



**Bangladesh Water Development Board (BWDB)**



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**Department of Agricultural Extension (DAE)**



**Technical Note 20**  
**Cycle 9 FFS**  
**May to November 2017**  
**Comparing benchmark and end data**

**April 2018**



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# Technical Note 20

## **Cycle 9 FFS**

Khulna, Patuakhali

May to November 2017

Comparing benchmark and end data

April 2018

Blue Gold Program

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## Summary

The ninth cycle of the Farmer Field Schools (FFS) took place from May 2017 to November 2017. A total of 57 FFSs were implemented in Khulna (where there were 33) and Patuakhali (24). In Khulna, FFSs were held in polders 25, 27/1, 27/2, 28/1, 28/2 and in Patuakhali in polders 55/2A, 55/2C, 47/3 & 47/4. The FFS content include fisheries, beef fattening and nutrition modules.

The collected benchmark and end line data are discussed in this report. Community Development Facilitators collected the data. A semi-structure questionnaire was used for data collection. Bringing the data of 57 FFS together creates a data set with information over 1,425 farmers. Totals and averages of the collected benchmark and end data are presented side by side. The calculated averages of collected data at the beginning and end of the FFS can be used to get an idea of the effect of the training.

Brief features of the report are discussed below:

Reviewing FFS participants' profile, it is found that a total of 1,425 farmer participated in the ninth cycle FFS, of whom 79% were women. This is particularly encouraging for the fisheries and beef fattening modules, where males are traditionally most active. The average age of FFS participants was 35 years, who were found to be young and dynamic. Comparatively well-educated farmers attended the FFS: only 13% were illiterate or could only sign their name. 38% farmers owned less than 50 decimal land so poor farmers were given priority involvement in FFSs. The average homestead and pond size were 20 decimals and 14 decimals respectively. 88% participants are registered WMG members, remaining yet to register in new polders.

**Fish Module** The survey reveals that 98% farmers had ponds, and that the average pond size was 14 decimals. 87% of the ponds were perennial and 84% pond were owned by a single individual. Clear differences showed for more fish species selection at the end of the FFS and it was more than five . On an average each farmer produced more than 100 kg fish and the minimum market value was Tk. 10,000. Adaptation of technical knowledge range from 95% to 100% which is reflected with increase of production. Both in Khulna and Patuakhali many more farmers linked with fingerling trader during FFS period.

**Beef Fattening Module** The survey reveals that among 1,425 farmers, 790 had cattle. Farmers with cattle owned an average of between two and three animals. Data reveal that average body weight gained/per animal was 46.53 kg in Khulna and 32 kg in Patuakhali. The average gross income earned/per farmer was Tk. 20,000. Adaptation of technical knowledge on that module was also ranged from 95% to 100%. Linkages between the Department of Livestock Service and FFS members increased during FFS period.

**Nutrition Module** For the nutrition module, thousand days dietary approach focused in the module along with proper cooking procedure, dietary status etc. During FFSs, member showed positive change in food habit and adaptation of knowledge on thousand day's food requirements. The nutritional value of Moringa leaf was given priority for inclusion in the daily meal, particularly for children under 5 years in age.

# 1. Introduction

Blue Gold Programme following Farmer Field School as a prime vehicle for trials, learning and adoption of improved farm technologies at homestead areas. For utilization of homestead resources, the programme is following a set of modules in each cycle at different polders.

This is a report of data collected in cycle 9, which took place from May 2017 to November 2017, with 33 FFS in Khulna and 24 FFS in Patuakhali. FFS cycle 9 included modules fisheries, cattle rearing and nutrition. 69 Farmer trainers involved as apprentice with Community Development Facilitator (CDFs) to run cycle 9 FFS.

## 1.1 Methodologies

A semi-structure questionnaire used for collecting bench mark and end line data. The questionnaire focused on content of fish, beef fattening and nutrition modules. Data on 1425 FFS members collected by Community Development Facilitators (CDFs). On-line questionnaire prepared by using ODK (Open Data Kit) tools. Open Data Kit (ODK) is a free and open-source set of tools which help manage mobile data collection solutions

The collected benchmark and end data are discussed in this report. Totals and averages of the collected benchmark and end data are presented side by side in Annexes 1 (Khulna), Annexes 2 (Patuakhali).

In Khulna, the FFSs took place in polders 25, 27/1, 27/2, 28/1, 28/2 and in Patuakhali the FFSs were in polders 55/2A, 55/2C, 47/3 and 47/4. Annex 3 shows the locations (WMG) of the 57 FFS.

Bringing the data of 57 FFS together, creates a dataset with information of over 1425 farmers. But some care should be taken when trying to draw conclusions. The data were collected by the same facilitators who organized the FFS, who may be biased to show good results. And the farmers themselves may also be tempted in the end survey to give answers that show how good they are, especially when questions are asked about changes in behaviour.

In the below discussion of the data, comments are included to help with the interpretation of the results.

## 1.2 Objectives

When comparing and interpreting these data it is important to understand the objectives of data collection in the FFS.

At the start of the FFS, the objectives of the “benchmark survey” are:

- To establish benchmarks that can be used by farmers and facilitators for measuring progress (e.g. in production) or to identify changes in behaviour



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- To generate interest among participants and introduce them to the topics which will be discussed and practiced during the FFS.

At the end of the FFS, the “end survey” is a repetition of the same questions. This allows the FFS participants to verify their own progress, and they can present their results (e.g. an increase of fish production), during farmer field days.

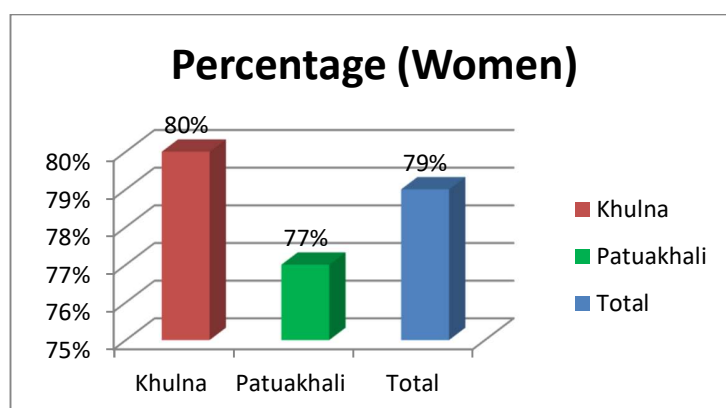
## 2. General information of FFS participants

In this chapter, the sets of “end data” are used to describe the profile of the FFS participants.

### 2.1 Gender

The following table and graph show that 79% FFS participants are women. Women are encouraged to participate the modules fisheries and cattle fattening which are mainly dominated by man. The women participation is higher in Khulna compare to Patuakhali.

Gender of participants	
Area	Percentage Women
Khulna (n=825)	80%
Patuakhali (n=600)	77%
Total (n=1425)	79%



### 2.2 Age

Young dynamic farmer preferably younger than 50 years old selected for FFS. In cycle 9 the average age was about 35 years.

Area	Age of participants		
	Average age	Youngest	Oldest
Khulna (n=825)	35	18	58
Patuakhali (n=600)	34	17	65

## 2.3 Education

The majority of farmers are literate, but a part (13%) is illiterate or can sign their name. At Khulna literacy rate is higher than Patuakhali.

Area	Education		
	Illiterate or can sign name only	Primary	Secondary/higher
Khulna (n=825)	8%	35%	58%
Patuakhali (n=600)	17%	48%	34%
Total (n=1425)	12.5%	41.5%	46%

## 2.4 WMG membership

Mainly the WMG executive committee helps selecting FFS participants according to a set of criteria. But for new polders where the WMGs are yet to form supported by AD hoc committee members. The following tables show that at the start of cycle 9 about 83% of the FFS participants were registered WMG members. By the end of FFS the percentage increased and it is 88%. After attending FFS participants are starting to become a WMG member at new polders.

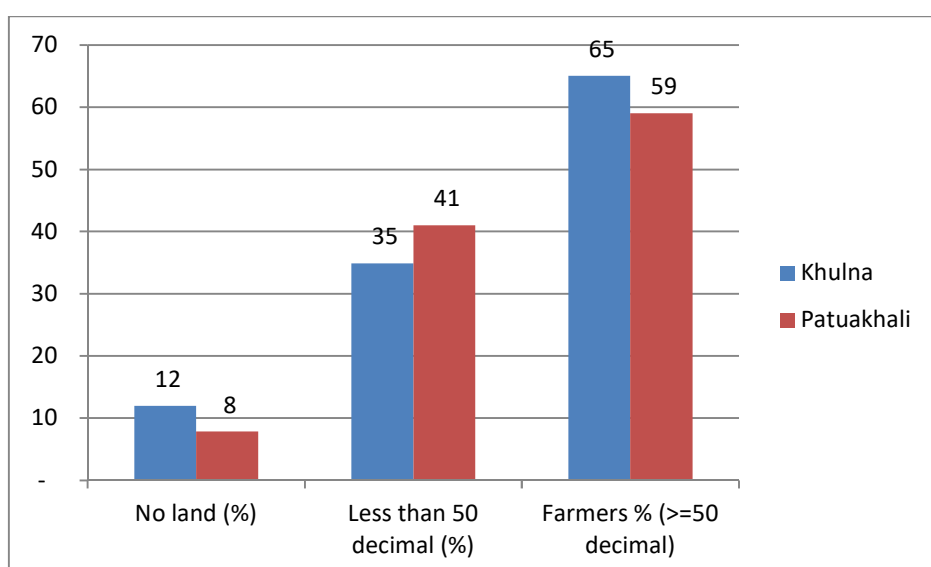
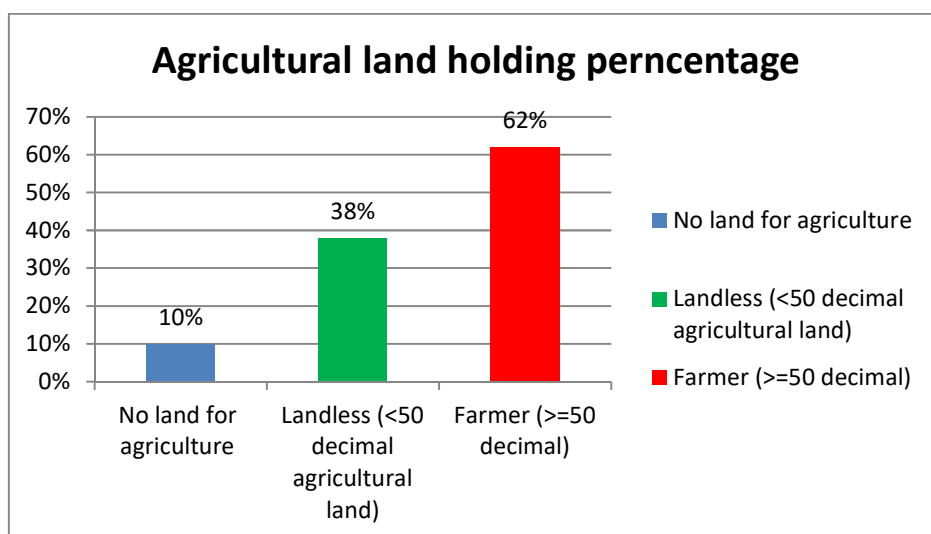
WMG members	Khulna (Number farmers)	Patuakhali (number farmers)	Total farmers %	
WMG members	803	384	1187	83%
Not members	22	215	237	17%
Total (n=1400)	825	599	1399	

WMG members	Khulna (Number Farmers)	Patuakhali (number farmers)	Total farmers %	
WMG members	821	437	1258	88
Not members	4	167	171	12
Total (n=1400)	825	600		

## 2.5 Land for agriculture and homestead area

During participant selection, priority is given to poor and landless households. In Cycle 9, about 38% of the participants belong to landless households (i.e. less than 50 decimal agricultural land. The following table and graph show land holding status (percentages) in both areas.

Area	Agricultural land available		
	No land for agriculture (percentage farmer)	Landless (Less than 50 decimal agricultural land) (percentage farmer)	Farmer (>=50 decimal) (percentage farmer)
<b>Khulna (n=825)</b>	12	35	65
<b>Patuakhali (n=600)</b>	8	41	59
<b>Total (n=1425)</b>	10	38	62

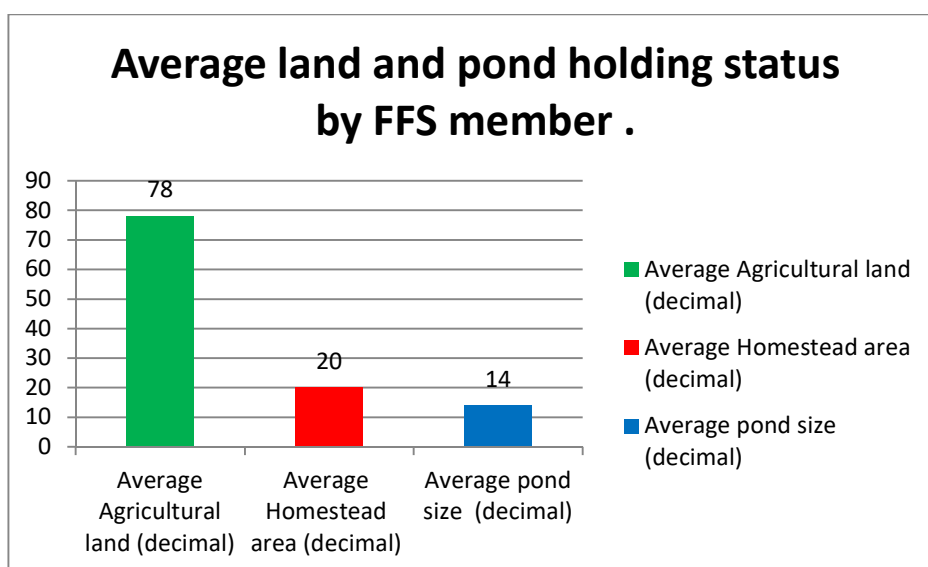


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The following table and graph show the average size of agricultural land , homestead area (Note: 100 decimal = 1 acre = 0.4 ha) and pond size owned by FFS members.

Area	Land area		
	Agricultural land area (decimal)	Homestead area (decimal)	Pond size (dec.)
<b>Khulna (n=825)</b>	76	13	15
<b>Patuakhali (n=600)</b>	80	26	13
<b>Total (n=1425)</b>	78	19.5	14



### 3. Comparing benchmark data with end data

The calculated averages of data collected at the beginning and end of the FFS can be used to get an idea of the effect of the training. However, this should not be seen as an impact study because some of the differences measured are a direct result of the training.

For example if all farmers report that they produce UMS, this shows that they did that during the training.

The increase of fish in their pond is caused by distribution of fingerlings and supplementary feed during the FFS as a learning by doing approach. And Adoption of such practices (and other changes in behaviour) should be measured in a follow-up survey at least one or two years after completing the FFS.

In the following chapters we compare some of the benchmark and end data and provide some comments for interpreting the differences. For a complete set of data please see annexes 1 and 2.

## 4. Fisheries module

In FFS Cycle 9, all FFS included the fisheries module. Objective of this module is to improve the efficiency and productivity of household ponds. Technical topics in the module include pond preparation, selection of fingerlings, stocking ratio, stocking density, use of supplementary feed, fertilizing ponds for natural feed, different problems of fish culture, fish diseases, and harvesting. Linkages with input providers and with staff of the department of fisheries are strengthened.

In this chapter, some fisheries related data are presented separately for the 2 districts where the FFSs took place. See also Annexes 1 (Khulna), 2 (Patuakhali).

### 4.1 Fish Pond Size

Farmers who participated in this FFS cycle (Patuakhali-100% , Khulna 95%) almost all own or have access to a pond. The average pond size was 15 and 13 decimal at Khulna and Patuakhali respectively. which is about 500 to 600 square meters.

Pond size	Average pond size (decimal)	Max pond size (decimal)
<b>Khulna (n=825)</b>	15	50
<b>Patuakhali (n=600)</b>	13	50

### 4.2 Type of pond

Ponds were classified as seasonal ponds (which are dry during the summer season) and perennial/year-round ponds which hold water through out the year. The following table shows 87.5% pond are perrinial pond.

Area	Types of pond (percentage of farmers)	
	Seasonal	Year-Round
<b>Khulna (n=825)</b>	13%	87%
<b>Patuakhali (n=600)</b>	12%	88%
<b>Total (n=1425)</b>	12.5%	87.5%

### 4.3 Pond ownership

Most ponds were owned by one household, but about 24% and 9% of the ponds had shared ownership at Khulna and Patuakhali respectively.

Area	Pond ownership (percentage of farmers)	
	Single ownership	Shared ownership
Khulna (n=825)	76%	24%
Patuakhali (n=600)	91%	9%

### 4.4 Pond preparation

One of the methods learned in the fisheries module is how to prepare the ponds before stocking fingerlings. We see a big difference between benchmark and end data. It shows 100% adpotability of the practice during FFS.

Pond preparation	Khulna (percentage farmers)		Patuakhali (percentage farmers)	
	Benchmark	End line	Benchmark	End line
No pond preparation	81%	<1%	78%	<1%
Partly pond preparation	15%	>1%	22%	0
Practice pond preparation	4%	98%	<1%	>99%

### 4.5 Type of fish in the pond

Farmers have different fish types in their ponds. There is a clear difference between benchmark and end data. Probably this is because farmers learned during the FFS to recognize more fish species, which can be cused to stock 3 layers of the pond, or made better production observations in their ponds.

In the end data we see that after Tilapia, the most popular fish species are Silver carp, Katla, Rui, and Rajputi



Type of fish	Khulna (percentage farmers)		Patuakhali (percentage farmers)	
	Benchmark (n=825)	Endline (n=825)	Benchmark (n=599)	Endline (n=600)
Tilapia	76.73	90.42	47.91	87.83
Silver carp	75.27	89.21	78.80	97.17
Catla	74.91	83.39	61.94	93.50
Rui	71.15	84.61	53.09	88.50
Mrigel	46.91	65.09	37.23	78.50
Mirror carp	25.70	41.58	16.69	38.67
Common carp	15.39	48.61	12.35	30.33
Rajputi	50.55	76.97	41.57	90.17
Shrimp	25.58	28.36	3.01	7.00
Other fish	12.24	28.97	16.36	16.50
Number of fish species in pond	Khulna (Average speices )		Patuakhali (percentage farmers)	
	Benchmark (n=825)	Endline (n=825)	Benchmark (n=599)	Endline (n=600)
Reported more than 5 fish species in their pond	4.7	6.4	3.7	6.3

## 4.6 Production of fish

The following tables show the production of fish. The first table is for Tilapia only, the next table for other fish, and the third table for all fish (Tilapia and other fish together). The production per farmer was calculated for all FFS farmers, and the production per decimal was calculated for the total pond area of all farmers together.

The tables show in all cases that fish production per farmer increased and that the production per decimal increased. Part of this increase is explained by the release of fingerlings which were given as an input during the FFS and part by better stocking density, stocking ratio, feeding and management of the ponds.

Comparing the districts shows that production per decimal, Khulna is better than Patuakhali.

Tilapia production	Khulna		Patuakhali	
	Benchmark (n=825)	End line (n=825)	Benchmark (n=599)	End line (n=600)
Total tilapia (kg)	24,867	46,648	4,893	24,309
Tilapia per farmer (kg)	30.1	59.1	8.2	40.5
Tilapia per decimal (kg)	2.0	3.7	0.6	3.1

Other fish production	Khulna		Patuakhali	
	Benchmark (n=825)	End line (n=825)	Benchmark (n=599)	End line (n=600)
Total other fish produce (kg)	54,510	144,856	19,618	76,109
Other fish per farmer (kg)	66.1	183.6	32.8	126.8
Other fish per decimal (kg)	4.3	11.5	2.5	9.7

All fish production	Khulna		Patuakhali	
	Benchmark (n=825)	End line (n=825)	Benchmark (n=599)	End line (n=600)
Total all fish produce (kg)	79,377	191,504	24,511	102,311
Total all fish per farmer (kg)	96.2	242.7	40.9	170.5
Total all fish per decimal (kg)	6.2	15.2	3.1	13.1

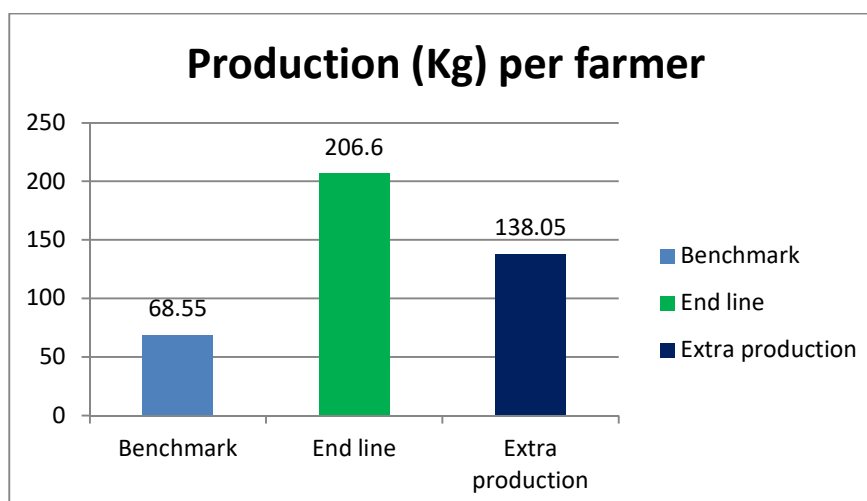
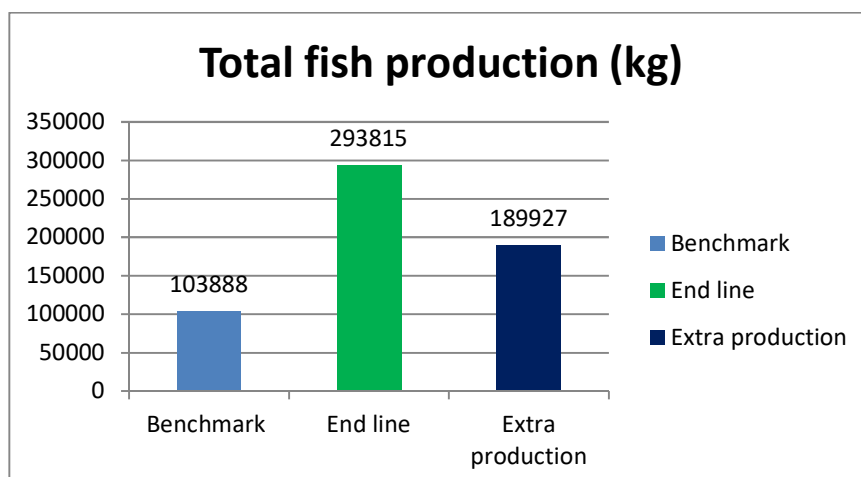
### 4.7 Increase of fish production

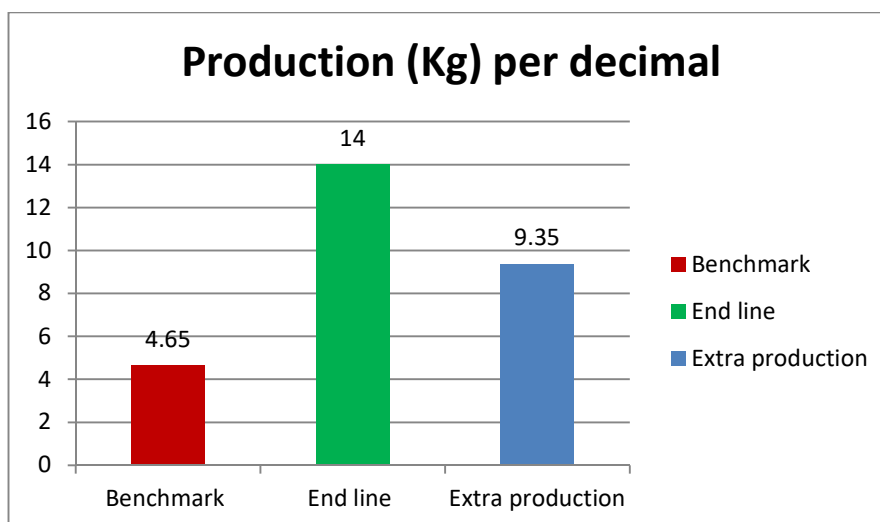
The next table shows the combining of the datasets of all fish for the three districts together. If we compare benchmark with end data we see a total of 189927 extra kg produced by the FFS members at the end of FFS. Almost 2 times increase of production (both kg/farmer and kg/decimal).

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On average each farmer produced more than 100 kg extra fish. The minimum value of this (about 10,000 Taka) is much more than the cost of a participant in an FFS (an FFS costs about 3,500 Taka per person). Of course there is some bias in the production data, as both the facilitators and farmers may have overestimated their results. But even if they produced half of what they reported, the increase in fish production has still a higher value than the cost of the training.

All fish production 2 districts	Benchmark (n= 1424)	End FFS (n= 1425)	Extra production
Total fish produced (kg)	103888	293815	189927
Kg per farmers	68.55	206.6	138.05
Kg per decimal	4.65	14	9.35





#### 4.8 Source of fingerling

The FFS curriculum pays attention to market orientation and linking farmers with input suppliers. Therefore, the benchmark survey included questions about where the farmers obtain their fingerlings.

During the benchmark survey most farmers reported that they use local vendors, while hatcheries and nurseries were hardly used. Some farmers use different sources (so the total of percentages can exceed 100%).

During the FFS season we see both in Khulna and in Patuakhali many more farmers have started using nurseries for their fingerling supply. In Khulna this is less obvious, possibly because not many nurseries are available near the FFS locations.

Source of fingerlings	Khulna (percentage farmers)		Patuakhali (percentage farmers)	
	Benchmark (n=825)	End line (n=825)	Benchmark (n=825)	End line (n=825)
Hatchery	2	10	9	8
Local vendor	97	94	32	42
Nursery	4	34	3	93

## 4.9 Use of supplementary feed

During the FFS farmers learned to use supplementary feed to increase fish production. Also some feed was distributed to farmers as an input during the FFS. That explains why in the end survey almost all farmers reported using supplementary feed, even though they did this not regularly because of the cost.

Use of supplementary feed	Khulna (percentage farmer)		Patuakhali (percentage farmer)	
	Benchmark (n=825)	End line (n=825)	Benchmark (n=825)	End line (n=825)
Use supplementary feed	16	97	2	99

## 4.10 Feed types used

Farmers were asked what types of feed they use in their fish pond. We see a clear change from using no feed or home made feed to use of locally made and commercial feed.

Fish feed types used	Khulna (percentage farmer)		Patuakhali (percentage farmer)	
	Benchmark (n=825)	End line (n=825)	Benchmark (n=599)	End line (n=600)
None	25.09	1.09	65	1
Home made	72.61	97.82	32	93
Locally made feed	24.73	72.12	8	94
Commercial feed	6.91	28.36	4	57

#### 4.11 Some other questions that relate to the fisheries module

Several other questions are asked in the benchmark survey, such as a question about practicing fish pond preparation and some knowledge questions. These questions are asked to generate interest and create expectations on what will be covered in the FFS. It is therefore no surprise to see big “improvements” in the end survey and the following table shows the clear behavioral change on technologies adoption. This is also reflected with their production .

Fish production knowledge	Khulna (percentage farmer)		Patuakhali (percentage farmer)	
	Benchmark (n=825)	End line (n=825)	Benchmark (n=599)	End line (n=600)
Practice fish pond preparation	4	98	>1	>99
Know how to select good fingerlings	1	98	0	>99
Know about stocking density	2	99	4	100
Know how to examine natural feed	1	98	1	100
Know about sampling	0	100	0	100

#### 4.12 Summary on Fish trial

As Farmer Field School is an experiential learning approach, trial ponds were established using learning by doing process (refer to Annex 4). A total of 57 trial ponds were established to put their learning into practice for economic benefit.

An average trial pond size was 13.82 and 14.5 decimal in Khulna and Patuakhali respectively. All trial farmers' having ponds of single ownership. Poly culture (such as- Indian major carps, exotic carps and tilapia) was practiced by trial farmers. Fish fingerlings were stocked from May to June, 2017 and an average stocking density was 45-50/decimal (11115-12350/ha). The annual fish production was 4.1 ton/ha in Khulna and 3.8 ton/ha in Patuakhali.

Fish production cost was Tk. 201,799/ha (Tk. 817/decimal) and Tk.216, 372/ha (Tk. 876/decimal) in Khulna and Patuakhali respectively, of which 28% was spent for fingerlings and 58% for supplementary fish feed purpose. In Khulna the gross income was Tk. 398,928/ha (Tk. 1615/decimal) and the net profit was Tk. 197,129/ha (Tk. 798/decimal). In Patuakhali, the gross income and net profit were Tk. 410,194/ha (Tk.1660/decimal) and Tk. 193,822/ha (Tk. 784/decimal).

Out of the 57 trial ponds, 37 (65%) ponds were operated by female. Generally, they were involved in cleaning the aquatic weeds, application of lime, fertilizers and supplementary feed. But very few women were involved in purchasing & selling activities (such as lime, inorganic fertilizer, fingerlings, supplementary feed purchase and harvesting & selling of fishes).

## Blue Gold Program



The constraints for sustainable pond fish farming in the areas were lack of acceptance of technical knowledge of the farmers, higher production cost (mainly fingerlings and feed), in-sufficient supply of fry and fingerlings, lack of money and credit facilities and inadequate extension services. The households have broadly improved their food consumption, increased protein intake from fish, gradually increasing the standard of living by selling fish, and also increased choice level and economic ability through fish farming.

## 5. Beef fattening module

In FFS Cycle 9, the FFSs that took place in Khulna and Patuakhali included the beef fattening module.

Objective of the beef fattening module is to improve the efficiency and profitability of beef fattening as an income generating activity. Technical topics in the module include cattle housing, cattle selection, feeding, green fodder crops, use of urea molasses straw (UMS), concentrated feed, vaccination and de-worming.

The FFS livestock modules also emphasize linkages and networking with input providers, service providers (such as animal health workers), markets, and with staff of the department of livestock services (DLS).

In this chapter, some data of the livestock module is presented for the two districts.

### 5.1 Number of cattle per farmer

The following table shows the average number of animals owned by the FFS farmers. On average, farmers who attended the FFSs had 2 to 3 animals.

An observation is that the number of bulls had decreased during the end survey, which is because during the Eid festival farmers sold their fattened animals.

Number of cattle	Khulna (Average number of animals)		Patuakhali (Average number of animals)	
	Benchmark (n=825)	End line (n=825)	Benchmark (n=599)	End line (n=600)
Number milk producing cow	0.71	0.81	1	0.80
Number non-milk producing cow	0.45	0.57	0.62	0.72
Number of male calf	0.67	0.79	0.41	0.58
Number of female calf	0.55	0.6	0.51	0.53
Number of bull	0.37	0.3	0.81	0.54
<b>Total cattle</b>	<b>2.75</b>	<b>3.07</b>	<b>3.35</b>	<b>3.17</b>

### 5.2 Cattle housing

Beef fattening module try to motivate farmers to improve the housing of their animals, both the design (ventilation, gutter for drainage, hard concrete or brick floor) as well as the hygiene (daily cleaning).

The following table shows that in the endline in all districts good progress is reported for ventilation, gutter and cleaning.



For the floor of the cattle shed we see a big difference between the districts. In Patuakhali, only very few farmers use hard materials (bricks, concrete) even at the end of the FFS. In Khulna the situation was already better at the beginning of the FFS and more progress has been made to improve the floor of the sheds.

Cattle shed	Khulna (percentage farmers)		Patuakhali (percentage farmers)	
	Benchmark (n=825)	End line (n=825)	Benchmark (n=599)	End line (n=600)
Cattle shed has ventilation	35	100	3.01	96.67
Cattle shed has gutter for drainage	29	95	0.50	92.17
Cattle shed is cleaned daily	42	99	1.84	94.17
Floor is only sand and/or soil	18.55	9.33	99.17	77.133
Floor is partly sand and/or soil and partly bricks and/or concrete	41	47	0.83	17.17
Floor is only brick and/or concrete	40	44	0	0.55

### 5.3 Feeding the cattle

Providing balanced feed to cattle will lead to better production in beef fattening. The following table shows that at the end of the FFS most farmers report that have shifted to a better way of feeding their animals.

Cattle feed used	Khulna (percentage farmers)		Patuakhali (percentage farmers)	
	Benchmark (n=825)	End line (n=825)	Benchmark (n=599)	End line (n=600)
Only roughage	4.61	1.09	16.19	5.18
Only concentrate	0.48	0.24	0.00	0.00
Only straw	12	0.24	3.51	0.33
Roughage and concentrate	0.25	7.57	0.00	3.84
Roughage and straw	80.73	94.55	80.30	90.82
Concentrate and straw	1.94	0.36	0.00	0.00
Roughage concentrate and straw	0	0	0.50	81.97

### 5.4 Green fodder

Farmers are stimulated to start producing green fodder for their animals. The following table shows for different types of green fodder how many farmers reported growing it. At the benchmark, very few farmers grow fodder.

At the end of the FFS, the high number of farmers growing Napier in Khulna with other fodder. In Khulna more farmer were involved in fodder cultivation. Availability of different fodder cutting and seed may help Khulna farmer to produce green fodder. There is a change also shown in Patuakhali. At the end farmer started cultivating some green fodder for their animal.

Green fodder	Khulna (number of farmers)		Patuakhali (number of farmers)	
	Benchmark (n=825)	End line (n=825)	Benchmark (n=599)	End line (n=600)
<b>Napier</b>	12	390	0	79
<b>Lucern</b>	0	12	0	1
<b>Jambo</b>	0	4	0	4
<b>Para</b>	0	4	0	31
<b>Maize</b>	3	43	0	12
<b>German grass</b>	4	14	2	1

### 5.5 Urea Molasses Straw (UMS)

In Khulna and Patuakhali, where the FFS included the beef fattening module, the benchmark survey included questions about the use of Urea Molasses Straw (UMS). At the end of the FFS almost all farmers know how to make UMS and most of them report that they feed it to their cattle

UMS	Khulna (percentage farmers)		Patuakhali (percentage farmers)	
	Benchmark (n=825)	End line (n=825)	Benchmark (n=599)	End line (n=600)
<b>Know how to make UMS</b>	1%	99%	<1%	97.83
<b>Feed UMS to cattle</b>	0%	93%	<1%	95.83

## 5.6 Measure body weight

For beef fattening it is important that farmers can measure the body weight of their animals. The following table shows that almost all farmers learned this in the FFS

Body weight	Khulna (percentage farmers)		Patuakhali (percentage farmers)	
	Benchmark (n=825)	End line (n=825)	Benchmark (n=599)	End line (n=600)
Know how to measure body weight	0	100	.50	100

## 5.7 De-worming

De-worming of cattle was not a common practice at the beginning of the FFS, but in the end survey most farmers report that they de-worm their animals regularly.

De-worming	Khulna (percentage farmers)		Patuakhali (percentage farmers)	
	Benchmark (n=825)	End line (n=825)	Benchmark (n=599)	End line (n=600)
De-worm cattle regularly	7	99	<1%	97.83

## 5.8 Receiving animal health

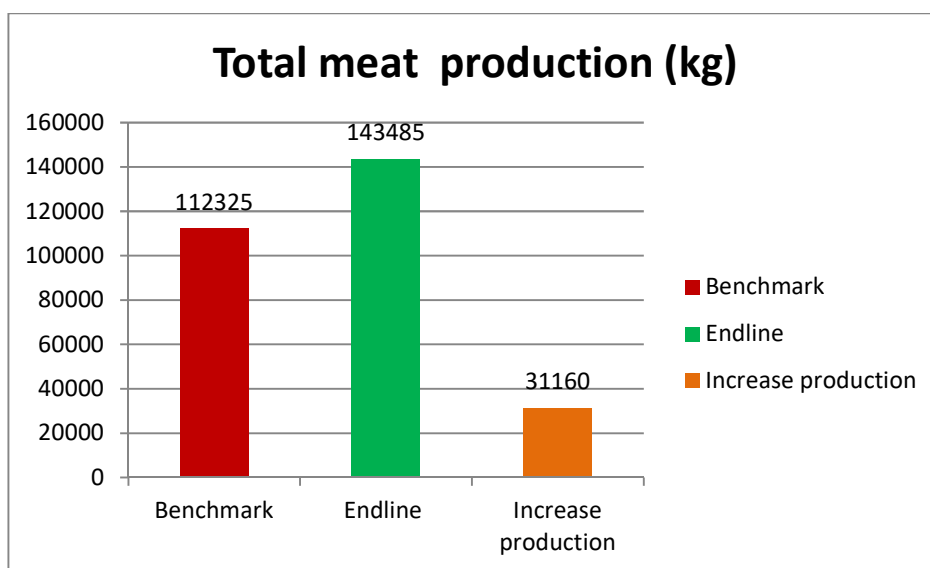
Farmers were asked if they receive or make use of animal health services, for example from community livestock workers or from staff of DLS. During the FFS the facilitators try to promote the linkages between farmers and these health services. An indicator for this is whether the farmers have a telephone number of these service providers. The following table shows the reported progress in linking with service providers.

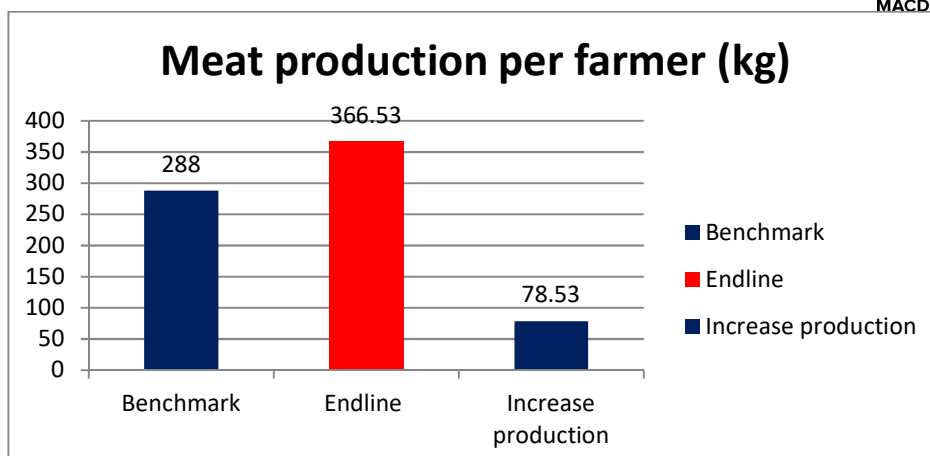
Receive animal health service	Khulna (percentage farmers)		Patuakhali (percentage farmers)	
	Benchmark (n=825)	End line (n=825)	Benchmark (n=599)	End line (n=600)
Never	62	2	93.49	13.33
Sometimes	38	60	5.34	69.67
Always	0	37	1.17	17.00
Have phone number of service provider	4	97	3.5	95

### 5.9 Meat production by all farmer

The next table shows the datasets of all farmer for beef fattening from two districts together. If we compare benchmark with end data we see a total of 31160 extra kg meat produced by the FFS members at the end of FFS. 78.53 kg extra meat produced by individual farmer at the end of FFS. Total meat production increased 27% .

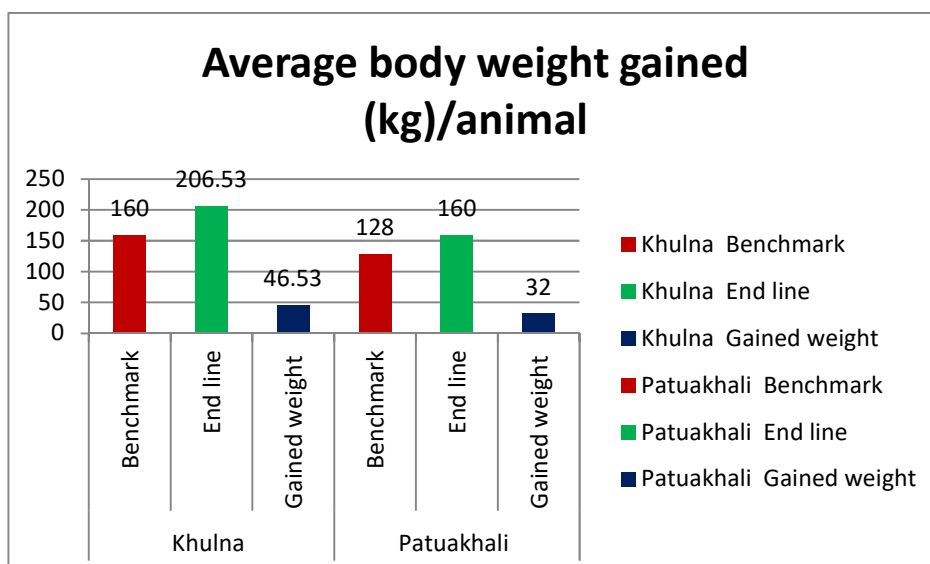
Increase of meat production by all farmer			
Meat production in 2 districts	Benchmark	End line	Extra meat production
Total meat production (kg)	112325	143485	31160 (27%)
Meat production per farmer (kg)	288	366.53	78.53





The table shows increase meat production at Khulna and Patukhali by individual farmer.

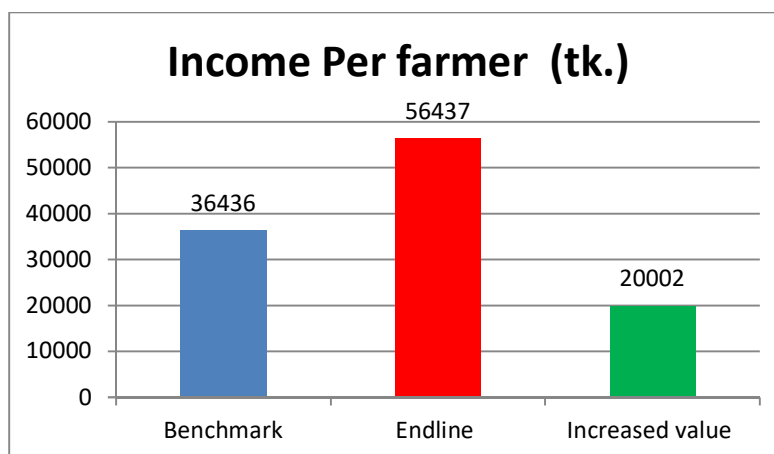
Meat production in 2 districts	Khulna		Patuakhali	
	Benchmark (n=423)	End line (n=423)	Benchmark (n= 350)	End line (n=350)
Total body weight (kg)	67614	87364	44711	56121
Average body weight / per animal (kg)	160	206.53	128	160



### 5.10 Increase of income

The following table and graph shows the increased gross income of FFS members from meat production. On an average per farmer earned tk. 20,000 from their fattened animal.

Market value of increased meat production			
All FFS member	Benchmark	End line	Increased income
All member in 2 districts (Tk.)	14166088	22087800	7921711
Per animal in both district (tk.)	36436	56437	20002



### 5.11 Summary on Beef Fattening Trial

To put learning into practice, a total of 57 Beef Fattening trial was established with 57 FFS. The data collected from FFS trials examined the profitability as well as operational economics efficiency of cattle fattening farming in Khulna and Patuakhali. Data was collected purposely with 52 FFS trials (refer to Annex 5) and using benchmark and end line data. Descriptive statistics were used to analyze the data. Results showed that small scale cattle farming were profitable. An average gross income of each animal of BDT 27,700 in both Khulna and Patuakhali. The average income of BDT 22,000 per cattle was in Patuakhali district and 32,000 in Khulna. Selected cattle for the fattening enterprise in Khulna were heavier than Patuakhali.

## 6. Nutrition module

The nutrition module is included in all FFS. Farmers learn about cooking procedures, hygiene, and about ingredients of balanced food. Emphasis is given on the “thousand day food requirements” which refers to special requirements for mothers during pregnancy and the first 2 years of the child. Farmers also learn about health benefits of Moringa.

To stimulate farmers to think about their own diet, questions are asked in the benchmark survey on what type of food they eat each week.

In this chapter, some data related to the nutrition module are presented separately for the 2 districts where the FFSs took place. See also Annexes 1 (Khulna) & 2 (Patuakhali).

### 6.1 Cooking procedures

During the nutrition sessions farmers learn about cooking procedures, for example that it is better to wash vegetables before cutting them. The positive reporting at the end of the FFS.

Know correct cooking procedures	Khulna (percentage farmer)		Patuakhali (percentage farmer)	
	Benchmark (n=825)	End line (n=825)	Benchmark (n=599)	End line (n=600)
Does not know	56	-	82	1
Knows partly	44	3	18	15
Knows fully	-	97	-	84

### 6.2 Moringa

At the beginning of the FFS most farmers are not familiar about the health benefits of Moringa, but they get exposed to this during the sessions

Moringa	Khulna (percentage farmer)		Patuakhali (percentage farmer)	
	Benchmark (n=825)	Endline (n=825)	Benchmark (n=599)	Endline (n=600)
Know moringa is healthy	2	100	2	100

### 6.3 Thousand-day nutrition requirements

At the benchmark surveys participants have limited knowledge on the food requirements during first thousand days. This improved by the end of the training.

Know 1000-day nutrient requirement	Khulna (percentage farmer)		Patuakhali (percentage farmer)	
	Benchmark (n=825)	End line (n=825)	Benchmark (n=599)	End line (n=600)
Does not know	58	0	67	-
Knows partly	41	4	33	8
Knows fully	1	96	0	92

### 6.4 Food Habit

Farmers were asked how many times per week they eat meat, fish, eggs, fruits and milks. Another question was to estimate how much vegetables they eat in a week. Results are presented below in a table.

Explaining the increased consumption at the end of FFS is difficult. Part of it could be an effect of the nutrition training. Nutrition messages on the importance of a balanced diet are emphasized. The increase in fish consumption can have been influenced by more fish being produced during the FFS.

The below table shows that almost all types of food got positive score in Khulna and Patuakhali. But Patuakhali secured less than Khulna. This suggests that in Patuakhali farmers in general have a poorer diet.

Food habit	Khulna		Patuakhali	
	Benchmark (n=825)	End line (n=825)	Benchmark (n=599)	End line (n=600)
Meat (times per week)	1.1	1.4	0.6	1.1
Fish (times per week)	3.6	4.3	2.1	3
Eggs (times per week)	1.8	2.5	1.4	1.9
Fruit (times per week)	2.6	2.9	1.5	2.3
Milk (times per week)	2.5	3.8	2.2	2.7
Amount vegetables per week (g)	1188	1942	1020	2158



## 7. Conclusion

The data presented in this report were collected during benchmark and end surveys of cycle 9 and represent the results of about 1425 farmers. Comparing end data with benchmark data shows some immediate effects of the FFS training, such as an increase of fish and meat production. FFSs in cycle 9 seem to have been very successful in increasing production and income.

Analysis of the data of FFS cycle 9 shows that the FFS approach is good “value for money”. The increased production and income of the FFS farmers during the FFS season exceeds the cost of the training.

For sustainability it need to a good relationship among service providers, line departments and contact farmer

## Annex 1 Khulna

### FFS modules: Fish, Cattle rearing, and Nutrition

Benchmark data of 33 FFSs (Cycle 9)

825 records

End data of 33 FFS (Cycle 9)

825 records

#### GENERAL INFO PARTICIPANTS

#### GENERAL INFO PARTICIPANTS

##### Records per polder

Polder 25 count	525
Polder 27/1 count	75
Polder 27/2 count	75
Polder 28/1 count	61
Polder 28/2 count	89
Total	825

##### Records per polder

Polder 25	525
Polder 28/1	75
Polder 28/2	75
Polder 27/1	75
Polder 27/2	75
Total	825

##### Age

Average age	35
Median age	35
Youngest	18
Oldest	58

##### Age

Average age	35
Median age	35
Youngest	18
Oldest	58

##### Gender

Men	165
Women	660
Total	825
Percentage women	80

##### Gender

Men	163
Women	662
Total	825
Percentage women	80

## Education

Illiterate	2
Can sign	53
Primary	246
Secondary	407
HCC and above	117
Total	825

## WMG member

Member	803
Not member	22
Count total	825

## Area agriculture (decimal)

Average	84
Median	66
Zero area (0 decimal)	92
Landless (<50 decimal)	278
Not landless (>=50 decimal)	547
Total	825
Percentage zero area	11
Percentage landless	34
Percentage not landless	66
Min area (decimal)	-
Max area (decimal)	600

## Area homestead (decimal)

Average	13
Median	10
Min	-
Max	99
Zero area (num farmers)	2

## Education

Illiterate	2
Can sign	60
Primary	285
Secondary	375
HCC and above	103
Total	825

## WMG member

Member	821
Not member	4
Count total	825

## Area agriculture (decimal)

Average	76
Median	66
Zero area (0 decimal)	97
Landless (<50 decimal)	288
Not landless (>=50 decimal)	537
Total	825
Percentage zero area	12
Percentage landless	35
Percentage not landless	65
Min area (decimal)	-
Max area (decimal)	600

## Area homestead (decimal)

Average	13
Median	10
Min	2
Max	75
Zero area (num farmers)	-

## CATTLE REARING - BEEF FATTENING

### Number milk producing cow

Average	0.71
Min	1
Max	1
Total animals	583

### Number non-milk producing cow

Average	0.45
Min	-
Max	4
Total animals	282

### Number male calf

Average	0.67
Min	-
Max	4
Total animals	554

### Number female calf

Average	0.55
Min	-
Max	5
Total animals	454

### Number bull

Average	0.37
Min	-
Max	4
Total animals	307

## CATTLE REARING - BEEF FATTENING

### Number milk producing cow

Average	0.81
Min	-
Max	8
Total animals	670

### Number non-milk producing cow

Average	0.57
Min	-
Max	8
Total animals	467

### Number male calf

Average	0.79
Min	-
Max	4
Total animals	652

### Number female calf

Average	0.6
Min	0.0
Max	4.0
Total animals	490.0

### Number bull

Average	0.3
Min	0.0
Max	4.0
Total animals	222.0

### Number of animals

Average	2.75
Min	-
Max	17
Total animals	2,267
Count farmers with 0	44
Count who have animals	781

### Number of animals

Average	3.03
Min	-
Max	17
Total animals	2,501
Count farmers with 0	35
Count who have animals	790

### Receive health services

Never	509
Sometimes	313
Always	3
Total	825

### Receive health services

Never	17
Sometimes	499
Always	309
Total	825

### Have phone of service provider

No	789
Yes	36
Total	825

### Have phone of service provider

No	23
Yes	802
Total	825

### Cattle shed has ventilation

No	533
Yes	292
Total	825

### Cattle shed has ventilation

No	4
Yes	821
Total	825

### Cattle shed has gutter for drainage

No	587
Yes	238
Total	825

### Cattle shed has gutter for drainage

No	38
Yes	787
Total	825

### Cattle shed cleaned daily

No	476
Yes	349
Total	825

### Cattle shed cleaned daily

No	8
Yes	817
Total	825

## Cattle shed floor

concrete	58
brick	158
sand	8
soil	142
concrete brick	114
concrete soil	20
concrete sand	14
brick sand	38
brick soil	41
sand soil	3
concrete brick sand	218
concrete brick soil	2
concrete sand soil	1
brick sand soil	5
concrete brick sand soil	3
Total	825

## Cattle shed floor

concrete	86
brick	169
sand	9
soil	67
concrete brick	108
concrete soil	1
concrete sand	2
brick sand	16
brick soil	50
sand soil	1
concrete brick sand	250
concrete brick soil	3
concrete sand soil	-
brick sand soil	14
concrete brick sand soil	49
Total	825

## Cattle shed floor types used

Only sand and/or soil	153
Combinations with brick and concrete	342
Only brick and/or concrete	330
Total	825

## Cattle shed floor types used

Only sand and/or soil	77
Combinations with brick and concrete	385
Only brick and/or concrete	363
Total	825

## What feed do you give

Only roughage	38
Only concentrate	4
Only straw	99
Roughage and concentrate	2
Roughage and straw	666
Concentrate and straw	16
Roughage, concentrate and straw	-
Total	825

## What feed do you give

Only roughage	9
Only concentrate	2
Only straw	2
Roughage and concentrate	29
Roughage and straw	780
Concentrate and straw	3
Roughage, concentrate and straw	-
Total	825

### What fodder you grow

No fodder	806
Napier	12
Lucern	-
Jambo	-
Para	-
Maize	3
German grass	4
Total	825

### What fodder you grow

No fodder	383
Napier	390
Lucern	12
Jambo	4
Para	4
Maize	43
German grass	14
Total	850

### Know how to make UMS

No	819
Yes	6
Total	825

### Know how to make UMS

No	11
Yes	814
Total	825

### Feed UMS to cattle

No	821
Yes	4
Total	825

### Feed UMS to cattle

No	58
Yes	767
Total	825

### De-worm cattle regularly

No	768
Yes	57
Total	825

### De-worm cattle regularly

No	8
Yes	817
Total	825

### Know measure body weight

No	822
Yes	3
Total	825

### Know measure body weight

No	3
Yes	822
Total	825

## Blue Gold Program



### Initial body weight (Kg)

All farmers animal weight (kg)	67614
Per farmer animal body weight (kg)	160
Average body weight (kg)	160
Count who have animal	423

### Last body weight (Kg)

All farmers animal weight (kg)	87364
Per farmer animal body weight (kg)	206.534279
Average body weight (kg)	206.534279
Count who have animal	423

### Initial market value (Tk.) (all farmer)

Total initial value (Tk.)	16382500
Per farmer initial cost (Tk.)	38729
Average Cost (Tk.)	38729
Count who have animal	423

### Last market value (Tk.)-all farmer

Total market value (Tk.)	27056800
Per farmer market value (Tk.)	63964
Average Cost (Tk.)	63964.07
Count who have animal	423



## FISH PRODUCTION

### Pond size (decimal)

Average	15.4
Median	11
Min	-
Max	50
Count no pond	32
Total pond area (decimal)	12,742

### Pond type

Seasonal	127
Year-round	698
Total	825

### Pond ownership

Single	563
Shared	229
Total	792
Percentage single owned	71

### Cultivate fish in pond

No	106
Yes	719
Total	825
Percentage cultivate fish	87.15

## FISH PRODUCTION

### Pond size (decimal)

Average	15.3
Median	12
Min	-
Max	50
Count no pond	36
Total pond area (decimal)	12,639
Count who have pond	789

### Pond type

Seasonal	99
Year-round	690
Total	789

### Pond ownership

Single	596
Shared	193
Total	789
Percentage single owned	76

### Cultivate fish in pond

No	37
Yes	788
Total	825
Percentage cultivate fish	96

### Types of fish

Tilapia	633
Silver carp	621
Katla	618
Rui	587
Mrigel	387
Mirror carp	212
Common carp	127
Rajputi	417
Shrimp	211
Other fish	101
Total farmers	825

### Types of fish

Tilapia	746
Silver carp	736
Katla	688
Rui	698
Mrigel	537
Mirror carp	343
Common carp	401
Rajputi	635
Shrimp	234
Other fish	239
Total farmers	825

### Number species

Average	4.7
Min	-
Max	10
Count 0	106
Count 1	7
Count 2	14
Count 3	59
Count 4	150
Count 5	131
Count 6	165
Count 7	117
Count 8	48
Count 9	26
Count 10	2
Total	825

### Number species

Average	6.4
Min	-
Max	10
Count 0	37
Count 1	11
Count 2	6
Count 3	11
Count 4	27
Count 5	75
Count 6	234
Count 7	227
Count 8	102
Count 9	41
Count 10	54
Total	825

### Tilapia production (kg)

Total Tilapia (kg)	24,867
Tilapia per farmer (kg)	30.1
Tilapia per decimal (kg)	2.0

### Tilapia production (kg)

Total Tilapia (kg)	46,648
Tilapia per farmer (kg)	59.1
Tilapia per decimal (kg)	3.7

## Blue Gold Program



### Other fish production (kg)

Total other fish (kg)	54,510
Other fish per farmer (kg)	66.1
Other fish per decimal (kg)	4.3

### All fish production (kg)

All fish (kg)	79,377
All fish per farmer(kg)	96.2
All fish per decimal(kg)	6.2

### Fish pond preparation

No	667
Partly	127
Yes	31
Total	825

### Know select good fingerling

No	819
Yes	6
Total	825

### Source fingerlings

Hatchery	19
Local vendor	801
Local nursery	30
Total farmers	825

### Use supplementary feed

No	689
Yes	136
Total	825

### Other fish production (kg)

Total other fish (kg)	144,856
Other fish per farmer (kg)	183.6
Other fish per decimal (kg)	11.5

### All fish production (kg)

All fish (kg)	191,504
All fish per farmer(kg)	242.7
All fish per decimal(kg)	15.2

### Fish pond preparation

No	4
Partly	9
Yes	812
Total	825

### Know select good fingerling

No	14
Yes	811
Total	825

### Source fingerlings

Hatchery	81
Local vendor	774
Local nursery	277
Total farmers	825

### Use supplementary feed

No	22
Yes	803
Total	825

### Feed type

None	207
Home made	599
Locally made feed	204
Commercial feed	57
None	207
Only Home made	397
Only Locally made	15
Only Commercial	3
Homemade + Locally made	149
Homemade + Commercial	14
Locally made + Commercial	1
Homemade + Locally made + Commercial	39
Total	825

### Feed type

None	9
Home made	807
Locally made feed	595
Commercial feed	234
None	9
Only Home made	161
Only Locally made	6
Only Commercial	2
Homemade + Locally made	415
Homemade + Commercial	58
Locally made + Commercial	1
Homemade + Locally made + Commercial	173
Total	825

### Know about stocking density

No	807
Yes	18
Total	825

### Know about stocking density

No	6
Yes	819
Total	825

### Know how to examine natural feed

No	817
Yes	8
Total	825

### Know how to examine natural feed

No	15
Yes	810
Total	825

### Know about sampling

No	823
Yes	2
Total	825

### Know about sampling

No	4
Yes	821
Total	825

## Blue Gold Program



### NUTRITION

#### Know cooking process

Does not know	461
Knows partly	364
Knows fully	-
Total	825

#### Know Moringa is healthy

Does not know	811
Knows	14
Total	825

#### Knows thousand-day food requirement

Does not know	480
Knows partly	340
Knows well	5
Total	825

#### Days per week eat meat

Average	1.1
Min	-
Max	5

#### Days per week eat fish

Average	3.6
Min	-
Max	7

#### Days per week eat eggs

Average	1.8
Min	-
Max	6

### NUTRITION

#### Know cooking process

Does not know	-
Knows partly	27
Knows fully	798
Total	825

#### Know Moringa is healthy

Does not know	2
Knows	823
Total	825

#### Knows thousand-day food requirement

Does not know	1
Knows partly	34
Knows well	790
Total	825

#### Days per week eat meat

Average	1.4
Min	-
Max	5

#### Days per week eat fish

Average	4.3
Min	-
Max	6

#### Days per week eat eggs

Average	2.5
Min	-
Max	6

## Blue Gold Program



### Days per week eat fruit

Average	2.6
Min	-
Max	7

### Days per week eat fruit

Average	2.9
Min	-
Max	7

### Days per week drink milk

Average	2.5
Min	-
Max	6

### Days per week drink milk

Average	3.8
Min	-
Max	6

### Amount vegetables per week (gram)

Average	1,188
Min	-
Max	4,000

### Amount vegetables per week (gram)

Average	1,942
Min	2
Max	4,000

## Annex 2 Patuakhali

### FFS modules: Fish, Cattle rearing, and Nutrition

Benchmark data of 24 FFSs (Cycle 9)

599 records

End data of 24 FFS (Cycle 9)

600 records

#### GENERAL INFO PARTICIPANTS

##### Records per polder

Count 55_2a	150
Count 55_2c	150
Count 47_3	224
Count 47_4	75
Total	599

##### Age

Average age	34
Median age	35
Youngest	17
Oldest	65

##### Gender

Men	134
Women	465
Total	599
Percentage women	78

#### GENERAL INFO PARTICIPANTS

##### Records per polder

Count 55_2a	150
Count 55_2c	150
Count 47_4	225
Count 47_3	75
Total	600

##### Age

Average age	34
Median age	35
Youngest	17
Oldest	65

##### Gender

Men	138
Women	462
Total	600
Percentage women	77

## Blue Gold Program



### Education

Illiterate	3
Can sign	100
Primary	289
Secondary	142
HCC and above	65
Total	599

### WMG member

Member	384
Not member	215
Total	599

### Area agriculture (decimal)

Average	76
Median	60
Zero area (0 decimal)	71
Landless (<50 decimal)	274
Not landless (>=50 decimal)	325
Total	599
Percentage zero area	12
Percentage landless	46
Percentage not landless	54
Min area (decimal)	-
Max area (decimal)	400

### Area homestead (decimal)

Average	27
Median	20
Min	-
Max	99
Zero area (num farmers)	2

### Education

Illiterate	5
Can sign	99
Primary	292
Secondary	138
HCC and above	66
Total	600

### WMG member

Member	437
Not member	163
Total	600

### Area agriculture (decimal)

Average	80
Median	60
Zero area (0 decimal)	47
Landless (<50 decimal)	246
Not landless (>=50 decimal)	354
Total	600
Percentage zero area	8
Percentage landless	41
Percentage not landless	59
Min area (decimal)	-
Max area (decimal)	400

### Area homestead (decimal)

Average	26
Median	20
Min	-
Max	99
Zero area (num farmers)	1



## Blue Gold Program



### CATTLE REARING – BEEF FATTENING

#### Number milk producing cow

Average	1
Min	-
Max	5
Total animals	379

#### Number non-milk producing cow

Average	0.62
Min	-
Max	8
Total animals	370

#### Number male calf

Average	0.41
Min	-
Max	3
Total animals	245

#### Number female calf

Average	0.51
Min	-
Max	8
Total animals	305

#### Number bull

Average	0.81
Min	-
Max	6
Total animals	484

### CATTLE REARING - BEEF FATTENING

#### Number milk producing cow

Average	0.80
Min	-
Max	8
Total animals	478

#### Number non-milk producing cow

Average	0.72
Min	-
Max	8
Total animals	431

#### Number male calf

Average	0.58
Min	-
Max	8
Total animals	347

#### Number female calf

Average	0.53
Min	-
Max	8
Total animals	318

#### Number bull

Average	0.54
Min	-
Max	4
Total animals	323

## Blue Gold Program



### Number of animals

Average	2.98
Min	-
Max	23
Total animals	1,783
Count number with 0 animal	74

### Number of animals

Average	3.16
Min	-
Max	22
Total animals	1,897
Count 0 animal	67

### Receive health services

Never	560
Sometimes	32
Always	7
Total	599

### Receive health services

Never	80
Sometimes	418
Always	102
	600

### Have phone of service provider

No	578
Yes	21
Total	599

### Have phone of service provider

No	30
Yes	570
Total	600

### Cattle shed has ventilation

No	581
Yes	18
Total	599

### Cattle shed has ventilation

No	20
Yes	580
Total	600

### Cattle shed has gutter for drainage

No	596
Yes	3
Total	599

### Cattle shed has gutter for drainage

No	47
Yes	553
Total	600

### Cattle shed cleaned daily

No	588
Yes	11
Total	599

### Cattle shed cleaned daily

No	35
Yes	565
Total	600

## Cattle shed floor

concrete	1
brick	0
sand	0
soil	594
concrete brick	0
concrete soil	2
concrete sand	0
brick sand	1
brick soil	0
sand soil	0
concrete brick sand	0
concrete brick soil	0
concrete sand soil	0
brick sand soil	0
concrete brick sand soil	1
Total	599

## Cattle shed floor types used

Only sand and/or soil	594
Combinations with brick and concrete	5
Only brick and/or concrete	-
Total	599

## What feed do you give

Only roughage	97
Only concentrate	0
Only straw	21
Roughage and concentrate	0
Roughage and straw	481
Concentrate and straw	0
Roughage, concentrate and straw	3
Total	602

## Cattle shed floor

concrete	2
brick	30
sand	7
soil	422
concrete brick	1
concrete soil	0
concrete sand	0
brick sand	3
brick soil	0
sand soil	37
concrete brick sand	84
concrete brick soil	0
concrete sand soil	0
brick sand soil	1
concrete brick sand soil	13
Total	600

## Cattle shed floor types used

Only sand and/or soil	464
Combinations with brick and concrete	103
Only brick and/or concrete	33
Total	600

## What feed do you give

Only roughage	31
Only concentrate	0
Only straw	2
Roughage and concentrate	23
Roughage and straw	544
Concentrate and straw	0
Roughage, concentrate and straw	491
Total	1091

## Blue Gold Program



### What fodder you grow

No fodder	597
Napier	0
Lucern	0
Jambo	0
Para	0
Maize	0
German grass	2
Total	599

### Know how to make UMS

No	597
Yes	2
Total	599

### Feed UMS to cattle

No	598
Yes	1
Total	599

### De-worm cattle regularly

No	598
Yes	1
Total	599

### Know measure body weight

No	596
Yes	3
Total	599

### What fodder you grow

No fodder	519
Napier	79
Lucern	1
Jambo	4
Para	31
Maize	12
German grass	1
Total	

### Know how to make UMS

No	13
Yes	587
Total	600

### Feed UMS to cattle

No	25
Yes	575
Total	600

### De-worm cattle regularly

No	13
Yes	587
Total	600

### Know measure body weight

No	0
Yes	600
Total	600

## Blue Gold Program



### Initial body weight of FFS members (all farmer)

All farmers animal weight (kg)	44711
Per farmer animal body weight (kg)	128
Average body weight (kg)	128
Count who have animal	350

### Initial market value (Tk.) (all farmer)

Total initial value (Tk.)	11949677
Per farmer initial cost (Tk.)	34142
Average Cost (Tk.)	34142
Count who have animal	350

### Animal Last body weight of FFS members

All farmers animal weight (kg)	56121
Per farmer animal body weight (kg)	160.3457143
Average body weight (kg)	160.3457143
Count who have animal	350

### Last market value (Tk.)-all farmer

Total market value (Tk.)	17118800
Per farmer market value (Tk.)	48911
Average Cost (Tk.)	48910.86
Count who have animal	350

## FISH PRODUCTION

### Pond size (decimal)

Average	13.0
Median	12
Min	3
Max	50
Count no pond	-
Total pond area (decimal)	7,787

### Pond type

Seasonal	77
Year-round	522
Total	599

### Pond ownership

Single	536
Shared	63
Total	599

## FISH PRODUCTION

### Pond size (decimal)

Average	13.1
Median	12
Min	1
Max	50
Count no pond	-
Total pond area (decimal)	7,839

### Pond type

Seasonal	72
Year-round	528
Total	600

### Pond ownership

Single	548
Shared	52
Total	600

## Blue Gold Program



Percentage single owned	89
-------------------------	----

Percentage single owned	91
-------------------------	----

### Cultivate fish in pond

No	89
Yes	510
Total	599
Percentage cultivate fish	85

### Cultivate fish in pond

No	-
Yes	600
Total	600
Percentage cultivate fish	100

### Types of fish

Tilapia	287
Silver carp	472
Katla	371
Rui	318
Mrigel	223
Mirror carp	100
Common carp	74
Rajputi	249
Shrimp	18
Other fish	98
Total farmers	599

### Types of fish

Tilapia	527
Silver carp	583
Katla	561
Rui	531
Mrigel	471
Mirror carp	232
Common carp	182
Rajputi	541
Shrimp	42
Other fish	99
Total farmers	600

### Number species

Average	3.7
Min	-
Max	10
Count 0	89
Count 1	10
Count 2	31
Count 3	99
Count 4	136
Count 5	138
Count 6	75
Count 7	13
Count 8	7
Count 9	-

### Number species

Average	6.3
Min	1
Max	10
Count 0	-
Count 1	8
Count 2	5
Count 3	4
Count 4	32
Count 5	60
Count 6	295
Count 7	95
Count 8	54
Count 9	26

## Blue Gold Program



Count 10	1
Total	599

Count 10	21
Total	600

### Tilapia production (kg)

Total Tilapia (kg)	4,893
Tilapia per farmer (kg)	8.2
Tilapia per decimal (kg)	0.6

### Tilapia production (kg)

Total Tilapia (kg)	24,309
Tilapia per farmer (kg)	40.5
Tilapia per decimal (kg)	3.1

### Other fish production (kg)

Total other fish (kg)	19,618
Other fish per farmer (kg)	32.8
Other fish per decimal (kg)	2.5

### Other fish production (kg)

Total other fish (kg)	76,109
Other fish per farmer (kg)	126.8
Other fish per decimal (kg)	9.7

### All fish production (kg)

All fish (kg)	24,511
All fish per farmer(kg)	40.9
All fish per decimal(kg)	3.1

### All fish production (kg)

Total all fish (kg)	102,311
All fish per farmer (kg)	170.5
All fish per decimal (kg)	13.1

### Fish pond preparation

No	468
Partly	130
Yes	1
Total	599

### Fish pond preparation

No	2
Partly	-
Yes	598
Total	600

### Know select good fingerling

No	597
Yes	2
Total	599

### Know select good fingerling

No	6
Yes	594
Total	600

### Source fingerlings

Hatchery	55
Local vendor	551
Local nursery	20
Total farmers	599

### Source fingerlings

Hatchery	50
Local vendor	253
Local nursery	558
Total farmers	600

## Blue Gold Program



### Use supplementary feed

No	589
Yes	10
Total	599

### Feed type

None	392
Home made	192
Locally made feed	50
Commercial feed	23
None	392
Only Home made	127
Only Locally made	5
Only Commercial	10
Homemade + Locally made	45
Homemade + Commercial	13
Locally made + Commercial	-
Homemade + Locally made + Commercial	-
Total	592

### Know about stocking density

No	577
Yes	22
Total	599

### Know how to examine natural feed

No	591
Yes	8
Total	599

### Know about sampling

No	598
Yes	1
Total	599

NUTRITION

### Use supplementary feed

No	4
Yes	596
Total	600

### Feed type

None	7
Home made	559
Locally made feed	564
Commercial feed	342
None	3
Only Home made	29
Only Locally made	37
Only Commercial	1
Homemade + Locally made	185
Homemade + Commercial	3
Locally made + Commercial	-
Homemade + Locally made + Commercial	338
Total	600

### Know about stocking density

No	2
Yes	598
Total	600

### Know how to examine natural feed

No	-
Yes	600
Total	600

### Know about sampling

No	-
Yes	600
Total	600

NUTRITION



## Know cooking process

Does not know	489
Knows partly	110
Knows fully	-
Total	599

## Know Moringa is healthy

Does not know	590
Knows	9
Total	599

## Knows thousand-day food requirement

Does not know	402
Knows partly	195
Knows well	2
Total	599

## Days per week eat meat

Average	0.6
Min	-
Max	3

## Days per week eat fish

Average	2.1
Min	-
Max	5

## Days per week eat eggs

Average	1.4
Min	-
Max	3

## Days per week eat fruit

## Know cooking process

Does not know	3
Knows partly	92
Knows fully	505
Total	600

## Know Moringa is healthy

Does not know	2
Knows	598
Total	600

## Knows thousand-day food requirement

Does not know	-
Knows partly	46
Knows well	554
Total	600

## Days per week eat meat

Average	1.1
Min	-
Max	4

## Days per week eat fish

Average	3
Min	1
Max	7

## Days per week eat eggs

Average	1.9
Min	-
Max	5

## Days per week eat fruit

## Blue Gold Program



Average	1.5
Min	-
Max	4

Average	2.3
Min	-
Max	6

### Days per week drink milk

Average	2.2
Min	-
Max	6

### Days per week drink milk

Average	2.7
Min	-
Max	6

### Amount vegetables per week (gram)

Average	1,020
Min	500
Max	1,800

### Amount vegetables per week (gram)

Average	2,158
Min	300
Max	4,000

## Annex 3 Locations of 57 FFS

### Khulna – Patuakhali (May- November 2017)

FFS ID	WMG	Polder	Union	Upazila	Facilitator
553	Kharnia	25	Kharnia	Dumuria	Hafsa
554	Ranai	25	Kharnia	Dumuria	Hafsa
555	Bhadradia	25	Kharnia	Dumuria	Hafsa
560	Bahadurpur	27_2	Kharnia	Dumuria	Hafsa
546	Rudaghara	25	Rudaghara	Dumuria	Monalisa
547	Sholgatia	25	Rudaghara	Dumuria	Monalisa
548	Chohera	25	Rudaghara	Dumuria	Monalisa
558	Bilpatela	27_1	Raghunathpur	Dumuria	Monalisa
556	Gutudia	27_1	Gutudia	Dumuria	Nasima
557	Ukhra	27_1	Kharnia	Dumuria	Nasima
559	Komolpur	27_2	Gutudia	Dumuria	Nasima
561	Golna	27_2	Dumuria	Dumuria	Nasima
538	Rangpur West	25	Rangpur	Dumuria	Nasir
539	Ramkrisnapur	25	Rangpur	Dumuria	Nasir
540	Rangpur East	25	Rangpur	Dumuria	Nasir
541	Ghona madardanga	25	Rangpur	Dumuria	Nasir
549	Baddagati	25	Jamira	Fultola	Rasel
550	Daukona	25	Jamira	Fultola	Rasel
551	Pathiabanda	25	Jamira	Fultola	Rasel
552	Garakhola	25	Jamira	Fultola	Rasel
562	Lata	28_1	Gutudia	Dumuria	Rasel
564	Kuloti	28_1	Gutudia	Dumuria	Sabina
565	Soilmari	28_2	Jolma	Batiaghata	Sabina
566	Guptomari douniyafad	28_2	Jolma	Batiaghata	Sabina
567	Rangamari	28_2	Jolma	Batiaghata	Sabina
542	Katenga	25	Dhamalia	Dumuria	Walliullah
543	Dohakula	25	Dhamalia	Dumuria	Walliullah
544	Sholua	25	Rangpur	Dumuria	Walliullah
545	Chechuri	25	Dhamalia	Dumuria	Walliullah
563	Uttar bill pabla	28_1	Gutudia	Dumuria	Walliullah
535	Raghunathpur	25	Raghunathpur	Dumuria	Zahida

FFS ID	WMG	Polder	Union	Upazila	Facilitator
536	Shahpur	25	Raghunathpur	Dumuria	Zahida
537	Rurampur	25	Raghunathpur	Dumuria	Zahida
520	Budharampur Khal	55_2c	Alipura	Doshmina	Basar
521	Kamarkhali Khal	55_2c	Bokulbaria	Golachipa	Basar
522	Rahitpura Khal	55_2C	Alipura	Doshmina	Basar
523	Tegachai Azimuddin	47_3	Mithagonj	Kolapara	Eusuf
534	Gulbunia Aramgonj	47_3	Mithagonj	Kolapara	Eusuf
525	Pachim Modhukhali	47_3	Mithagonj	Kolapara	Eusuf
529	Baisakhola	47_4	Mithagonj	Kolapara	Feroz
530	Purbo Dulbugonj	47_4	Dulbugonj	Kolapara	Feroz
531	Khaprabhanga	47_4	Dulbugonj	Kolapara	Feroz
532	Tulatuli	47_4	Balitoli	Kolapara	Mijan
533	Chow para	47_4	Balitoli	Kolapara	Mijan
534	Pachim Dularsar	47_4	Dularsar	Kolapara	Mijan
514	Sunkipur Moishadi	55_2a	Sankipur	Doshmina	Nahar
515	Chownkhola Lobilochan Lamla	55_2a	Bokulbaria	Golachipa	Nahar
516	Patabunia	55_2a	Bokulbaria	Golachipa	Nahar
517	Kachua Mohisdanga	55_2c	Chiknikhandi	Golachipa	Nargis
518	Kallyankalash proghan Khal	55_2c	Kolagachia	Golachipa	Nargis
519	Ulashir Khal	55_2c	Bokulbaria	Golachipa	Nargis
526	Musulliabad	47_4	10 no Baliatoli	Kolapara	Shahidul
527	Purbo modhukhali	47_4	10 no Baliatoli	Kolapara	Shahidul
528	Chotobaliatoli	47_4	10 no Baliatoli	Kolapara	Shahidul
512	Hazirhat Sluice	55_2a	Adabaria	Baufol	Jabbar
511	Dashkin Dharnadi bazar sluice	55_2a	Komlapur	Patuakhali Sadar	Jabbar
513	Madhy dharandi chandipur	55_2a	Komlapur	Patuakhali Sadar	Jabbar

## Annex 4 Fish Trial Pond Report

### Abstract

In Farmers Field School (FFS Cycle 9), a total of 57 trial ponds (33 in Khulna & 24 in Patuakhali) for 57 FFS were established in the polder area of Khulna and Patuakhali. This trial was started on April, 2017 and completed on November, 2017. The trial was conducted in order to demonstrate the farmer through “learning by doing process”, adapt the improved technology and improve the efficiency and productivity of household ponds. An average pond size at different polder areas of Khulna and Patuakhali was 13.82 decimal and 14.5 decimal respectively. Moreover, the total area of 33 trial ponds of Khulna was 1.85 hectare and 24 trial ponds of Patuakhali was 1.41 hectare. Most of the farmers practiced carp (Indian major carps and exotic carps) poly culture with tilapia. Fish fingerlings were stocked from May to June, 2017 at stocking density 45-50/decimal (11115-12350/ha). The annual fish production was 4.10 ton/ha and 3.83 ton/ha of Khulna and Patuakhali respectively. Fish production cost in Khulna and Patuakhali were Tk. 201,799/ha and Tk.216,372/ha respectively of which 58% for feed and 28% expenditure was for fingerlings.

In addition, the gross income and net profit were Tk. 398,905/ha and Tk. 197,106/ha in Khulna. However, a little higher gross income Tk. 410,020/ha but lower net profit 193,648/ha was found in Patuakhali compared to Khulna region.

Out of the 57 trial ponds, 37 (65%) ponds were operated by women. Generally, they were involved in cleaning the aquatic weeds, application of lime, fertilizers and supplementary feed. But very few women were involved in purchasing and selling activities (such as lime, inorganic fertilizer, fingerlings, supplementary feed purchase and harvesting & selling of fishes). The constraints for sustainable pond fish farming in the areas were lack of acceptance of technical knowledge of the farmers, higher production cost (mainly fingerlings and feed), in-sufficient supply of fry and fingerlings, lack of money and credit facilities and inadequate extension services. The households have broadly improved their food consumption, increased protein intake from fish, gradually increasing the standard of living by selling fish, and also increased choice level and economic ability through fish farming.

### 1. Background

Bangladesh is an agro-based developing country and is striving hard for rapid development of its economy. Fisheries is one of the major sub-sector in agriculture and plays a vital role in the socio-economic development of rural area, fulfilling the animal protein demand, creating employment opportunity, reducing poverty and earning foreign exchange for the country.

Aquaculture practice has become a promising and gainful methodology to attain self-sufficiency in food sector and also to alleviate poverty in developing country like Bangladesh (Ahmed *et al.*, 2008). Scientific management techniques are rarely followed by the rural people in this country. It is generally agreed that capture fisheries, both marine and freshwater are declining day by day. To prevent the declining fish catches and malnutrition, excellent opportunities exist for small scale aquaculture development in rural areas, where majority of households have pond and ditches.

Bangladesh, though rich in having around 2 million of ponds of different sizes covering an area of about 377,968 hectares, only about 55% of the ponds are using for fish production at this time (FRSS, 2016). The total number of people benefiting from direct employment (full time and part time) in aquaculture is 14 million and women employment is 1.4 million (BFTI, 2016). Much of the employment benefits accrue in rural areas and include the poor. Therefore, the contribution of pond fish farming to rural livelihoods is far reaching in Bangladesh.

Improved traditional pond culture system in Bangladesh starts mainly with Indian major carps and exotic carps. Organic and inorganic fertilizers (mainly cow dung, Urea and TSP) are used irregularly and

supplemental feed consisting of rice-bran, wheat bran and oilcakes. In extensive method feeds and fertilizer are rarely used in small quantity and/or irregular basis. In addition, in traditional system the target fishes are not specifically selected, predator is not eliminated and not fertilized or managed throughout the production cycle.

Pond fish farming in Bangladesh is mainly major carps and exotic carps-oriented farming. At present major carps such as- rohu (*Labeo rohita*), catla (*Catla catla*) and mrigal (*Chirrhinus cirrhosus*) along with exotic carps such as silver carp (*Hypophthalmichthys molitrix*), grass carp (*Ctenopharyngodon idella*), bighead carp (*Aristichthys nobilis*) and common carp (*Cyprinus carpio*) are cultured in polyculture system in ponds and gained much popularity because of its easy culture system, rapid growth, disease resistance and high market price.

The farmer field school (FFS) approach is an innovative, participatory and interactive learning approach that emphasizes problem solving and discovery-based learning. FFS aims to build farmers' capacity to analyze their production systems, identify problems, test possible solutions, and eventually encourage the participants to adopt the practices most suitable to their farming systems (FAO, 2003). The (FFS) approach was developed by FAO and partners nearly 25 years ago in Southeast Asia as an alternative to the prevailing top-down extension method of the Green Revolution.

Blue gold (BG) has conducted FFS activities in a one bundle through 20 sessions in different polder areas of Khulna and Patuakhali. In Khulna and Patuakhali, FFS cycle 9 included the

modules fisheries, beef fattening and nutrition. In FFS Cycle 9, a total of 57 trial ponds (33 in Khulna & 24 in Patuakhali) for 57 FFS were established in 57 WMGs in the polder area of Khulna and Patuakhali from April, 2017 to November, 2017. Technical note has been prepared for conduct the fish FFS activities. Technical topics in the module include pond preparation, selection of fingerlings, stocking ratio, stocking density, use of supplementary feed, fertilizing ponds for natural feed, different problems of fish culture, fish diseases, and harvesting. Linkages with input providers and with staff of the department of fisheries are strengthened.

### 1.2 Objectives

- To demonstrate the farmer through “learning by doing process” from first to last event through field trial activities in selected trial ponds and farmer ponds.
- To increase the fish production by extension activities through FFS approach
- To adapt the improved technology in the polder area
- To make some suggestions for development and management of pond fish production.

## 2. Methodology

A total of 57 trial ponds were used this year with 57 FFS groups (table 1). One trial pond was established for each FFS in different location of different polders. The learning sessions were split into 8 sessions considering the field practices and culture technologies. Trial ponds were selected considering on the physical condition of the pond, depth of the pond, duration of water retention, the opinion of WMGs president, secretary and members as well as considered the trial pond owners opinion.

**Table 1. Polder wise fisheries trial ponds in Farmer Field School (FFS)**

Zones	Polder wise FFS trial ponds								
	25	27/1	27/2	28/1	28/2	55/2A	55/2C	47/3	47/4
Khulna	21	03	03	02	04	-	-	-	-
Patuakhali	-	-	-	-	-	06	06	03	09

Pond Selection was started from March 2017 through community meeting with direct involvement of WMG representatives and pond owners. Pond preparation activities were started after the completion of final selection. It was started from April, 2017 and completed the preparation within this month. Afterwards, fish fingerlings stocking activities were started from mid-May, 2017 and completed in the mid-June, 2017. Some of the fishes were partially harvested at the end of November and the fishes were finally harvested on March, 2018. Respective CDFs and consultant supervised and monitored the culture activities of the trial ponds. FFS activities have been finished in November 2017. At the end of November 2017, fish sampling was conducted to estimate the present production. To calculate the total production, 10% - 15% of fish is deducted as a mortality rate. For this purpose, a structured questionnaire was supplied to respective FFS. Organizers (CDF) collected the information and entered into computer for analysis.

**Table 2. Activities of Fish Culture in trial ponds.**

Activities	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	Mar 2018
Community meeting with respective WMG areas													
Pond resources survey with WMG members													
Selection & list of ponds with WMG members													
Pond preparation													
Stocking of fingerlings													
Rearing period													
Sampling													
Partial harvesting													
Total Harvesting													

**2.1 Pond Size, Total area and pond ownership**

The Farmers who participated in this FFS cycle all have single ownership or have access to a pond. Ponds size ranged from 06 to 25 decimals and 10 to 20 decimals with an average size of 13.82 and 14.5 decimal in the WMG areas of Khulna and Patuakhali respectively. Moreover, the total area of 33 trial ponds of Khulna was 1.85 hectare and 24 trial ponds of Patuakhali was 1.41 hectare (Table 3).

**Table 3. Size of trial ponds in different polder areas of Khulna and Patuakhali.**

Zones	Minimum size (decimal)	Average size (decimal)	Maximum size (decimal)	Total ponds	Total area (hectare)
Khulna	06	13.82	25	33	1.85
Patuakhali	10	14.5	20	24	1.41

**2.2 Pre-stocking Management**

Pre-stocking management of ponds included repairing of dike, control of aquatic weeds, eradication of unwanted fish species, liming and fertilization etc. Most of the farmers control aquatic weeds manually and for controlling unwanted species, most of them used rotenone, netting method and few followed dry method. Afterwards, liming was done 15 days before stocking at the rate of 240- 250 kg/ha (1 kg/decimal) during pond preparation. Thereafter, the natural productivity of a pond was increased by fertilizing with organic and inorganic fertilizers. Organic fertilizer mainly cow dung were used at the rate of 1000-1250 kg/ha and inorganic fertilizer (urea and TSP) at the rate of 48-50 kg/ha (200 gm/decimal). Farmers also followed the related pre-stocking management procedures like natural feed test, quality of fingerlings with size and fingerling releasing techniques etc.

**2.3 Stoking density**

The FFS curriculum pays attention to market orientation and linking farmers with input suppliers. Hatchery produced nursing fingerlings were supplied to the farmers to stock in trial pond. The average stocking density was 45-50/decimal (11115-12350/ha) at different polder areas of Khulna and Patuakhali. An average weight of Indian major carp and exotic carp was 40-50 gm and 20-35 gm and size was 4-5 inch. In case of tilapia and Sarputi, an average weight and size was 05-35gm and 2-3inch.



**Fig 2: Releasing of Fingerlings in FFS trial pond**



**Fig 1: Size of the Fingerlings**



**Table 4. Stocking density of different fish species per decimal area of pond**

Species	Spatio-trophic habits	Size (inch)	Species ratio
Silver carp	Surface feeder – Phytoplankton	4-5	6-7
Catla	Surface feeder - Zooplankton	4-5	6-7
Grass carp	Surface/column feeder - Macrophyte	4-5	4
Rui	Predominantly column feeder - plankton and organic debris	4-5	8-9
Thai Sarputi	Column/bottom feeder - Plankton and soft aquatic weeds	2-3	12-13
Mrigal	Bottom feeder	4-5	6-7
Tialpia	Omnivorous	2-3	3-4
			Total: 45-50

**2.4 Use of Fertilizers and lime during culture period**

It was noted that most of the trial farmers used cow dung as organic fertilizer, as well as urea and TSP as an inorganic fertilizer to produce and maintain the natural feed in pond. Farmers used cow dung, urea and TSP in their ponds at the rate of 7200- 7500 kg/ ha /yr, 570-590 kg/ha/yr and 450-490 kg/ha/yr respectively. Fertilizers were applied four times in a month.



**Fig 3: Application of lime in FFS trial pond**

Lime was used to increase the productivity as well as maintain the pH balance. All the farmers used the lime regularly in different doses. However, during winter season it was applied at the rate of 80-85 kg/ha to maintain the production capacity of pond and save the animals from diseases.

**2.5 Feed and feeding practices**

Most of the farmers applied supplementary feed like rice-bran and oil-cake from their own fund with a less quantity and irregularity. A few solvent farmers of trial pond owners tried to supply the sufficient feed for their fish culture. First months of stocking of fingerlings, supplementary feed was supplied to equivalent amount of 5% of the total body of fish, and gradually decrease the rate of percentage (2-3% of body weight) of supplementary feed amount from the next month. Here noted that BG supplied 37 kg of Mustard oil cake to every trial pond owners



**Fig 4: Supplementary feed preparation in FFS session**

to motivate farmers as practice of supplementary feed. Only few farmers supplied leaf of banana tree and duckweeds for the Grass carp and Thai puti fish.

### 3. Results and Discussion

#### 3.1 Fish growth performance

After ensuring the natural feed availability in trial ponds, proper size (4-5 inch) of fingerlings were stocked in pond maintaining the proper releasing techniques of fingerling. After one or two months later sampling was done fortnightly to check for growth performance of fishes. Initial average weight of stocked major carps and exotic carps were 35-50 gm and 20-35 gm at different polder areas of Khulna and Patuakhali respectively.

In Khulna and Patuakhali, the initial weight of Thai Sarputi and tilapia was 17-20 gm and 5-35 gm. After 7 months culturing of fingerlings, the following weight was gained by fishes - rohu 460 & 405 gm, Catla- 495 & 424gm, Silver carp- 545 & 560gm, Mrigal-375 & 390gm, Thai Sarputi- 260 & 295gm and Tilapia- 250 & 260gm at different polder areas of Khulna and Patuakhali respectively. Grass carp were cultured only in Khulna trial ponds and average weight gain was 505 gm (table 5). There was no significant growth variation was observed between two zones and an average weight gained after seven months was almost similar.



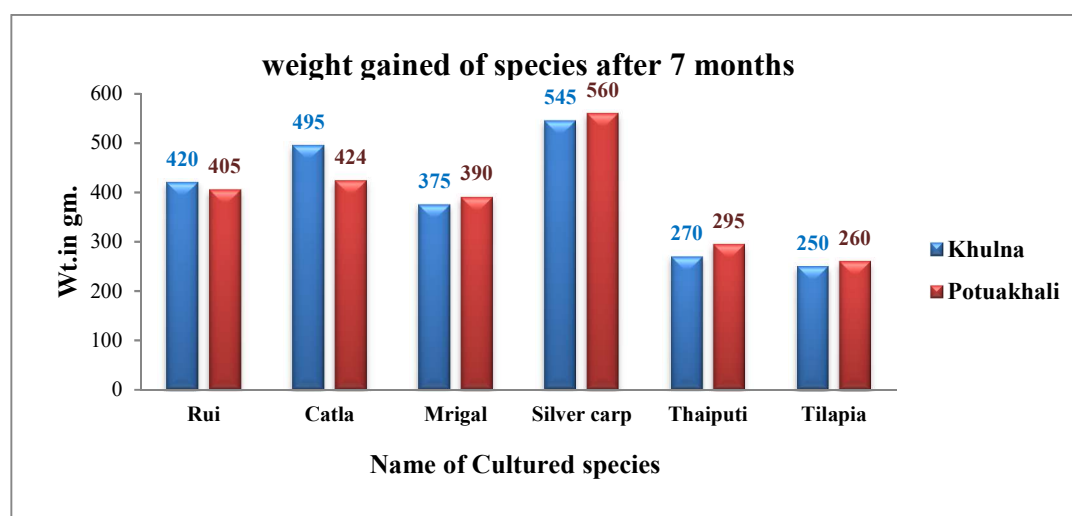
**Fig 5: Fish sampling was done by the FFS Farmers**



**Fig 6: Measuring weight of fishes**

**Table 5. Average initial weight, final weight and weight gained after seven months at different polder areas of Khulna and Patuakhali.**

Species	Khulna			Patuakhali		
	Initial weight (gm)	Final weight after 7 months (gm)	Weight gained after 7 months (gm)	Initial weight (gm)	Final weight after 7 months (gm)	Weight gained after 7 months (gm)
Rui	40	460	420	35	440	405
Catla	50	545	495	30	454	424
Silver carp	50	595	545	36	596	560
Mrigal	40	415	375	30	420	390
Thai Sarputi	18	288	260	15	310	295
Grass carp	50	555	505			
Tilapia	17	267	250	12	272	260



*Fig 7: Growth performance of different fish species at different polder area of Khulna and Patuakhali.*

### 3.2 Fish production

It was observed that the average per hectare fish production of Khulna polder areas was higher than Patuakhali polder areas. Therefore, the annual fish production was 4.10 ton/ha and 3.83 ton/ha in two polder areas respectively (table 6).

Table 6. Average fish production at different polder areas of Khulna and Patuakhali.

Zones	Avg. Fish Production (kg/decimal)	Avg. Fish production (ton/hectare)
Khulna	16.60	4.10
Patuakhali	15.51	3.83

### 3.3 Production Cost

It was found that the average fish production cost of Patuakhali polder areas was slightly higher than of Khulna polder areas. The average cost of fish production was Tk. 201,799 / ha (Tk.817/decimal) and Tk.216,334/ha (Tk.876/decimal) in polder areas of Khulna and Patuakhali respectively. The highest cost was observed in supplementary feed (58%), followed by fingerlings (28%) and fertilizer and lime cost (8%) and labour and others cost (5%).

Table 7. Average fish production cost at different polder areas of Khulna and Patuakhali.

Cost Items	Khulna			Patuakhali		
	Production cost/decimal (Tk.)	Production cost/hectare (Tk.)	Percentage of cost (%)	Production cost/decimal (Tk.)	Production cost/hectare (Tk.)	Percentage of cost (%)
Dike Repairing	25	6175	03%	25	6175	03%
Lime	30	7410	04%	30	7410	03%
Fertilizers	45	11115	05%	45	11115	05%
Supplementary feed (BGP + Farmers supplied)	475	117325	58%	510	125970	59%
Fingerlings	227	56069	28%	245	60515	27%
Others (labour, netting etc.)	15	3705	02%	21	5187	03%
<b>Total</b>	<b>817</b>	<b>201,799</b>	<b>100%</b>	<b>876</b>	<b>216,372</b>	<b>100%</b>

### 3.4 Gross income and net Profit from fish production

It was observed that the average gross income and net profit from fish production were Tk. 398,905/ha (Tk. 1615/decimal) and Tk. 197,106/ha (Tk. 798/decimal) in polder areas of Khulna. However, the gross income and net profit were bit lower in polder areas of Patuakhali and it was Tk. 410,020/ha (Tk.1660/decimal) and Tk. 193,648/ha (Tk. 784/decimal).

**Table 8. Average gross income, production cost and net income at different polder areas of Khulna and Patuakhali.**

Zones	Gross income/ha (Tk.)	Gross income/dec (Tk.)	Production cost/ha (Tk.)	Production cost/dec (Tk.)	Net income/ha (Tk.)	Net income/dec (Tk.)
Khulna	398,905	1615	201,799	817	197,106	798
Patuakhali	410,020	1660	216,372	876	193,648	784

### 3.5 Harvesting and marketing

Cast net and seine net (locally known as ber jal) were used for harvesting fish by the farmers. Harvested fish were kept in plastic drum. It was observed that around 75% of the fishes were sold by the farmers to local paikers and the rest 25% was consumed by the households and give/present to the relatives.



**Fig 8: Partial harvesting of fish by using Ber Jal**

In marketing systems, there found to be a number of middlemen such as local agents, whole sellers, local fish traders and retailers. Market communication is normally being made through middlemen. Majority of the farmers sold their fish in local markets as well as directly to local *paikers* or consumers. Only few women were involved in harvesting of fish for their family consumption but they are fully depended on male members for harvesting and selling of fish due to social barrier.

## 4. Observations

- Early stocking (in April/ May) is better for better production.
- Avoid the practices for more and small size fingerlings stocking in pond for better production.
- Ensure the natural feed (phytoplankton and zooplankton) production in pond to reduce the cost of fish production as well as for good production.
- Motivation is very important for supplying the supplementary feed in the pond for more production.
- Supplementary feed should be made from farmer's own ingredients to minimize the cost.
- Culture of fish is possible with low production cost by providing home-made feed side by side creating a natural feed through using organic and inorganic fertilizer in pond.

## 5. Conclusion

- Pre-stocking management is very important for more production.
- Quality fingerlings are major concern to increase the production of fish.
- Large size fingerlings (above 5 inch) are essential for good production as well as help to increase the survival rate of fish.
- Moderate (5-6ton/ha/year) carp fish production would be possible through proper management and using homemade supplementary feed (rice bran, wheat bran and oil cake) and through creating natural feed in pond.

## 6. References

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## Annex 5 Trial report on Beef Fattening

### Abstract

A small-scale cattle fattening farming is representing an important component of the agribusiness sector of the economy with great economic, income, poverty reduction and social implications. A large number of farmers involved in the cattle fattening Farmer Field School (FFS) just before 3 to 4 months of Eid-UI-Adha (Muslim festival), when they sell the animals with profitable prices. It is an important business for the smallholder farmers in Bangladesh. The data collected from FFS trials examined the profitability as well as operational economics efficiency of cattle fattening farming in Khulna and Patuakhali. Data was collected purposely with 52 FFS trials and using benchmark and end line data. Descriptive statistics were used to analyze the data. Results showed that small scale cattle farming were profitable. An average gross income of each animal of BDT 27,700 in both Khulna and Patuakhali. The average income of BDT 22000 per cattle was in Patuakhali district and 32000 in Khulna. Selected cattle for the fattening enterprise in Khulna were heavier than Patuakhali.

### Introduction

Cattle fattening program is an important sub-sector considered as the backbone of agriculture. This sub-sector contributed to solve the economic problems of small and marginal farmers and played the role in poverty alleviation. Livestock provides milk, meat hide, fuel, organic fertilizers and draft power. The total contributions of livestock to the Gross Domestic Product (GDP) are approximately 6.5% (DLS, 1998). It is an important subsidiary to agriculture and playing a significant role in the rural economy in Bangladesh (Hashem et.al. 1999). Bangladesh has the world's third largest Muslim majority population. Muslims always go for sacrificing slaughtered livestock (cattle, goats, camels, and sheep) for kurban to celebrate the holy Eid-ul-Azha festival.

About 1.8 million cattle sacrificed at this time each year (Sujan et al., 2011). Straw is the important crop residue; contribute the major portion of the fibrous part of the diet of the beef fattening cattle. Rice straw is the basal feed for ruminants with low nutritive value and low digestibility. Farmers use rice straw of traditional varieties, green grass, sugarcane tops, wheat and rice bran, molasses, pulse bran and locally available resources such as pumpkin, banana, vegetable by products, boiled rice, oil cake etc for beef fattening. Straw is mainly treated with urea and molasses (UMS) in beef fattening resulted higher body weight gain, dressing percentage and also in better carcass quality than untreated straw. However, UMS found to be easy, economic and acceptable method of urea and molasses provided molasses is available to the farmers at a reasonable price.



**Fig 10: UMS prepared by woman**



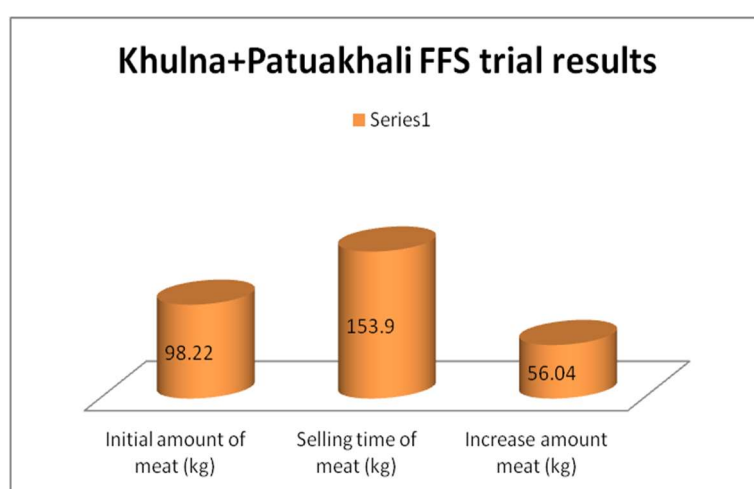
**Fig 9: Cattle eating UMS**

## Materials and Methods

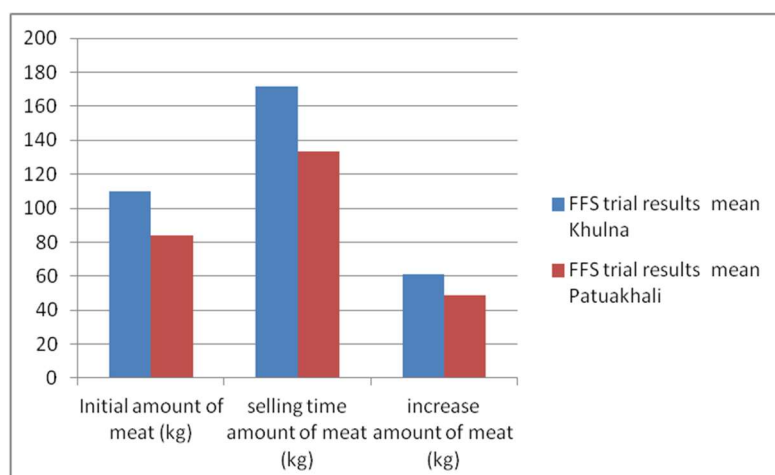
The study was conducted at four polders of 55/2C, 55/2A, 47/3 & 4 in Patuakhali and five polders of 25, 271 & 2, 28/1 & 2 in Khulna under beef fattening FFS of cycle nine started from May to October 2017. Data were collected from June to August, 2017 from 52 FFS trials purposively. Collected data were organized and analyzed by using simple descriptive statistical tools in Microsoft Excel and SPSS program.

## Result and Discussion:

Data reveals that mean of initial amount, selling time of meat production of the animals were  $98.22 \pm 28.08$ ,  $153.9 \pm 38.08$  respectively. Data shows average increased meat production was  $56.04 \pm 15.17$  in all FFS trials. The average tentative initial price and selling price and gross profit were 47,900 BDT, 75,600 BDT, and 27,700 BDT respectively.

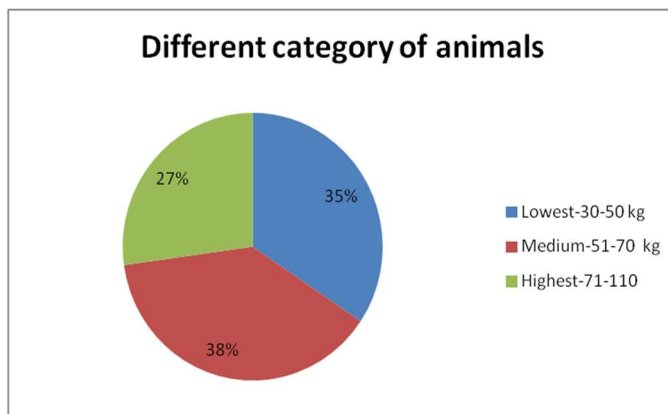


In Khulna zone we have seen that average initial amount, selling time of meat production of the animals were  $110.20 \pm 23.63$ ,  $1715.4 \pm 34.311$  respectively. It shows average increased meat production was  $61.34 \pm 15.36$  in all FFS trial. The average tentative initial price and selling price and gross profit were 51,800 BDT, 83,700 BDT, and 32,000 BDT respectively.





In Patuakhali zone we have got the mean of initial amount, selling time of meat production of the animals were  $84.25 \pm 26.72$ ,  $133.32 \pm 33.71$  respectively. It shows average increased meat production was  $49.07 \pm 12$  in all FFS trial. The average tentative initial price and selling price and gross profit were 43,500 BDT, 66,200 BDT, and 22,000 BDT respectively.



It was categorized the animals into three on their meat production. The lowest, medium and highest category of meat production of cattle were 35%, 38% and 27% respectively. Analyzed data reveals farmers who have medium category of animals got maximum profit.

### Conclusion

Cattle fattening enterprise is a potential and effective option for poor and extreme poor and gained prominence as an important agribusiness sector of agriculture in Bangladesh. It gives farmer year-round work and provides him/her with extra income. In the study area under Blue Gold Polders cattle fattening could be a vital in poverty reduction, creation of self-employment opportunities for water management group (WMG). This year farmers belong to WMG got an extra income from selling cattle in an average BDT 27, 500 and have medium category of animals got maximum profit.



**Fig 11: Cattle ready for sale after fattening**