives - DoC), engineering supervision, agricultural development and homestead production (with resources for DLS and DoF), marketing and business development, as well as managing an innovation fund, training and capacity building, together with contracting services and program management. In addition, the TA team advised EKN on requests by BWDB for infrastructure funds. In part because of the changing operational modalities over time, and a sharpened focus on water management and agriculture, some of the original services included in the Program Document were dropped in later stages of the project. For example, in 2017 EKN decided to discontinue the vocational training program which evolved from the concept of the Program Document - as a platform for the Underprivileged Children's Education Programs (UCEP) - to using entrepreneur-technocrats or ustads to train mobile mechanics, an adaptation of the approach used in a parallel EKN-funded project, Profitable Opportunities for Food Security (PROOFS) managed by ICCO Cooperation (refer to Section G Chapter 31, sub-section Vocational Training).

30.2 Early Arrangements for the TA Organisation

The Inception Report of the TA team (approved in March 2014) summarised the work plan and budget for the TA team, as well as the team organisation, tasks to be implemented and their overall timeline, and forms the basis of the 2014 and 2015 Annual Work Plans (based on calendar years at the time) and then the 2015/16 Annual Work Plan (when the planning period was changed to suit the July to June cycle used by GoB) and their corresponding budgets.

From late 2015, concerns were noted about the slow rate of implementation of Blue Gold infrastructure and the higher investment costs. As a result, the 2016 Annual Review Mission proposed to enhance funding to BWDB and to extend the timeframe of the Blue Gold Program by two years from end-December 2018 to end-December 2020. In addition to the major infrastructure activities addressed by the proposed changes, a number of other critical activities were to be included in the revised scope: (a) in-polder water management by WMGs and WMAs³; (b) strengthened coordination between WMGs and Union Parishads as a priority, and also with Upazila and District levels; and (c) integrating capacity building activities for WMGs⁴. During late-2015 and early-2016, it became clear that further revisions to the scope of TA support were required, and the following exercises were completed:

- Recommendations for engaging Local Government Institutions (LGIs) in water management, which inter alia reemphasized the involvement of LGIs from the beginning of activities in any polders, in order to forge a 'water management partnership' between WMOs and Union Parishads^[1].
- Prompted by the 2015 Annual Review Mission (ARM), an Exit Strategy was prepared to:
 - set out an explicit, time-bound and staggered action plan for each polder
 - formulate a unified approach (single work process) to integrate the BGP components and thus provide greater coherence between agricultural activities, business development and internal polder water management activities

3 Described in the Programme Document page 39.

4 The Programme Document describes three components, but at inception the TA-team organisation was further split-up into five components with little or no arrangements for their coordination

- focus on the promotion of collective actions by WMGs
 - bring renewed attention to the national enabling environment for participatory water management; and
 - to reorganise the TA team^[2] accordingly
- In a parallel exercise which engaged all project partners, the Theory of Change (ToC) was examined and re-framed to reinforce cross-linkages between water management, agricultural technology and marketing support for greater productivity and profitability, and thereby to improve the livelihoods of polder communities. The lessons learnt from this process were then used in decentralising the TA team and integrating its field activities.^[3]

The changes arising from these exercises were first formalised in the 2016/17 Annual Work Plan and associated budget.

30.3 Evolution of TA organisation

This section describes the TA team organisational set-up in 2013 and its development with a view to drawing lessons for the design of future programs.

30.3.1. Timeline

Formal project documents, as listed in Section A Chapter 4, set out the definition and scope of the Blue Gold Program. Underpinning this formal definition is the more philosophical notion of what and how the program sets out to achieve, termed the ‘project concept’. This concept is captured by the tagline ‘Water Management for Development’ and has, while retaining the spirit of the tagline, developed over time. Table 30.1 shows the timeline for this process.

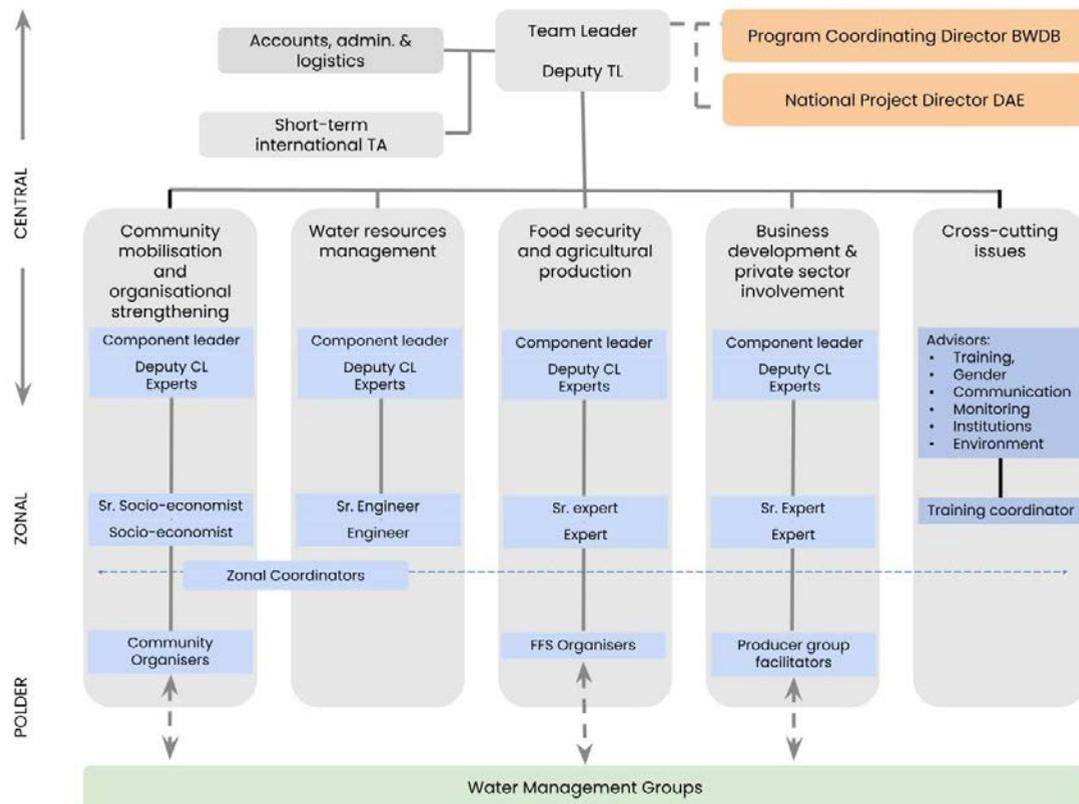
Table 30.1: Phases in the Development of Blue Gold Concept

| Phase | Main thrust | Documents |
|--------------------------------------|--|---|
| 2011 to 2012 Formulation | WMG to be developed as cooperatives acting as main driver for economic development | Program Document |
| 2013 to 2015 ‘IPSWAM plus’ | Start of the implementation period, in which infrastructural works and the formal establishment of WMGs (and their re-establishment under PWMR 2014) were undertaken along the lines of the precursor IPSWAM project; in parallel to implementation of novel project components for agricultural development and business development. | <ul style="list-style-type: none"> • Inception Report • PWMR 2014 |

| Phase | Main thrust | Documents |
|---------------------------------------|---|---|
| 2015 to 2017 Transformation | <p>A reconsideration of the approach, enhancing the synergy between water management organisation, agricultural development and business development:</p> <ul style="list-style-type: none"> • From developing organisations to developing institutional networks • From parallel components to an integrated approach • From central control to decentral initiative • From multi-purpose cooperatives to functional WMOs supporting multiple initiatives for economic development | <ul style="list-style-type: none"> • LGI Sourcebook • Theory of Change 2016 • Exit Strategy • Unified Approach (Bangla/ English) • ARM Aide Memoires 2015, 2016, 2017 |
| 2017 to 2019 Maturity | <p>Rapid emergence and consolidation of new approaches for in-polder water management, for agricultural development, for extension and dissemination, for targeting, for capacity building, and for the increased prominence given to gender issues.</p> | <ul style="list-style-type: none"> • Internal strategy documents on Catchment planning • TR20 and TR24 on Community Agricultural Water Management • Internal concept notes on horizontal learning, extension methodologies and targeting; • BGP's 'Lessons Learnt' repository |
| 2019 to 2020 Handing-over | <p>Establishment and activation of WMAs and support to their functionality. WMAs in the driver seat for activities aimed at individual WMOs. Lessons learnt formulated with the aim to inspire improvement of national water governance environment and to support formulation of future programs and projects.</p> | <ul style="list-style-type: none"> • Catchment Plans • WMA work plans • O&M agreements • National PWM Conference |

30.3.2. Original TA Organisational Structure

The TA team was led by an international team leader and a national deputy team leader supported by professional, administrative and support staff. In line with the original concept (in the Program Document, Section 28.3), the organisation for the project implementation (Figure 30.1) was initially concentrated into four parallel components for community mobilisation and institutional strengthening; water resources management; food security and agricultural production; business development with the fifth relating to cross-cutting issues.

Figure 30.1: Original organisation chart of the BGP TA team (only solid black lines imply hierarchical relations)

Each of the components, barring the cross-cutting issues, was led by a component leader, assisted by a deputy component leader both of whom were Dhaka-based. In each of the two (later three) zonal offices national technical experts were based who reported directly to their respective component leaders. For three of the components (community development, agriculture and business), field workers were posted to live and work in Blue Gold polders. These were known as the Community Organisers (COs), Farmer Field School Organisers (FOs) and Producer Group Facilitators (PFs), respectively. These polder staff provided vital and direct connections with the polder communities – recognised by the large allocation over Blue Gold’s lifetime of some 22% of overall TA staff time, equivalent to around 100 staff during the main implementation period (2014-2019). Initially, some 50% of the polder staff were female, a percentage which reduced to around 35% with natural turnover and the greater proportion of males amongst applicants for the replacement positions. In due course, the senior zonal socio-economists in Khulna and Patuakhali Zonal Offices were assigned as Zonal Coordinators, with additional responsibilities for logistic coordination and administrative processes.

This structure emphasised vertical reporting while mechanisms for horizontal coordination were minimum. Unintentionally, the set-up in components resulted in ‘organisational silos’ that were poorly connected. The effects of these ‘organisational silos’ were:

- Community Organisers (COs) were confronted by WMG members about problems observed in infrastructure works, and especially the contractual arrangements with LCSs. Because the COs were neither involved in works planning, nor aware of the payments made to the LCSs, they were unable to help. The engineering team in the water resources management component (and the BWDB engineers) - who were responsible for planning of infrastructure contracts and works completion - preferred to leave community interactions to the COs, but without sharing information with them.

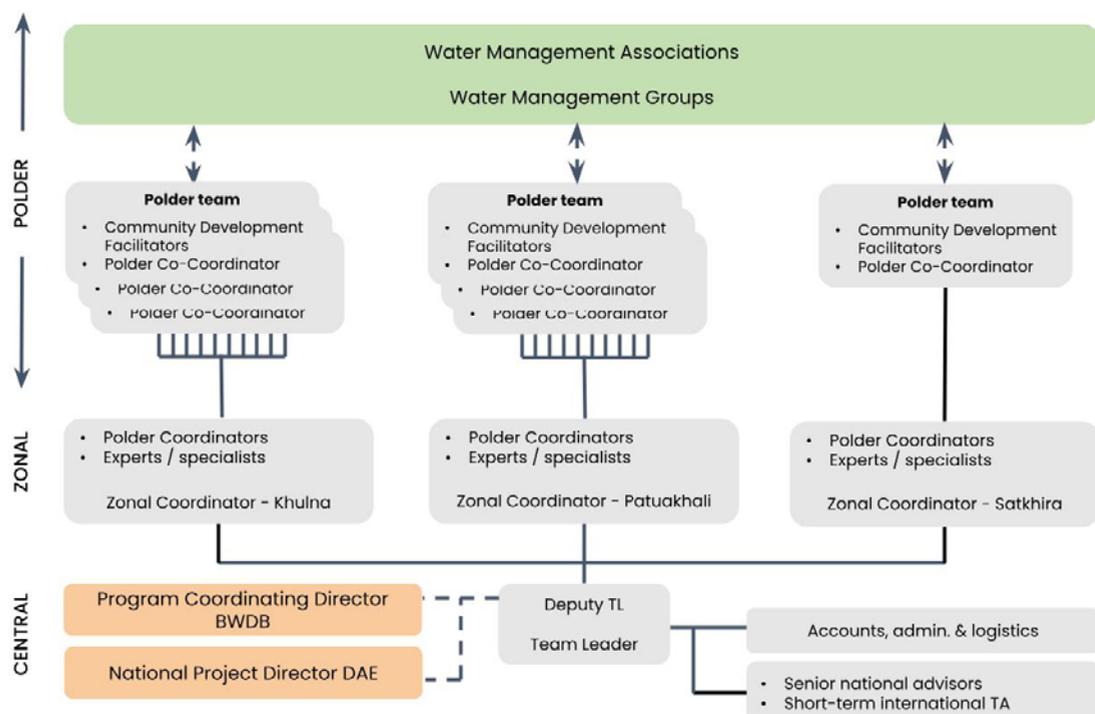
- The formation and registration of WMGs was initiated by COs and zonal-level Socio-Economists. But the capacity building arrangements through field crop FFSs, homestead FFSs and market-oriented FFSs were - at least initially - not coordinated with WMGs or, for that matter, with the COs because this training was organised by the two components concerned with food security and business development.
- Water management - as the founding principle for Blue Gold - presupposes cooperation between agriculturalists, engineers and communities. Given the rigid structure of BGP, in-polder water management activities (ie other than the development of the main infrastructure) were initially neglected. To some extent, the lack of clarity of the respective roles of BWDB and DAE in in-polder water management, was reinforced by the TA organisation, where water management was not owned by any one TA component whilst straddling all.

The lacking horizontal coordination mechanism was also reflected in the Polder Development Plans, where activities for specific components failed to address the real need - which was to develop cropping systems suitable for local environments around the opportunities offered by the major water management infrastructure. In-polder water management was a blind spot, and the reason it was overlooked can be explained - in part at least - by the way Blue Gold was originally organised and managed.

30.3.3. Revised TA Organisational Structure (2016)

One of the recommendations of the 2015 Annual Review Mission was to update the Theory of Change (ToC) - a process which brought participatory water management to its intended central position within the project, and which is explored in more detail later in this section. The process involved workshops and key informant interviews in Dhaka, Khulna and Patuakhali during February and March 2016, and led to the ToC's publication in May 2016. From early-2016 onwards, the TA organisation was re-shaped to address the priorities established from the ToC which resulted inter alia in the integration of different disciplines into teams, the empowerment of staff based in the polders, and the devolution of management responsibilities closer to the point of service delivery (see Figure 30.2).

Figure 30.2: Revised organisation chart of the BGP TA team (only solid black lines imply hierarchical relations)



A unified approach to management was set-up across three levels from the TA team office in Dhaka and via zonal offices to the polders. In practice, this meant that cross-disciplinary teams were formed at all three levels, integrated and given wider-reaching mandates for equitable water management and strengthened value chains - and this is expanded upon below in the section concerning participatory water management.

At polder level, the three previous categories of polder level staff each with a specific technical role (community organisation, farmer field schools or business development), were given the responsibility of coordinating all community interactions and delivering all activities on behalf of Blue Gold, and were renamed Community Development Facilitators (CDFs). In each polder, a senior CDF was made 'Polder co-Coordinator', with the position of Polder Coordinator entrusted to the erstwhile subject matter specialists at Zonal level. The Zonal Coordinators – in each of Khulna, Patuakhali and Satkhira, respectively – were mandated to lead BGP's TA teams in the zones and at polder level.

The single most important outcome from the revised ToC was the recognition of the crucial role that CDFs fulfil in empowering polder communities to take and act on decisions which prioritise the requirements of the wider community. This important distinction from the previous organisational arrangement is represented in Figure 30.2 by placing the WMGs and WMAs at the head of the organisational chart - placing their needs as primary stakeholders at the top of the hierarchy, and identifying the CDFs as the main point of contact between the WMGs/WMAs and the Blue Gold team. For the CDFs, this required a radical change from their primary role of routine administration of meetings, elections and audits; facilitating training modules (FFSs), and conveying project-level information to WMGs. Many of the CDFs were challenged by the changed expectation. Although many of them are university or college graduates, they had been used as functionaries in organisational development and training, managed by technical experts in Dhaka. It took time and effort to reorient the CDFs and their managers to their new role in empowering communities.

A fundamental re-structuring of an established organisation is difficult, in part because long-established concepts and roles and responsibilities are challenged, and - with that - the impact on personal authority of individuals resulting from changes in line-management relationships. A number of measures helped to initiate the integration and decentralisation processes:

- To translate the ToC into practice, new organisational arrangements with associated revised Terms of Reference – including decentralisation, and the development of multi-disciplinary polder teams - were implemented, and a number of staff were made redundant or reassigned.
- A PWM Field Manual (in Bangla and English) was published in February 2017 to provide practical guidelines for participatory water management at polder level and to thus 'create a larger critical mass, to make field activities more efficient and create a stronger interface with local government and others working in the polders'. The manual provided guidelines for field staff on the work processes: preparations, activation at entry, planning for action, WMG activation, and learning and networking. The distribution of the manual was followed by training and coaching of polder and zonal staff.
- A continuing process - reinforced at project-level meetings - by which the entire project team from top to bottom recognised the complementarity of expertise within the polder teams, and the combined strength provided by CDFs from different educational background, skills and experiences - in agriculture, community mobilisation, training, water management and market orientation. The aim was that CDFs would be equally regarded - irrespective of their technical background - and deployed in cross-disciplinary teams used in the capacity building of WMGs. Initially, zonal staff were appointed as 'Polder Coordinators' - to manage the polder teams and to encourage the CDFs to form cross-disciplinary sub-teams for each different activity, and to ensure that project-level messages were communicated quickly and accurately to polder level. Over time, with the growing understanding by CDFs of their roles, and with improved communications between project and polder level teams, selected CDFs were appointed as co-Coordinators to manage polder-level activities.

- The role of CDFs was to empower WMGs to take over the full range of activities involved in participatory water management, using complementary technical and financial resources available within the wider community and at union and upazila level. A long and iterative process was required to build sufficiently confident and assertive WMGs - using the WMG's knowledge of the local economy, constraints to successful water management within the catchment of their sluice/regulator, and their suggestions for activities to stimulate economic development through agriculture. When this local knowledge is assembled, the WMG can collectively decide on appropriate interventions, their relative priority, and seek technical and financial assistance is available from local public and private partners (UPs, UZPs, BWDB, DAE, input suppliers, fariachs etc).
- Awarding and recognising exemplary performance by specific CDFs and, at a later stage, exemplary team-work by specific polder teams.
- Establishing zonal-level monthly coordination meetings with all zonal and polder staff to facilitate informed decision-making with senior staff attending from the central team.
- Establishing project-level management team meetings with senior central and zonal-level staff to provide coordination and to ensure that both positive and negative lessons learnt were carried across the project area.

The ensuing organisation was more agile and supportive of initiatives prioritised by the WMGs. The reorganisation enabled the TA team to focus as an integrated team on in-polder water management. Different polder teams made use of (local) opportunities to enhance the project impacts, eg initiatives for summer tomato, boro cultivation, and the expansion of improved poultry sheds and hajols.

30.3.4. Lessons Learnt

Despite distinct progress and important successes, achieving a genuine decentralised mode of operation within the TA polder teams required careful monitoring and adjustment to management practices. Promoting and sustaining decentralisation for the implementation period of a typical project should take into account the following factors which were revealed and addressed in Blue Gold:

- While the reorganisation aimed to establish decentralised and integrated teams, the established hierarchical relations continued to exert influence over 'their staff' - in some cases, by after-hours coaching and mentoring - which continued for some time, slowing down the actual implementation of a true multi-disciplinary approach.
- The lack of soft or managerial multi-disciplinary skills within the team since most staff had been originally recruited as technical specialists – agriculturalists, engineers, social scientists, etc - and were reluctant to take on a role of managing staff from different disciplines in a cross-disciplinary activity that was on the edge of their experience.
- A genuine reluctance by staff from one discipline to be managed by a line manager from another discipline, and a concern that the management skills in their new role (eg as 'polder coordinator') would not be recognised by a future employer.
- There were relatively few team members who appreciated, for example, the contrast between traditional top-down lecture-style training and facilitation and participatory and experiential training – and how a modern approach aims to incentivise self-evolution ie 'taking control'.
- Annual performance assessments of CDFs were successfully introduced to encourage the CDFs to recognise the importance of complementarity, learning from peers (and WMG members), as well as a willingness to work outside their 'comfort zone'. The performance assessments were also used to allocate increments in recognition of those who had adopted the new approaches and who had taken on coordinating responsibilities. In addition, excellence in team-work was recognised with occasional awards.
- Regular meetings were held by the central management team with zonal and polder staff to reinforce the principles of decentralisation, integration, and coaching for WMG-led initiatives, and to assess the degree of adoption of the decentralised and integrated approach.

- In early stages of the decentralisation of responsibilities, zonal teams aimed at meeting the requirements of the central team but with a high degree of independence, exerting control over the upward flow of information (especially where negative), and being reluctant to host visits by experts from the central team - who had earlier led the development of new tools for WMG development, including CAWM, catchment planning, CII, etc.
- A series of WMG 'health checks' by combined teams of central and zonal experts used focus group discussions with WMG representatives to assess their level of maturity and autonomy, and to use the results in fine-tuning project interventions. As a by-product, these health checks also allowed central and zonal staff to jointly reflect on the complementarity of their differing perspectives and helped to heal the rift between central experts and zonal management.
- The ultimate aim of empowering WMGs to inter alia take over the role of CDFs created uncertainty amongst the CDFs about their job security - which needed to be addressed as part of the performance assessments of the CDFs.
- Success stories were often difficult to obtain for complex reasons – eg individual CDFs were criticised by their line managers for self-promotion, or there was a reluctance for an individual to document a community experience in which many CDFs had played a role, etc. However, once it had been established that the success stories were used in planning horizontal learning exchange visits, the initial reluctance to provide these case studies was overcome.
- An unwanted result of stimulating the flow of success stories meant that there became an unexpected singular 'focus on the positive' and that case studies which investigated 'why things didn't work' were avoided by zonal and polder level staff. From this, we learnt that nuanced messages were difficult to transfer through the chain of command. Thus, a 'counter campaign' was required to explain that learning opportunities from failures of interventions were also a constructive part of the feedback process.
- In addition to their main purpose of empowering WMGs, polder teams became increasingly involved in data collection and preparatory works as well as other monitoring tasks for the project. There was a growing awareness that CDFs were not able to focus on their key activities, so a workload assessment for CDFs was carried out in June 2017 which revealed that - in addition to the project duties mentioned above - they were also fulfilling administrative responsibilities of the WMGs, such as preparing resolutions from meetings, organising elections and meetings, preparing for audits and AGMs etc. In order to return CDFs to their main purpose, the accumulated obligations of the TA team and WMGs were removed, in particular, WMGs were expected to carry out their own administration by themselves, and reporting responsibilities by the CDFs were streamlined.
- The decentralisation of the Blue Gold TA team took shape from 2016 (the fourth year of implementation). From 2017, there was a gradual transfer of staff from 'old' polders - where they had worked for the five year period of Blue Gold - into newly selected polders. In some new polders, where there had been no previous community mobilisation activity by earlier projects, CDFs working on the front-line observed that the new communities were much more willing to engage with them than those who 'knew what to expect' from previous experience with other projects and were more cynical.
- Staff reductions and transfers sometimes undermined the morale of the polder teams, and resulted in a loss of contextual information and networking knowledge from the institutional memory of the polder team. Whilst this loss of local knowledge from the TA polder team could interrupt the information flow within the TA team, it was of greater importance that this local knowledge was retained within the WMGs - and this should be the aim from the start of engagement with the WMG to the finish.
- Resistance to change in its many forms should be anticipated when a major reorganisation takes place. In any society, a change from a top-down to a bottom-up management system brings major upsets to many, especially those in a senior position with most to lose. While decentralisation aimed that WMGs take ownership of their activities at an early stage, often with only tacit support from CDFs and no involvement of senior TA staff, working with WMGs was likely to be scrutinised and possibly resisted by senior team members who were not included in the process. Recognising and rewarding these local

initiatives was part of the process of encouraging others to 'let go of control', including recognising that not all local initiatives are successful or based on a representative collective view - experience had shown that local elites can capture decision making to serve their own specific interests. But this and other similar cases can also be used as a 'learning event' for the local WMG.

Whilst the length of this list of lessons learnt may appear disheartening, our aim is that future PWM projects will build on Blue Gold's experience with polder-based multi-disciplinary teams. Independent reviewers, such as Dr Shamsul Alam of the Planning Commission has endorsed his confidence in the approach, observing that:

'The Dutch funded Blue Gold Program of Water Development Board is playing a role model for integrated water management in the coastal areas of Bangladesh. It is necessary to continue this as a role model even after the implementation period of Blue Gold Program. For this, government and private cooperation and effective participation of local people must be ensured.' Dr Shamsul Alam, General Economics Division as published in 'Bonik Barta', 3rd February 2020 (See also full article in Bangla and English)

For polder teams to provide situation-specific and tailor-made support, they need to be given a clear mandate and authority and a suitable degree of freedom in their actions. This must be done from the onset of the project, rather than as an afterthought.

30.4 Theory of Change: the emergence of a practical approach to PWM

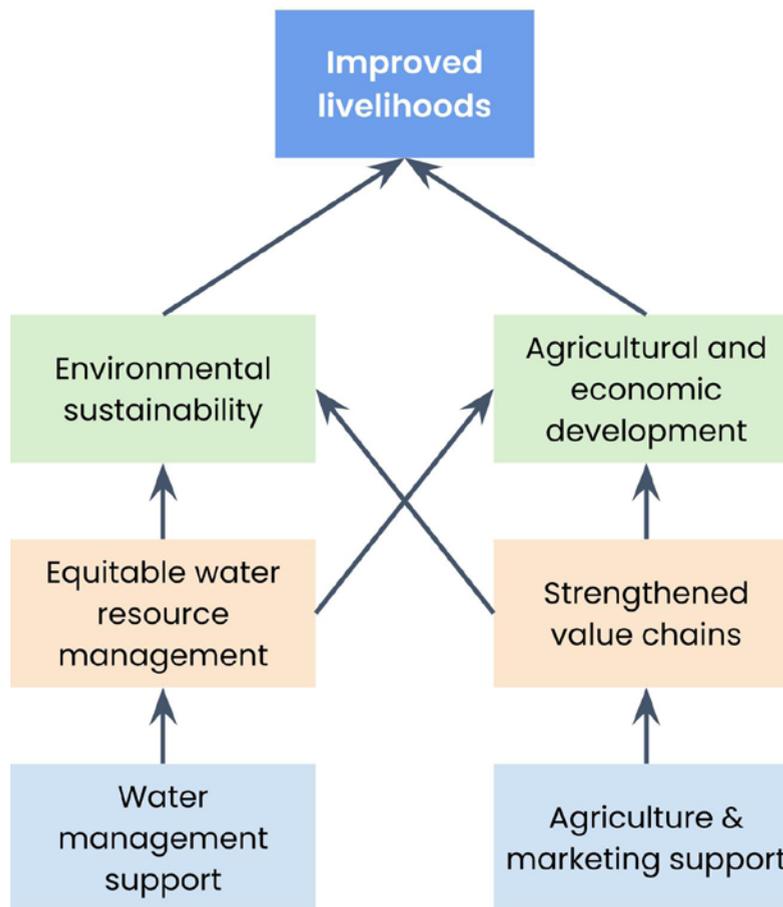
30.4.1. 2016 Theory of Change

Starting from the approaches set down in GPWM 2000 and PWMR 2014, Blue Gold developed and sharpened the concept of participatory water management (PWM) around four elements (which are further elaborated in Section D chapter 19):

1. Promoting in-polder water management as a pre-requisite for commercialising agriculture; Making water management the core function of the WMOs
2. Empowering WMOs to seek out partnerships for local economic development
3. Forming WMOs within hydrological boundaries (as opposed to community or administrative boundaries)
4. Forming WMOs within hydrological boundaries (as opposed to community or administrative boundaries)

Blue Gold's practical experience of developing PWM has also allowed an examination of the applicability of the Participatory Water Management Rules 2014 (PWMR 2014), and resulted in a clearer understanding of the inter-relations between water resources infrastructure investment, organisation and cooperation, and opportunities for commercial agriculture in achieving local economic development objectives. An important contribution to this growing understanding was gained during the development of a 'Theory of Change' (ToC) in 2016.

The 2016 Theory of Change (ToC) describes five main development pathways that comprise the BGP intervention. Within these five pathways, a total of 39 causal relationships are described, which link the actions of the Project, through a chain of effects and impacts to its intended development outcomes. Figure 30.3 provides a visual summary of the development pathways.

Figure 30.3: BGP Theory of Change – summary results chain (2016 version)

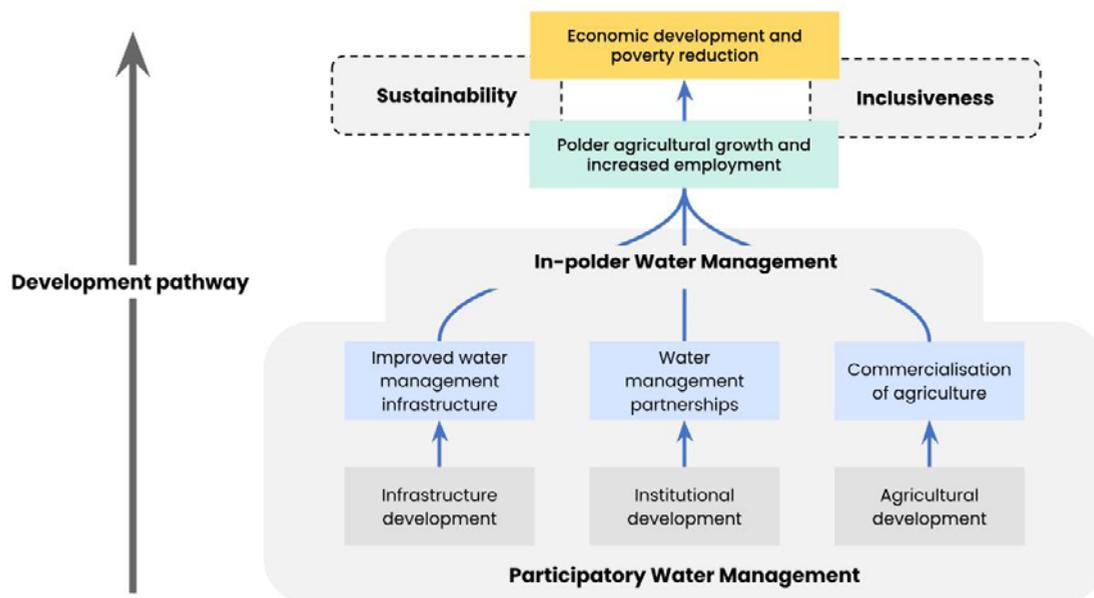
The Blue Gold activities are represented by the two boxes (water management support and agriculture and marketing support). The five main development pathways are:

- Pathway 1: From Water Management Support to Environmental Sustainability
- Pathway 2: From Water Management Support to Agricultural & Economic Development
- Pathway 3: From Agriculture & Marketing Support to Environmental Sustainability
- Pathway 4: From Agriculture & Marketing Support to Agricultural & Economic Development
- Pathway 5: From Environmental Sustainability and Agricultural & Economic Development to Improved Livelihoods

30.4.2. 2019 Theory of Change

During 2019, the Theory of Change was revised to better reflect the importance of in-polder water management as a means for achieving development outcomes. Figure 30.4 below is the distillation of Blue Gold's experience, setting out the conceptual basis for PWM in coastal polders. The figure reads from bottom to top and shows the steps to achieve the objective of agriculture-based growth in the polders – of enhanced incomes and employment – resulting in overall economic development and poverty reduction.

Figure 30.4: Participatory Water Management – The BGP Theory of Change (2019 version)



At the heart of Blue Gold are the local stakeholders, WMGs, which were empowered to be the drivers for local development through water management. The project focused on ‘in-polder water management’ – bringing benefits of water management to the polders, with increased returns from more intensive agriculture and more profitable crop choices. The expectation was that a portion of these increased returns would be contributed by stakeholders to the operation (eg salary of officials and gate keepers) and maintenance (eg painting of gates, clearance of sediment, water hyacinth etc) of the improved water management infrastructure.

As of June 2019, just under an average of BDT 7,000 - equivalent to Euro 70) was held in WMG bank accounts to fund O&M activities (WP9H WMG Tracker Final Report to June 2019). Given the anticipated scale of O&M expenditures, this is a negligible amount. Interviews with WMGs revealed that they preferred to fund specific O&M activities through a general collection from both WMG members and non-members - and this could be in cash, by crop share or in labour. For the period July 2017 to June 2019, collective actions by WMGs on O&M activities averaged BDT 14,000 per WMG, mostly made in labour and in-kind contributions for khal clearance (41%), excavation of field channels (21%), embankment repair (18%) and repair of structures (19%).

To promote in-polder water management (IPWM), interventions were made through Blue Gold to improve or rehabilitate infrastructure, to develop institutional partnerships and to promote cropping patterns suited to the local conditions and from the perspective of farming-as-a-business:

- Infrastructure development initially focussed on rehabilitation works on embankments, sluices and primary khals or drainage channels. From 2015, Blue Gold promoted the utilisation and improvement of water management infrastructure to provide better conditions for agricultural production and sometimes fisheries: khals were cleaned, illegal obstructions (both cross-bundhs and fishing nets) were removed from the khals and communities were helped to invest in new small-scale infrastructure to optimise local conditions for profitable agriculture.
- Institutional development kicked-off with the establishment of WMGs (an average of 23 WMGs per polder), followed by a single WMA at polder level^[4]. The initial focus on WMG formation and

registration was replaced by the practical development of institutional networks – between WMGs/ WMAAs and departments, local governments, other community-based organisations and the private sector. By promoting partnerships for water management, WMGs and WMAAs achieve much more than they would in isolation.

- For agriculture, the transfer of technology for field crops was led by DAE, and support was provided through the TA team working with the Department of Livestock Services (DLS) and Department of Fisheries (DoF) to diversify, increase and improve homestead production. For both field crops and homestead production, a strong market-orientation was provided. For field crops, the aim was to demonstrate how improved water management and a more desirable cropping pattern would realise higher productivity and profitability. Activities used to provide practical demonstrations included farmers' field schools (FFSs), community-led agricultural water management (CAWM) schemes, the cropping intensification initiative (CII), and a large number of horizontal learning activities for field crop and homestead production. Collective activities, such as the bulk purchase of inputs (eg seeds and fertilisers) and the joint sale of agricultural produce, demonstrated the immediate benefits of working together – lower unit rates for bulk purchases and higher prices and/or additional services for bulk sale of agricultural produce (for example, collection of watermelons from the farm).

Whilst some activities remain within one of the three activity areas of the ToC, there was increasing recognition of the importance of cross-linkages. For example, DAE used CAWM schemes to demonstrate adjustments to the year-round cropping cycle to favour the winter cultivation of high value crops. WMGs promoted crop synchronisation amongst the farmers so that planting of the T Aman (monsoon rice) crop could be carried out at the same time (with the result that drainage of the paddy fields prior to harvesting is also synchronised) and so that rabi winter crops – with higher profit margins than rice - could be planted in December.

The demonstration activities described above typically covered relatively small blocks of about 20 to 100 ha. But the aim of Blue Gold was to scale these benefits to a wider group of farmers, and eventually to all 22 polders. The first step was to encourage those farmers within the catchment drained by a regulator or sluice to agree on how the sluice should be operated so as to optimise water levels for all farmers in the catchment, and to also consider potential investments in works to improve the drainage (and irrigation) infrastructure within the catchment area. A typical sluice catchment area averages 470 ha (ranging from 185 ha to 1,300 ha) and involves up to five WMGs. There are many examples where catchment committees formed from these WMGs have used investment plans, backed collectively by the WMGs within the catchment area, to present a case for financial assistance from the Union Parishad (UP) - for example, for small-scale infrastructure such as the clearance of khals and construction of culverts. Over the years of BGP implementation, the (financial) support from UPs to WMGs for the implementation of small-scale water management infrastructure has increased significantly.

These various IPWM activities have resulted in:

- reduced waterlogging
- higher cropping intensities and reduction in fallow areas
- higher paddy production due to the selection of varieties which are better suited to local conditions (eg BR 52 which has submergence tolerance)
- an expansion of the area under high value crops such as watermelon and sunflower
- development of water management partnerships
- greater awareness of commercial opportunities, which led to higher incomes (for those who own and operate land) and better employment opportunities (for those who provide labour)
- increases in farmers' incomes, also enhancing non-farm economic development in the polders

Local economic development is most effective when it is based on collaborative decisions by community-based water management organisations, technical departments, local governments and local businesses. When communities, leaders and experts work together there is an opportunity to take account of long-term sustainability and how outcomes contribute to livelihood of different classes of people. The majority of Blue Gold beneficiaries were smallholder farmers or landless farmers – making it a poverty-targeted project at its core.

Inclusiveness and Sustainability

Apart from in-polder water management being the main driver for to achieving BGP's outcomes and impact, two transversal themes were considered essential for the success of the program: inclusiveness and sustainability, which became explicitly included as part of BGP's Theory of Change, see Figure 30.4.

From its start, the Blue Gold Program aimed to be inclusive. Inclusive development intended to achieve that potentially all inhabitants of the Blue Gold polders, including marginalized groups, had access to opportunities and benefits created by BGP. In practice this meant that women / women farmers, landless and smallholder farmers were also explicitly targeted by BGP interventions. Gender mainstreaming was the main approach to ensure that women were reached (i.e. ensuring that activities involved both men and women). This was complimented by selected specific gender activities, eg for raising gender awareness and some special training for women, eg on market linkages and women's empowerment. Poor and (nearly) landless households were reached by pro-poor interventions, including homestead FFS, and by creating income generating opportunities through Labour Contracting Societies, that acted as contractors to implement earthwork for the water management infrastructure. It should be realized that this inclusiveness approach was not only helpful to the concerned (marginal) groups, but also contributed to better achieving BGP's goal of economic development within its polders.

The need for more attention to sustainability emerged at the start of BGP. The assumption, implicitly made in the Blue Gold Program Document of 2012, that organizing community members into WMGs and WMAs would be adequate enough to ensure that the Blue Gold outcomes would be sustained after the closing of the program, was found to be overoptimistic. This meant that over time more attention was given to sustainability, focusing on sustaining maintaining and operating the water management infrastructure, thereby discussing to which extent WMGs and WMAs are an end (and hence need to be sustained) or rather a tool (hence accepting that they become inactive if there is no felt need for them anymore). Maintaining and improving increased agricultural production as well as local capacities of polder inhabitants to cope and handle risks were also seen as important sustainability elements. Because the (future) role and capacity of BWDB as a support organisation of WMGs and WMAs, including to actively maintain major polder infrastructure, was considered very limited, other avenues of enhancing sustainability were emphasized, focusing more on the strengthening of local networks, involving local governments and relevant private sector actors.

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- [2] Sustainability from The Start - Exit Strategy (draft final), Working Paper 2A. Euroconsult Mott MacDonald & Associates. February 2016. https://www.bluegoldwiki.com/index.php?title=File:WP02A_Exit_Strategy_feb_16_v2.pdf
- [3] Theory of Change (version 2), Working Paper 5 (PDF). Euroconsult Mott MacDonald & Associates. May 2016. https://www.bluegoldwiki.com/index.php?title=File:WP5_-_Theory_of_Change_rev_2_25may_16.pdf
- [4] BWDB preference was to have a single WMA per polder so that there was a single point of contact for the O&M Agreement between the WMA and BWDB's Executive Engineer. For historical reasons, and because of the large size and population of some of the Blue Gold polders, it was impossible to have a single WMA per polder in all cases.



31 Capacity building

Because an overall objective of Blue Gold has been to empower water management groups (WMOs) as the driving force for development, many of the capacity building activities are addressed under the four main interventions of Blue Gold, which are reported in sections C, D, E and F. Since the perspective of Section G is project management, this chapter on capacity building aims to present the ‘what, how and why’ of capacity building activities ie to catalogue ‘what’ activities and to explain ‘how’ and ‘why’ our approach evolved over time.

The chapter starts with an inventory of the capacity building programs aimed at all local stakeholders (in government implementing agencies, local government, WMOs, LCSs, specialist farmers and private sector representatives), and is followed by a listing of the exposure provided to selected government staff through international visits, tours and specific courses. The chapter then continues under the heading ‘Refocused Training’ to explain the rationale for the move away from large scale training by external training organisations to locally-focused trainers who were familiar with the communities and the stage of organisational development, and the local environment. We then briefly explain why we refocused the homestead Farmer Field Schools (FFSs) from FFS Cycle 10 which started in April 2018 - much more is written about this in chapters 21 and 25. And the final section of the chapter explains the intended rationale for ‘Vocational Training’, and some background to its discontinuation.

31.1 Capacity building programs

Table 31.1 summarises the capacity building programs provided through Blue Gold under ten themes, showing that over 94,000 participants (M46% F54%) attended nearly 89,000 training days - which is the equivalent of 240+ training years or an average of 0.9 training days for each of the 800,000 polder residents. This does not include training provided through Farmer Field Schools (FFSs) for field crops (by DAE) or homesteads (by the Community Development Facilitators), which is covered under Section E Chapter 23 ‘Household outreach of commercialisation interventions’.

Table 31.1: Summary of capacity building programs

| | Number of courses | Participants | | Total | Training Days | WMOs | LCSS | Specialist Farmers | BWDB | DAE, DLS, DOF | Other GoB | LGIs | Private Sector | TA | Misc | TOTAL |
|--|-------------------|--------------|--------|--------|---------------|--------|--------|--------------------|------|---------------|-----------|-------|----------------|-------|------|--------|
| | | M | F | | | | | | | | | | | | | |
| A. Organisational development | 12 | 7,272 | 3,460 | 10,732 | 23,966 | 9,963 | | 2 | 147 | | | 168 | | 452 | | 10,732 |
| B. Water infrastructure | 6 | 9,292 | 6,072 | 15,364 | 16,711 | 2,112 | 12315 | | 86 | 75 | | 518 | | 258 | | 15,364 |
| C. Agriculture | 13 | 526 | 188 | 714 | 3,285 | 107 | | 274 | 3 | 200 | | 5 | | 125 | | 714 |
| D. Farming-as-a-business | 19 | 953 | 837 | 1,790 | 5,817 | 40 | | 1,053 | 5 | 85 | | | 200 | 357 | | 1,790 |
| E. CAWM | 6 | 945 | 145 | 1,090 | 2,466 | 34 | | 256 | 111 | 450 | | | | 239 | | 1,090 |
| F. Practical water management | 5 | 509 | 72 | 581 | 1,904 | 454 | | | 28 | | | | | 99 | | 581 |
| G. WMO partnership development | 5 | 2,513 | 573 | 3,086 | 3,086 | 1,517 | | | 189 | 219 | | 1,133 | | 28 | | 3,086 |
| H. Women's empowerment | 7 | 17,608 | 39,030 | 56,638 | 26,852 | 55,983 | | 263 | 8 | 4 | | 200 | 30 | 150 | | 56,638 |
| I. Cyclone preparedness | 2 | 86 | 51 | 137 | 274 | 124 | | | | | | 13 | | | | 137 |
| J. Monitoring, reflection and learning | 10 | 3,128 | 831 | 3,959 | 4,310 | 3,544 | | | 8 | 5 | | | | 402 | | 3,959 |
| Total | 85 | 42,832 | 51,259 | 94,091 | 88,671 | 73,878 | 12,315 | 1,848 | 585 | 1,038 | | 2,037 | 230 | 2,110 | 0 | 94,091 |
| Ratio | | 46% | 54% | | | 79% | 13% | 2% | 1% | 1% | | 2% | 0.2% | 2% | | |

Notes:

1. Excluding Farmer Field School (FFS) training

The table also shows the numbers of participants for each theme by their occupation. The majority (92%) of the capacity building targeted members of Water Management Organisations (79%) and Labour Contracting Societies (13%).

A full listing of all capacity building courses is also provided by theme. This listing contains the title of the course, its duration, number of batches, venue, date, lead organisation, and number and occupation of participants.

31.1 International exposure

During the project, a number of opportunities were taken to provide exposure to selected key staff to the broader issues of development in a deltaic region. A listing of the international training courses is provided in Table 31.2, with the title, location and dates for the course, its duration, and the number of participants and their sponsoring organisation.

Table 31.2: International training courses

| Name of Training Courses | Location | Date | No of Days | Participants | | | | | | | | | | | | | | Total | Trainee Days | Remarks |
|--|---------------------------|---------------------|------------|--------------|---|------|---|-----|---|-----|---|-----|---|--------|---|-------|---|-------|--------------|---|
| | | | | MoWR | | BWDB | | DAE | | BGP | | WMG | | Others | | Total | | | | |
| | | | | M | F | M | F | M | F | M | F | M | F | M | F | M | F | | | |
| 1. Amsterdam International Water Week (AIWW) | Netherlands | Nov-14 | 7 | 1 | | | | | 1 | | | | | | | 1 | 1 | 12 | 14 | |
| 2. International Conference “Deltas in Times of Climate Change ii” | Netherlands | 24-26 Sep 2014 | 3 | | | 1 | | | | 1 | | | | 1 | | 3 | | 3 | 9 | Others = PD SWAIWRPM |
| 3. Study Tour on “Flood Control and Drainage System” | Indonesia | 19-27 Apr 2015 | 9 | 1 | | 9 | | | | 1 | | | | 1 | | 12 | | 12 | 108 | Others = Deputy Chief, Planning Commission |
| 4. Multilevel Water Governance | Hague Academy Netherlands | 26 Oct - 6 Nov 2015 | 12 | | | | | | | 1 | | | | | | 1 | | 1 | 12 | Because of last minute complications with visas, no GoB nominees were able to join, and only one TA representative joined the course and prepared a report which confirmed its value. The GoB nominees attended the sessions in April 2016 (see Item 6 below). |

| Name of Training Courses | Location | Date | No of Days | Participants | | | | | | | | | | | | | | Trainee Days | Remarks | |
|--|---------------------------|-----------------|------------|--------------|---|------|---|-----|---|-----|---|-----|---|--------|---|-------|---|--------------|---------|---|
| | | | | MoWR | | BWDB | | DAE | | BGP | | WMG | | Others | | Total | | | | |
| | | | | M | F | M | F | M | F | M | F | M | F | M | F | M | F | | | Total |
| 5. Amsterdam International Water Week (AIWW) and comparison of UK/Netherlands Water Management Policy Approaches | UK Netherlands | 1-12 Nov 2015 | 12 | 2 | | 2 | | | | 1 | | | | 1 | | 6 | | 6 | 72 | Others = PD SWAIWRPM |
| 6. Multilevel Water Governance | Hague Academy Netherlands | 4-15 April 2016 | 12 | 1 | 1 | 6 | | | | 1 | | | | 1 | | 9 | 1 | 10 | 120 | Others = Assistant Chief, Planning Commission |
| 7. Advance Level Design and Life Cycle Costing of Sustainable Water Management Infrastructure | Netherlands | 14-27 Sep 2016 | 14 | | | 8 | 4 | | | | | | | | | 8 | 4 | 12 | 168 | Attended by 12 mid-level engineers from BWDB Design Circle Reporting: proposal DWA LCC&D 11mar_16 |

| Name of Training Courses | Location | Date | No of Days | Participants | | | | | | | | | | | | | | Trainee Days | Remarks | | |
|--|--|----------------------|------------|--------------|----------|-----------|----------|----------|----------|----------|---|-----|---|----------|---|-----------|----------|--------------|------------|-------|--|
| | | | | MoWR | | BWDB | | DAE | | BGP | | WMG | | Others | | Total | | | | | |
| | | | | M | F | M | F | M | F | M | F | M | F | M | F | M | F | | | Total | |
| 8. Workshop on towards better integration of R4D for improved food production systems in the Coastal Zone | IRRI SIIL Bangkok, Thailand | 18-19 Oct 2016 | 2 | | | | | | 1 | 1 | | | | | | | 1 | 1 | 2 | 4 | Workshop was coordinated by USADI/IRRI Sustainable Intensification Innovation Lab (SIIL). Attended by R4D: BARC, BRRI, BARI and 12 internationally supported projects working in the coastal zone Reporting: Polder Tidings vol1 nr2, Dec 2016 |
| 9. Organizing farmers as partners in agribusiness: optimising the performance of producers' organisations (OPPO) | CDI, Wageningen University and Research, The Netherlands | 17 Sep to 5 Oct 2018 | 20 | | | | | 1 | | | | | | | | | 1 | | 1 | 20 | Reporting: contents of course in WUR leaflet |
| | | Total | | 5 | 1 | 26 | 4 | 1 | 2 | 6 | | | | 4 | | 42 | 7 | 49 | 527 | | |

31.2 Refocused training

In the first years of the Blue Gold Program, a number of WMG capacity building programs were provided, in particular training in Gender and Leadership Development (GLD), Accounts Keeping and Audit System (AKAS), and Organisational Management (OM). These were out-sourced to external training organisations, and were well-structured, classroom-based courses using interactive participatory methods.

Whilst these courses were all delivered by well-qualified, experienced and professional organisations, they:

1. were framed around a standard set of courses with very little room for customizing the content (and with little local knowledge of the WMG which would help them to do so)
2. fitted around a timetable which suited the training organisation – aiming to complete the target number WMGs set under the contract in the least possible time; and
3. without an appreciation of local sources of information, knowledge or services – the networked partnerships which are the foundation of self-evolving WMGs

The refocused approach aims to achieve something different:

“Support to a self-organizing network of WMOs should be built into the field operations from the beginning – encouraging WMOs to take control of their own establishment and the organisation of activities to the largest extent possible using a range of horizontal expansion methods.”

“Continuous partnership building between WMOs and LGIs, service providers, public and private organisations with relevant knowledge and information, as well as other programs and parties operating in the polders should be at the heart of the field operations.”

Unlike outsourced training firms, Blue Gold community development facilitators (CDFs) have a wealth of local knowledge:

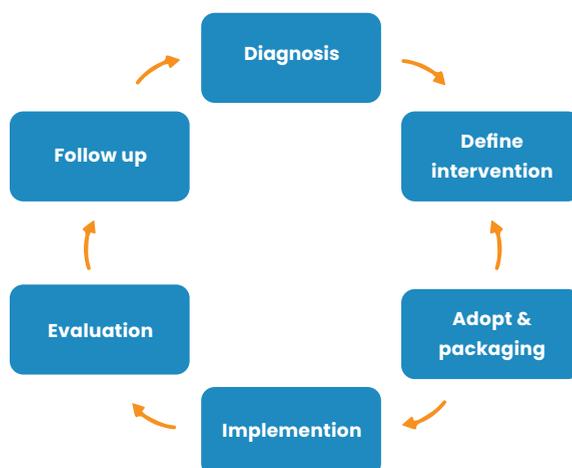
- of WMGs: their skills, interests, capacities and priorities
- of local conditions (markets, crops, water)
- of local service providers in the public and private sectors
- of local examples of collective actions, CAWM, CII

These CDFs are well-placed to build self-evolving WMGs by encouraging WMGs to take control of their own activities using an approach which encourages learning-by-doing. The combined experience of the polder team (as agriculturalists, water management specialists, business developers, and community facilitators) means that the CDFs have a wide range of resources and ideas to build on interests of the WMGs, to guide them to fellow WMGs with successful implementation experience, and at the same time building partnerships with local sources of technical knowledge – so that in the future WMGs can make decisions in an ever-changing environment based on good quality information (perhaps about market prices) and knowledge (about seed varieties, treatment of diseases etc).

The process of building WMG capacity includes a range of measures: experience sharing, facilitating issue-based discussion and problem solving by WMGs, horizontal learning, collective actions, exchange/exposure visits, and good practice expansion.

CDFs – working with individual WMGs - play a key role: they work with the WMG to diagnose the situation and to then define and implement an appropriate intervention to build WMG capacity (see Figure 31.1).

Figure 31.1: Capacity building cycle for WMGs



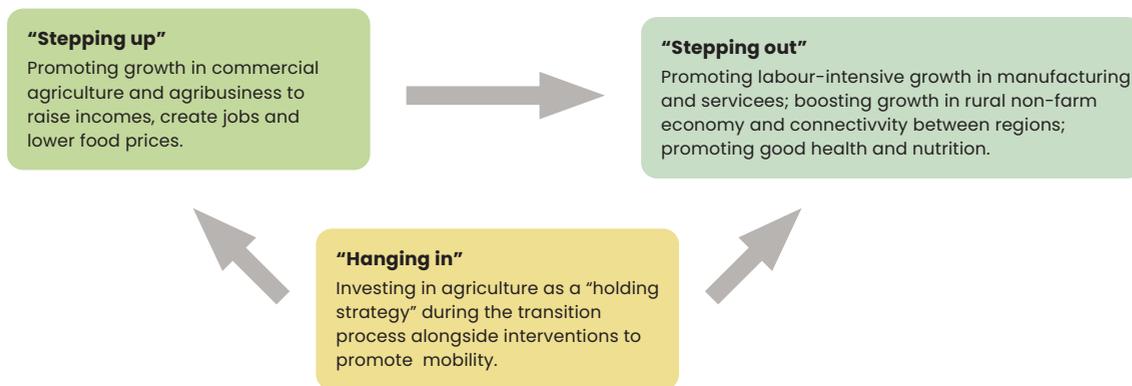
During 2017/18, courses run by training firms were brought to an end, and the responsibility for capacity building was transferred to polder teams. Many of the 2017/18 training/capacity building courses have therefore aimed at developing facilitation skills in BWDB/DAE/TA staff.

This change resulted in training courses being organised locally using locally available resources such as staff of DAE/DoF/DLS, CDFs, private sector input dealers and farmers with specialist knowledge (eg farmer trainers, catchment facilitators). Curricula were revised to include greater use of interactive methods such as hands-on practice (LCS training), visualisation (gender and leadership sessions) and applied planning (catchment planning training). This resulted in a training portfolio that was more practical, relevant and therefore more inspiring for the participants. Yet, the envisioned responsiveness of capacity building activities to specific needs of WMOs was not fully successful, with the the planning and content of training not being fully driven by staff in direct contact with the WMOs (ie TA polder teams); and with training programs continuing to be rolled-out for blanket coverage. Thus Blue Gold's attempt to refocus capacity building by decentralising responsibilities to polder teams has gained traction gradually, but still requires further empowerment of polder teams to fully realise the ambition.

31.3 Refocused TA FFS

Blue Gold aims to reduce poverty by facilitating polder economic development, through increasing income and employment opportunities. (For further details, refer to Chapters 21 and 25). Economic development depends on rural transformation that can be observed in changes in broader agricultural and livelihood strategies of polder dwellers. We embraced a conceptual framework^[1], used by the Dutch IOB and DFID, offering three major types of livelihood strategies relevant to the polders' farming population (see Figure 31.2).

Figure 31.2: Economic and livelihood strategies



31.3.1. Stepping up

These are farmers who depend on agriculture as main source of income, who have ownership and access to land or water bodies. Their economic situation can be improved by motivating them into commercial agriculture and agribusiness. Blue Gold investments in sluices, embankments and canals, in FFSs for field crops (by DAE), and other practical guidance in water management and farming-as-a-business are aimed to increase cropping intensity and profitability. Improved market linkages are essential to support this development and to make it sustainable.

31.3.2. Hanging in

The less privileged section of the households has limited access to crop production, limited access to finance, and lack skill and knowledge in modern agricultural practices. The transformation process supports them by investing in agriculture to survive, to secure the necessary food and required nutrition – which is the focus of the TA FFS programme. During the first five years, Blue Gold has implemented 10 cycles of FFS on either homestead production-poultry-nutrition module or fish-cattle rearing-nutrition module. Following the last ARM recommendations BGP reviewed the basics of the TA FFS program.

31.3.3. Stepping out

This group of polder dwellers use their skills primarily in non-farm activities, by providing labour in manufacturing and service sectors. They are often migratory in nature and move outside the polder whenever they find an opportunity to earn more. Skills development is the appropriate support strategy but is outside the scope of BGP.

During January 2018, a workshop reviewed Blue Gold's experience with farmer field schools (FFSs) and FAO's core FFS principles with the aim of refreshing and realigning TA FFS Cycle 10 (April to October 2018) with 2017 ARM recommendations and its call “not to lose the poverty focus”, in order to:

- Reach more households
- Target those neediest households with sufficient assets to participate

- Deliver more demand driven content
- Enhance women empowerment
- Use DAE/TA farmer trainers (FTs) to lead FFSs
- Facilitate market orientation and market systems development

The ensuing modification included:

- Instead of combining several modules into a single FFS (i.e. beef fattening, aquaculture, home gardening and poultry); several FFSs were organized according to one topic each, for better HH targeting and meaningful participation
- WMG executive committees, made aware of the TA FFS target group and objectives, choose specific FFS modules for their area based upon local needs
- Farmer Trainers (FTs), trained in 2017, were engaged to run FFS supported by CDFs experienced in facilitating FFS and by the broader polder teams
- By using FTs as facilitators, the number of TA FFS per cycle could be increased. BGP implemented 166 TA FFS in cycle 10 (an increase from 67 FFS in Cycle 10). Accordingly, the number of participants also increased, from 1,675 HH to 4,150 HH per cycle
- Properly integrating relevant market orientation aspects, including attention to basic financial literacy and decision making, and enhancing market access by mobile phone, collective action and networking. Most of this is of particular relevance to women empowerment
- Instead of being treated as stand-alone groups, the FFS groups were linked to other actors e.g. CAHW, vaccinators, resource farmers (RFs), extension agencies and other goods and service providers to explain their business model and develop linkages
- Booklets containing key messages from FFS sessions were prepared and distributed among participating farmers so that they in turn could pass messages to their neighbours and other interested visitors
- Resource Farmers (group leaders), mainly women, were trained on market orientation issues, such as how to organise collective actions, and were taken on market visits introducing them to different input suppliers and buyers. Thus, RFs could communicate with actors and engaged in face to face discussion with market actors to strengthen linkages
- Linking local resources such as RFs and FTs into the network of WMOs

31.4 Vocational training

The EKN Program Document (Section 5.2.6) sets out a rationale for enhancing access to vocational training for families of the poorest members of WMGs. The aim was to provide disadvantaged youth - often primary school drop-outs - with training and subsequent employment by private sector enterprises. The Program Document recommended that priority was given to services provided by organisations, such as the Underprivileged Children's Education Programs (UCEP) which was already supported by EKN.

Whilst UCEP has educational establishments in Barisal and Khulna divisions, discussions indicated that their strength was in urban areas where there are good opportunities for private sector employment, and that - although UCEP had planned to increase coverage of rural areas - they were focused on strengthening their urban program.

A needs assessment^[2] on vocational training opportunities was prepared in August 2016, which collected and summarised the needs, opportunities and challenges regarding vocational training in the polder areas. Stakeholders consulted for this assessment included representatives from WMGs, unemployed persons and drop-out youths (14-20 years of age) and service providers. A total of 148 participants from the community attended the focus group discussions (FGDs) and four service providers were visited.

Key findings from the discussions indicated that:

- There is a need for a further study on local job market, looking into the demand and supply of trade-based technical skills. This will inform decision making on suitable trades more with concrete evidence
- More technological advancement happened in the area of agriculture and communication over the past five years. But the technical services are only sufficiently available in the market areas and are often of low quality and high cost
- Most of the technicians providing trade-specific technical services in the market are trained through informal on the job training. Dissatisfaction was expressed about the quality of learning and skills development from such informal training
- Clear preference expressed towards short courses (max. 1 year) and venues close to their area (preferably within 5 km radius). Some also requested for a tool box for the students so that they can use it easily to provide services in their locality
- Trades directly relevant to BGP must be given priority while selecting trade courses. However, specific needs of women, for those who have higher educational background and those training that will improve the overall quality of life (such as – paramedics/nursing) also needs to be considered while selecting the courses. Trainings that are already being provided by BGP must not be included under this vocational training initiative
- Two models of implementation (ustad model and conventional classroom model) can be tested simultaneously. In that case, selection of trades for both the models will be important. ‘Ustad’, is a reverential title in Bangla for an accomplished master in a specific trade
- Options for and access to economic activities for women are very limited. BGP can support in designing a focused intervention to encourage, engage and sustain girls in a wide range of technical training (both traditional and non-traditional) and eventually in the job market. An advocacy campaign to raise awareness about how families can benefit from girls’ technical education can be very effective to bring more girls under this initiative
- WMGs can play a vital role in ensuring that the services are also available within the community and not in the market alone

As a result of the needs assessment, recommendations were made for a pilot phase to test out different models of providing vocational training. This included adapting the ‘ustad model’, as developed by the EKN-funded Profitable Opportunities for Food Security (PROOFS) to provide guided vocational training out of small workshops in the repair and maintenance of agricultural equipment. In this model village-level technocrat entrepreneurs who run small workshops would act as ustad and take on and train apprentices for a fee. In January 2017, however, despite recommendations for continuation by the 2016 Annual Review Mission, EKN resolved to discontinue the vocational training (VT) program, and implementation was halted

References

- [1] Dorward, Andrew; et al. "Hanging in, Stepping In and Stepping Out: livelihood aspirations and strategies of the poor". *Development in Practice*. 19 (2). doi:10.1080/09614520802689535 – via ResearchGate. <https://doi.org/10.1080%2F09614520802689535>
- [2] WP4 Vocational Training Opportunities: A Needs Assessment Report. August 2016.



32 Agricultural Extension Methods and Communication

32.1 Communication aimed at beneficiaries

The transformation of the agricultural production system – driven by market opportunities and enabled by better control over water resources – was central to the Blue Gold Program. To pursue agricultural transformation, BGP used an array of agricultural extension methods to stimulate, convince and teach producers about water management and new agricultural practices. At the start of Blue Gold, the Farmer Field School approach – which was embraced by DAE – was the method of choice^[1]. However, as the programme progressed, additional methods and means were applied. This ranged from the conventional (newsletter, hand-outs) to more innovative methods (Horizontal Learning, popular theatre).

The array of methods employed included:

- **Farmer Field Schools** – Farmer groups of around 25 members undergo a cycle of training sessions, including the review of a trial plot managed by a lead farmer, throughout the season and jointly investigate and experience new agricultural practices. In BGP, field crops (i.e. paddy) were addressed in DAE-led FFSs, whereas various production options around the homestead were addressed in homestead FFSs organised by the TA team. Whereas the DAE method is highly standardised and includes regular sessions throughout the season, the homestead FFS were, from 2018 onwards, split up into shorter cycles, dependent on the specific topic (i.e. vegetable cultivation, poultry rearing, beef fattening, aquaculture).
- **Horizontal Learning** – the approach borrows from a methodology developed by the WB-funded Horizontal Learning Project, which used the methodology to promote good governance practices in Union Parishads. Horizontal learning starts from the premise that you can learn from successful innovation practices employed by your peers. FFSs include elements of horizontal learning: (i) it is in essence a method by which a participant can learn from his neighbours' queries or experience; (ii) participants are encouraged to spread the new knowledge to neighbours that are not participating; and (iii) the farmer field day (FFD) that is included towards the end of an FFS presents the lessons learnt and the trial plot to a larger group of visitors. Horizontal learning, as employed by BGP is, however,

treated as a method in its own right and is discussed at greater length in Section G Chapter 33.

- **Videos** – the BGP TA team developed a number of videos and compiled an impressive library of materials obtained elsewhere. The latter includes also video's developed through partners of the Blue Gold Innovation Fund. Aside from videos aimed at an external audience, there are broadly speaking, two categories of video's in support to agricultural transformation:
 - Instruction video's that show step-by-step how a new practice is done (e.g. using the hajol in poultry rearing;
 - Motivational video's that call upon the observer to consider a new practice and to actively search information on the same (e.g. improving agricultural water management through community action).
- **Mass events** – these include agricultural fairs , network meetings of producers and their back- and forward market linkages and Blue Gold fairs (all termed as melas in this report). These are public meetings where speeches and stalls provide information on a wide range of issues. Contributions to the event are generally made by farmers already engaged with a particular innovation. 'Melas' are common events in rural Bangladesh and generally linked to an explicit objective (eg tax melas are organised by UPs to promote the payment of holding tax);
- **Popular theatre (natok)** – Popular theatre in Bangladesh discusses social issues, is provocative, funny and highly interactive. Blue Gold used local theatre to promote discussion - for instance, on the mismanagement of water resources or using group cohesion to overcome the self-interest of an influential individual - during which the audience reacted with cheers, laughter and boos. At the end of the play, a representative of the WMG or Union Parishad gave an analysis of the issues covered in the play often with local illustrations, and encouraged the audience to respond. Interestingly, in internal annual retreats, polder-based members of the TA team also used popular theatre to present issues they had encountered in the field.
- **Demonstrations** – The transfer of knowledge on new agricultural practices and water management was demonstrated to selected farmers who willingly adopted the new practices on their lands, and became leaders and extension agents to neighbours and visiting farmers - using their farms as demonstration schemes. The demonstrations were provided with agricultural inputs and sometimes contributions to costs of water management infrastructure. A number of demonstrations were organised:
 - Community Agricultural Water Management – combining knowledge, inputs and infrastructure with beneficiary contributions to remodel a local water system and to introduce new crops and agronomic and water management practices. Generally, it was applied on waterlogged lands;
 - Crop Intensification Initiative – farmers on higher lands (where water management was not a constraint) demonstrated the value of annual cropping patterns through the provision of seeds and inputs;
 - Community-led Fisheries – Same as for CAWM, transformation was supported by knowledge, inputs and infrastructure support.
- **Printed material** – Various materials were produced to support the introduction of new agricultural practices. This included a newsletter (Barta) distributed to WMGs, posters (mainly on water management), hand-outs (generally distributed during FFSs or mela), as well as signboards and notice boards informing by-passers about specific activities. Printed material generally complements other extension methods.

Sample of BGP communication material

প্রত্যেকের সহযোগিতা সকলের উন্নয়ন

উন্নয়নে পানি ব্যবস্থাপনা

গণপ্রজাতন্ত্রী বাংলাদেশ সরকার
 Blue Gold Program
 স্ব পোস্ত প্রোগ্রাম
 রাজকীয় দেপারশ্যামস সরকার

বাস্তবায়নে: বাংলাদেশ পানি উন্নয়ন বোর্ড ও কৃষি সম্প্রসারণ অধিদপ্তর

What are the results of Participatory Water Management?

BLUE GOLD PROGRAM
Water Management for Development

Implemented by: Development Board
 Bangladesh Water Development Corporation
 Department of Agriculture Extension

খাল, বেড়িবাঁধ, স্লুইস গেইটসহ সকল অবকাঠামো পরিচালনা ও রক্ষণাবেক্ষণের দায়িত্ব আপনাদের

উন্নয়নে পানি ব্যবস্থাপনা

গণপ্রজাতন্ত্রী বাংলাদেশ সরকার
 Blue Gold Program
 স্ব পোস্ত প্রোগ্রাম
 রাজকীয় দেপারশ্যামস সরকার

বাস্তবায়নে: বাংলাদেশ পানি উন্নয়ন বোর্ড ও কৃষি সম্প্রসারণ অধিদপ্তর

উন্নয়নে পানি ব্যবস্থাপনা

উন্নয়নে পানি ব্যবস্থাপনা

গণপ্রজাতন্ত্রী বাংলাদেশ সরকার
 Blue Gold Program
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 রাজকীয় দেপারশ্যামস সরকার

বাস্তবায়নে: বাংলাদেশ পানি উন্নয়ন বোর্ড ও কৃষি সম্প্রসারণ অধিদপ্তর

To guide the development and use of the wide range of extension methodologies, an external review was conducted in early 2018 by Agro-Insight, an international advisory service on agricultural extension methods.^[2] Agro-Insight commented positively on the range of instruments and the creative approach to their use, but did not offer guidance on how to maximise the impact of the extension instruments. To address this, an internal working group of Blue Gold TA staff was established. Members of this group were familiar with the range of extension methodologies and had worked alongside the Agro-Insight team. The recommendations of this working group were presented in a strategic action plan. While the choice of instruments was to an extent predetermined by the project design (e.g. use of FFS by DAE was enshrined in the Department's policy and in its budget), the Project has influence over how the instruments are used; and on how frequently they are employed.

Decisions on the use of instruments based on considerations of reach, impact and efficiency are helpful in guiding decisions (see *Table 32.1*). Whilst quantitative data is available for reach and cost, scores on impact based on judgement and are therefore more debatable.

Table 32.1: Cost-effectiveness assessment extension methods in use in BGP

| Instruments for scaling up the production system transformation | | | | |
|---|--|---------------------|--------------------------|-----------|
| # | Instrument | Immediate reach-out | Impact on transformation | Cost/unit |
| 1 | Horizontal learning | | | |
| 2 | Homestead Farmer Field School (New format) | | | |
| 3 | Handheld method | | | |
| 4 | Popular theater | | | |
| 5 | Video | | | |
| 6 | Crop farmer field school (DAE) | | | |
| 7 | Mass events | | | |

- The entries in the above table are grouped from high to low cost-efficiency. Mass events are at the bottom. Despite a high outreach in number of attendants per event, the impact on cropping system change is limited against a relatively high cost. Video and popular theatre also rank low because on their own (as a single event) they have little impact. The value of these two instruments emerges, however, in combination with others: i.e. showing a video at an FFS in combination with follow-up discussions and explanations;
- Homestead FFSs rank higher than crop FFS, reflecting a lower cost per unit for the homestead FFSs. This reflects the changed approach adopted after 2018, when the number of training sessions was reduced and separate FFSs covered single specific topics (eg beef fattening, home garden production, etc.). It also reflects the involvement of Farmer Trainers (FTs) as local resource persons trained by BGP to provide services – such as a homestead FFS – to their communities;
- The DAE FFS come out rather low based on their limited impact. The exact rank is sensitive to how much impact an FFS has and hence to the quality of implementation. Breaking down FFSs into smaller programmes, as done for homestead FFSs, may enhance cost efficiency;
- CAWM, CII and CLF (the demonstration schemes) obtain the higher middle position. When ranking, it was found that the outcome here is particularly sensitive to small changes in how reach-out, impact or costs per event are rated. Ranking is particularly difficult as the capital investment differs widely per location. This shows how arbitrary the ranking is, but also how sensitive cost efficiency is to how well an instrument is applied;
- Horizontal learning appears to have relatively high cost efficiency. Yet, the method was and continued to be used sparingly - one reason being that any single WMG is only willing to host a relatively small number of visits.

- Printed material has not been included in the comparison as it generally is used as a secondary instrument; i.e. in combination with (and adding value to) other instruments.

Moreover, methods serve to some extent different purposes and cannot always be interchanged. But very often methods can be combined to greater effect: e.g. a relevant video can be added-on to an extension event, thereby reinforcing the messages in a rather cost-effective manner.

The strategic action plan provided both practical guidance and internalised the lessons learnt which resulted in a more creative use of the methods: homestead FFS teams were refocused into a more effective format (see also *Chapter 25 and Chapter 31*); horizontal learning was organised for agricultural innovation but also to compare experiences on organisation management; the quality of video material spiked; and natok were adapted for use in formal events, such as the formal signing ceremonies for the O&M agreement between BWDB and WMAs.

While there is no answer to the question ‘which is the best extension method?’; posing the question and struggling with it provided a beginning of a more free, creative and, in the end, more effective use of methods.

32.2 Communication aimed at organisations

Communication methods and means were also employed to communicate with stakeholder agencies and beneficiary organisations. Communication aimed at beneficiaries – described above – had from the onset an explicit focus on the transformation of agriculture and water management. Communication aimed at organisations had a less focussed aim. From 2018 onwards, however, communication aimed at sector agencies was systematically aimed at reinvigorating water sector governance in Bangladesh with lessons from Participatory Water Management.

- **Barta** – The Bangla newsletter ‘Barta’, which is primarily aimed at WMOs but which is shared within the sector as well, had an intended quarterly frequency and has been published 16 times with a wide circulation among WMGs and WMAs, and a limited circulation to local organisations (UP, Upazila offices, local NGO, Community clinic, college, FFS/MFS group, DAE, and BWDB offices) and national partner agencies. The final issue of ‘Barta’ was published in September 2019. With the growing number of beneficiaries, the total circulation was increased to 7,000 issues:
 - Barta provided four pages in colour on (i) recent main events within the BGP program (e.g. DAE mela, agreement signing ceremonies, crop cut festivals, etc.); (ii) noteworthy WMG activities, like khal cleaning; (ii) success stories of WMGs, WMAs and / or individual beneficiaries; (iv) technical information on agriculture and livestock production. In each issue, one particular polder was basic progress data on BGP were included, like number of WMO formed, FFS, MFS, enrolment in WMOs, civil work progress, etc.
 - Initially, preparation of Barta was outsourced but the quality did not justify the high cost of doing so and subsequently an internal editorial board was formed, including BWDB and DAE representatives, the three zonal coordinators and two TA team members. Contributions were mainly solicited from the staff, with a careful review of contents, length and regional balance. Both encouraging staff to contribute as well as editing their contributions proved to be time consuming;
 - A major lesson is that strong discipline is needed to ensure timely and regular publication. Timeliness is especially important given the seasonality of agriculture and water management.
 - The impact of WMGs or farmers seeing their own story in print is substantial; while success stories also inspire the readers to follow the set example.

- **Trend Watcher** – As a result of a recommendation of the Aide Memoire of the Annual Review Mission 2016, the Blue Gold Trend Watcher. was issued as an English-language bulletin the timing of whose publication was loosely aimed to review the performance of the preceding season. It aimed at summarizing and sharing updates on project interventions and achievements as well as on stakeholder participation in water management and economic activities. Monitoring results at both output level and outcome level, success stories of WMOs or WMG members, innovative initiatives of BGP or WMOs, challenges and limitations in implementing BGP interventions were among the major topics of the bulletin. While Barta, the Bangla newsletter, was aimed at the WMGs and WMAs, the ‘Trend Watcher’ targeted management representatives of project partners, partner agencies/donors and allied organizations. In total, six issues of the ‘Trend Watcher’ were published between December 2016 and December 2019;
- **Publications** – Blue Gold received some coverage in magazines and newspapers. An extensive article by BWDB’s Program Coordinating Director and published in a national English-language newspaper in 2019, explicitly pursued the broader adoption of integrated water management in the coastal zone (*See: Box 30.1*).^[3]

Box 30.1: Blue Gold Program: A way forward for coastal Polder Water Management by Eng. Md. Amirul Hossain

“It may be concluded that, drainage during monsoon and availability of usable water round the year has been ensured through repair/re-sectioning of embankment, re-excavation of interior channels/Khals, repair/reconstruction, timely operation of water management infrastructures and active participation of local stakeholders of Polder area. Increased agricultural production as well as improvement of natural environment has become possible by protecting saline water intrusion through water control structures inside Polder area and storing/preserving rain water in re-excavated khal/channels and other water bodies. Natural resource based agricultural production, job opportunity and livelihood development have been accelerated. Improved livelihood of local people has become possible due to integrated and synchronous activities of water management, agricultural production and community involvement/participation. Production of crops and fishes in the water bodies inside Polder area has been increased due to proper drainage and availability of saline free useable water. Huge change is being observed in improvement of environment as well as in livelihood. Sustainable development has also become possible for these program activities. BGP has been playing an important role in poverty reduction and to achieve food security in 14 upazilas of four districts through integrated participatory water management. This may be considered as a way forward for improvement of coastal polder water management”.

- **Advisory group meetings** – Realising that written publications only go so far in influencing organisational actions, Blue Gold used advisory group meetings to encourage cross-sectoral dialogue on participatory water management. These informal meetings were intended to allow senior representatives of BWDB, DAE and LGRDC to discuss the strategy of the project and the policy environment. Attendees included EKN, DG BWDB, PCD BWDB, PD DAE, a representative of LGRDC and TA team. In most cases, a presentation was made at the beginning of the meeting on a specific issue, followed by responses from the attendees, and a round-up of decisions made. Although the meetings in this form were discontinued from 2016 because of a lack of support from BWDB, discussions on PWM policy restarted in 2019 when a team of senior national experts prepared three interlocking working papers with the aim of engaging a select circle of government in a policy dialogue, as described in *chapter 20 Way Forward*.

- **Seminars and congresses.** Blue Gold representatives spoke regularly at workshops, congresses and seminars. In doing this, emphasis was gradually shifted from activity reports to promotion of renewed policy development with respect to water governance and participatory water management.

The communication aimed at organisations would have benefited from an immediate and strong focus on further development of the state of the art of participatory water management in Bangladesh; both in an immediately practical sense by supporting PWM practices within the 22 polders; as well as by initiating and contributing to a national dialogue on water governance and the lessons from PWM. The latter is – since 2019 – taken up by a panel of senior experts preparing an independent review within the context of the Bangladesh Delta Plan 2100 (see *chapter 20 ‘Way Forward’*).

References

- [1] For background on Farmer Field Schools: <http://www.fao.org/farmer-field-schools/home/en/>
- [2] Blue Gold Program Communication interventions and extension methods – A study of sharing information with farmers in Bangladesh. Agro-Insight. March 2018.
- [3] Hossain, Md. Amirul (2019-10-22). “Blue Gold Program: A way forward for coastal Polder Water Management”. New Nation.



33 Horizontal learning

Within the methods used by BGP for agricultural extension and for communication on innovative practices in general, Horizontal Learning stands out for its cost-effectiveness (see *chapter 32*). Blue Gold's monitoring data recorded a staggering 243,900 participants in horizontal learning activities^[1] up to June 2019. This figure includes exchange visits and farmer field days organised through Farmer Field Schools (FFS) also as horizontal learning events. In addition, there is likely to be a fair deal of double counting of participants.

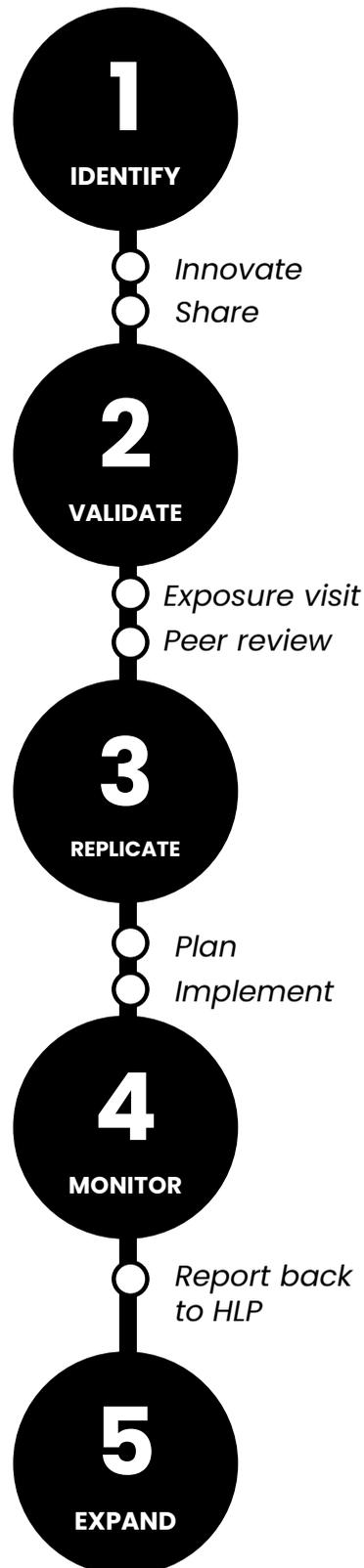
This chapter looks specifically at the Horizontal Learning method that was introduced with Blue Gold from late-2016, and which involved some 6,500 participants up to mid-2019. To distinguish this approach from the use of the words 'horizontal learning' as a container term for other kinds of peer-to-peer exchanges and gatherings; the specific method referred to in this chapter is capitalised as Horizontal Learning (HL).

33.1 Horizontal Learning – the approach in BGP

The World Bank-funded Horizontal Learning Program (HLP) was set up to promote good governance by Bangladesh' Local Government Institutions (LGIs). It provided a structured approach for peer-to-peer learning and for replication of lessons learnt (see *Figure 33.1*).^[2] HLP organised workshops in which participating elected local leaders were asked to identify a good governance practice employed in their constituency. Several Unions or Upazilas participated and the proposed good practices were presented, discussed and assessed. The participants then selected the best practice, to which they would subsequently make an exposure visit. During the visit, the practice was reviewed in detail and the visit also included a session to prepare a back-home action plan aimed at replicating the practice. Good practices were documented and included on a central website, with tracking for their replication.

Blue Gold adapted the HLP approach to suit WMGs. Good practices were identified by TA polder teams, and collated in two booklets in Bangla^[3]: The first collection of factsheets (38 no.) were published in October 2017 and the second collection of factsheets (45 no.) were published in February 2019. The successes described in the factsheets ranged from women's participation in decision-making, the

Figure 33.1: HLP steps of knowledge sharing



introduction of new agricultural practices, market successes, operation and maintenance of water infrastructure and running a savings and credit operation. The factsheets were distributed to TA polder staff and WMOs with the intention that community development facilitators (CDFs), the TA team's field level staff, would use them to identify subjects of immediate interest to the WMG - and to then encourage the WMG to organise horizontal learning visits to find out more about the good practices from the originating WMG (whose contact details were provided with each factsheet).

With the aim of expanding CAWM demonstrations in new areas, Horizontal Learning was used to showcase existing CAWM sites to encourage uptake by farmers in the new areas. This approach was also embraced for community fishery activities. When a successful practice was identified, Horizontal Learning visits were arranged in which the host WMG invites representatives from 4 to 5 neighbouring WMGs as well as representatives of LGIs and departments (notably DAE) to witness their success. The success is explained in a courtyard session, after which the program offers an opportunity for field visits and interviews. The visitors then reconvene for a Q&A session with the host, and are then encouraged to provide feedback and lessons they have learnt, and to plan to replicate the success in their own farms.

33.2 Horizontal Learning – An assessment of BGP's experience

In general, HL events were festive occasions that created good-will and enthusiasm amongst the participants as well as pride amongst the host-protagonists of the good practice. Because they were often attended by LGI representatives and DAE, DLS and DOF experts, they also served as networking events. While the TA polder teams often initiated and organised the event and assisted with (a small) financial contribution, the receiving WMGs always took clear ownership of the program and took their role as hosts very seriously.

No systematic review has been made of replication as an effect of HL. Most new CAWMs have reviewed an experience elsewhere but it is difficult to say whether that was the sole factor in their decision to apply CAWM. The rapid expansion of HYV T Aman (especially the BR52 variety) may have benefited from HL, but the pace of expansion appears to exceed the rate of HL events. Introduction of new mustard varieties and mustard cultivation as a chance crop benefitted from HL, as well as from efforts to improve forward- and backward market linkages.

Although the Horizontal Learning approach was appreciated by the BGP TA team and considered as a highly cost effective approach, it was – over a 3-year period – only used to reach a mere 6,500 people. This is only 3% of the total reach-out recorded for all peer-to-peer extension methods used by the project^[1], and implies an estimated 10 HL sessions per polder over a 3-year period. With hindsight, this was due to the following factors:

- Organisational – The HL approach requires the identification of opportunities for HL by the polder teams. The challenges in transforming the BGP TA organisation to an integrated and highly decentralised organisation – described elsewhere – have hampered a more intensive and creative use of the HL method;
- Planning – HL came into the programme as an add-on and not as a replacement of other methods. Targets for the other methods continued to exist and continued to attract the programme's energy. At the same time, only modest targets for HL were set in the annual plans, with concomitant funding;
- Initiative – HL had no clear and continuous owner within the team, who would follow-up with colleagues and polder teams on the application of the approach. The attention given to HL has therefore been somewhat short-lived;

- Culture – One could speculate that an internal culture of horizontal learning would greatly encourage the application of HL among the WMOs. Some polder teams did emphasise peer-to-peer learning, e.g. by setting up small Facebook groups wherein experiences, reports, etc. were shared, but cross-learning was neither set-up at a higher level, nor strongly encouraged.

The application of Horizontal Learning in BGP was modest but significant. The method attracted quite some attention and this sparked a replication by a third party using the BGP innovation fund. During the Blue Gold Program, HL proved to be a viable addition – and a potential alternative – to other methods of agricultural extension.

References

- [1] WMG Tracker FINAL Report to June 2019, Working Paper 9H. Euroconsult Mott MacDonald & Associates. October 2019.
- [2] Mikelle Adgate, Maryam Hariri, Kathryn Matheny, Ethel Mendez, Tammy Singer (2009). Horizontal Learning Program: An Independent Assessment.
- [3] Fact Sheets, 2017 and 2019 (Originals in Bengali). Euroconsult Mott MacDonald & Associates.



34 Monitoring and evaluation

Together, Chapters 34 and 35 describe the monitoring and evaluation (M&E) process and management information system used in Blue Gold. Chapter 34 gives an overview of the processes of designing the monitoring, evaluation and learning and how the information was collected, analysed, communicated and used in Blue Gold Program and Chapter 35 explains how the M&E and other information was included in MIS to provide a consistent set of data for analysis, data presentation and reporting, and facilitated informed, timely and evidence-based project decisions. Part of the M&E processes are also included in Chapter 35 to illustrate how these fit into the MIS.

An analysis of the development outcomes from the M&E process is presented in Section B Chapters 5 to 9.

34.1 M&E Objectives

The M&E system was designed to collect and manage data to allow a regular assessment of the relevance, performance, efficiency, outcomes and impact against the stated objectives of the Blue Gold Program. The M&E activities aimed to collect, analyse, communicate and disseminate the information. Key information users were the direct beneficiaries (local communities), government and other collaborating institutions, technical assistance (TA) team, donors and similar projects.

The Program Document of August 2012 states (Section 6.4.7 p74): “Monitoring of progress towards the goals will be a task of the TA-consultant, at the start of the Program a baseline survey will be conducted per polder as to define clearly the status then of the households and of the physical and socio-economic environment. The monitoring will be done at an annual basis. The monitoring will have to be done by an independent organisation and will report directly to the members of the Steering Committee and EKN.”

The information gathered and analysed through the M&E process was used to improve strategies programs and other activities, to assist organisational learning and development, to ensure that decisions were based on sound evidence, and to provide accountability. These monitoring, evaluation and learning processes provided insights into the opportunities and challenges of implementing PWM in Blue Gold as well as

outcomes and impact of the PWM interventions on livelihood, poverty and food security. Based on these findings, lessons were drawn on the impact and likely benefits of scaling-up the PWM interventions. The lessons learnt from M&E in Blue Gold will therefore be of value to projects in the coastal zone which include participatory water management and agricultural production.

34.2 Approach to the Participatory Water Management Project Monitoring and Evaluation Framework

34.2.1. Conceptual Basis

Soon after the start of Blue Gold, four logical frameworks (or 'logframes') were in existence – the GoN/EKN version of August 2012 from the Program Document (Annex 3), the BWDB version (in the BWDB Development Project Proforma, DPP of March 2013¹, the DAE version (in DAE's DPP from May 2013², and the version which appeared in the TA Inception Report (Annex 11) dated November 2013. The TA's November 2013 version was essentially a reworked version of the GoN/EKN logframe from the Program Document, modified to take out the WASH component (which had been contracted to BRAC for Khulna and Max Foundation for Patuakhali).

The BWDB and DAE logframes were a results-based management tool intended to address targets within components which were primarily of interest to the parent organisation.

The Aide Memoire of the 2015 Annual Review Mission suggested (in Annex 11) that the Theory of Change should be revisited to better focus on integration, collaborative working relationships and developing the analytical and reflective capacity within the program. In addition, the Policy and Operations Evaluation Department (IOB) of the Ministry of Foreign Affairs of the Government of the Netherlands had provided inputs in March 2014 and March 2015, which inter alia resulted in a draft Theory of Change, and they also recommended an examination of the underlying assumptions of how Blue Gold interventions contribute to the project goal. Revising the Theory of Change (ToC) offered the opportunity to be more explicit about how the inter-relation between the different program activities could be strengthened to achieve the project goal. And a related benefit was expected to be the harmonisation of the three logframes (ie BWDB, DAE and EKN/TA).

As part of the process of revisiting the ToC, four workshops were organised in February and March 2016 - two in Dhaka, one in Patuakhali and one in Khulna. In Dhaka, the key workshop was entitled 'Theory of Change for Monitoring & Evaluation' and involved representatives from BWDB, DAE, DoF, DLS and EKN. A fuller description of the process, the agenda for the workshops and a list of participants is provided in Working Paper 5 of May 2016 – which also provides the summary results chain and five logical pathways to change.

The main aim of the ToC was to interlink the various levels of the program and which moved from input and activity-based indicators towards results/outcomes-based indicators and to provide the basis for program planning, monitoring and reflection. By improving both the development pathway as well as the broader (relational) perspectives of M&E to enhance impact.

A workshop to present the outcome of the workshops and the impact of the ToC was held on 29th August 2016 chaired by BWDB's ADG (Planning) with senior representatives from BWDB, DAE, DoF and DLS. The workshop discussed the revised set of indicators for program achievements, the benefit of a single integrated Logical Framework for the whole program, and the organisational implications for the TA team. In his introductory remarks, First Secretary EKN stated that 'water management is not an end in itself,

1 Updates were made to BWDB's logframe in BWDB's revised DPPs dated June 2018 and September 2020

2 DAE's logframe was updated in the revised DPP approved in October 2018

but a means to come to, among others, higher incomes through increased agricultural production in the broadest sense. But the link between water management and agricultural production is not automatic. In the ToC, this link is explored and provides an important step towards understanding the processes involved.' Although the benefits of the ToC and the reorganisation of the TA team were recognised, neither BWDB nor DAE was able to authorise changes to their respective logframes – both of which had been authorised through the DPP planning process.

An updated version of the ToC development pathways for participatory water management was developed in 2019 based on the experience of WMGs with participatory water management (refer Chapter 30 "Theory of Change: the emergence of a practical approach to PWM"). Given the setup and operational levels of the program, the M&E framework was designed to combine selected elements of the traditional project type M&E which focused on assessing inputs-outputs relationship and implementation processes, with results-based M&E, or outcome monitoring.

34.3 Key elements in the Project's M&E Framework

The M&E framework for Blue Gold comprised of five elements, each of which fed into and informed the others:

1. **Definition of appropriate indicators**
2. **Establishing the baseline situation**
 1. Phase I Baseline in 2014
 2. Phase II Baseline in 2017
3. **Regular performance monitoring of activities levels of achievement of outputs (which led to the development of the WMG Tracker)**
4. **Monitoring and evaluating outcomes of the outputs**
 1. Participatory monitoring of WMOs
 2. Outcome Surveys
 1. WMG surveys 2018, 2019 and 2021
 2. Polder-level surveys using restructured DAE data
 3. Remote sensing/earth observation survey
5. **Monitoring and evaluating the impact of program**
 1. Impact assessment/endline survey 2020

34.3.1. Definition of appropriate indicators of attainment of targets

Key indicators were suggested for each stage of the M&E for each of three main areas of interventions: development of infrastructure, institutional development and agricultural development. Formats for the key indicators were formulated to guide the collection of data and so that specific progress at each level was recorded. Initially, indicators were based on the original logframe. In 2016, these were revised to reflect the five main development pathways identified in Blue Gold's Theory of Change (ToC).

34.3.2. Establishing the baseline surveys/situation

At the start of the program interventions, information was collected on the pre-implementation levels of each of the key indicators identified for each of the specific objectives of the project. This baseline provided a quantitative data set that guided project implementation and evaluation. It provided a benchmark for measuring a wide range of outcomes and impacts over the life of the project. In addition to assessing the prevailing socio-economic situation with a special emphasis on agricultural, fisheries and livestock production, it served as both a valuable information source for the program as well as a method for tracking the progress and outcomes of the Blue Gold Program. This served as the baseline data to be inbuilt

as a benchmark against which progress in putting in place the desired outcomes and levels of achievements of the objectives over time were measured during the implementation of the projects by regularly assessing the levels of achievement of some of the important indicators.

Blue Gold implemented the interventions in 22 polders in two rounds³. The majority of the first round of polders aimed to have relatively a low level of investment (termed ‘fine-tuning’ in the BWDB DPP) – so nine IPSWAM polders were included. The second round covered a wider spread of polders, the selection for which was finalised in 2015. Baseline studies were conducted in two phases using sample surveys. The Phase I Baseline survey was conducted in 2014 covering 9 polders and 1,400 households. And the Phase II Baseline survey was conducted in 2017 covering 7 polders as representatives of the balance of the 13 polders with interviews of 3,651 households. In the first phase 9 polders got the interventions while rest of the polder were from 2nd and 3rd phasing out polders. Both databases and reports are available in the MIS for the use of the stakeholders.

Table 34.1: Sample design of the baseline phase-I survey

| Zone | Polder | Village | Total HHs | Sample villages | Sample HHs |
|-------------------------|-----------|---------|-----------|-----------------|------------|
| Khulna | 22 | 12 | 2,768 | 25 | 600 |
| | 29 | 47 | 13,395 | | |
| | 30 | 31 | 6,511 | | |
| Total Khulna | | 90 | 22,674 | | |
| Patuakhali | 43/1A | 11 | 4,542 | 45 | 900 |
| | 43/2A | 14 | 8,133 | | |
| | 43/2B | 25 | 8,575 | | |
| | 43/2D | 21 | 9,593 | | |
| | 43/2E | 4 | 2,745 | | |
| | 43/2F | 12 | 6,457 | | |
| Total Patuakhali | | 87 | 40,045 | | |
| Total | 9 polders | 177 | 62,719 | 70 | 1,400 |

Table 34.2: Sample design of the baseline phase-II survey

| Zone | Polder | Mouza | Total HHs | Sample HHs |
|--------|---------|-------|-----------|------------|
| Khulna | 25 | 50 | 18,816 | 755 |
| | 31 Part | 14 | 4,196 | 169 |
| | 28/1 | 14 | 6,056 | 242 |

3 The first polders selected for Blue Gold interventions included nine IPSWAM polders: 22, 29, 30, 43/1A, 43/2A, 43/2B, 43/2D, 43/2E, 43/2F; plus three with no previous history: 26, 31-part and 2. The selection of the second round of ten polders was finalised in 2015, comprising 25, 27/1, 27/2, 28/1, 28/2, 34/2 part, 47/3, 47/4 and 55/2A and 55/2C.

| Zone | Polder | Mouza | Total HHs | Sample HHs |
|-------------------|------------|-------|-----------|------------|
| | 34/2 part | 23 | 11,227 | 448 |
| Patuakhali | 55/2A | 31 | 13,966 | 558 |
| | 47/4 | 12 | 11,853 | 474 |
| Satkhira | 2 & 2 Ext. | 50 | 25,077 | 1,005 |
| Total | 7 polders | 194 | 91,191 | 3,651 |

The reports on these studies include:

- 2015 TR 14: Socio-Economic Baseline Survey Report-Phase 1
- 2017 TR 23: Socio-Economic Baseline Survey Report-Phase 2

34.3.3. Regular performance monitoring of planned activities and expected outputs

In Blue Gold, outputs were considered as the immediate products and used to monitor the progressive achievement at WMG-level to check whether the project was meeting quality, quantity and timeliness targets. To collect and store output information relating to every water management group (WMG), a ‘WMG Tracker’ was developed (refer to Chapter 35 “Establishing a WMG Tracker”).

34.3.4. Monitoring and evaluating outcomes/results

A main purpose of M&E was to measure and assess performance to manage the development results - outputs and outcomes. M&E at this level, therefore, helped to improve performance and achieve results. It was one thing to implement activities and report about the many quantitative achievements, and another for these achievements to cause the necessary changes or livelihood improvements within the coastal communities. Outcomes of BGP were measured through the organisational development of WMOs as well as increases in agricultural production and profitability.

Participatory outcomes monitoring for WMOs

Refer to Chapter 35 “Self-assessment of WMG performance.”

Outcome surveys for monitoring and evaluation

Here we examine outcomes resulting using three different instruments: WMG outcome surveys, DAE agricultural data and earth observation data.

WMG outcome surveys 2018, 2019, and 2021

To evaluate the outcomes of BGP interventions through the changes in production and profitability resulting from changes in cropping patterns and improved farming at WMG level, BGP conducted series of WMG surveys in 2018 and 2019. In 2021, BGP team implemented another WMG survey, that made available data on the changes in production and profitability of main crops over the three seasons 2017/18, 2018/19 and 2020/21. An independent consultancy firm was responsible for data collection, analysis and reporting of these surveys.

Before carrying out the first full WMG survey, a pilot study was conducted in P2 in Satkhira and P43/2B in Patuakhali by the TA team and an independent economic analyst appointed by EKN. Based on the findings of the study of the two pilot polders, the study team made some estimates of changes in

profitability and income, along with suggestions for further data gathering and analysis to fill gaps in data from these two polders and for assessment of benefits in other polders of BGP. Along with this pilot study, BGP conducted a full phase study to understand the economic changes in all phase I & II polders (P22, P26, P29, P30, P43/1A, P43/2D, P43/2E and P43/2F, P31 Part, P43/2A, P43/2B, P55/2A, P55/2C and P2 & 2Ext.) except polder 2 & 2 Ext. and P43/2B as we had enough information of these two polders from the pilot study. The report on the 2018 WMG Survey was submitted in October 2018.

The WMG survey was repeated in 2019 with 509 WMGs in 22 polders. These surveys compared the pre-project with the present situation of the water management system, along with changes in land use and yields for the main crops, land tenure arrangements, employment and income generation in the three main seasons (rabi, kharif-1 and kharif-2). Based on this data Technical Reports TR 25 and TR 26 were prepared and shared with all stakeholders.

A final WMG survey was conducted in 2021. The rationale for planning another round of WMG survey were: WMG survey 2019 was conducted when 53% of the construction works were completed. BGP conducted the impact assessment/endline survey 2020. This survey was conducted when 72% of the construction works were completed. Data shows that the production of aman 2019 and boro 2020 were hampered significantly due to pest/disease attract and uneven weather conditions. So, with a bad production year in the endline survey was not able to cover the full outcomes and impact scenarios of BGP interventions. The 2021 WMG survey was therefore be extended to include all registered WMGs (509) of BGP and 1018 households (2 households per WMG) covering changes in household level in a normal production year compared with the start of BGP for a limited number of key indicators. As a result, along with earlier WMG surveys and end-line survey 2020, WMG survey 2021 will gave a complete outcomes and impact scenario of BGP interventions.

In the WMG surveys, the outcome indicators were carefully identified to enable the assessment of perceptions and responses of the target groups to the program activities and outputs. These surveys helped the implementers to understand the level of acceptance (adaptation) of the expected outputs among the communities of coastal areas. Outcome indicators therefore measured changes in responses of coastal communities particularly concerning the agricultural production and profitability of the specific interventions of BGP. The focuses were on the changes in production, profitability, income and employment generation through adopting new technologies. A thorough analysis of this information at this level showed whether the program was in the right direction or the strategies have some problems. The questionnaires, database of the surveys and all related reports are available in the MIS of BGP.

The reports on these studies include:

- 2018 TR 25: Improving the Productivity of Land in Coastal Bangladesh: Outcomes of Blue Gold Program Interventions 2013-2018
- 2019 TR 26: Improving the Productivity of Land in Coastal Bangladesh: Outcomes of Blue Gold Program Interventions 2013-2019
- 2021 TR 29: Improving the Productivity of Land in Coastal Bangladesh: Outcomes of Blue Gold Program Interventions 2013-2021

Comparative agricultural performance⁴

DAE, as one of the two implementing organizations, plays a vital role in increasing agricultural production and profitability through educating farmers on technologies for improved crop production and by utilizing

4 Using DAE production data collected at 'Block' level, the information was reorganized to provide data for the 22 Blue Gold polders over the period 2012-13 to 2020-21

the benefit of improved water management and organizational strength of the WMOs. DAE assembles agricultural data for administrative units, starting with 'Block level' (on average there are three Blocks per Union) where DAE Sub-Assistant Agricultural Officers (SAAOs) are responsible for data collection. The data is then aggregated at Upazila and District levels and reported to DAE's Director Field Services. This means compiling data from all Blocks within a specific polder, on an areal pro rata basis where the Block is divided between on one or more polders. BGP restructured those preserved data as a secondary source of information and analysed the data to compare practices and land utilization pattern, changes in cropping intensity and yield over the period 2012/13 to 2020/21.

Table 34.3: DAE data analysis of BGP polders

| | Analysis in 2021 (TR 28) | | | | | | | | | Upazila |
|-------------------|--------------------------|---------------|---------------|---------------|---------------|---------------|---------------|---------------|---------------|------------------------------|
| | Analysis in 2017 (TR 22) | | | | | | | | | |
| Polder | 2012/ 2013 | 2013/ 2014 | 2014/ 2015 | 2015/ 2016 | 2016/ 2017 | 2017/ 2018 | 2018/ 2019 | 2019/ 2020 | 2020/ 2021 | |
| Khulna | | | | | | | | | | |
| P22 | Y | Y | Y | Y | Y | Y | Y | Y | Y | Paikgacha |
| P26 | Y | Y | Y | Y | Y | Y | Y | Y | Y | Dumuria |
| P29 | Y | Y | Y | Y | Y | Y | Y | Y | Y | Dumuria, Batiaghata |
| P30 | Y | Y | Y | Y | Y | Y | Y | Y | Y | Batiaghata |
| P31-part | Y | Y | Y | Y | Y | Y | Y | Y | Y | Batiaghata |
| Satkhira | | | | | | | | | | |
| P2 and P2 Ext. | Y | Y | Y | Y | Y | Y | Y | Y | Y | Satkhira sadar & Assasuni |
| Patuakhali | | | | | | | | | | |
| P43/2A | Y | Y | Y | Y | Y | Y | Y | Y | Y | Patuakhali Sadar (PS) |
| P43/2D | Y | Y | Y | Y | Y | Y | Y | Y | Y | PS |
| P43/2E | Y | Y | Y | Y | Y | Y | Y | Y | Y | PS |
| 43/2B | Y | Y | Y | Y | Y | Y | Y | Y | Y | Galachipa, PS & Amtali |
| 43/1A | Y | Y | Y | Y | Y | Y | Y | Y | Y | Amtali |
| P43/2F | Y | Y | Y | Y | Y | Y | Y | Y | Y | Amtali |

In this analysis 12 polders were taken as representative of 22 polders of BGP. The selected polders were polder 2 & 2 ext. from Satkhira, polder 22, 26, 29, 30, 31-part from Khulna, and polder 43/1A, 43/2A, 43/2B, 43/2D, 43/2E, 43/2F from Patuakhali. The study covered 53 blocks under 8 Upazilas (see the table). These exercises have been done in two stages. In the first stage in 2017, BGP analyzed the data from 2012-13 to 2016-17 and prepared a report (TR 22). In the second stage in 2021, BGP updated the analysis that covered the whole project period 2012-13 to 2020-21 and prepared a report (TR 28). In the second stage an independent consultant was responsible to conduct the survey. The questionnaire, database of the surveys and all related reports are available in the MIS of BGP.

The reports on these studies include:

- 2017 TR 22: Agriculture Improvements/changes in Blue Gold Polders 2012-13 to 2016-17
- 2021 TR 28: Agriculture Improvements/changes in Blue Gold Polders 2012-13 to 2020-21

Remote Sensing/Earth observation survey

To evaluate the outcomes of BGP interventions through the changes in the agricultural productivity with cropping intensity and changes in the cultivated area as main indicators, BGP took another survey by making use of Earth Observation (EO) methods (combining Landsat and Sentinel-1). An efficient organisation on EO, Satelligence was contracted for doing this work. The objectives of this survey were 1) to create a baseline for agricultural productivity, 2) show changes in agricultural productivity - which could be related to BGP interventions, and 3) make agricultural productivity information accessible and understandable for the BGP technical team to use for further (intervention) planning. Performance of the polders was estimated for the start of BGP (2011-2015) and two years during the project (2017 and 2018). A report was prepared based on this remote sensing data and shared with all the stakeholders of the BGP.

To update this work BGP contracted another reputed organisation on EO, Terrasphere. They provided analysis and map of agricultural productivity to make a comparison between 2011 and 2020/21 for 22 polders of BGP. A report was prepared based on the analysis of the updated remote sensing data. The database of the surveys and all related reports are available in the MIS of BGP.

The reports on these studies include:

- 2018 Earth Observation for Monitoring and Evaluation of Blue Gold Interventions (2011-2017/18) (Satelligence)
- 2021 Satellite Mapping of Blue Gold Polders 2011-2021 (Terrasphere)

34.3.5. Monitoring and evaluating the impact of Blue Gold program

As the ultimate goal of the entire M&E process, the focus in impact assessment was to analyse the effects of the outcomes measured in relationship with the overall goals or development objectives. Impact M&E involves the application of information and data generated from the different stage of the outcome monitoring surveys to conduct an end of the project evaluation. With this data, an impact assessment/end-line survey was conducted in 2020. This data collected and analysed in comparison with the baseline information about actual effects of implementation of PWM of BGP on poverty and food security and a sustainable socio-economic development of the communities of Southwest Coastal Zone of Bangladesh.

34.4 Impact assessment/Endline survey 2020

The impact assessment/endline survey was designed to be follow-up to baseline surveys carried out in 2014 and 2017 to assess and measure 1) changes in agricultural and other livelihoods, income, food security, living standards for households benefitting from BGP; 2) Extent to which BGP has addressed major constraints faced by farmers and achieved its objectives; 3) Identify major problems that remain for farmers, including those that may stem from climate change; 4) Gather data on participation in community institutions and in water management, and assess possible factors that may motivate households to join WMGs. The investigation also highlighted the issue of gher as significant areas in the Khulna and Satkhira zones are occupied by gher and the effect of recent events (cyclone Amphon and COVID-19) on livelihoods and living standards. Another organization and independent consultant were responsible for data collection, analysis and reporting of this survey.

The impact assessment survey covered 9 polders from the 17 polders that were surveyed in of baseline-1 & 2. The impact survey used a panel sample⁵, interviewing the same households as those in the baseline survey. The table below shows the required sample. In total the impact survey covered 92 villages and mouzas from nine polders, with a target number of 4,111 sample households and a required minimum of 3,719 sample households.

Table 34.4: Sample design of the impact assessment survey

| Polder | District | Sample HHs | Interviewed HHs | Analysed HHs | |
|------------|--------------|--------------|-----------------|--------------|--------------|
| | | Target | Minimum | | |
| 25 | Khulna | 755 | 680 | 754 | 743 |
| 31P | Khulna | 169 | 169 | 166 | 162 |
| 28/1 | Khulna | 242 | 218 | 239 | 237 |
| 34/2P | Khulna | 448 | 403 | 433 | 431 |
| 2 & 2 ext. | Satkhira | 1,005 | 905 | 1,018 | 982 |
| 55/2A | Patuakhali | 558 | 502 | 534 | 529 |
| 47/4 | Patuakhali | 474 | 427 | 456 | 452 |
| 43/2B | Patuakhali | 240 | 216 | 234 | 230 |
| 43/2D | Patuakhali | 220 | 200 | 204 | 203 |
| | Total | 4,111 | 3,719 | 4,038 | 3,969 |

20 qualitative interviews were conducted in 9 polders (2 interviews from each polder except the polder 2 and 2 ext.) for in-depth understanding of the quantitative findings. Polder 2 and 2 ext. is the biggest polder in term of area and numbers of households. So, 4 interviews were conducted in this polder. Data was analysed by polder and zone (Khulna, Satkhira and Patuakhali), with further analysis by key parameters such as farm size and poverty/income levels. The questionnaire, database of the survey and the report is available in the MIS of BGP. The report on this study was issued as TR 27 Impact of the Blue Gold Program in May 2021.

34.5 Independence of M&E Reporting

One of the recommendations of the 2016 Annual Review Mission was that the TA team should pay greater attention to the collection and analysis of data to provide: evidence of economic changes for use by Annual Review Missions; increased knowledge and understanding of beneficiaries' responses to project interventions and adaptations; and quality-assured data for the Policy and Operations Evaluation Department (IOB) with material to carry out a post-project review of Blue Gold.

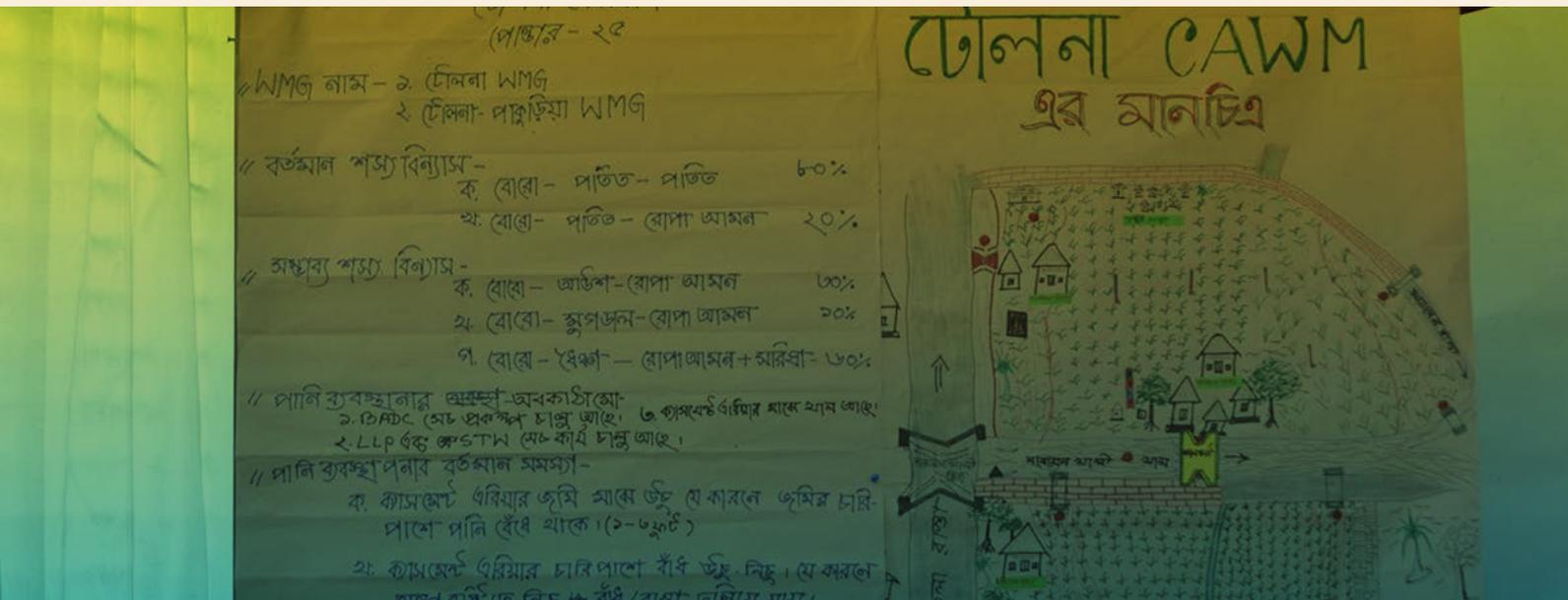
⁵ A panel sample also allows analysis to trace the impact for a group of households defined by a baseline parameter. For example, have the poorest households benefited?

To ensure impartiality and objectivity, the economic analyst is contracted by, and reports directly to, EKN Dhaka. The independence of the economic analyst from the TA team has been an important modality in achieving the acceptance of the analysis and reporting by the implementing agencies BWDB and DAE.

Another degree of independence has been achieved by using external organisations to carry out the field surveys. The use of polder-based TA staff (now termed Community Development Facilitators) as enumerators was identified as a potential conflict of interest⁶ and resulted in a decision to contract external organisations to carry out field data collection.

The international economic analyst (Edward Mallorie) carried out fieldwork in Blue Gold polders with the national TA M&E Expert (Dr Sharmin Afroz) in May 2018, through which an effective and complementary working relationship has developed. This complementarity creates a powerful combination of high level analytical and reporting ability, detailed local socio-economic knowledge and interpretation of events which is well placed to identify, portray and explain trends as polder communities respond to the complex mix of economic, weather events, market forces, and personal circumstance.

6 Because the role of CDFs is to empower the polder communities, their relationship is often complex, multi-faceted with a great deal of co-dependence. For this reason, the impartiality of the CDFs when collecting data from their communities could be compromised.



35 Management Information System

Chapter 34 'Monitoring and Evaluation' describes the role of monitoring and evaluation (M&E) in assisting strategic planning and management. Chapter 35 aims to complement the earlier chapter by describing the background leading to the emergence of a WMG tracker in 2016/17 as a response to:

- a growing capacity of WMGs in four key areas: economic development, water management, organisational management and capacity development
- recognising the value of a dashboard to monitor the adoption of Blue Gold norms by individual polders
- the value to the TA team of hands-on health checks conducted with specific WMGs; and
- the positive response from water management organisations to participatory monitoring and eventually to self-assessment

The final sections of this chapter account for the development of a polder dashboard to provide an overview of the progress of individual polders towards the goals of the Blue Gold Program, and how 'health checks' of WMGs gave insights into progress, achievements and challenges, and allowed project resources to be targeted more effectively and efficiently. And finally, a discussion about arrangements for the continuation of self-assessments by WMGs after the project.

35.1 Background

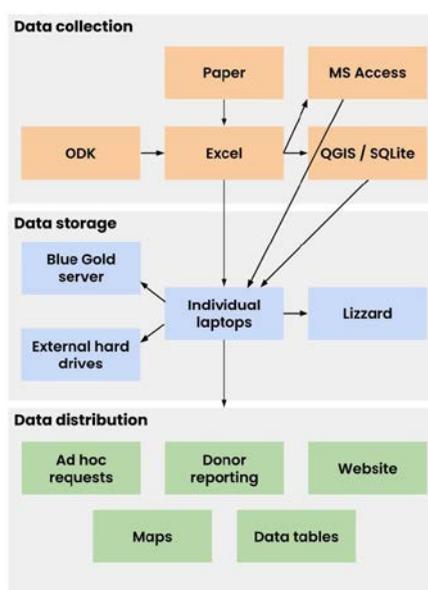
The original main purpose of monitoring and evaluation (M&E) in Blue Gold was to monitor and evaluate progress and achievements against key performance indicators of the program at output and outcome levels, with the aim of enhancing evidence to use in planning and management of the program. Information on, and the progress of different activities was collected by technical assistance (TA) sub-teams - then known as 'components' - who analysed the data and presented progress and shortcomings against the targets set in the Annual Work Plan - which in turn was based on the project logframe.

From the outset, data related to the different TA activities were collected - at output level as well as at outcome level. This data was then compiled and analysed, and reports were prepared:

- TR06 household surveys for P22, P30, P43/2D and P43/2F (31 Mar 2014)
- TN07 FFS Cycle 4 benchmark and end data: Mar-Sep 2015 (23 Dec 2015)
- TR14 Phase I Socio-Economic Baseline Survey Report (28 Dec 2015)
- Master Files¹ with geography, present situation, economic sectors and potential value chains for P2, P22, P26, P29, P30, P31-part, P43/1A, P43/2A, P43/2B, P43/2D, P43/2E and P43/2F (various dates from Jun 2014 to Sep 2018)

Figure 35.1 shows how data was collected, stored and distributed before the introduction of a digital management information system (MIS). The data were collected on paper and entered into spreadsheets, and were then analysed by specific individuals. Access to information by other project stakeholders was only then available through project reports, as processed data.

Figure 35.1: M&E data management system prior to MIS



The international economic analyst (Edward Mallorie) carried out fieldwork in Blue Gold polders with the national TA M&E Expert (Dr Sharmin Afroz) in May 2018, through which an effective and complementary working relationship has developed. This complementarity creates a powerful combination of high level analytical and reporting ability, detailed local socio-economic knowledge and interpretation of events which is well placed to identify, portray and explain trends as polder communities respond to the complex mix of economic, weather events, market forces, and personal circumstance.

35.2 Establishing a WMG Tracker

In August 2016, as part of a refocusing of the scope of the monitoring, reflection and learning team, an activities plan¹ was prepared and discussed with the 2016 Annual Review Mission (ARM). This included a prototype WMG tracker which had been developed in September 2016. During its visit in October 2016, the ARM recommended that the strengthening of WMOs should “be supported with an adequate MIS system”, and that the TA’s prototype WMG tracker should be converted to a dashboard type MIS with target setting that is open access, with quarterly reports from the MIS provided to all stakeholders. (Recommendations 2.3 and 4.4)

A provisional format for data collection for the WMG Tracker was prepared in January 2017 and given to polder teams for a trial. WMG data was collected by TA polder-level staff, Community Development

¹ The Master Files on these 12 polders were incorporated into the Polder Development Plans (PDPs). For the remaining 10 Blue Gold polders the information assembled for the Master Files was published only in the PDPs.

Facilitators (CDFs). Steps to overcome a difficulty with accurate data entry were agreed in March/April 2017 and the revised format was finalized in May 2017. A first report on the WMG Tracker^[2] for the period up to June 2017 was issued in November 2017. WMG tracker data continued to be collected by CDFs on a quarterly basis for each of the Blue Gold WMGs.

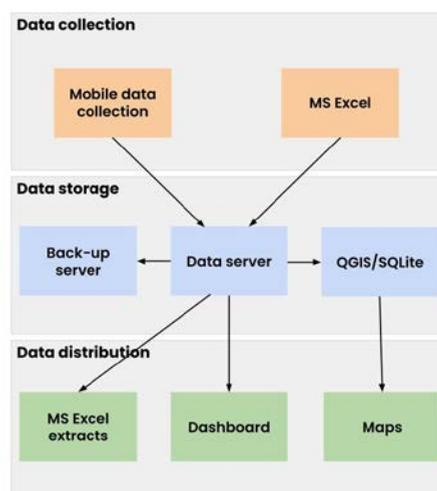
35.3 Management Information System (MIS)

A vast amount of data is collected from the WMG Tracker and from field surveys and the participatory monitoring system. A rationalisation of the systems for data collection and management aimed to collect and store data from different sources at one location (a central server), which would allow better analysis and data presentation to aid decisions for project implementation. The main objectives of the Blue Gold MIS were therefore to:

- Collect and store information collected by the program in one place/server
- Standardise the information collected by the project
- Present the data in standard reports that can be shared with program partners; and
- Make the MIS accessible so that interested users can obtain and analyse data
- The ultimate aim of providing a consistent set of data for analysis, data presentation and reporting, was to facilitate informed, timely and evidence-based project decisions

Figure 35.2 shows the proposed M&E data management system, in which data collected through electronic device are stored in a single location, the server where data can be analysed and presented in an MIS dashboard. In addition, data can be downloaded from the server in MS Excel for further analysis as may be required – all stakeholders have real time access to data and the dashboard without having to wait for a report to be generated.

Figure 35.2: Digital Management Information System



35.4 MIS Design and Development

In March 2017, Blue Gold contracted mPower Social Enterprises of Dhaka, to develop an MIS platform. Their specialist team included system design and database analysts, mobile and web app developers and quality assurance engineers. During the inception phase for mPower's project, the technical data requirements of Blue Gold stakeholders were mapped and the project activity chain was agreed. Proposed features of the MIS platform included customizing Open Data Kit (ODK) software so that data could be collected through android devices, and uploaded into a custom-made, cloud-based data collection system with a visual reporting dashboard at the front-end.

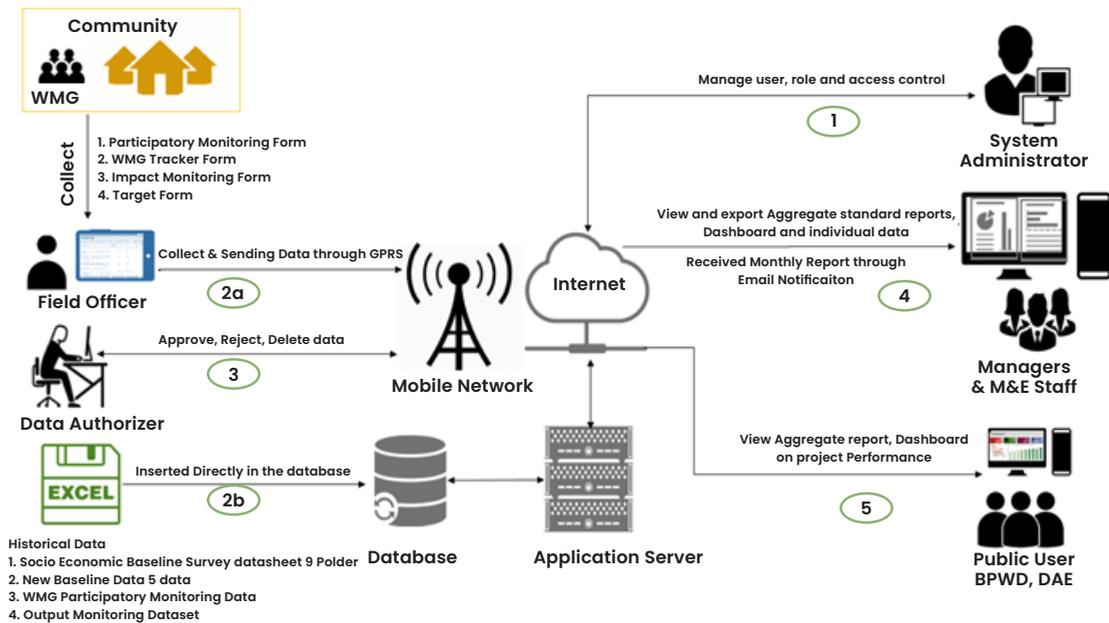
The MIS system (see Figure 35.3) was ready in October 2017, and output results from the WMG tracker were first presented to BWDB during a workshop on 25th October 2017. Training in the design and use of the database was then provided to staff of BWDB and DAE both in Dhaka and in field offices. The MIS system was used from June 2017 to June 2019, when the collection of data was discontinued because of the expectation (in June 2019) that there would be staffing reductions in preparation for closure of the program at end-June 2020.

Box 35.1: An overview of the MIS system

Blue Gold’s MIS system is a mobile, web-based solution with built-in forms for the collection and combination of historical data (from previous data sets), baseline data, WMG tracker data, participatory monitoring as well as outcome and impact assessment data. Data is entered through an android-based mobile application using standardised forms which – after completion – can be saved locally and reviewed and then submitted to the server.

Users are able to view and export raw data and review reports. Those with administrative user rights are able to create, assign, edit and build new functions into the system. Data required for reporting can be exported imported into the M&E database from the MIS, providing a quick and simple way to share the data without disrupting the proven MIS processes. All M&E databases and reports are available in the MIS. The MIS can also be linked to a GIS-enabled solution so that information can be depicted graphically on a cadastral map, with interrogation possible at division, District, Upazila, Union and WMG level.

Figure 35.3: An overview of the MIS system



35.5 MIS Results Reporting

One series of working papers, WP9, presented an analysis of information of data collected through the WMG Tracker. They provided evidence of growing WMG capacity in four key areas: economic development, water management, organizational management and capacity development.

| | | |
|------------------|-------|-----------------------------------|
| 22 November 2017 | WP 9A | WMG Tracker Report-June 2017 |
| 15 April 2018 | WP 9B | WMG Tracker Report-December 2017 |
| 20 June 2018 | WP 9C | WMG Tracker Report-March 2018 |
| 27 August 2018 | WP 9D | WMG Tracker Report-June 2018 |
| 26 January 2019 | WP 9E | WMG Tracker Report-September 2018 |
| 20 February 2019 | WP 9F | WMG Tracker Report-December 2018 |
| 16 May 2019 | WP 9G | WMG Tracker Report-March 2019 |
| 30 October 2019 | WP 9H | WMG Tracker Report-June 2019 |

BWDB's Project Coordinating Director (PCD) used the dashboard, analysed and cross-checked data, and monitored the activities and progress of WMGs. He used information from the dashboard in preparing articles for publication in newspapers, making presentations, and shared information on WMOs with other BWDB officials.

35.6 WMG Tracker Closure

Plans to discontinue the WMG tracker were made during 2019, as part of a gradual phasing out of TA staff in expectation of project closure at end-December 2020, and with reductions in TA polder-level staffing (the staff who collected the raw data) planned at end-December 2019, and in the absence of a stakeholder willing to take over its management. The final report was issued in October 2019 based on information collected from April to June 2019.

35.7 Polder Dashboard

To provide an overview of the progress of individual polders towards the goals of the Blue Gold Program, ten proxy indicators were identified from project monitoring tools to represent the four broad thematic areas towards empowering WMGs:

- overall achievement
- organisation
- water management, and
- economic development

For each of the ten indicators, targets were set for achievement by end-June 2020 but without defining the modality, thus freeing polder teams to select implementation arrangements which best suited the local environment, in other words, providing 'a clear destination' but with some flexibility as to how to get there. Figure 35.4 provides an example of a dashboard summarising results as of June 2019. A short note accompanied the dashboard to identify actions required to achieve the targets, and to identify the achievements for each polder and to recommend corrective actions (for example, see the note dated September 2019).

The polder dashboard was in use from December 2018 to September 2019 but discontinued when information for the WMG tracker - from which some of the proxy indicators were derived - ceased to be collected from end-September 2019.

Figure 35.4: Polder Dashboard to end-June 2019

| Targets | | Cumulative achievement against BGP target as per 30/09/2019 per polder | | | | | | | | | | | | | | | | | | | | | | | |
|----------------------|--|--|--------|--------------|--------------|--------------|--------------|-----------|-----------|-----------|-----------|--------------------------|----------------|--------------|--------------|--------------|--------------|-----------|-------------|-------------|-------------|-------------|------------------|-------------|-------------|
| Sl. No. | Average cumulative polder targets by June 30, 2020 | source of verification | Unit | Polder 43-2D | Polder 43-2F | Polder 43-1A | Polder 43-2E | Polder 22 | Polder 30 | Polder 26 | Polder 29 | Polder 2 and 2 extension | Polder 31 part | Polder 55-2A | Polder 55-2C | Polder 43-2A | Polder 43-2B | Polder 25 | Polder 27-1 | Polder 27-2 | Polder 28-1 | Polder 28-2 | Polder 34-2 part | Polder 47-3 | Polder 47-4 |
| Overall | 1 | 70% functional WMGs | % | 93% | 70% | 71% | 58% | 92% | 73% | 47% | 64% | 81% | 50% | 93% | 94% | 55% | 75% | 2% | 0% | 0% | 0% | 8% | 0% | 0% | 22% |
| Organisation | 2 | 70% WMGs engage in water management-related activities jointly with government and non-government agencies and LGIs (UP) | % | 72% | 37% | 86% | 67% | 75% | 73% | 27% | 61% | 63% | 0% | 21% | 25% | 55% | 54% | 2% | 0% | 17% | 8% | 0% | 0% | 22% | |
| | 3 | One O&M agreement in each Polder signed between BWDB and WMA(s) | yes/no | Yes | Yes | Yes | Yes | yes | yes | yes | yes | no | yes | Yes | Yes | no | Yes | no | no | no | no | no | no | no | |
| | 4 | Active Community based Service Providers (FT, CAHW, RF, RP etc.) in 70% WMGs | % | 100% | 100% | 100% | 100% | 100% | 100% | 100% | 100% | 100% | 100% | 100% | 93% | 100% | 100% | 100% | 100% | 100% | 100% | 100% | 100% | 100% | |
| | | | | | | | | | | | | | | | | | | | | | | | | | |
| Water Management | 5 | 20% of the total value of earthwork in the polder is carried-out by women through LCS | % | 16% | 15% | 11% | 30% | 15% | 16% | 17% | 10% | 8.03% | 14% | 6% | 11% | 14% | 14% | 4% | 0% | 0% | 1% | 3% | 6% | 6% | |
| | 6 | 1 CAWM per two sluice catchments (i.e. 50%) ² | % | 24% | 19% | 80% | 0% | 100% | 10% | 17% | 18% | 67% | 29% | 46% | 86% | 83% | 50% | 70% | 20% | 33% | 0% | 33% | 43% | 23% | |
| | 7 | 50% of the Sluice Catchments managed by a WMA O&M sub-committee with a basic and up-to-date Catchment Management Plan (less than 1 year old) | % | 100% | 100% | 100% | 100% | 100% | 100% | 100% | 100% | 100% | 100% | 92% | 100% | 100% | 100% | 50% | 0% | 0% | 0% | 56% | 100% | 100% | |
| Economic Development | 8 | 30% of WMG members are involved in an economic collective activity | % | 100% | 41% | 56% | 100% | 34% | 30% | 6% | 47% | 100% | 14% | 100% | 100% | 30% | 16% | 5% | 10% | 11% | 18% | 28% | 33% | 56% | 100% |
| | 9 | 40% of polder population reached with modern agricultural technologies | % | 76% | 72% | 63% | 89% | 100% | 87% | 77% | 58% | 99% | 100% | 100% | 100% | 32% | 30% | 28% | 44% | 54% | 35% | 39% | 86% | 100% | |
| | 10 | 70% of WMGs report that about 50% or more male and female farmers of the area have adopted modern agricultural technologies for crop cultivation | % | 86% | 100% | 100% | 100% | 100% | 80% | 100% | 100% | 100% | 94% | 0% | 93% | 94% | 36% | 71% | 46% | 67% | 50% | 42% | 0% | 0% | 33% |

35.8 Polder "Health Checks"

In addition to the quantitative data obtained on polder and WMG performance, qualitative polder “health checks” have been carried out by multidisciplinary teams of TA staff (see example output in Table 35.1). These health checks were intended as a third-eye, qualitative assessment, which in combination with quantitative project data, provides insight into progress, achievements and challenges in specific polders, and help the team to target project resources more effectively and efficiently.

Table 35.1: Health Check for Polder 29 WMG

| Topic | Snap shot of discussion | Outcome & Remark |
|----------------|---|--|
| Goal | Members think WMG is for achieving something jointly. They gave emphasis to water management for development. | This is an organisation based on a temple. It is a close-knit community. Whatever, the goal, they focused mostly on unity. |
| Leadership | It is a close-knit temple committee. Same leadership since 2005. | Members think they are well consulted. They are happy with leadership. Seems mostly democratic. |
| O & M | They performed collective actions for improved water management. | Collected BDT 4,150 yearly from members. When needed they employ self-labor and raise fund. |
| Networking | Sound knowledge about potential support they can get from DAE, DLS and LGIs. | It seems that leadership is well-shaped to network with GoB organisations and LGIs. |
| Sustainability | They are very confident about sustaining as WMG. They have been working as a coherent group since 2005. | They are more a temple committee who are ready to work jointly to solve any problems; WMG is just a label for them. |
| Functionality | They have the potential to evolve / sustain. | Leadership & members need to strengthen vision. |

35.9 Participatory Monitoring

Through participatory monitoring of both WMGs (from October 2016 to October 2019) and WMAs (from May to October 2019), WMGs and WMAs had rich experience of using monitoring information to make decisions. Working papers WP8 are a series of reports using information collected through participatory monitoring at WMG level to present self-assessments by WMGs of their performance against potential targets at outcome level – and actions required to move towards full achievement of the targets.

| | | |
|-----------|-------|---|
| 28-Feb-17 | WP 8A | Participatory Monitoring October - November 2016 |
| 20-Nov-17 | WP 8B | Participatory Monitoring April- May 2017 |

| | | |
|-----------|-------|--|
| 07-Apr-18 | WP 8C | Participatory Monitoring October -November 2017 |
| 24-Jul-18 | WP 8D | Report on Participatory Monitoring April/May 2018 |
| 26-Jan-19 | WP 8E | Report on Participatory Monitoring October 2018 |
| 10-Jul-19 | WP 8F | Report on Participatory Monitoring April 2019 |
| 15-Dec-19 | WP 8G | Report on Participatory Monitoring October 2019 |

Working papers WP10 use information collected through participatory monitoring at WMA level to present self-assessments by WMAs of their performance against potential targets at outcome level.

| | | |
|-----------|--------|---|
| 05-Aug-19 | WP 10A | WMA Participatory Monitoring to May 2019 |
| 24-Dec-19 | WP 10B | WMA Participatory Monitoring to October 2019 |

35.10 Post-Project Monitoring

Whilst the closure of the WMG tracker was because of resource constraints within the TA team, WMAs - the key players for polder water management - had indicated their interest in continuing to operate and use a streamlined version of the self-monitoring system beyond the end of TA involvement. In addition, a meeting held on 20th August 2019 with representatives of EKN/BWDB/TA supported the continuation and suggested that the views of potential stakeholders and options for handover should be examined. During this review, BWDB's Chief Water Management (CWM) and WMO representatives agreed that the monitoring should continue, but because of resource constraints, CWM requested that WMOs take the major responsibility for data collection and management. The WMOs were willing, but unable to handle large amounts of data. To minimise data processing and reporting, an ICT-based data collection and reporting system was proposed, with WMGs and WMAs collecting and entering data on their status and performance.

35.11 Self-assessment of WMG performance

WMAs and WMGS are familiar with the process of participatory monitoring. For three years (from October 2016 to October 2019), WMAs and WMGs have assessed their progress and performance against potential development targets - and have used this information in meetings to decide on interventions to lead to a full achievement of those targets. During this participatory monitoring, Blue Gold worked with the WMOs to evolve the process and to observe how the output was used to encourage internal reflection by the WMO - with actions corresponding with the targets. With this experience, there is reasonable confidence that WMOs will continue the self-monitoring using the mobile App. The presence of the TA team in 2020/21 (at a reduced level) will allow some hands-on assistance to establish a quarterly monitoring routine - led and owned by the WMAs.

In January 2020, an IT solution provider, mPower Social Enterprises of Dhaka², was contracted to develop a web-based system for collating and organising data about the status and progress of activities collected and entered by WMGs and WMAs - and for it to be automatically uploaded to a web-platform. The system has been designed so that WMOs can collect data through, and view results in Bangla on, their mobile phones. The mobile application is used for data collection each quarter. Through self-monitoring, the WMAs and WMGs are able to examine their performance in three key areas of their organizations:

- Legality – Does the WMA, and its constituent WMGs, still comply to the formal requirements of its registration: are there timely elections, are accounts ready for audit, are annual general meetings (AGMs) held?
- Legitimacy – is the WMA recognised within the polder; does it represent 70% of active WMGs and well-connected to LGI, BWDB and others?
- Functionality – Does the WMA do what it is set-up for: ensure catchment management plans are current, and that water management activities are carried out?

The performance assessments are colour coded, and WMAs can also access status reports of their constituent WMGs as well as the status reports of other WMAs (for purposes of comparison).

At the time of writing (in March 2021), two rounds of WMO self-assessment have by been conducted using the IT-based mobile application, and a third is planned for Q1 2021. All WMOs were trained in the use of the App, and most WMOs - 35 out of 36 WMAs and 507 out of 511 WMGs - participated in the self-monitoring exercise. The feedback from the WMOs has been mostly positive, they find the system simple and intuitive. The two main challenges were that: (a) the App couldn't be installed on some of the WMO mobiles because the configuration was incompatible; and (b) the signal from the mobile network was not always sufficiently strong to operate the App.

The polder teams have reviewed the monitoring results with a number of WMAs and WMGs during meetings for other purposes, during which they encourage the WMOs to reflect on the results and plan follow-up actions. From March 2020 and through the first half of 2021 (when permitted by government restrictions to minimise the spread of COVID), WMA capacity building workshops used the self-monitoring outcomes to help WMAs analyse their strengths and the areas for improvement.

Reports (in English) on the findings of the first two self-monitoring exercises are available in the File Library:

| | | |
|-----------|--------|-----------------------------|
| 28-Dec-20 | WP 11A | WMO Self-Monitoring Q3-2020 |
| 25-Mar-21 | WP 11B | WMO Self-Monitoring Q4-2020 |
| | WP 11C | WMO Self-Monitoring Q1-2021 |

² mPower Social Enterprises had worked earlier with Blue Gold in developing the overall MIS system so were already familiar with the project and its aims and objectives.

References

- [1] Monitoring, Reflection and Learning Plan. Working Paper 6. Euroconsult Mott MacDonald. August 2016.
- [2] WMG Tracker Report – to June 2017. Working Paper 9A. November 2017.



36 Environmental Due Diligence

Environmental legislation, such as the Bangladesh Environment Conservation Act, 1995 (amended in 2002) requires that development projects obtain environmental clearances from the Department of Environment (DoE). Under the Environment Conservation Rules 1997 (updated in 2002 and 2003), projects which include construction and expansion of flood control embankments are categorised as ‘Red’, and must have an Environmental Impact Assessment (EIA) study in order to obtain an environmental clearance certificate. The construction works in coastal polders under Blue Gold fall into this ‘Red Category’, and therefore EIA studies were mandatory.

36.1 Objectives of EIA Studies

The objectives of EIA studies were to assess the environmental aspects of proposed rehabilitation interventions, specifically by:

- Preparing an environmental and social baseline of the project area
- Assessing potential environmental impacts as well as cumulative, induced and reciprocal impacts for the proposed interventions;
- Identifying mitigation measures to minimise the negative impacts and enhance the positive impacts; and
- Preparing an Environmental Management Plan¹ which included mitigation and enhancement plans, compensation and contingency plans and a proposal for monitoring activities.

¹ Environmental Management Plan provides plan for the pre-construction, construction and operation phases against the impacts on the IESCs pertaining to water resources, land and agriculture resources, fisheries resources, ecological resources and socio-economic conditions together with a necessary monitoring program.

36.2 Process for Obtaining Environmental Clearances

Guidelines for preparing EIAs for water sector projects were developed by the Flood Planning Coordination Organisation (FPCO) in 1992 and updated by the Water Resources Planning Organisation (WARPO) in 2003. The 1997 guidelines formulated by the Department of Environment (DoE) mainly concerned industrial projects and were of limited relevance to Blue Gold activities. For the purposes of Blue Gold, WARPO's EIA guidelines were adopted, for which the following information was presented in the EIAs:

- Feasibility study
- Initial Environmental Examination
- Environmental Impact Assessment (EIA) report which fully addresses the terms of reference approved by DoE
- Environmental Management Plan (EMP)
- No Objection Certificate (NOC) from the respective Union Parishad.

Environmental Impact Assessments (EIAs) were prepared for each polder.² The BWDB Program Coordinating Director (PCD), in his capacity as the authorised representative of the lead implementing agency, was responsible for submitting the EIAs to the Dhaka headquarters of the Department of the Environment (DoE), which then assigned responsibility to the appropriate DoE divisional office in Khulna and Barisal to review the EIAs, conduct physical verifications, and hold consultation meetings with stakeholders. A positive report on the environmental and socio-economic impact by the DoE divisional office, allowed DoE Dhaka to issue an Environmental Clearance Certificate (ECC).

36.3 EIA Preparation

The responsibility for preparing the Environmental Impact Assessments (EIAs) was assigned to the Centre for Environmental and Geographic Information Services (CEGIS) for the first 12 polders³ during 2015/16. CEGIS was responsible for the whole process of preparing and submitting the EIA to DoE, and obtaining the ECC.

| EIAs Conducted by CEGIS | |
|-------------------------|----------------|
| Khulna | |
| 22 | September 2015 |
| 26 | June 2016 |
| 29 | June 2016 |
| 30 | September 2015 |
| 31 Part | June 2016 |
| Patuakhali | |
| 43/1A | April 2016 |
| 43/2A | June 2015 |
| 43/2B | April 2016 |
| 43/2D | June 2015 |
| 43/2E | April 2016 |
| 43/2F | June 2015 |
| Satkhira | |
| 22 | June 2016 |

² With the exception of Polder 27/1 and 27/2, the EIA for which covered both polders.

³ P2, P22, P26, P29, P30, P31-Part, 43/1A, 43/2A, 43/2B, 43/2D, 43/2E and 43/2F

During 2019/2020, BWDB's Directorate of Planning -3 (DP-3) office carried out the fieldwork and prepared EIAs for the remaining 10 polders.⁴ The role of BWDB's DP-3 office included fieldwork, reporting, preparing and submitting the application and documentation to DoE, and defending the submission at the DoE office in Dhaka.

| EIAs Conducted by BWDB | | |
|-------------------------------|-----------|--------------|
| Khulna | | |
| 6 | 25 | August 2020 |
| 7 | 27/1 | January 2020 |
| 8 | 27/2 | |
| 9 | 28/1 | January 2020 |
| 10 | 28/2 | January 2020 |
| 11 | 34/2 part | January 2020 |
| Patuakhali | | |
| 18 | 55/2A | January 2020 |
| 19 | 55/2C | August 2020 |
| 20 | 47/3 | August 2020 |
| 21 | 47/4 | August 2020 |

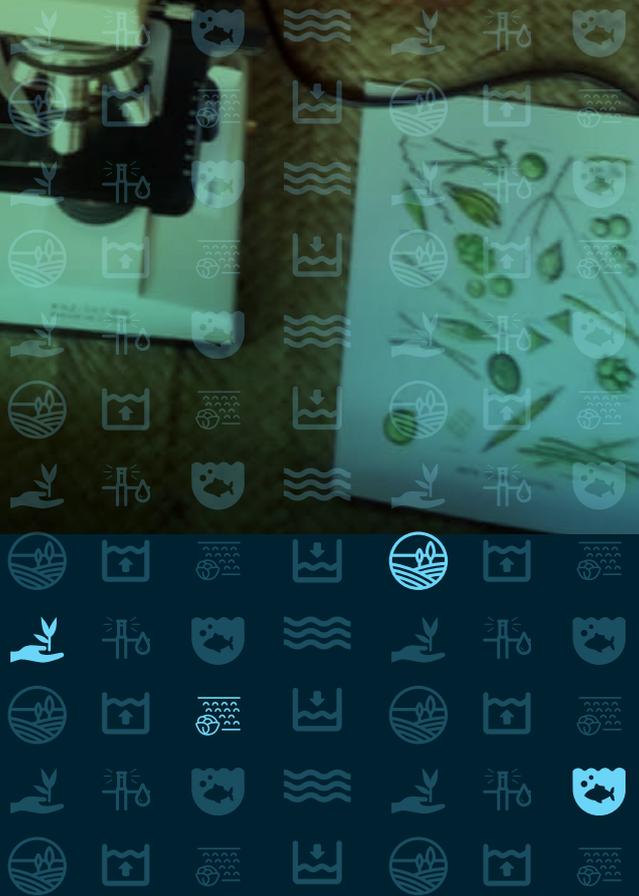
The advantage of this second modality is that the implementation of the environmental management plan, adherence to conditions stipulated by DoE and monitoring of environmental compliance are more strongly embedded within BWDB. Future arrangements for institutionalising this function in BWDB are summarised below.

A government department can form a separate EIA cell and obtain DoE's concurrence to conduct an EIA. The cell should - in accordance with 2003 WARPO guidelines - include a water resources engineer, environmentalist, agriculturist, fisheries biologist, socio-economist, GIS Specialist and field researchers. Under the leadership of the BWDB program/project director, the EIA cell could be assigned the study, and be responsible for all aspects of the fieldwork and reporting through to obtaining the DoE ECC.

4 P27/1 and P27/2, P28/1 and P28/2, P34/2, P55/2A, P55/2C, 25, 47/3, 47/4



Section H Innovation Fund



Section H

Innovation Fund

Summary

The €2.45 million Blue Gold Innovation Fund (BGIF) supported the Blue Gold Program (BGP) to establish Participatory Water Management (PWM) and strengthened value chains. The BGIF funded 42 projects that proposed innovative approaches and new initiatives for the socio-economic development of BGP's intervention areas. The solutions considered, therefore, contributed to BGP's outcomes.

The objective of the BGIF was to promote the introduction and application of innovations, both technological and conceptual. Each innovation has to be relevant to the beneficiary communities of both the Blue Gold Program, and that of the applicant implementing agencies.

Some of these innovations were adopted from other projects and organisations working in Bangladesh, with Dutch knowledge institutions and private sector enterprises. The BGIF tested the relevance and effectiveness of these innovative concepts in their application and scale-up.

H.1 BGIF applicants

- **Large organisations:** produced good proposals, but they did not necessarily understand the context of BGIF. These proposals thus held no promise of realistic implementation
- **Academic organisations:** very enthusiastic and keen to pilot abstract concepts
- **Small organisations:** effective implementers with strong local networks, but weak in proposal development

Potential applicants to the BGIF were alerted of details, news, and knowledge of previous successful applicants primarily through the BGP website. Other sources of information included: announcements on sector relevant platforms, special events, newsletters, videos, and project booklets.

H.2 Lessons learnt

- **External communications on details of the fund should have been prioritised** at the operations stage of the project in order to encourage the involvement of agricultural development practitioners
- **Horizontal Learning (HL) between BGP and BGIF projects should have been facilitated more.** BGIF projects, when harmonised with the objectives of the BGP, ensured greater learning opportunities for development programmes in the southwest region
- **Consortia-led projects proved to be most effective.** Solicited calls for specific types of larger contracts effectively engaged more local and international organisations in submitting concept notes. The most successful projects were implemented by consortia. They were led by international NGOs, or Dutch companies, with local implementing agencies operating in the field. Both parties learnt how to clarify needs, concepts, and approaches from each other

- **Mapping of context, constraints, and uncertainties at an earlier stage would have generated greater impacts.** The BGIF should have been clearly marked as an integral part of BGP to ensure applicants targeted BGP outcomes through their innovations. This would have been supported by the BGP itself, planning activities with an innovation fund from its inception. Clarifying what constitutes as innovative in such a programme would have generated more focussed ideas. Practitioners from a broader range of organisations in the coastal zone would have been able to participate at an earlier stage in that case. The planning should also have mapped uncertainties and gaps, and how to circumnavigate activities through that. This could then have allowed applicants to define activities more clearly. More budget should have been retained for BGIF applicants and team members to familiarise themselves with local conditions and problems
- **Overhead and management costs are reduced if expertise is shared.** The advice of experts from the BGP team meant reduced management costs for BGIF. This also established strengthened linkages between BGPIF and BGP
- **There should be guidelines for projects to change activities when necessary.** It was almost natural for innovation projects like those funded by the BGIF to be unable to implement all activities proposed during the planning phase. This conundrum required flexibility from both implementing agencies, and funds from managers. Problems arise when either party is too rigid and therefore become unable to react to threats and opportunities. The BGIF had attempted to avoid these pitfalls with contract addenda. These addenda attempted to compromise where entirely necessary, and ensured the efficient implementation of the grant.



37 Purpose, fund evolution and management

37.1 Blue Gold Innovation Fund

The Blue Gold Innovation Fund (BGIF) was created as an instrument to accelerate the development process in the geographical area of the Blue Gold Program. It financed innovative approaches and new initiatives to socio-economic development. Innovations submitted to the BGIF were expected to contribute to the outcomes of the Blue Gold Program; The impact was expected to be mostly locally or regionally centred.

An original allocation of €4.4 million (ref Program Document, August 2012 - Section 5.2.5 pp 60/61) was made for “services providers under the Water Innovation Fund of approximately € 2.4 million and the Productive Sectors Innovation Fund of approximately € 2 million,” In the Technical Assistance (TA) contract (February 2013), this was adjusted to €2.4 million for the Water Innovation Fund and €1.9 million for the Productive Sectors Fund.

As one of the outcomes of the 2016 Blue Gold Annual Review Mission, internal transfers were made between budget heads of the TA contract which resulted in a reduction in the amount available to the Blue Gold Innovation Fund (BGIF) to a total of € 2.45 million. This was divided into two separate funds: Water Innovation Fund with a budget of € 1.4 million, and a Productive Sectors Fund with a budget of € 1.05 million (focusing on agricultural production and food security). From 8th December 2017, a separate Water Management Knowledge and Innovation Program¹ (WMKIP) with an action research fund of €1.4 million (approximately) to be disbursed over a three year period, was created under the jurisdiction of EKN, managed by Deltares, an independent institute for applied research in water, based in Delft, the Netherlands, in association with the Institute of Water Modelling (IWM). a Bangladeshi organisation which carries out research, planning and technology transfer related to water management projects. Other knowledge institutions in Bangladesh and the Netherlands were to be involved in the program, with the aim of strengthening their cooperation in applied research and innovation. WMKIP's overall objective

1 WMKIP Bangla Delta. <https://mybangladelata.wordpress.com>

was to make an “effective contribution to the medium- and long-term development goals for the southern coastal region, through tested and sustainable water management innovations, knowledge development and participatory action research.”

To support the WMKIP objective, four innovation themes were defined, focusing on the key challenges and opportunities in the southern coastal areas, and including one cross-cutting theme:

- Theme 1: Drainage Improvement; addressing the key issue of waterlogging
- Theme 2: Enhanced Operational Water Management and Monitoring; in support of more effective and efficient water management at polder level
- Theme 3: River and Embankment Management and Protection; to develop solutions for river siltation and embankment erosion; and
- Cross-cutting Theme: Participatory Water Management; aimed at fostering sustainable and equitable water management.

WMKIP's initial fast track projects carried forward initiatives started under the Blue Gold Program, including an action research project for pumped drainage in Polder 2, a typology for river management, the use of water apps to enhance operational water management, and the use of composite materials in regulator gates.

37.2 Evolution of the Fund

The Innovation Fund has been subject to a number of changes since its inception: in addition to a reduction in the budget allocation from € 4.4 million to € 2.45 million in early 2017, approaches to the procurement, design and implementation of BGIF projects evolved as a result of experience and external influences.

The general objective and approach were captured in the project document (28 February 2012) as follows:

“The Program will promote the introduction and application of innovations, both technological as well as conceptual innovations, as long as they are of clear relevance for the beneficiaries of the Program and the concerned implementing agencies in Bangladesh. Such innovations can be found in other projects and organisations working in Bangladesh, but also specifically with Dutch knowledge institutions and private sector enterprises.² In order to facilitate the adoption of such innovations, resources are included in the Program to identify and test the relevance and effectiveness of these innovations and scale-up their application. For this purpose, both funding and expertise is required. The type of expertise needed depends mostly on the nature of the innovations identified and will be mobilised on a short-term basis. The necessary resources to allow the identification, testing and scaling-up of innovations can be drawn from funding for the specific purpose of innovation included in the budgets of each of the components.”

Roughly three distinct periods can be identified, where the focus and methods of the BGIF shifted significantly.

37.2.1. 2013–2015: Setting up the BGIF, demand driven

In the Blue Gold Inception Report, a number of potential innovative technologies and approaches were identified, including:

² In its new multi-annual plan for development cooperation, one of the strategies to be promoted is to broaden the number stakeholders in development cooperation, specifically to include Dutch knowledge centres and private sector enterprises

- Research results to maximise the use of available fresh water after the monsoon period (water storage and crop diversification)
- Cage fishing
- Rainwater harvesting through infiltration (managed aquifer recharge)
- Saline tolerant rice varieties and other crops
- Improved cropping system and technologies
- Dealing with the siltation and erosion problems in water courses
- Improved drainage by pumping, using renewable energy; and/or
- Web based GIS/MIS
- Use of geo data for information to farmers

From 2013 to 2015, around nine feasibility studies and pilot projects were financed, based on un-solicited proposals.

It quickly became evident that the objectives laid out in the Program Document were difficult to implement on the ground. In addition, adherence was required to European Union procurement rules and procedures - which inter alia limit the contract values for solicited proposals to around €133,000 and for un-solicited proposals to around €50,000.

Therefore, in order to guide prospective bidders for BGIF funds, a Procedures Manual³ was prepared with background information on Blue Gold, the concept of the innovation fund, the scope and purpose of the two separate funds (for water management and productive sectors), outline procurement and contracting arrangements, descriptions for each of seven steps in the process from generating a proposal to its evaluation (using the “funnel” diagram, as shown in Figure 36.1), and the standardised format to be used for proposals and concept notes. Preparation of the manual started from around June 2015 and the first published version was issued in November 2015.

37.2.2. 2015–2017: Aid for Trade, supply driven

The Aide Memoire of the BGP Mid Term Review of 2015 recommended that *“the Dutch ‘Aid & Trade’ policy favours the creation of sustainable business links between the Dutch private sector and that in the partner countries. In that context, innovations that have a link to international markets, both in terms of Bangladesh products and in terms of engendering supply contracts or direct investment from the Netherlands to Bangladesh, would be most welcome”*. Following the MTR recommendation, substantial efforts were made to attract Dutch companies to visit Bangladesh and see if their innovative approaches could be applied in the Blue Gold area.

The Mid-Term Review (MTR) emphasised that the BGIF should be aimed at realising the ‘Aid to Trade’ policy of EKN in Bangladesh, and recommended that BGIF should target a far more active involvement by Dutch enterprises - not only for the development of Dutch business in Bangladesh, but also for the opportunities for collaboration between the Netherlands and Bangladesh. The view of the MTR was that BGIF offered suitable opportunities for Netherlands-based enterprises operating in the fields of water management and agriculture and which were interested in expanding their operations to Bangladesh.

In order to communicate these opportunities to Small and Medium Enterprises (SMEs) in the Netherlands, BGIF entered into partnership with the Dutch Network Group (DNG) in March 2017. Together with DNG the Innovation Fund launched a marketing campaign, titled ‘Ondernemen in

3 Alongside the evolution of the BGIF, the Procedures Manual was revised on a number of occasions and issued in May 2018 in its final (and eighth) version, a copy of which is available in the File Library. https://www.bluegoldwiki.com/index.php?title=File:BGIF_Procedures_Manual_v8_22may_18.pdf

Bangladesh' ('Doing business in Bangladesh'), using email, social media (LinkedIn, Twitter) and a website (www.oibd.nl) to target SMEs and entrepreneurs from the Netherlands. The campaign had three main objectives:

- Create awareness amongst Dutch entrepreneurs in both the agriculture and water management sector, of the business opportunities that the Blue Gold Program area offers, and to motivate them to submit applications to the Blue Gold Innovation Fund.
- Enlist the Dutch agriculture- and water management- entrepreneurs to an information program to nurture them.
- Create engagement with the Dutch agriculture- and water management- entrepreneurs to enlist with the Blue Gold Program and inspire them to implement their business ideas in Bangladesh.

By mid-2018, this resulted in the campaign attracting 75 organisations interested to follow an online mini-course on Bangladesh and 17 organisations applying for a feasibility study under Blue Gold Program.

- Unfortunately, the campaign did not result in any running feasibility or pilot projects under the Blue Gold Program. More detailed discussions on the practicalities caused some organisations to withdraw their plans and focus on other activities or countries; others had so little understanding of the local context that too much support from the TA team would be required or so many elements of the project design would need to be changed to make it a success.
- Since most of the Dutch SMEs had a limited understanding of the local context and were poorly networked with local organisations, a proposal for an arranged visit by SMEs which included a visit to the Blue Gold area and matchmaking with local organisations was made. However, once the mission was confirmed 8 out of 10 organisations pulled out. It was concluded that Dutch organisations should be shortlisted from those with experience of working in remote underdeveloped areas, preferably in Bangladesh.

In summary, a number of barriers prevented NL companies from active involvement in BGIF:

- For compliance with EU procurement rules, the value of unsolicited BGIF projects was limited to € 50,000, an amount considered by NL companies to be insufficient reward for the anticipated risks.
- The (M)SMEs had little to no connection to local entrepreneurs and local field staff to help them implement the projects on the ground.
- The Dutch (M)SMEs had little idea about local market conditions in Bangladesh.
- If Dutch entrepreneurs showed an interest in Bangladesh (markets), their first priority for market entry would not be the coastal zone where Blue Gold worked because of its remoteness (from Dhaka) and the difficult communications to and within the polders. Those with interest would be enterprises already involved in water/delta development in general (eg Wageningen University & Research (WUR), and MetaMeta).

From 2015 to 2017, BGIF attempted to attract investments based on innovative conceptual thinking from Bangladeshi and Dutch applicants. However, the perceived financial, implementation and market risks proved to be insurmountable barriers to Dutch (M)SMEs. As a result, only a relatively few Netherlands-based enterprises applied for BGIF funds in the period from 2015 to 2017.

37.2.3. 2017-2020: Demand driven; consolidation, scale up

The supply-driven approach that had characterised the previous phase, was gradually replaced by a demand-driven approach, where a mix of local Bangladeshi and foreign international NGOs and Dutch companies partnered up to implement locally relevant and feasible projects that added value to the Blue Gold Program objectives.

In order to generate interest and attract innovative ideas from Dutch and international companies and organisations a call for proposals was launched, where the project size was 2.7 times higher than the previous budget ceiling, to EUR 133,000. The applications to the Innovation Fund now followed two routes:

1. Unsolicited proposals, which have a budget ceiling of €50,000 and focus on smaller interventions such as feasibility studies or pilots.
2. Solicited proposals, which have a budget ceiling of up to €133,000 and are initiated by Blue Gold through an international call for proposals (tender), supported by a detailed ToR and a guideline document.

The demand-driven approach was further stimulated through the appointment, in July 2017, of two BGIF managers, both of whom had existing technical roles in the Blue Gold Program. They were thus able to better match Blue Gold interventions with BGIF proposals, and to guide applicants in the preparation of projects which were both relevant and delivered tangible benefits to Blue Gold communities. Working linkages between Blue Gold's technical experts and the BGIF implementing team, helped to better target the communities involved with implementation.

37.3 Fund Management

37.3.1. Procedures Manual – Unsolicited Proposals

In order to guide those submitting unsolicited proposals, a Procedures Manual summarised the application process (Chapter 1), provided background information on Blue Gold (Chapter 2), explained the concept of the innovation fund, the scope and purpose of the two separate funds - for water management and productive sectors - (Chapter 3), described the seven steps in the process from generating a proposal to its evaluation (Chapter 4), gave the evaluation criteria (Chapter 5) and the standardised format to be used for proposals and concept notes (Chapter 6).

Preparation of the manual started from around June 2015 and the first published version was issued in November 2015. This early version of the manual was revised twice in December 2015 and in January and February 2016 (when it was issued as version 5). Thereafter, revisions were carried out at a more regular intervals: October 2016, February 2017 and in May 2018 (the final and eighth revision).

37.3.2. Solicited Proposals

Two calls for invitations were issued for bidders to submit proposals in response to a call for proposals with a terms of reference (ToR).

First Call - Improved Information for Agriculture: In June 2017, invitations were issued inviting concept notes to be submitted under the theme “improved information for agriculture”. These concept notes were received in August 2017, and the shortlisted organisations were invited in October 2017 to submit full proposals by end-November 2017. Nine proposals were evaluated, as a result of which the following contracts were awarded:

- mPower Social Enterprise “Breed identification and digital cattle registry” (March 2018)
- MetaMeta Communications “Accelerating horizontal learning in Bangladesh polders: ICT as a force multiplier” (May 2018)
- International Maize and Wheat Improvement Centre (CIMMYT) for “Leveraging decision-making science to sustain climate- and market-smart mungbean advisories in Patuakhali’s polder communities” (August 2018)

Second Call – Water Hyacinth and Climate-Smart Adaptations: In 2018, invitations were issued for proposals for: (a) the removal of excessive water hyacinth; and (b) the implementation of climate smart adaptation of agri-technologies. After a first-round evaluation of the 38 applications received in July 2018, six organizations were invited to submit full proposals (two for climate smart adaptation agri-technologies and four for the removal of excessive water hyacinth). Of the six full proposals received in September 2018, the evaluation committee met in October 2018 and recommended one proposal on climate smart adaptation agri-technologies and one on removal of excessive water hyacinth. As a result, the following contracts were awarded:

- Practical Action for ‘Sustaining sack farming practices through agro-met services in coastal polder areas of Bangladesh’ (signed in December 2018); and
- Khulna University for the “Development of value- added products from water hyacinth to support alternative livelihoods and ecological resilience in coastal villages of southwest Bangladesh” (January 2019).

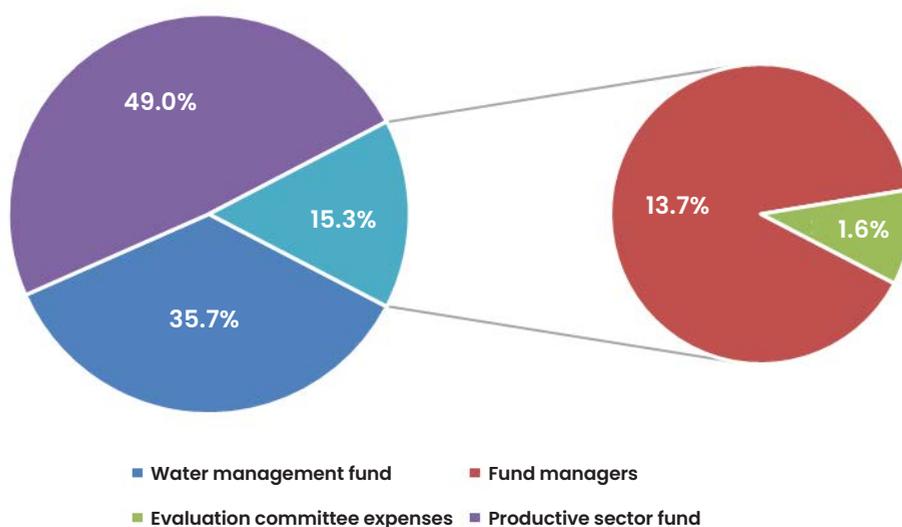
37.3.3. BGIF Management

A full-time manager was appointed in March 2015 to coordinate BGIF activities. On the resignation of this manager in July 2017, a part-time, joint management team was appointed from within the Blue Gold TA team – a short-term international and a full-time national consultant. From July 2017, a number of Blue Gold’s technical experts located in zonal offices became part of the team supervising the implementation of BGIF projects⁴.

The overall fund management costs account for about 15.3% of the whole BGIF. Out of this 90% went to BGIF fund managers and 10% to Evaluation Committee expenses, and occasional expert judgement on unsolicited proposals.

This 15.3% does not include the time and expenses of ad-hoc inputs from regular BGP staff involved in project appraisal. In addition, the designated lead technical BGP advisors to individual BGIF projects were full time employed by BGP and therefore also didn’t require additional reimbursements from the Innovation Fund.

Figure 37.1 BGIF funds and fund management expenses 2013–2020



⁴ The benefits of the involvement of Blue Gold’s technical experts is described above.



38 Overview of BGIF Projects

The 42 Blue Gold Innovation Fund (BGIF) projects^[1] are categorised in the summary table 38.1 and are then further analysed in this chapter.

Table 38.1: BGIF project size per type

| | Number of BGIF projects | Total expenditure (Euro) | Average value (Euro) | %age BGIF fund allocation |
|---------------------------|-------------------------|--------------------------|----------------------|---------------------------|
| Feasibility Study | 20 | 395,774 | 19,789 | 20% |
| Pilot | 11 | 529,631 | 48,148 | 26% |
| Scaled-up | 2 | 83,787 | 41,893 | 4% |
| Integrated project | 6 | 541,317 | 90,219 | 27% |
| Solicited | 3 | 464,770 | 154,923 | 23% |
| TOTAL | 42 | 2,015,279 | 47,983 | 100% |

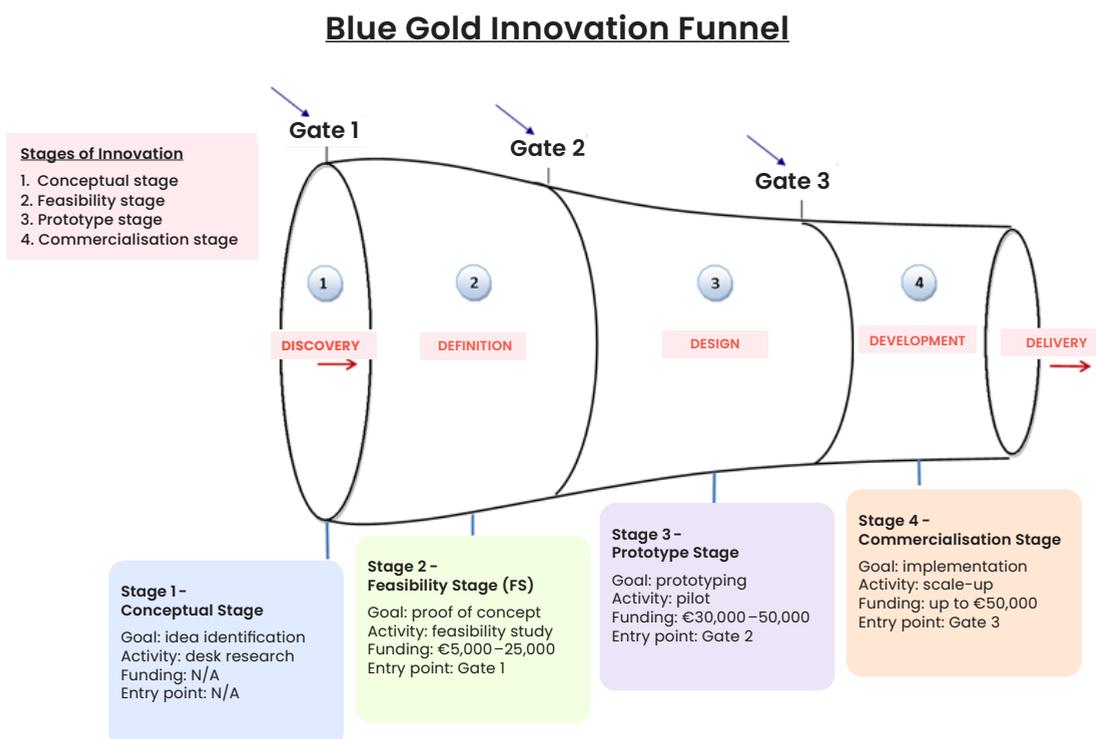
38.1 Project types and the innovation funnel

At the outset, it was intended that projects would pass through feasibility, pilot and scaling-up stages. However, for a variety of reasons, a relatively small number of the 42 projects (only 6) followed this path.

The Innovation Funnel (in Figure 38.1) provides applicants with a view of the structured approach to selection used by Blue Gold evaluators, and how a proposal for a specific stage fits into an overall process. The 'converging funnel' approach starts from a wide-ranging set of proposals covering very different

subject matter. This group of proposals are then compared against criteria given in the initial invitation with the aim of selecting innovative development projects each of which has a strong potential for scaling-up and commercialisation.

Figure 38.1: Blue Gold Innovation Funnel



While a few did indeed follow the full trajectory, most started at the feasibility stage but did not progress further. Others started at pilot phase (the concept having already been demonstrated elsewhere).

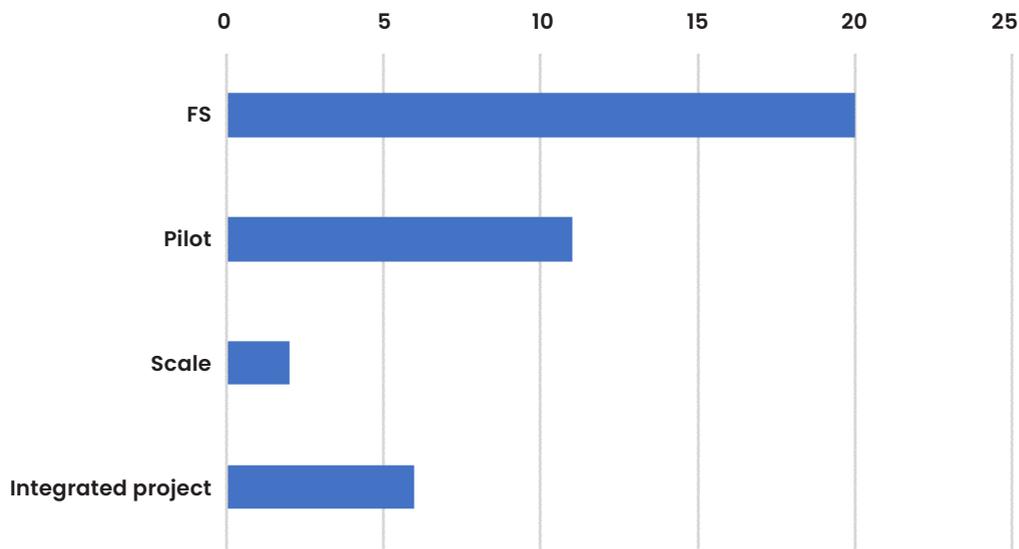
A further category, termed as 'solicited projects', resulted from two separate formal requests for proposals in the agriculture and ICT sectors, each with a budget ceiling up to €133,000 (refer to Chapter 37 'Solicited Proposals').

Most projects were feasibility studies (20 out of 42), only three of which reached pilot stage (Stage 3 Prototype) - and of these three projects, only two reached the final 'scaled-up' stage (Stage 4 Commercialization). Two feasibility studies were developed to pilot-scale under the Deltares-managed Water Management Knowledge and Innovation Program (WMKIP): an action research project for pumped drainage in Polder 2, and the use of water apps to enhance operational water management. So, five feasibility studies in total or 25% graduated to pilot phase. Eight pilot projects did not have a FS predecessor. The final report for three feasibility studies was not accepted because the relevance to Blue Gold was not well-established. The six 'integrated projects' were considered to be a merger of pilot and scaled-up stages which omitted the feasibility study stage - and had shown their feasibility, for instance by demonstrating that the concept had been proven elsewhere.

In the rest of this report, the category 'Other' is not analysed as the results are not fully related to innovation outcomes.¹

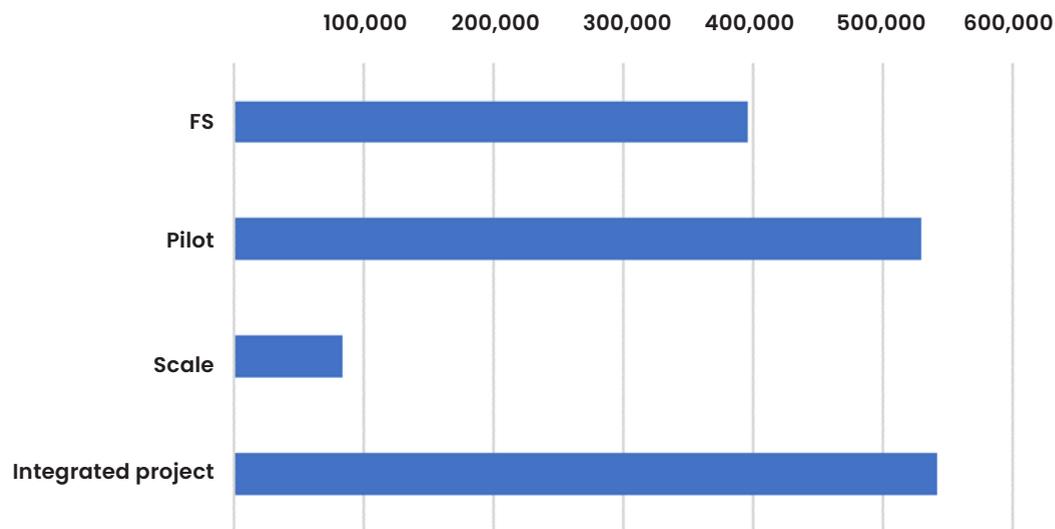
¹ Other category contracts are funded through the BGIF but whilst they were important for BGP objectives, they were not aimed at innovative approaches and are mostly works contracts, and not services.

Figure 38.2: Number of BGIF projects



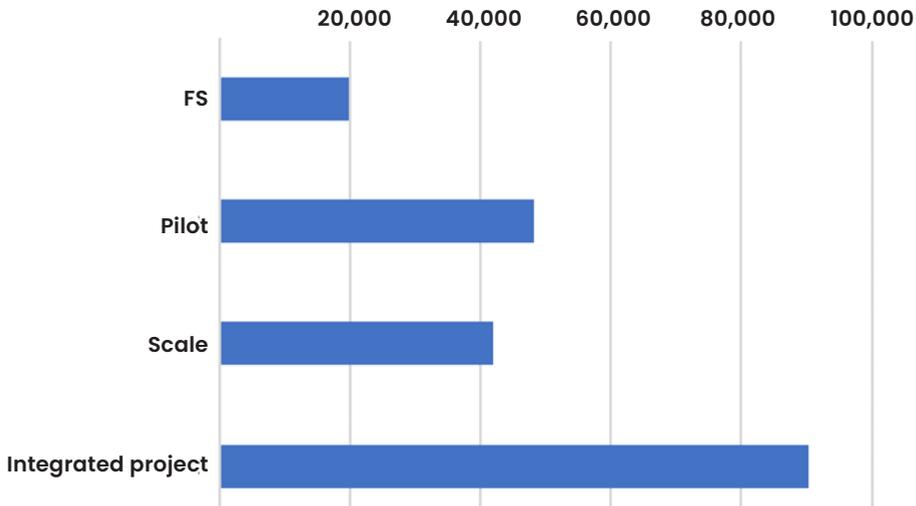
Although there are more FS projects funded than pilot or solicited projects, total funds towards these last two types of projects is far more. This is important since the Innovation Fund ultimately aims at implementing innovations on the ground and not only studying the feasibility potential ideas.

Figure 38.3: Expenditure on BGIF projects (EURO)



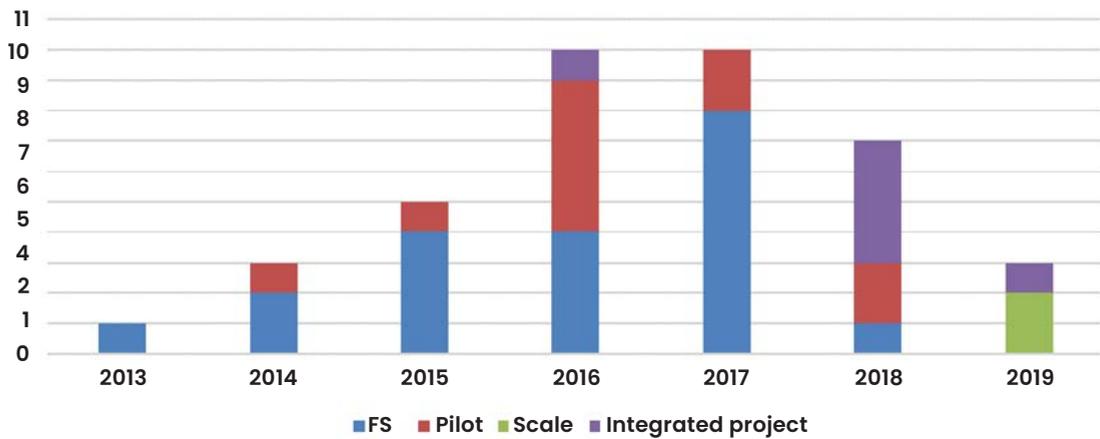
Given that there were relatively more feasibility studies, the allocation per type of project shows that relatively speaking, integrated projects are the largest, followed by pilot and scale projects. FS size in EUR is about half of pilot and scale projects. Integrated projects are roughly 4 times the size of FS types, on average.

Figure 38.4: Average value of BGIF projects (EURO)



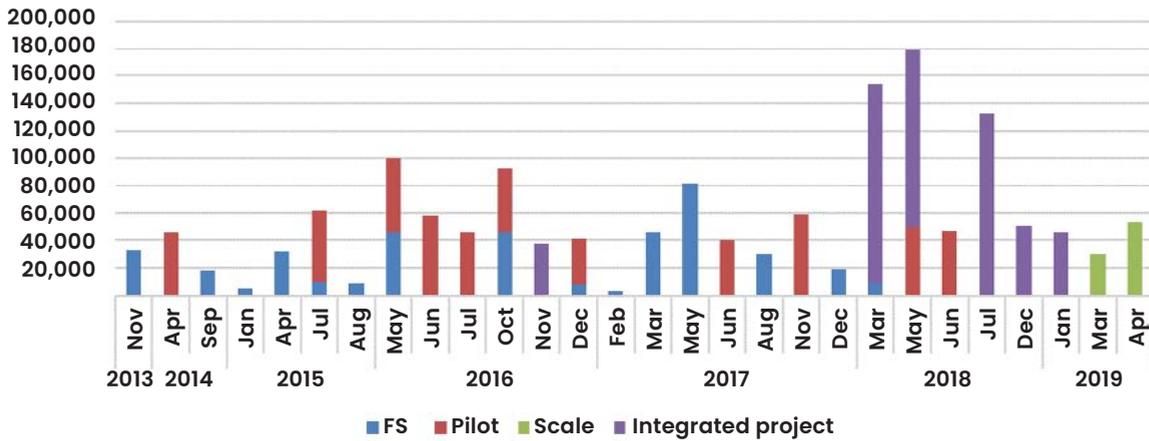
Now we take a chronological perspective, where, looking at the contract signing date, we can deduce a trend where at first mostly FS and pilot projects were contracted in 2013-2017. In 2018, larger and integrated projects were mostly signed. This makes sense, since Innovation Fund moved from funding feasibility studies into funding the implementation of pilot, scale and integrated projects.

Figure 38.5: BGIF contracts per year (2013-2019)



The graph below depicts the same contracts but now breaks it down into months of each year and the cumulative amounts of signed contract amounts in EUR per month in the 2013-2019 period.

Figure 38.6: BGIF contract amounts per month & year (2013-2019)



Chapter 37 reflects on how the fund re-oriented its focus towards demand led initiatives and involved Blue Gold’s field-based technical experts in the appraisal of BGIF project proposals and subsequent implementation from 2017.

In terms of length of implementation², feasibility studies have taken just under six months on average, while pilot and solicited projects take between 1 year and 18 months (based on projects completed as of October 2019).

Table 38.2: Average duration of BGIF projects (as of October 2019)

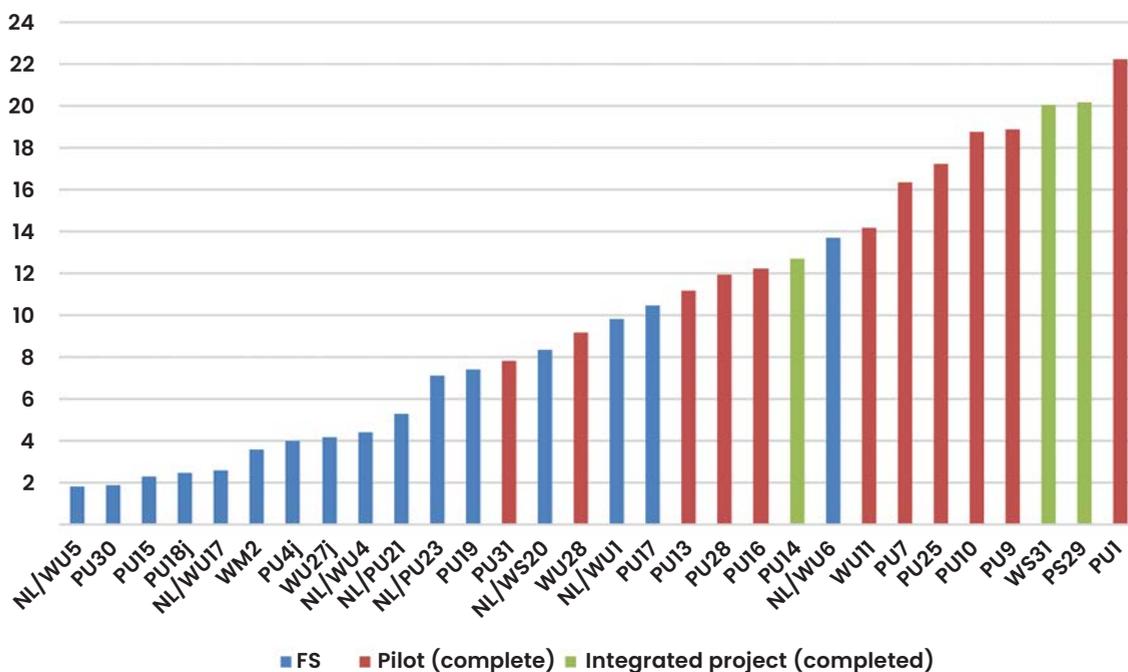
| Type | No. | Length of implementation (months) |
|--------------------------------|-----|-----------------------------------|
| FS ³ | 16 | 5.6 |
| Pilot (completed) | 11 | 14.5 |
| Solicited projects (completed) | 1 | 12.7 |

In some cases, total project duration exceeded their original allocated schedules - a contributor cause of which was the time taken to achieve an acceptable standard of final reporting.

2 Duration has been calculated as the time in-between the signed contract (official start) and date of final report (official end).

3 Does not include 3 feasibility studies that were cancelled.

Figure 38.7: Completed BGIF project duration by contract codes in months



38.2 Projects in the Water Innovation Fund and Productive Sector Fund

The BGIF features two funding windows: for water innovation and the productive sector.

The **water innovation fund** was meant to be closely connected with water management activities in the Blue Gold Program. It aimed to involve representatives of all community stakeholders (eg farmers, fishermen, landowners, landless, etc.) working through water management organisations (WMOs) in partnership with government, NGOs and the private sector to manage water to meet agricultural requirements. Interventions included the rehabilitation of flood embankments, plus associated structures such as sluices to convey water across the embankment, to reduce the risk of loss of lives and crops; maintenance of main khals to remove water from the fields, or to store water for supplementary irrigation; operation of sluices to drain excess water or to introduce fresh water in times of shortage. In-polder water management demonstration schemes were set up to enable collective action to ensure timely drainage, synchronisation of cropping patterns and improved agricultural production strategies. In-polder water management was included as it helps to establish resilient, productive and diverse cropping systems; and the capacity to manage that into the future.

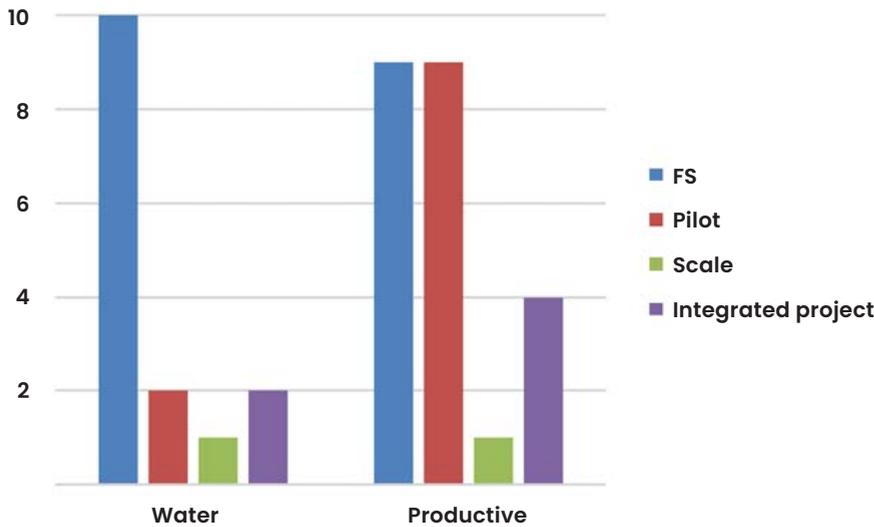
The **productive sector fund** aimed to enable the farm households to enhance their productivity, be it for home consumption or sales; to make use of additional availability of land and opportunities for different cropping systems; and to pursue better services from government and private agencies; and better deals from input suppliers and bulk buyers. Market system development was aimed for through Farmer Field Schools (FFS), which introduced concepts as farming as a business and market orientation, but also development activities which strengthened the capacity of and linkages with other actors such as input suppliers.

All BGIF projects were funded by either of these two windows, depending on whether the project outcomes were aligned with the goals of the water management fund or the productive sector fund.

In this sub-section we look at which projects were funded by these two funding windows and what outcomes these projects achieved, and what lessons were learned from a fund management perspective.

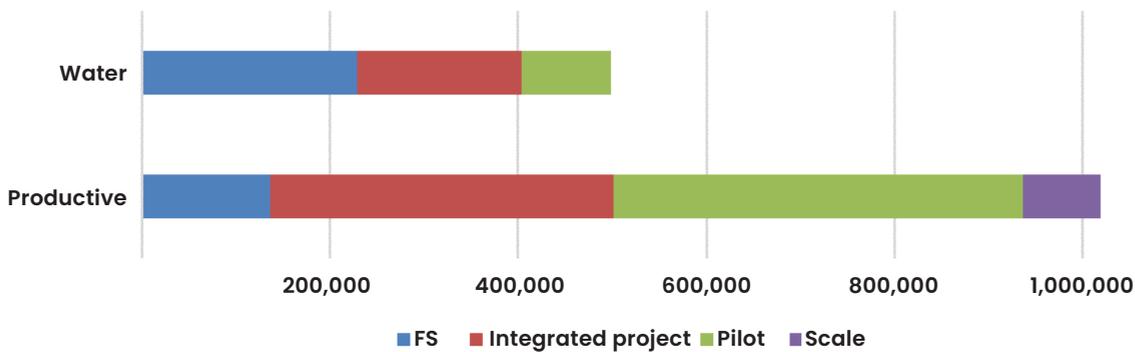
First, we look at the total number of projects funded by the two windows, see Figure 38.8 below. Both the Water and Productive fund have funded many feasibility studies (10 and 9, respectively), but the Water Fund has far fewer pilot projects (2 versus 9), scale (1 versus 1) and solicited projects (2 versus 4).

Figure 38.8: Completed BGIF project duration by contract codes in months



Size wise, the Water Fund has about half of its funds allocated to FS, Pilot, Scale and Integrated projects compared to the Productive Fund.⁴

Figure 38.9: Aggregate values (in Euro) of Water and Productive funds



4 The Water Fund has funded a number of large ‘other’ category projects and when looking at total expenditure/ allocation, the two funds are almost on par. In addition, many water projects were transferred to WMKIP of Deltares/IWM

30.2.1. Water Innovation Fund projects

This section reviews a number of specific projects (excluding feasibility studies), their main outcomes and lessons learnt.

Community Based Integrated Water Management, FHRC [BGIF 14]

The project served to test whether an alternative community based integrated approach to water, land and natural resources management could help communities address their priorities and improve returns under BGP. Some outputs:

- Training main local stakeholders (WMG members)
- Exchange visits (WMG in Polder 43/1E to and from WMG in P.29)
- Enabling minor tertiary works to improve water storage/supply and drainage
- Promoting low water demand dry season crops so that water is used more efficiently (assistance with seeds, advice on crops)
- Vegetable cultivation in polybags was tested by 44 households and then spread. Brinjal, tomatoes and chillies were successfully grown for home consumption, enhancing nutrition
- Rice variety BRRI Dhan 67 was demonstrated and gave yields 1.5 times that of usual varieties and was free from rust disease which was widespread in this dry season

Lessons learned: Starting with Participatory Action Plan Development and helping WMGs implement their plans builds trust and capacity but depends on a flexible response to WMG demands. It takes time to build trust and obtain government support, so a phased approach is needed. Forums of adjacent WMGs (cluster approach) bridged gaps between WMGs and enabled learning between pilot and other WMGs. Knowledge sharing encourages improved performance and healthy competition among WMGs.

SWIFT, United Purpose (& SMKK) [BGIF 26]

The Sustainable Water Management through Indigenous Finance and Technology Research (SWIFT) project helped farmers to decide their priorities for small scale water infrastructure work, gather (in-kind) contributions from Union parishad and the farmers themselves and finally obtain funds from government to implement these small works themselves. The project has comprised a Feasibility Study, a Phase II pilot and a Phase III scaling up. Highlights from the project include:

- WMGs are taking leadership in resource mobilization, made a start with breaking the cycle of aid dependency from external donors which will positively support them to ensure sustainability of their activities.
- WMGs came forward to take the lead on flood control and drainage infrastructure (FCDI) works to be implemented through mobilising resources from different sources by their own initiatives.
- WMG members improved ownership for initiating FCDI works.
- In the pilot phase, mobilised resources value in BDT 6,56,864 against BDT 5,94,948 for 26 FCDI schemes.
- Enhanced networking and linkages of skills between WMGs and Union Parishad Authorities, DAE and BWDB representatives.

Lessons learned: The project showed that the mobilization of support for constructing small structures is possible if the participants are convinced of the benefit of such investment. Participants are ready to contribute in different ways, if they cannot afford financial contribution, they are ready to contribute by physical labour or kind.

Accelerating Horizontal Learning in Blue Gold polders: ICT as force multiplier, MetaMeta (& JJS and Access Agriculture) [BGIF 30]

The horizontal learning project trained farmers to make videos and helped them capture their best-practise examples, which were subsequently shown to other farmers groups in the project area.

Outputs:

- Trained 27 UDC Members in video making & sharing
- Trained 250 WMG Members in video making & sharing
- Improved self confidence on some of the video-makers and view of improved personal development

Lessons learnt: Behavioural change takes time, thus longer training with supportive funding helped to achieve the objectives. Good practices needs to be identified for such visual dissemination. Moreover, mentoring during shooting and follow-up with the audience enhances the impact.

Water Hyacinth, Khulna University (&WUR and BEDS) [BGIF 32]

‘Development of value-added products from water hyacinth to support alternative livelihoods and ecological resilience’ is implemented in Polder 25 (WMG at Thukra Bazar, Dumuria, Khulna) to address water hyacinth infestation problem in southwest coastal polders.

Outputs:

- A pilot manufacturing plant for producing water hyacinth paper was set up at polder 25 with Thukra WMG. Necessary manpower were trained
- Compost preparation process was transferre
- An art competition was arranged to promote WH craft paper among users
- Steps were taken to link producer with buyers

Lessons learnt: Craft paper and compost have niche markets. But there are strong suppliers as well. KU project implementation team has shown sincere efforts in transferring WH craft preparation technology and marketing of product. The important lesson is, water hyacinth, a seemingly harmful weed can be transformed into an asset. This simple pilot has engaged many beneficiaries and created opportunities for additional income.

30.2.2. Productive Sector Fund projects

Eco Pond, World Fish [BGIF 7 and BGIF 20]

In the Ecopond approach small homestead ponds are used to create shade and shelter for fishes with simple materials which can be easily collected and maintained by women. The Ecopond project has shown that the participatory methods and tools used were effective to engage women actively in the program even with small numbers of staff. It has demonstrated that development of community groups, setting up of the Learning Centres, involvement of women leaders and linkages with the WMGs and other stakeholders along with training were useful. A total of 3,377 women owning around 4,500 small ponds were involved and more than 80% were successful in generating income and receiving better nutrition from the small ponds. The Ecopond approach has been undertaken by other institutions too such as the CREL project of Winrock International who scaled-out the approach by working directly with more than 500 households near the Sundarbans. During the project, WordFish has developed a training manual, a video, a database and other articles and papers to promote upscaling. It has also acquired additional funds to keep on monitoring the Ecopond project in the BGP area up to June 2018 and upscale the project further in the coastal belt.

Lessons learnt:

- The Ecopond project approach works, i.e. developing women local service provider (LSP) and Lead Farmers worked for scaling the ecopond production system through effective engagement of women.
- Engagement of women in small-scale aquaculture can increase women empowerment and household nutrition by increased consumption of small fishes at the household.
- Families consumed almost all the fishes (93%) produced in the ecopond, ameliorating their daily nutrition.
- To ensure quality breed or fingerlings of small native species in the time of stocking in the ecopond, as many of the small ponds dry up during dry season.

Pig rearing pilot, Nice Foundation [BGIF 10]

To improve the economic and social status of the pig-rearing community by investigating particular aspects of hygienic pig management and rearing: pigs' reproductive performance, their mortality rates, diseases and treatment, feeding practice, and marketing. The project trained 200 pig farmers (90% women) on hygienic practices in pig husbandry using the Farmer Field School (FFS) approach. Market linkages were established between service providers, farmers and traders. A pig demonstration farm was established as a learning model for pig farmers.

Some lessons learnt:

- Pig manure can be used for bio-gas and organic fertilizer in agricultural field
- Pig farming can be accepted by local population, if they are hygienically and sensitively managed
- Scaling-up is difficult because of small community involved and remote markets

Increasing mungbean production of small farmers, JUST Farming [BGIF 15]

The project intended to address two major challenges in the mungbean value chain:

The project intended to address two major challenges in the mungbean value chain: 1) quality of produced mungbean is low and 2) volumes of farmers are not high enough to allow efficient marketing. A Production Hub (with an IT-system to support production management and quality control) was the solution that the project sought to implement.

Two hundred small-scale mungbean producers signed contract agreements with Just Farming. 100 farmers harvested on average 218 kg, which was sold to JF on average at BDT 76 p/kg (improvement compared to previous year sale price of BDT 62 p/kg). The other 100 farmers lost their crop due to unfavourable weather conditions.

Lesson learnt:

- Just Farming pilot had some extension success but ultimately failed in securing their own forward linkage, i.e. contracting with a mung processor prepared to pay a premium for mung cultivated along particular requirements of size (variety), cultivation practice (pest management), harvesting etc.
- The selected IT-system was a standard package. It proved useful to manage a producer group in a 'contracting' situation thereby largely serving the needs of the lead firm. It was insufficiently flexible in its set-up to serve farmer needs though.

Floating Cage Aquaponics, Practical Action [BGIF 19]

IFCAS (Integrated Floating Cage Aquaponics System) was found as a suitable option for resource poor people in vulnerable areas to get a quick return. 15 farming families of Satkhira District have practiced aqua-geoponics technology in canals and ponds and confirmed that the business case was profitable within two cycles. Major risks found were 1) presence of crab in the canal which can damage net, 2) water availability and security issues to protect the fish. Three things can be further improved: – 1) diversification of fish and vegetable species 2) rethink cage material and cost, 3) test such cases with access to commercial finance.

Lessons learnt:

- Pilot achieved breakeven in terms of costs and benefits
- Idea is good in waterlogged area, but limited replicability in rest of polder due to easier, and more lucrative options for farmers involved.

Tilapia Feed, WorldFish (& WUR and CGIAR) [BGIF 21]

The new pond feed formulation resulted in 15% additional fish growth during the piloting phase and created tremendous interest among the tilapia farmers in the working areas. It also increased farming gross margin at high stocking density was nearly double with the new feed. However, due the regulatory restriction according to “Fish feed and Animal feed Act 2010” of the Government of Bangladesh, the commercial feed companies cannot follow the new composition. To address this policy barrier, WorldFish together with several fish feed companies organised a large-scale piloting for evidence together with DoF.

The project successfully demonstrated the benefit of using feed in doubling productivity of fish in the homestead and commercial ponds. This has created increased demand of tilapia feed in the southwest region, which has been reflected by the continued growth of the feed business by the local service providers and net production increase of tilapia from SW Bangladesh in contrast to rest of the country. For the semi-automatic feed millers the project could attract interest of “Single Spark”, a Dutch start-up company working on digital extension of fish and animal feed formulation by developing feed calculator. This company has now included formulation in their apps and is scaling in Bangladesh and Africa. The industrial collaboration with Dutch Feed Company, De Heus, continued to grow in areas of both research and market expansion in Bangladesh.

BG Innovation Challenge, Social Business Youth Alliance (& YY Goshti) [BGIF 23]

The Blue Gold Innovation Challenge aimed at inspiring innovative business solutions to the various problems faced by the inhabitants of the BGP polder areas so that they can begin to support themselves independently and profitably. The project resulted in seven winning youngsters with innovative ideas and entrepreneurial ambitions. Four youngsters started working on a prototype.

Lessons learnt:

- Quality of submitted proposals to the BGIF were below the acceptable standard. It is perhaps too ambitious to expect that young people without any work or business experience (some still studying) can devote sufficient capacity and time to prepare and implement a project under BGIF on their own.
- More efforts could have been stimulated from the start to let them form partnerships with well-established organisations and businesses in Bangladesh.

Pen Culture, BSMRAU [BGIF 28]

The seasonally waterlogged areas could potentially be utilised for adoption of pen fish culture technology. The target fish to culture would preferably be the short-grown species like tilapia. The major carps may also be stocked as secondary fish species.

The main benefit of the project was building awareness and knowledge of WMGs (and the rural communities as well) on productive utilization waterlogged beels for local livelihood improvement through adoption of pen fish culture.

The production cycle in one area could not be completed due to water drainage as a result of re-excavation of a nearby khal under the Blue Gold Program (the success of the Amodkhali excavation, which reduced the waterlogging greatly, but located in the wrong location for this BGIF project). In addition, there intentional damage of nets prior to final harvesting that caused a huge number of fishes to escape.

Lessons learnt:

- Closer cooperation between water infrastructure team and those involved with BGIF project appraisal and monitoring.
- Implementation team of mostly senior team of professors does not work with very few operational staff for actual implementation on the ground.

Pangas Farming, Innovision [BGIF 27]

Using improved culture practice, Pangasius aquaculture in homestead ponds of three Upazilas of Patuakhali District resulted in increased fish production. The participating farmers used farm-made feed. The farmers also got a better farm gate price of Pangasius in comparison to capital city market price.

Lessons learnt:

- Feed quality, particularly protein content, was a major concern as the feed was produced from unidentified sources. Moreover, farmers' perception in pond management, specifically in feeding practices, resulted poor fish growth in some ponds.
- Transportation in the local urban markets need strong infrastructure system.
- The farmers need a strong backup linkage to continued fish or Pangasius farming practices in their ponds

Women Business Centres, United Purpose [BGIF 22]

Centres were designed to improve rural women's access to services, income, and their position in agricultural value chains in rural areas. The Feasibility Stage was successful, women were trained and selected for the subsequent phase to set up profitable businesses and marketing services not usually available in the local rural setting (like scanning documents, printing pictures, etc) and selling some relevant products for women as well (like sanitary pads). However, the WBC quickly became regular micro retail-stores, selling eggs, cigarettes, some vegetables, etc like any other roadside shop.

Lessons learnt:

- The local management team should be fully committed to the WBC concept and and be provided with coaching and technical support. Due to high staff turnover of key team members , insufficient guidance was provided to WBCs.
- Ensure sustainable partnerships among group members

- WBCs need coaching in business planning, in particular to assess the requirements of local customers and to establish linkages with suppliers to cater for the demand, and to create a profit to run the centre and pay the staff

Climate and market smart mung bean advisory services, CIMMYT [BGIF 33]

Mung bean is an increasingly popular crop in the central coast of Bangladesh. This twenty-one month project focused on building the resilience of smallholder mung bean farmers in the southern central coast of Bangladesh to heavy rainfall risks. Research activities developed farmer-friendly and demand-driven climate- and market-smart mung bean advisory dissemination systems using ICT tools in the form of interactive voice response and smartphone app systems.

Lesson learnt:

- Climate and market information services need to be demand-driven, and based on farmer's preferences in order to be successful.
- Partnerships are key, CIMMYT established relationship with the Department of Agricultural Extension and BMD for successful implementation.
- COVID-19 crisis interfered with planned field activities, so that fewer workshops were held.

Breed identification and digital registry of cattle, mPower [BGIF 29]

Objective: Livestock sector of Bangladesh is characterized by low cattle productivity compared to other countries. Although artificial insemination was introduced many years ago, there is no proper record of improvement in the genetic material of cattle breeds.

Results: The project successfully developed digital cattle breed identification application and implemented in Dumuria of Khulna, Satkhira Sadar and Patuakhali Sadar Upazilas. 6,000 plus livestock farmers received improved livestock services which includes tele-veterinary, breed identification & AI recommendation and SMS based Advisory services with a very high satisfaction. Successfully developed AI Dashboard for DLS and AI service providing companies. 52 community livestock service providers have improved their technical knowledge and competency through digital E-Learning modules and videos.

Lessons learnt:

- Strong demand has been observed for tele-veterinary and breed identification services among farmers, local service providers as well as the community leaders. These digital services increased confidence and competency of service providers in delivering livestock treatment and advisory services to farmers.
- Breed Identification service AI technicians find it easy to motivate farmers take right type of semen for their cattle. Farmers developed strong awareness on negative and long-term consequences of wrong type of semen use for AI. However, the recommended type of semen was not always available for the appropriate AI.
- Although willingness to join Shurokkha tele-veterinary service among community service providers is quite strong, soliciting service with payment is limited to only complicated cases.

Sack Farming, Practical Action [BGIF 31]

Waterlogging, flood, salinity and erratic weather shocks are common challenges for farmers in south-west Bangladesh. Gardening in sacks is such a technique, which can be applied to improve food security, nutrition and household income of the poor people. Sack gardens, also known as 'bag gardens' or 'vertical gardens', are tall sacks filled with soil from which plant life grows. Practical Action implemented this project aimed at increasing the coping mechanism with climate resilient agriculture technologies for the most vulnerable communities in the coastal polder areas.

Lesson Learnt:

- Accessing soil and seeds is difficult in areas subject to frequent flooding. Sack gardeners need to ensure collecting enough soil before the rainy season.
- The average life-span of a sack is around 12 months. Sufficient water is required during the dry season to prevent crops from wilting.
- Farmers adopt technology easily that they find easy to copy and beneficial.

38.3 Fairs by GoB departments

In order to showcase successful innovations and promote the adoption of good practices, DAE and DoF arranged a number of ‘Fairs’ or melas. BGIF supported three fairs, two from DAE and one DoF fair.

- DAE organised the fair at Yunus Ali Khan Degree College, Amtali, Barguna from in December, 2019. United Purpose with their project ‘Sustainable Water Management through Indigenous Finance and Technology’ and Practical Action with their project ‘Sustaining Sack Farming Practices through Agro-met Services in Coastal Polder Areas of Bangladesh’ participated in the fair.
- DoF organised a fair at Patuakhali District Fisheries Office premises during July 2019. Innovision Agro Service Ltd. participated the fair with their project ‘Augmenting homestead Pangasius aquaculture productivity in three Upazilas of Patuakhali through community participation’.

Local farmers, WMG members, value chain actors participated the fair with great interest.

Table 38.3: BGIF fairs

| Location | Date | GoB Department | BGIF project |
|------------------------|-----------------|----------------|--------------------------------|
| Patuakhali, DoF office | 20-22 July 2019 | DoF | Pangasius (Innovision) |
| Patuakhali, Barguna | 7-9 Dec 2019 | DAE | SWIFT (UP) & Sack Farming (PA) |

References

- [1] See List of BGIF projects, BGIF Project Locations map, BGIF Project Locations (Pilot and Integrated) map.
https://www.bluegoldwiki.com/index.php/List_of_BGIF_projects.
<https://www.bluegoldwiki.com/index.php/File:Bgif-project-locations.jpg>.
<https://www.bluegoldwiki.com/index.php/File:Bgif-project-locations-pi.jpg>



39 BGIF Lessons Learnt

This chapter aims to capture the main lessons learnt during the period when the Innovation Fund was most active, from 2015 to 2020. Although we have structured these lessons under specific sub-headings, individual BGIF projects would be included in more than one of these headings.

39.1 Preparation of Requests for Proposals (RfPs) – Specific calls for proposals

- Invitations to Dutch organisations should be restricted to those who have the experience, confidence and local contacts to work in the remote underdeveloped areas of south-west Bangladesh, preferably with prior experience in Bangladesh.
- Although the solicited call “Improved Information Services for Agricultural Processes” was considered successful, a great deal of time was required for preparation, processing and management. It was most effective for topics where a healthy number of interested organisations with appropriate credentials submitted bids. The overall evaluation of the call was an intensive process which was well-handled by the fund managers. A number of bidders who offered an excellent conceptual design but which didn’t fulfil the full scope were coached to further develop their proposals to address the evaluation criteria.
- With hindsight, more invitations to bid could have been issued if an earlier analysis had been made with the communities of the context, problem area(s) and identification of the problems in the field - and with possible solutions. In explanation, the team needed to accumulate knowledge during the implementation process in order to recognise the importance of a demand-driven approach, by which time there was insufficient time and budget.

39.2 Announcing RfPs – Type of implementing organisations:

- Large organisations were able to produce good proposals, but their solutions were sometimes decontextualized and showed little promise of realistic implementation. Academic organisations tried enthusiastically to pilot abstract concepts into development implementation. Smaller organisations were

shown to be effective implementers with strong local networks but were not good at presenting their arguments in formal proposals.

- During the development of a concept by a bidding organisation, the role performed by the BGIF team helped to clarify needs, concepts, approaches etc - as a result of which, the implementers learnt just as much from us, as we from them.

39.3 Announcing RfPs – Communications and generating awareness of BGIF:

- A multi-pronged approach to communicating BGIF opportunities for interested organisations was adopted:
 - Regular announcements via the Blue Gold website and Facebook page
 - Circulation in newsletters to 150 relevant organisations and networks
 - Video productions - to spread video production via social media channels, like BGP Facebook group but also external lines like Water-Channel
 - BGP was successful getting broadcasting space on national television on special programs for farmers.
 - Project booklet
 - Organisation of special events to target a specific group (including Blue Gold Innovation Challenge for Youth and the SME Campaign “Entrepreneurship in Bangladesh”)
- Once projects reached operational stage, external communications and usage of social media could have been better, in order to promote uptake of innovative methods by other interested organisations. WMKIP social media channel (My Bangla Delta) has quite a strong presence, especially considering its projects are fewer and smaller.
- In terms of agriculture development, earlier and closer links to practitioners should have been established with local research institutes. They could have been involved earlier in ‘innovations’, which could ‘leverage’ BGP activities. At the same time, BGP had some staff doing their own basic research on sugar beets, rather than linking up with others (research institutes) to leverage their findings. Even so, some effort was made to connect to local research institutes. Several visits were paid to Patuakhali and Khulna universities as well other agricultural institutes throughout the country. However, only Khulna university came up with a really viable proposal on water hyacinth.

39.4 Procurement Modalities

Organising a solicited call on a specific topic with the higher contract ceiling that is possible for competitive tenders under European Union rules is an efficient process for attracting a large variety of concept notes from both Bangladeshi and international organisations.

39.5 Selection – Too good to be true:

- Some applicants provided ideas of how to spend a EUR 50,000 allocation without sufficient consideration of BGIF expectations.
- A number of proposals used an intentional excessively ambitious and innovative approach in order to win the project funds, only to later find out, through stakeholder consultation, an unwillingness or capacity constraint prevented the adoption of the proposed approach. Preference was therefore given to simpler and less innovative approaches, which also turned out to be less expensive to develop. We have

attempted to remedy this through strong negotiation and ensuring that the original budget assigned to those innovative activities was properly utilised. Later, payment milestones were included in contracts to address these 'soft spots' in the proposal and to make sure project implementers achieved ambitious milestones.

39.6 Selection – Reflections on the innovation funnel approach

- The innovation funnel has been helpful in discussions with interested applicants, to help them understand how the BGIF could help to realise their innovations.
- Five projects traversed two stages, and two projects moved through all three stages from feasibility study to pilot to scale-up: a record of 25% of projects going from FS to pilot is a reasonable achievement.
- Most feasibility studies were unable to convince the BGIF team during the pilot phase that the project would provide significant benefits to the target population.

39.7 Selection – Small but realistic

- The ideas and solutions proposed by applicants did not always match with local needs,
- Proposals from Bangladesh- and Netherlands-based applicants did not always take account of the practical difficulties of implementing projects in the Blue Gold area – where remoteness from Dhaka, difficult communications, and exposure to floods and storms required consideration.
- As part of their due diligence mandate, considerable time of the BGIF management team was required in negotiating budgets and realistic fee levels for experts.
- In general, BGIF projects were not chosen for their high ideals, but rather for their realistic objectives - which were targeted and achievable - and which ensured that benefits for farmers and their families took centre stage. Although hygienic pig farming (Nice Foundation)¹, for example, created strong reactions, it was a good example of a small project which showed that improved hygiene in existing pig farms could improve relations in a mixed community. The low-income Hindu families that were part of the project, obtained significant benefits – both in terms of increased knowledge and skills and respect from Muslim neighbours as well as increased incomes due to improved breeding practices. At the same time, other potential beneficiaries in the same community were upset that they were not selected for the project and created tension.

39.8 Selection – Mix of pure innovation and achieving scale with proven technologies

- Members of the evaluation committees sought to identify a mix of projects with genuine innovation alongside those which achieved strategic objectives for the region. For example, whilst the sack-farming project (Practical Action)² may not be considered an innovation, it scaled-up and spread a proven concept to a population which otherwise wouldn't have been introduced to the idea.
- In the early stages of BGIF, zonal office staff of the TA team were not involved in the evaluation of BGIF proposals, which resulted in a lack of ownership at zonal level. However, a subsequent decision to involve zonal staff in the evaluation process also had its difficulties since the zonal staff were (not surprisingly) predisposed to select projects which they believed would benefit Blue Gold farmers, rather

1 See Project 11 in List of BGIF projects. https://www.bluegoldwiki.com/index.php?title=List_of_BGIF_projects

2 See Project 35 in List of BGIF projects. https://www.bluegoldwiki.com/index.php?title=List_of_BGIF_projects

than to encourage innovation and/or were scaling-up proven technologies that were not available within the Blue Gold area. In the final round of project proposals (sack farming with Practical Action and water hyacinth processing with Khulna University), the zonal teams were included in the evaluation panel, and this ensured local buy-in.

- The CIMMYT project with mung bean may not have been approved if the local vote was given higher weighting. In this case, the selection committee for the solicited call was almost entirely external.

39.9 Project Management – ownership and complementarity

In general, the best BGIF projects were led by consortia where the lead organisation implemented the project and took responsibility for delivery, using complementary specialist skills, sometimes from an international NGO or Dutch company.

39.10 Selecting/Monitoring – added-value of appointing BGP technical leads

- Assigning technical leadership from within the Blue Gold technical assistance team for the implementation phase of each BGIF project, was an important reason for their success. Implementing organisations benefited from this local level ownership with access to BGP's network of contacts, at community level (through WMGs) as well as at local and regional level. At the same time, the Blue Gold technical leads were obliged to ensure the relevancy of initiatives to BGP communities. For example, promoting banana flour (powder) to local WMGs through the horizontal learning project was discouraged by the Blue Gold team because of its limited relevance to farmers - instead the implementers were encouraged to show videos on best practice in poultry farming, seedbed preparation for rice, etc.
- The technical lead also monitored financial performance - checking that the implementing organizations achieved budgeted activities and material distribution. Field monitoring by BGP staff added ensure that activities defined in the proposal were actually executed in the field.
- Occasionally, poor relations between local Blue Gold staff and staff of the implementing organisation resulted from an unwillingness of the Blue Gold staff to accept alternative approaches, or to accept the need to try (and rather fail than not to try at all).

39.11 Monitoring – Adaptive management

- By their nature, innovation projects should and allow for adaptive management both by the project implementers and the fund managers, whilst avoiding extremes: ie allowing too little change (where rigidity prevents opportunities and threats being appropriately addressed) or too much change (which results in a loss of focus and key objectives being missed). Through contract addenda, a middle way is sought in which the adjustments proposed by f the implementing teams are captured and formalised through a process which ensures that the original objectives are met, that the change is well thought out (with new payment conditions) and will be efficiently implemented. Agreeing upon these payment milestones assures common understanding about outcome of BGIF projects, both from BGP and project implementers.
- Milestone payments based on specific agreed deliverables are easy to administrate but require more budget scrutiny before contract signing. Vouchers, timesheets, etc. do not tell much about the quality of work delivered. Although attractive reports can mask the reality of poor execution, they cannot fully prove that all activities have been undertaken with satisfaction of stakeholders. In the end, field monitoring is essential.

39.12 Failure is part of innovation

By their nature as projects for innovation, the type and sequencing of project activities will vary from a project proposal – requiring adaptive management capacities both within the implementing organisation and from the fund managers. There are extremes, allowing for too little change (with rigid management which is unable to respond appropriately to opportunities and threats) or too much change (where there is little top-end supervision and modifications are made to assist field operations with a resulting loss of focus and departure from overall objectives). Through addenda to the original contract agreement, we have aimed to allow a process to emerge in which the wishes of the project teams to modify their activities are formalised whilst at the same time ensuring that the change doesn't depart from the original target, is well thought out (with new payment conditions) and can be efficiently implemented.

“The feedback from Blue Gold is most valued by United Purpose as it is informing and helping us to develop stronger and robust WBC and shaping of the social enterprise connecting all of them. This is particularly important as we are scaling up with promotion of 160 WBCs in Chittagong hill tracts” - Sriramappa Gonchikara - Country Director United Purpose

39.13 Rejected Proposals – reasons for not proceeding with unsolicited bids

In total, 108 project concepts and proposals were rejected, of which 76 were un-solicited, 32 solicited.³ Here a distinction should be made between concept notes and proposals. Many concept notes were rejected, but a just limited number of proposals.

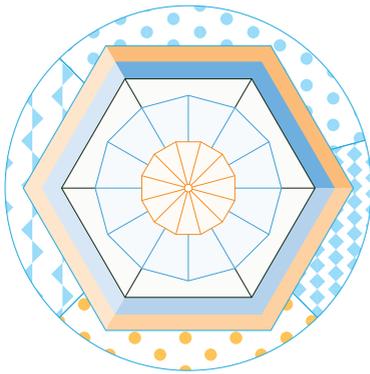
The main reasons for rejection can be summarised as follows:

- **Outside of project area:** some proposals did not take place in the coastal zone at all (eg Rangpur, Rajshahi, etc), which indicated how little preparation had been made by some applicants to understand the scope and location of Blue Gold.
- **Decontextualized:**
 - A number of applications were not appropriate to the coastal zone. Perhaps this was understandable as expenditure by these organisations was limited, but it led to otherwise good but ill-founded concepts. In our context we might try and clarify more at publication of the call, for all interested.
 - Ideas were not applicable or relevant to the project area (eg potato seed and potato processing in coastal zone will not work), or too academic and unfeasible.
- **Not innovative solutions** (grow shrimp – already there, pond fisheries – already there, sheep farming, etc.).
- **Cannot be adopted:** In a number of cases, proposals for activities outside the scope of the law were rejected (for example collecting crab from Sundarbans).
- **Too similar to BGP approach:** In these activities the Blue Gold Program follows the same extension method to increase local production. Therefore, the activities mentioned in the proposal do not qualify as ‘innovative’.
- **No response** on evaluation outcome of concept note, rejected after six months of waiting – surprisingly common reason for project rejection with no interest received from organisation after they were invited for proposal submission.

³ See list of rejected project concepts and proposals. https://www.bluegoldwiki.com/index.php?title=List_of_rejected_project_concepts_and_proposals

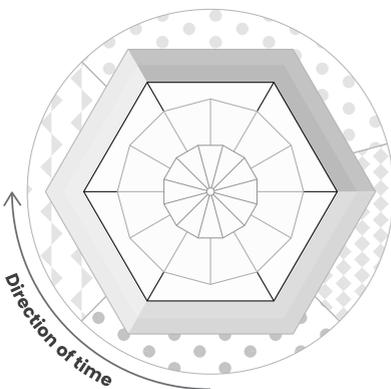
- A number of projects were targeted at **large-scale commercial farmer operations**, rather than the small-scale farmers who are typical of the Blue Gold area.
- **Organizational strength**: little or no previous experience and unable to demonstrate capability of achieving ambitious targets set down in proposals.
- Doubtful **scaling up** opportunities, none or little market potential.
- Too **expensive** – budget outside permissible BGIF range.

Appendix 1: The agricultural calendar

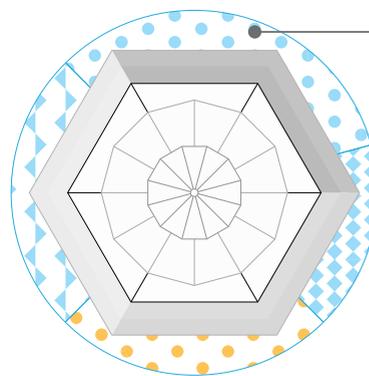


Understanding the diagram

Here we have broken down the diagram with key legends to understand the diagram.

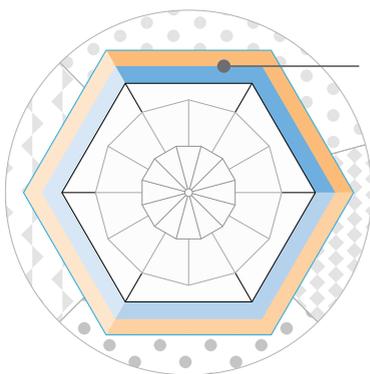


Direction of time is clockwise in the diagram.



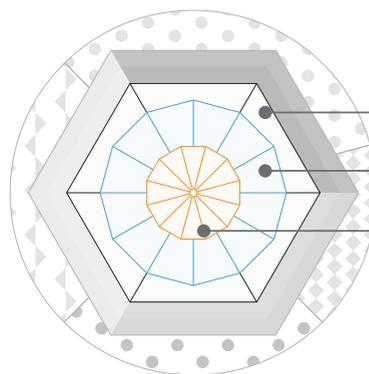
Seasons after Brammer¹

-  Pre-monsoon
-  Monsoon
-  Post-monsoon
-  Dry season



Crop cycles

-  Rice crops
-  Cropping seasons



-  Bengali season (Season in English)
-  Bengali calendar
-  Gregorian calendar

[1] Brammer, H. (2014). Section 2.2, **Climate Change, Sea-level Rise and Development in Bangladesh** (1st ed.). The University Press Ltd.

Bangladesh: seasons, rice crops and Bengali months

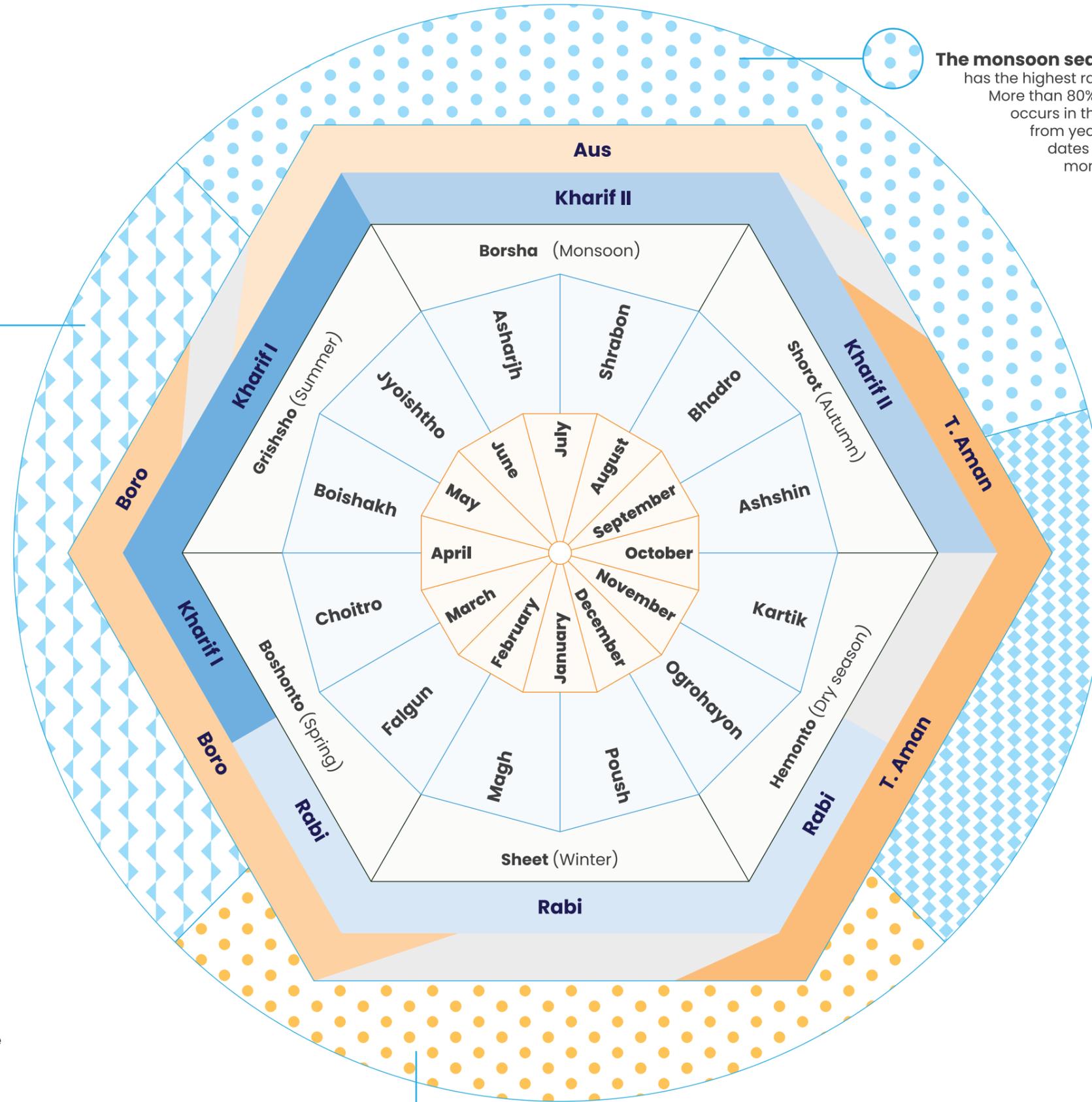
The pre-monsoon season (March to May) has the highest temperatures and evapo-transpiration rates. Occasional squalls (norwesters) give heavy rain showers with strong wind (and occasional hail and tornadoes). Tropical cyclones affect coastal areas in some years.

The monsoon season (June to September) has the highest rainfall, humidity and cloudiness. More than 80% of the annual rainfall usually occurs in this season. Totals vary greatly from year to year, and the start and end dates of the season can vary by a month or more between years.

The post-monsoon season (October to November) is hot and humid with occasional rainfall and increasing amounts of sunshine. Tropical cyclones can affect the coastal areas.

The dry season (December to February) is relatively cool and sunny with little and unreliable rainfall.

Direction of time is clockwise



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