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Department of Agricultural Extension (DAE)



Technical Report 19

Mustard Value Chain Analysis Report

February 2017



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Blue Gold Program

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List of Abbreviations

AIS	Agricultural Information Systems
BADC	Bangladesh Agricultural Development Corporation
BARI	Bangladesh Agricultural Research Institute
BBS	Bangladesh Bureau of Statistics
BCIC	Bangladesh Chemical Industries Corporation
BGP	Blue Gold Program
BINA	Bangladesh Institute of Nuclear Agriculture
BRRI	Bangladesh Rice Research Institute
DAE	Department of Agricultural Extension
DAM	Department of Agricultural Marketing
FAO	Food and Agriculture Organization
FGD	Focus Group Discussion
HH	Household
HYV	High Yielding Variety
ICT	Information Communication Technology
Kg	Kilogram
LLP	Low Lift Pump
MOA	Ministry of Agriculture
MOP	Murat of Potash
MT	Metric Ton
NGO	Non-Government Organization
NSB	National Seed Board
OFRD	On-Farm Research Division
ORC	Oil Research Centre
PSO	Principal Scientific Officer
PTOS	Power Tiller Operated Seeder
SCA	Seed Certification Agency
TA	Technical Assistance
T-Aman	Transplanted Aman Rice
TSP	Triple Super Phosphate
UAO	Upazila Agriculture Officer
UP	Union Parishad (Local Government)
WMG	Water Management Group

1. Introduction

Blue Gold Program (BGP) conducted Cropping System Market Oriented Farmer Field Schools (MFS) with polder dwellers to promote the concept of “Agriculture as a Business” and with a view to increase earning opportunities at household level. One of the major objectives of the Cropping System MFS is increasing cropping productivity and profitability in the polder area in the extension of water resource management efforts. To allow the farmers to experience potential improvements, BGP through its MFS activities in close cooperation with DAE, promoted BIRRI developed short duration rice varieties of T-Aman rice on relatively high land where drainage of water is assured. Such land serves as a proxy to good water resource management. We acknowledge this generally leads to a productivity improvement but not really a profitability improvement of rice production. The objective though of the adoption of short duration T-Aman rice, is to create the opportunity to cultivate more intensively and profitably thereafter during the Robi season. In the Patuakhali area there is an opportunity to include short duration Mustard before Mung bean on the same piece of land. While it is a widespread cropping system idea, it is not practiced in the area. The question is why? For this purpose, we undertook the Value Chain Analysis on Mustard.

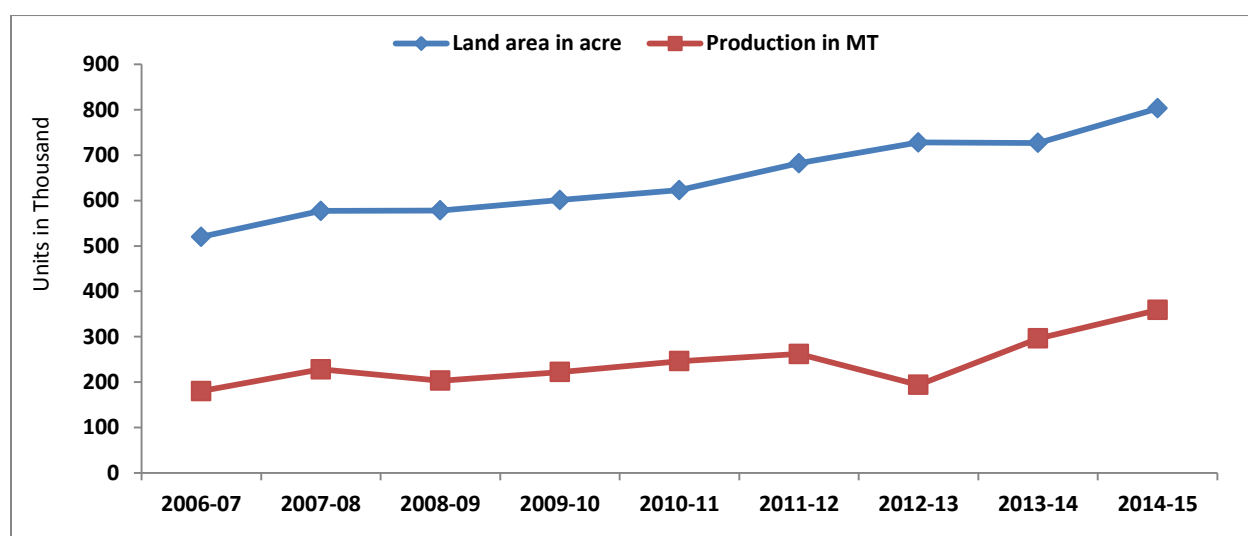


Figure 1: Mustard Production trend in Bangladesh as of BBS-2015

Mustard (*Brassica campestris*) belongs to the family Brassicaceae. Bangladeshi farmers cultivate several types of oilseed crops and the seeds are a popular and major source of edible oil in Bangladesh as well as the Patuakhali region. During the last decade its production is expanding in terms of area and production but the yield varies enormously between species and across locations. Mustard is generally produced as short duration rabi crop before Boro rice cultivation. As a Government priority cropping

system (Cereal — Oilseeds — Pulses) DAE is trying to expand mustard in the Southern part of Bangladesh.

Presently 77.51% of land under oilseeds in Bangladesh is covered by mustard (*Yearbook of Agricultural Statistics-2015*, BBS). Oilseeds crop cultivation is although not widespread in Bangladesh, only 2.75% of total agricultural land is under oilseeds cultivation (*Yearbook of Agricultural Statistics-2015*, BBS). The total area cultivated under mustard in Bangladesh is 8,02,882 acre, with a production of 35,952 MT and an average yield of 447Kg/acre (*Statistical Yearbook, BBS-2015*).

The same survey discloses that in Patuakhali, the mustard cultivated area is only 117 acre, with a production of 27 MT and a yield of 230Kg/acre. So, as per *Agricultural Statistics-2015* in Patuakhali the average mustard yield is lower than the national average yield. In fact, the Patuakhali region including Amtali of Barguna, and particularly the polder areas, are not included by DAE in their mustard crop zoning on the basis of their actual cropping systems. In the BGP working area mustard only covers 0.001% of land (*District Statistics, BBS-2011*). Among BGP's working upazillas (Polders in Bauphal, Dashmina, Galachipa, Patuakhali Sadar and Amtali upazilla), Galachipa upazilla is the highest mustard growing upazilla in terms of land coverage and production. This area has more loamy soils, has somewhat better water resource management and cultivates sesame after mustard, or drop the robi crop completely.

The mustard market is not very seasonal as it is produced across different production zones in Bangladesh and the variability of prices is limited due to imports and ease of storage. Oilseeds production does not match requirements by far, so it has a large local and national potential end-market demand if production and quality can be improved.

Improved drainage and irrigation systems can induce a substantial expansion of mustard cultivation and productivity enhancement in polders 43/2B, 43/2D, 43/2E, 43/2F and 43/1A. Traditionally farmers keep their land fallow for about 90-100 days after harvesting T-Aman as the land is not ready for ploughing due to water logging and by awaiting the proper time to sow mung bean. Mustard is a short duration crop which could fit between T-Aman rice (improved variety) and mung bean cultivation.



Figure 2: Information collection from the Farmers

Nearly 5-7% of cultivable land in Patuakhali, where early drainage of water is possible and land elevation is a bit higher, could come under mustard cultivation if farmers would cultivate short duration rice e.g. BRRI Dhan 53, BRRI Dhan 52 etc.

Mustard expansion demands little labour for sowing in November when T-Aman harvesting is still ongoing. This labour is although offered by the tillage services which are idle during this period. Harvesting of mustard does demand labour in February when there is no alternative labour demand. Women could be involved in post-harvest processes.



Figure 3: DAE UAO and TL of BGP, talk with mustard

In areas where the Blue Gold program provided support to T-Aman rice farmers and short duration varieties were produced, DAE and TA staff encouraged 23 farmers to undertake 700 decimal trials with mustard. Simultaneously a quick assessment was started on the mustard value chain with the aim to improve the understanding of its present status, prospects and constraints, the market linkages for both input and outputs, along with available service actors, mechanization and labour and issues in the business enabling environment (BEE). Along with the positive results of the short duration rice in the Cropping System MFS, there appeared a sufficient basis to proceed with the demonstrations ahead of a more detailed value chain analysis.

2. Report preparation methodology

As indicated, discussions with DAE UAOs led to the initiative to set up block demonstrations. Their continued involvement has proven to be very valuable. To prepare this Value Chain Analysis report, information was collected from both secondary and primary sources. Information from secondary sources was used to identify key informants on the value chain including relevant researchers, key research organizations, as well as private and public actors. Information collection from meetings and field visits helped us to structure key informant interviews (KIIs) and focus group discussions (FGDs) and to validate the information from secondary sources.

Preparation The consideration of mustard in the local cropping system is not new. It arose from field contacts between DAE staff and TA. DAE included mustard in their programs. DAE Upazilla Agricultural Officers in the area supported the process throughout.

Key Informant Interviews (KIIs) with relevant stakeholders like mustard processors (crushing millers), arottders, beparies (big buyer), farias (small buyers), advance farmers, extension service providers (DAE officials), researchers (BARI-OFRD) who are involve with mustard production, improvement, extension, processing, and trading. Through these KIIs, information was collected about problems and constraints in *the mustard Value Chain and how to address these issues as part of Value Chain Analysis*.

Focus Group Discussions (FGDs) Jointly with DAE staff, a series of FGDs were conducted with local farmers of Polders 43/2B, 43/2F & 43/2D using a guideline. Through the FGDs, information was collected about cultivation practices, problems and constraints, prospects and marketing issues in the mustard Value Chain and how to address these issues.



Figure 4: UAO of Patuakhali Sadar visited the Mustard field



Figure 5: UAO Amtali visited the mustard field in his area

3. Regional crop production context and mustard production status

While overall mustard is cultivated on a limited scale in Bangladesh, in Barisal division, Barisal district is the highest mustard growing district in terms of area and production. (*Yearbook of Agricultural Statistics-BBS, 2015*).

In Barisal division Patuakhali district's contribution to area coverage is only 4% and an even smaller 2% to production. In Barisal division mustard productivity is 375Kg/acre; whereas in Patuakhali productivity is only 230Kg/acre (*Yearbook of Agricultural Statistics-BBS, 2015*). Actually, in Patuakhali region especially Patuakhali and Amtali upazilla, mustard is not a regular crop.

In the monsoon most of the rice growing lands submerge in Patuakhali sadar, Bauphal, Dashmina and Galachipa upazilas of Patuakhali and Amtali upazila of Barguna district. There is no high land area in these BGP polders for field crop production. but there are some medium high lands. In Patuakhali region farmers mostly (>80% of land) cultivate long duration (180-220 days) local rice varieties which is one of the major constraints for mustard cultivation or any other Robi crop. Focus Group Discussions confirmed farmer awareness of DAE mustard demonstrations. In addition, there were demonstrations by OFRD and NGOs. Still only a very few advance farmers cultivated mustard

after T-Aman rice. Doing so, they mostly sacrificed mung bean production thereafter or were sowing late and therewith were running into climatic hazards (rain and storm) at harvesting time.

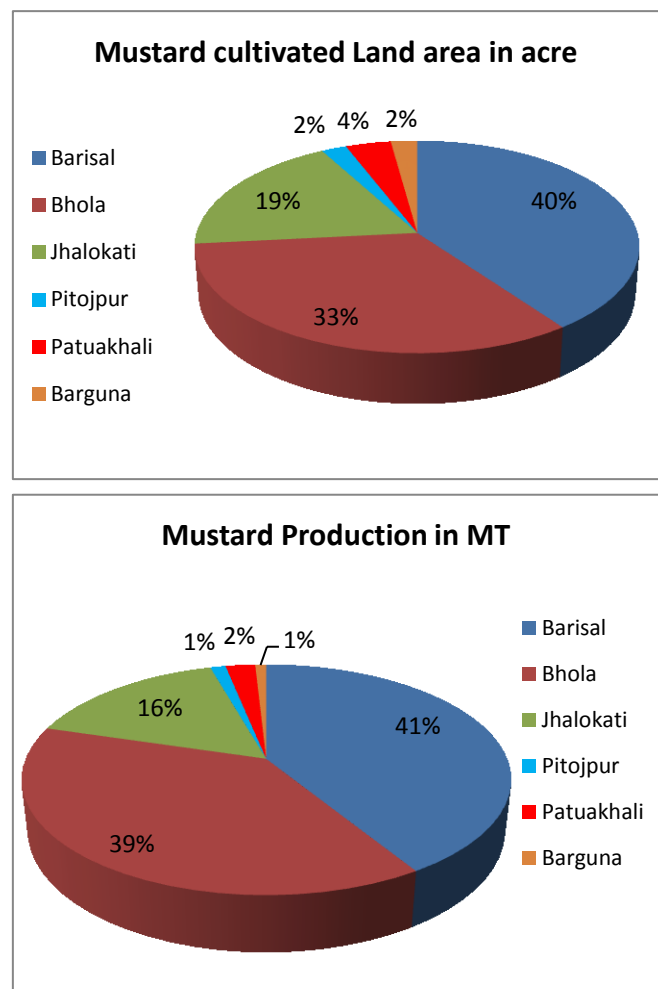


Figure 6: Mustard production scenario in Barisal division

As mustard is not a very non-conventional crop in the Patuakhali region, there is no specifically developed or functional market for inputs, outputs and other required services. But by prior demand arrangements the seed sellers of Patuakhali were able to ensure the required quantity and variety of mustard seeds.

4. Mustard value chain and market system

4.1 Overview of mustard value chain

The findings of this report are presented in line with the three value chain analysis elements, namely the core actors' functions along the value chain, the supporting actors' services and the enabling environment, again constituted of a number of actors and organizations. The core functions directly involve the market actors which deal with buying and selling of products, the supporting functions deal with the relevant services that impact on producing, processing, handling and distributing the product and the enabling environment deals with rules and regulations which impact on the functions of the actors in the value chains.



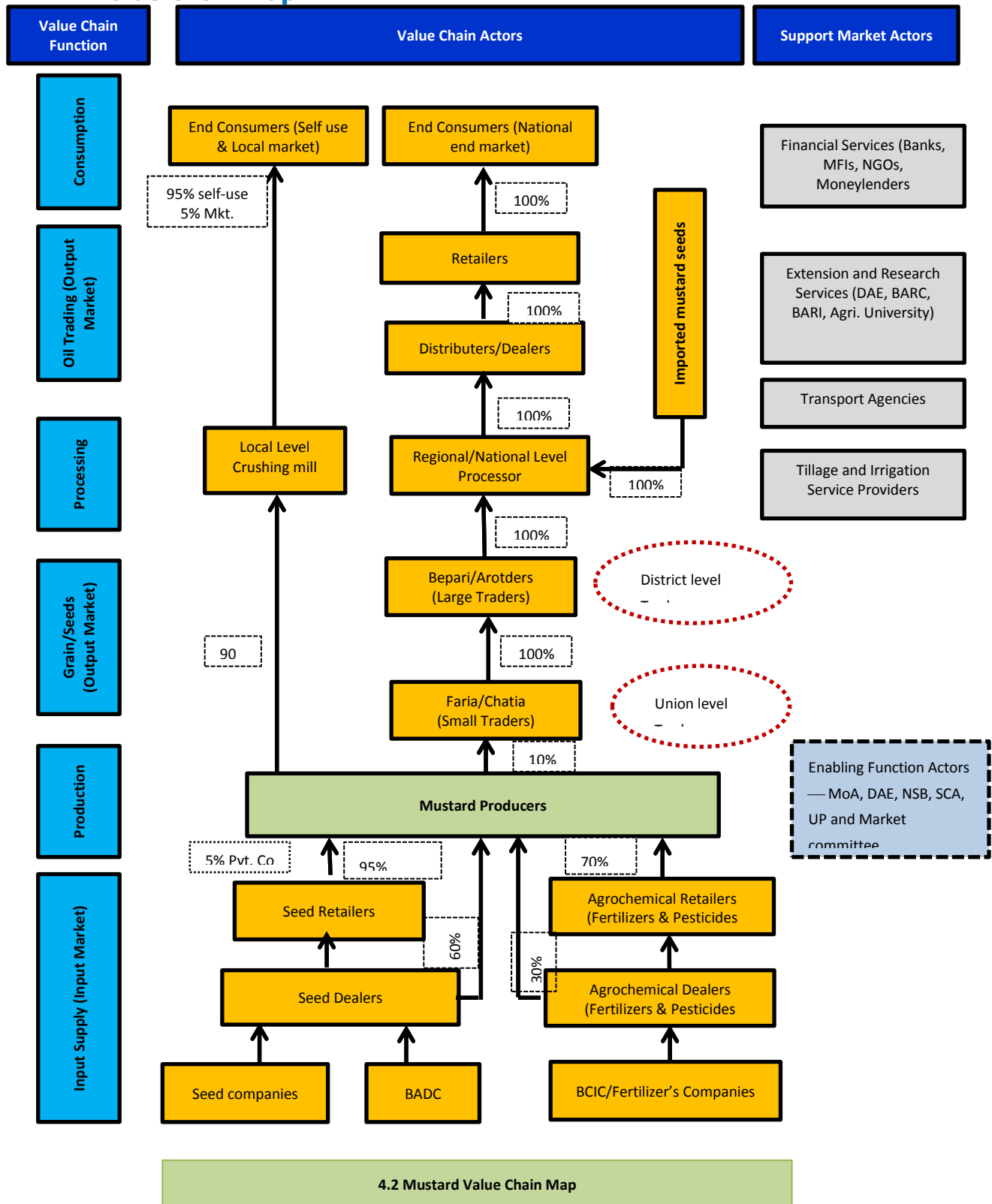
Figure 7: Information collection from output actors

Core Function and Actors: Input sellers, Producers, traders (Faria/Bepari), Processors, and wholesalers/retailers are defined as core actors directly involved with mustard input and output market.

Supporting Function and Actors: Micro Finance Institutions (MFIs), Transport agencies, line agencies and research institutes, such as Department of Agricultural Extension (DAE), BADC, Oilseeds Research Centre of BARI (ORC-BARI), On-Farm Research Division of BARI (OFRD-BARI), Department of Agriculture Marketing (DAM), public and private companies (seed, fertilizer, pesticide) etc. these actors are involved indirectly to provide support for stimulating market change to leverage a response within a specific market system.

Enabling Environment: Ministry of Agriculture (MoA), DAE, Seed Certification Agency (SCA), Food Department, Union Parishad (UP), and Market Committee, etc. formulates, regulates and implement the different government policies, rules and regulations, issue trade license, undertake registration, quality control etc. all elements which create the enabling business environment.

4.2 Value Chain Map



4.3 End Market and Market Level analysis

International Market

Bangladesh is a deficit country in oilseeds production. A substantial quantity of mustard seed is imported, mainly from India through the Benapole land port. Mustard has unmet national, regional and local market demand. Due to taste preferences and its multipurpose use, the demand for mustard oil is substantial and only a fraction is met by locally produced mustard. No mustard oil is imported, only soya and palm oil.

Also mustard oilcake is a highly demanded by-product and equally its local, regional and national demand is unmet. Again, India is a large supplier of mustard oilcake.

National Market

The large mustard traders in the national market are mostly found in Pabna, Sirajganj, Tangail, Dhaka, Narsindi and Chittagang etc. From these large traders the oil moves into the distribution channels (regional traders, districts traders, small traders, and grocery shops) to oil end-consumers. Sometimes the end-consumers are also reached by the local oil processors. Square, Ruchi, Teer, Suresh, Al Modina Oil Mills, Paul, Tanveer Mustard Oil Mill, Amrita, etc. are the big mustard oil marketing



Figure 8: Nationally processed mustard oil in the market

companies in Bangladesh. The demand for mustard from these processors is growing every year and new companies are emerging. The branded bottled mustard oil price is Tk. 240-250/Litre and loose oil (not bottled, unbranded) is Tk. 140-180/Litre. The product competes to some extent with maize, soya and palm oil.

Regional Market

The regional market level for mustard oil from Patuakhali is defined by the district and divisional market of South-western part of Bangladesh. At regional market, the key role players are the large beparies and arotders which are mainly based in Patuakhali Sadar, Golachipa, and Amtali of Borguna. There are only a few large arotders collecting mustard seed from paikars/beparies. Sometimes large collectors (beparies or paikars) sell mustard directly to millers. The large paikars/beparies sell mustard to the arotders/millers at a profit of Tk.1/kg, in this case the incurred costs like labour, transports, bagging etc. are born by the arotders/millers. Arotders sell to the big millers in distant districts at a profit/commission of Tk. 1-1.20/Kg after incurring all costs for loading, bagging etc. and the millers bear transport, unloading and other costs.

Local Market – Polders and Upazilas

Very little of the production in Bangladesh, including Patuakhali, goes to the national end-consumer market through either mustard traders or oil processors. Up to 90% of the production of mustard is used by the producers themselves or by local end-consumers. The population in the polders and upazilla constitute the

local consumers' market for mustard. The main market places are Amtali badghat, Kalagachhia, Badurabazar, Amkhola bazar, Hajirhat, Khasherhat, Boga, Chunakhali, Chiknikandi, Botolbunia, and Khatashia. At household consumer level mustard oil is considered one of the more expensive oils on the market, still there is an indication that demand is increasing locally. Mustard seeds are used as mash to eat local cake (Pitha) but are mostly consumed as edible oil after processing/crushing and its by-product-oilcake-is used as fertilizer, fish feed and as well as cattle feed. In the local market farmers sell oil at Tk. 120/Litre and oilcake at Tk.40-45/kg. Other uses for the oil are (i) as medicine for new born bay body message, (ii) as hair oil for all, (iii) as body lotion mainly in winter season, (iv) used in potato or any other mash preparation, (v) in salad preparation etc.

A preliminary focus on the local demand at introduction of a crop in an area, such as Patuakhali, is justified. Most of the mustard producers of Patuakhali use their produce for family consumption, and only a limited number of farmers sell any mustard and, if doing so only a small quantity of their production.

4.4 Production and Producers

Availability of Land

In this region there is no high land for field crop production, moreover tidal flows and long monsoons and heavy rainfalls reduce the crop cultivation options of the farmers. Moreover, poor drainage systems in the polders hinder the cropping system and crop diversification. Still in every polder nearly 5-7% of the land is feasible for mustard cultivation under existing (poor) water management systems. If the water management systems improve then 10-15% of the land potentially can come under mustard cultivation.

Mustard Producers in the Polders' area:

Mustard is not new crop, but no farmers were found who continuously cultivated mustard or had several years of experience with its production. Mustard cultivation was mainly undertaken by extension agencies setting up demonstrations. There are no producer groups for mustard in BGP's working area in the Patuakhali region. Farmers who cultivated mustard before could not say what variety they had cultivated, or clarify their crop management practices like fertilizers application, pest management, etc.

The KII and FGD information indicates that farmers have sown mustard late November and harvested late February, thus they endured a loss by sowing their mung bean late in that field. The reported mustard yield varied from farmer to farmer and was between 100-300Kgs per acre of land. All mustard growers reported that they faced an infestation of 'small black insects' (aphids) and they sprayed insecticides as remedy. One reported to have irrigated the mustard field.

All interviewed farmers produced mustard for edible oil in home consumption. With a production on 40-50 decimal of land the farmer can meet the yearly HH demand of edible oil. Farmers take their mustard to local mills for crushing and take the oil home along with some oil cake. There appear sufficient mills in the locality.

Production Trend

For the last decade, land acreage under mustard cultivation is increasing in Bangladesh. As per District Statistics, 2011 this is also true in Patuakhali region (BGP working upazilas), namely from 285 acres and 79MT of 2009-10 to 300 acres and 85MT in 2010-11. But this production trend does not match the rising demand; i.a. by population growth.

The Patuakhali region including Amtali of Barguna, and particularly the polder areas, is not featuring as a mustard growing zone in DAE's zoning. Due to water resource conditions related to the long monsoon

mustard simply does not fit in the present cropping systems. In the BGP working area, mustard only covers 0.001% of land (*District Statistics, BBS-2011*). Among BGP working upazillas (Polders in Bauphal, Dashmina, Galachipa, Patuakhali Sadar and Amtali upazilla), Galachipa upazilla is the highest mustard growing upazilla in terms of land coverage and production.

The main reason for the increasing trend, is the extension work through demonstrations by the Department of Agriculture Extension (DAE) and other line agencies including NGOs activities. BARI played an important role in increasing mustard cultivation by developing short duration mustard varieties.

Productivity of Mustard

Also productivity is increasing across the country but remains lower than expected on the basis of the BARI recommendations. In Patuakhali region the productivity lags behind the national productivity and it is particularly poor. (*Agricultural Statistics-2015*). Reasons include, poor adherence to recommended

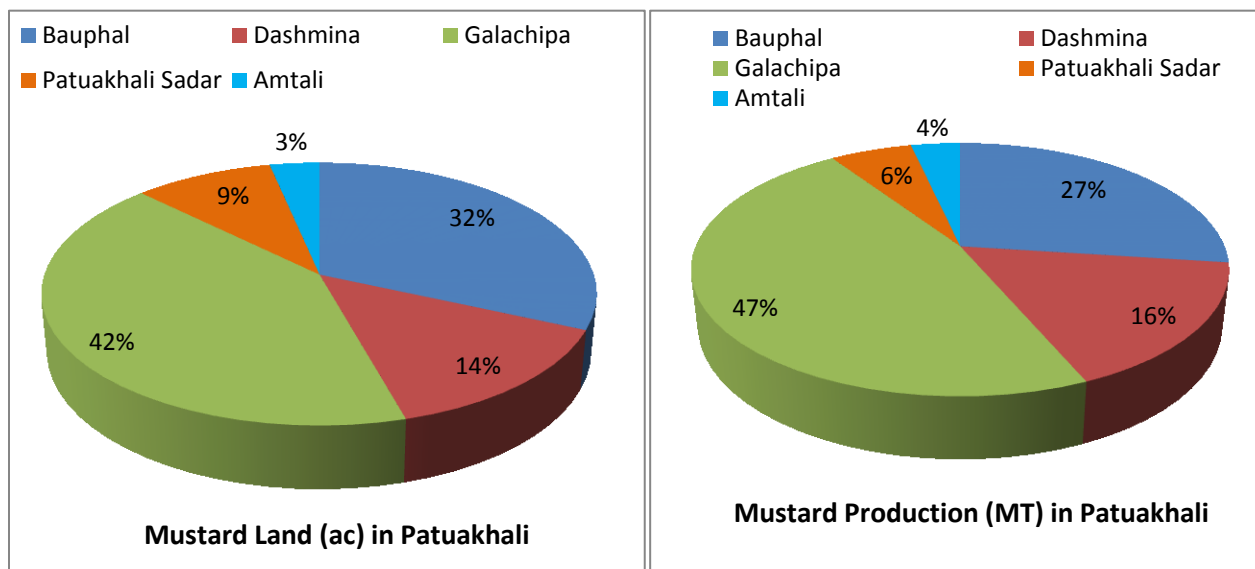


Fig: Upazila wise land coverage and Production as per District Statistics, 2011

cultivation practices, poor crop management and particularly quality seed and timely ploughing. In Patuakhali productivity is 230Kg/acre, whereas national productivity is 447kg/acre. Late seed sowing (entering short winter), poor management, susceptibility to diseases, insect pests attacks and limited to no fertilizer use, are the main causes for low productivity. The core problem among these is late sowing due to late T-Aman harvesting.

4.5 Cultivation Practices of Mustard

Seed Use (Variety):

In the FGD farmers had no idea of what variety they cultivated last year or the year before. From DAE staff and seed suppliers it appears that most farmers probably were cultivating BARI Sarisha 11 (Sampad) and BARI Sarisha 14 in this region. Bari and DAE recommended varieties are BARI



Figure 9: Fig: Mustard field at Polder 43/2F

Sarisha Tory-7, BARI Sarisha 14 and BARI Sarisha-15.

Tillage:

While late, farmers ploughed according to tiller availability. Those owning a tiller ploughed 3-4 passes while those renting a tiller ploughed 2-3 passes. The former is the recommended practice as mustard is a small size grain.

Crop Management:

Farmers who cultivated mustard as demonstration, applied fertilizers as per DAE supplied rate. They, and neither the farmers who cultivated on their own initiative, could recall which fertiliser dosage they used. All the farmers did report that they used TSP (Kala sar) and urea (sada sar) and that they provided one irrigation. Meanwhile, none of the farmers had taken any weed control measurement (neither manually weeding or weedicide use).

Harvesting and Yield:

The farmers didn't recall the actual crop life cycle, but they assumed that crop duration was 85-90 days after seed sowing and harvesting at the end of February. They harvested plants with pods and heaped in place then threshed by gentle beating with a stick. While farmers reported mustard yields of 100-300Kg/acre, it must be possible to achieve 400Kg/acre. This yield depends on seed sowing time, fertilizer use, irrigation and pest control measurement etc.

Post-Harvest Activities:

Post-harvest activity for mustard is rather simple. After threshing, 2-3 days of sun drying is required to have seeds ready for processing or shelling. Since it is a very small grain, mustard should be dried on the polythene sheet, blue net, mat or something similar.

Processing and Uses of Mustard:

In Patuakhali there are several mustard crushing mills in and around the polders area, so mustard crushing capacity is not a problem. The crushing service charge varies from mill to mill and from place to place, but is generally from Tk.8 - 10/Kg mustard seed. At Galachipa an alternative system operates. Anybody bringing 40Kgs mustard to the mill, receives at no further cost 12-14Kgs of crude oil in return depending on seed quality. In the former system the farmer receives also the oilcake, while in the latter the miller retains it.

According to farmers and local millers the oil content in mustard seed is 25-40% of seed weight varying on seed quality. The variation is explained by mustard variety, seed quality and crushing technology. The Manager of a local mill, the Sikder Flour & Oil Mill, reported that the oil content in mustard seed is 32-35% (13-14 Kg oil per 40 Kg mustard seeds). At the same time mustard oil cake content is 55-65% (22-26Kg oil cake produced from 40Kg of mustard seeds) of mustard seed weight.

Marketing:

Across the country the main usages of mustard seeds are edible oil, hair oil, body lotion and as medicine. In



Figure 10: Local level mustard crushing Mill at Patuakhali

the rural areas mustard oil is, besides as edible oil, largely used as insect repellent for new born babies and for adults against cold related diseases. In addition, it is widely used in the preparation of fried rice and different types of mash, in Patuakhali, particularly to eat with local cake (pitha). In this region more than 90% of mustard seeds are used for household oil consumption and 10% of seed is sold in the local markets. Very rarely some oil is traded. Farmers use oil cake as fertilizer in their beetle leaf field, and as fish feed and cattle feed.

4.6 Margins and Profit

Despite the low productivity mustard cultivation is still profitable as a ‘chance crop’ in between T-Aman and mung bean. On the basis of our information a preliminary gross margin calculation was made in Table-2. The production costs with minimum inputs (as per demo farmers) are around Tk.6,500/acre and Tk.8,500/acre with recommended inputs. The revenue is respectively Tk.9,500/acre and Tk.15,200/acre, resulting in a respective gross margin of Tk.2800/acre and Tk.6500/acre. Mustard cultivation as an extra crop appears sufficiently profitable. It has a year-round demand and a relatively steady market price. The latter is attempted by satisfying demand through balancing domestic supply with imports.

Table 1
Cost and Profitability Calculation in 1ha of Land (Grain basis)

Head of Expenditure/Income		Description	Existing Practices with low inputs (Tk.)	Recommended Practices (Tk.)
1	Land preparation	Rental Tiller (3 Passes)	2,500	2,500
2.	Cost for Input use			
a	Seed	BADC Seed, 2.8Kg	182	182
b	Fertilizers			
b.1	Fertilizers	Urea	810	1,215
b.2		TSP	910	1,457
b.3		Gypsum	00	486
b.4		MoP	180	300
b.5		Borax	00	120
b.6		Zinc Sulphate	00	100
Sub-Total for Fertilizers in Tk.			1,900	3,558
c	Pest Management			
c.1	Insecticides	Insect killer (depends on insect attack)	265	265
c.2			-	-
c.3	Fungicides	Thiovit	-	-
c.4		Amister Top		-
Sub-Total for Pest Management			265	265
d	Irrigation	Own/Rental Pump	500	500
2. Total Cost for Input Use in (a + b +c + d) Tk.			2,847	4,505
3.	Cost for Labour			
3.a	Own/Family Labour	Land preparation (@Tk. 300/day)	150	150
3.b		Seeds sowing in line (@Tk. 300/day)		
3.d		Irrigation/drain-out	150	150
3.e		Crop harvest (@Tk. 300/day)	600	900
3.f		Shelling, drying & bagging (Tk.300/day)	300	300
Sub-Total for against Family Labour in Tk.			1,200	1,500
3.g	Hired Labour	Seeds sowing in line	00	00
3.h		Irrigation/drain-out	00	00
3.i		Crop harvest	00	00
Sub-Total against Hire Labour in Tk.			00	00
3.Total Cost for Labour use (3a-3i) in Tk.			900	1,200
Total Production Cost (1+2+3) in Tk.			6,547	8,505
4.	Revenue Earned from production			

Head of Expenditure/Income		Description	Existing Practices with low inputs (Tk.)	Recommended Practices (Tk.)
a	Produced	Main crop/Product (Tk.45/Kg) 202 Kgs for existing practices and 324 Kgs for optimal practices.	9,090	14,580
b		Byproduct/plant stems (Lump sum)	400	600
Total Revenue earned/Income (4a+4b) in Tk.			9,490	15,180
5	Marketing Cost			
a	Selling Cost	Bagging/Packaging		-
b		Transportation	100	150
c		Labour		
d		Tax		
Total Marketing Cost in Tk.			100	150
6	Total Cost of Enterprise (1+2+3+5) in Tk.		6,647	8,655
7	Gross margin (4-6) in Tk.		2,843	6,525
	ROI (including labour)		54% (43%)	95% (75%)

Note that labour costs are difficult to define at this stage, especially own labour inputs. The calculations include very rough estimates at present. Their importance is although recognised for future comparisons between crops on the basis of returns to labour.

Ignoring hired and own or family labour, the ROI are respectively 54% and 95% which is a substantial return. The returns of mung, ignoring labour (126%), are somewhat higher but particularly labour is a major cost for mung. It indicates mustard to be of a somewhat higher investment risk with a slightly lower return on the expenditure put at risk but most probably a higher return on labour. Actual risks are also lower than for mung and sesame, which have higher climatic risks. For mustard risks are largely limited to pests and a lack of irrigation water. One must also remember this is an extra crop. Farmer decision making so far was determined by opting for the higher return on mung or sesame and by the time constraint to fit in mustard between T-Aman rice and mung or sesame. There are few alternatives, but the mustard-mung combination could be replaced by a high risk watermelon crop for example.

Table 2
Cost and Profitability Calculation for 40kg (1 mound) mustard seed (Oil basis)

Head of Expenditure		Limited input	Optimal input	Remarks
1	Production cost of 40kgs mustard seeds	1,296	1,050	Optimal input → more produ ⁿ . → less prod ⁿ . cost
2	Crushing (Tk. 8/kg)	320	320	
3	Transport	50	50	Person + Goods, Up-down
4	Others (like wage cost)	100	100	Lump sum
5	Total oil production cost (Tk.)	1,766	1,520	
Revenue Earned				
6	Main product (Oil) By-product (Oil cake)	12 L 26Kgs	14L 23Kgs	Optimal input → better quality → more oil prod ⁿ .
7	Value received from edible oil @ Tk. 120/L oil	1,440	1,680	
8	Value received from oil cake (by-product) @ Tk. 45/kg oil cake	1,170	990	
9	Total revenue earned (Tk.)	2,610	2,670	
10	Packaging cost (Tk.)	50	50	Used water bottle
11	Total Cost Tk. (5+10)	1,606	1,419	
	Gross margin (Tk.)	884	1,150	

Table 3
Value comparison Mustard Seeds versus Own Comparison Oil

	Head of Income	Limited input	Optimal input	Remarks
1	Production maund per acre	5.05	8.1	ref. table 2
2	Oil received (liters)	60.6	113.4	ref. table 3
3	Oil cake received (kg)	131.3	186.3	ref. table 3
4	Value consumed Oil and Oil cake	4,010	9,275	
5	Selling income mustard seeds	2,843	6,525	ref. table 2

Table 3 compares the income from selling the mustard production as seeds to the value of own consumption of seeds in the form of oil and oilcake (expenditure replacement). Under the above assumptions the income, or expenditure reduction, generated by own consumption compares well (4,010/9,275) with the income from selling the produce as seeds (2,843/6,525). If one makes provision for the financing cost of seed storage in the former the benefits might be almost similar though. The processor's income is 8 BDT on 45/kg. This seems substantial but has to cover his investment and operational costs and still appears acceptable as the value of own consumption is definitely not lower than the income from the sales of seeds.

4.7 Backward linkages – Input market actors' function

Seed sellers (Dealers & Retailers):

In Bangladesh there are 17 varieties of BARI and 8 varieties of BINA mustard seeds. Not all varieties are high yielding and not all varieties are feasible and profitable in the Patuakhali region but three varieties are generally recommended (BARI Sarisha – Tory 7, Sarisha 14 and 15). The seed supply chain is not really considering the agro-ecological feasibility and cropping systems of this region. The recommended varieties are not widely available, neither in the polder, nor at district level.



Figure 11 Mustard seeds sold by Seed dealers

On the one hand there is little specific demand. Few farmers have heard of these varieties and their advantages in terms of yield and short duration characteristics that make these feasible to cultivate between T-Aman and mung bean. On the other hand and in reply, the seeds are only to a limited degree distributed by BADC and private companies like Krishibid Group, ACI Seeds Ltd., Siddik Seeds etc. On the supply side, there is very little or no evidence of any promotional activities for suitable and quality mustard seeds. Besides, mustard seeds are not always timely available and of the desired variety in the small and uncertain market in Patuakhali.

Of the total demand, 95% of mustard seed originates from BADC and the rest is sourced from private companies. When selling BADC seeds, BADC dealers must adhere to a fix price and get only a commission which results in a lower profit. In case of private company seeds, dealers earn more profit on a higher selling price. The BADC price of mustard seed is Tk.65/kg whereas it is Tk.115-125/Kg for private company seed. About 70% of mustard seed is purchased directly from the dealer and only 30% from retailers. This is somewhat odd but DAE and NGOs are responsible for most of the seed purchases for use in their demonstrations. New farmers entering the business buy small quantities and other farmers seldom use their own preserved seeds. The small amount required (1 kg for 40 dec) and low cost involved (1kg = Tk.65) is not worth the seed preservation trouble. An actors list is attached as Annex-1.1

Agrochemicals Sellers (Fertilizers and Pesticides):

Fertilizers and pesticides play an important role in crop production including mustard cultivation. Fertilizers and pesticides are made available by the retailers but the farmers often complain about quality and price of pesticides and fertilizers.

Urea, TSP and MoP fertilizer is supplied by the government agency (BCIC) supposedly at fixed prices but the farmers can't access it at this government declared rate. Farmers have to pay Tk.1-2/Kg more than the declared price. Gypsum and boron are supplied by private companies. An actors list is attached as Annex-1.2.

Mustard is susceptible to insects especially aphids which can reduce the yield of mustard as well as the quality dramatically while IPM practices are ignored. Agro-Chemical input providers are not very knowledgeable on mustard diseases and tend to give priority to personal gain above farmer result. They have active marketing and sales forces in district headquarters and at Upazilla level, but their distribution networks at polder and union level are insignificant.



Figure 12: Supply Chain for Mustard in Patuakhali

4.8 Forward linkages – Output market actor's functions

Faria/Chatia: Faria is a kind of small trader who collects mustard along with other grains (rice, mung bean, sesame etc.) from farm gate and different hats (bazar). They are generally local people and purchase mustard from the farmers and sell to bepari/arotders (big buyers) who receive in bulk and sell to the processors. Generally, farias carry their own weighing scale during hat day and purchase cash. Mostly they sell also cash or sometimes on credit and sometimes they receive an advance payment from the bepari/arotders. In this region, there are many farias buying grains/seeds who also buy mustard. An actor's list is attached as annex 1.3.

Table 4
Invest and profit calculation for Farias of Mustard

SL.	Head of expenditure	Cost (Tk./mound)	Remarks
1	Mustard seeds (grains)	1,800.00	
2	Toll to hat committee	10.00	Sometimes no toll (as small amount)
3	Jute bag purchase	00.00	Provided by bepari

4	Weighing	00.00	Own labour
5	Transport cost	10.00	For bulking. Sometimes sold from hat, and cost paid by bepari.
	Total cost	1,820.00	
6	Sale value	1880.00	
	Profit	60.00	varies Tk.1 - 2/Kg

Bepari/Arottders: Beparies/arottders collect mustard from farias and sometimes directly from producers at their business place (arot) and bulk substantial quantities at Patuakhali Pura Bazar, Galachipa and Amtali. After bulking they contact processors/large millers in distant markets and sell as per agreement in Pabna, Sirajganj, Tangail, Narshindi and Dhaka. In Barisal there is a big mustard processor, but he procures mustard mainly from Barisal and Bhola district. Processors/large millers crush mustard and market mustard's finished products (oil and oil cake). Usually the arottders receive Tk.40-50/mound as profit/commission excluding all kinds of incurred cost. There are no exclusive businesses/arottders for mustard. They conduct their mustard business along with other agriculture products. The arottders provide handling labour, storage facilities and invest money in the trade. They 'oil' the system with credit satisfying the cash needs of the producing farmers. The investment and profit calculation of arottders for mustard is given in the table below. An actors list is attached as Annex 1.4.

Table 5
Invest and profit calculation for Farias of Mustard

SL	Head of expenditure	Cost (Tk./mound)	Remarks
1	Mustard seeds (grains)	1,880.00	
2	Jute bag purchase	32.00	
3	Labour	2.00	
4	Local transport cost	10.00	Truck fair paid by Processors/buyers
5	Truck load (Labour)	6.00	
6	Warehouse rent	00.00	Warehouse fair incurred on main products
	Total cost	1,930.00	
7	Sale value	1980.00	
	Gross margin	50.00	Varies Tk. 1 to 1.25/kg

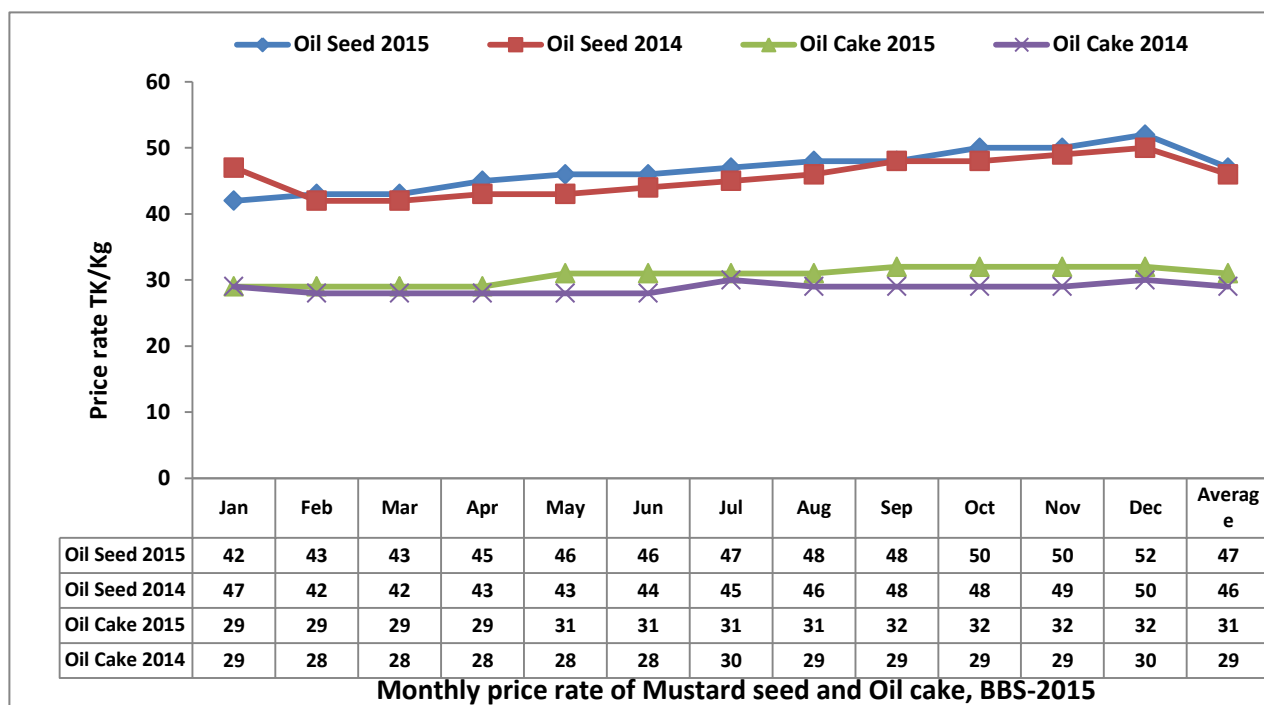


Figure 13: Countrywide monthly prices of mustard seeds and oil cake for 2014 & 2015

Local Processors/Crushers: There are sufficient local processing mills in this region that can be categorized from small to medium mills. Most of these are old and pre-date the expansion of mung bean cultivation in the area when a lot of sesame was cultivated instead and farmers were still very much self-dependent for their needs. These mills presently crush mustard along with sesame and sunflower and only provide a crushing service. None of these are involved with post-crushing processing and distribution or marketing activities for either oil or oil cake. As a result, they do not impact directly on the mustard seed price.

Local millers do not seem to be interested in such vertical integration of value chain functions. Such activities would bring along major stock financing costs. The local mill combines business in flour milling, spice crushing, rice husking and oil seed crushing to maintain a balanced operation over the year. The rather limited supply of oil seeds does not encourage them to renovate their technologies or invest in more efficient technologies. As a result, crushing technology at local level is not efficient when compared to the large scale millers such as Savar, Pabna or Narshindi. Large mills can obtain 40-45% oil content while local mills only obtain 32-35% oil of unrefined condition.

Table 6 provides a profitability calculation for a local miller. Local mills do not procure mustard or sell oil but charge a service fee per maund. Only in Galachipa there is an alternative system based on exchange. For one mound (40Kgs) of mustard the millers return 13-14Kg mustard oil in exchange depending on mustard quality. A list of local oil mills is attached as Annex 1.5.

Table 6
Cost and Profitability Calculation for 40kg mustard crushing

Head of Expenditure	Unit Cost (Tk.)	Cost for 40Kgs (Tk.)	Remarks
Salary/Wage (Manager, Driver)	21,000	87.50	Crushing Capacity 8 mound/day

Head of Expenditure	Unit Cost (Tk.)	Cost for 40Kgs (Tk.)	Remarks
Electricity bill per month @ Tk.10/unit	15,000	62.50	50 units for 8 mound
Room fare per month	4000	17	
Depreciation for machine per year	5,500	2	Total value Tk. 110,000, Life 20 years
Monthly miscellaneous & maintenance	1,500	6	Lubricant,
Total Crushing Cost (Tk.)		175	
Revenue earned @ Tk.8/kg		320	Generally, rate is Tk. 8-10/kg
Gross Margin		145	

Wholesalers/Retailers

PRAN, ACI, BD-FOODS, SQUARE, Fresh, Suresh, etc. are the leading companies engaged in the sale of packed mustard oil from small to large bottles as consumer item. They collect mustard seeds mainly from regional markets and through seed import. They directly take oil from millers located at Pabna, Sirajganj, Narshindi and Dhaka.

Presence of a Large Number of Middlemen

The oilseed crop value chains are characterised by the presence of a large number of middlemen. At each level of middlemen some value is added of which some part is margin/profit. The extent of value added by other actors determines the share of end-product value governed by the farmer, while the extent of power an actor can exert on others in the value chain commands the margin. Overall the margins of the middlemen are not that high though. While there are no exclusive mustard middlemen, there are many trading in rice and mung serving the mustard farmers as well. A major factor exerting a downward pressure on local mustard prices are the high transportation costs due to poor infrastructure and connectivity.

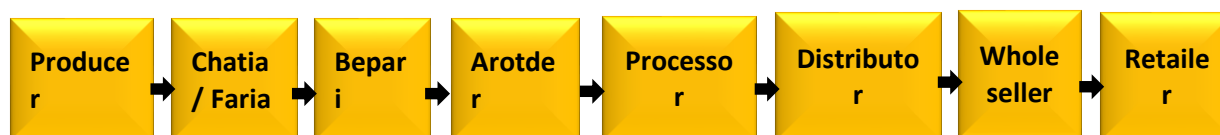


Table 7
Added value and margin analysis along the value chain

Value Chain Actor added value and margin share Analysis - Mustard									
Value Chain Actor	Cost			Revenue			Margin		
	total cost	Added cost	% added cost*	price	margin**	% total margin*	value	% retail price	% processor price
Farmer	1050	1050	94%	1800	750	87%	1800	48%	91%
Faria	1800	20	2%	1880	60	7%	80	2%	4%
Arotdar	1880	50	4%	1980	50	6%	100	3%	5%
Processor	1980		0%			0%		0%	
Retailer	0		0%	3780		0%	1800	48%	
Total		1120			860		3780		
	* up to processor level			**excludes by-product					

Table 7 presents an analysis of the added value generated and margin realised of the main actors in the mustard value chain. The figures are at best indicative and at the higher end of the value chain some are difficult to determine. Overall, they give a reasonable idea of the actual situation. The farmer receives nearly half of the retail price, though this could drop to 40% if the bottled end-product is considered. Farmers can at best hope to supply to distant market processors so indicators up to that level are sufficiently of interest. The farmer takes responsibility for most of the costs, and commands only a slightly

lower margin and share of the processor price. Contrary to general belief, the margins by the trading middlemen are not excessive. It is an indication of the extent of competition in the trading of grains/seeds. Simultaneously, it gives an idea of what stands to be gained when farmers integrate the functions performed by these middlemen. On an individual basis farmers will face much higher transaction costs and at present low volume production levels it will be hard for them to coordinate the bulking and the transportation to gain from this. Moreover, this is not an issue at present as farmers largely produce for home consumption. Table-8 presents a similar analysis for the home consumption option of edible oil.

The margin of the processor is substantially higher (11%). They are somewhat of a local monopolist but the financial advantage to the farmer of oil for home consumption over selling the seeds (see table-3) is an indication that the processor is reasonably held in check by this alternative market channel and that his margin is not excessive. Besides, his share of the total cost, of the value and his margin are nearly identical and are indicative of a well-balanced relation.

Table 8
Cost, Value and Margin Analysis for home consumption end-product

Value and Margin Analysis for home consumption							
Farmer	production costs	1050	/maund	processor produces	11%	of value till end product	
	crusching costs	320		farmer produces	89%	of value till end product	
	crusher's costs		175				
	crusher's margin		145	farmer receives	89%	of margin till end product	
	other costs	200		crusher receives	11%	of margin till end product	
	Total cost	1570					
	Margin	1220		processor adds	12%	of total costs till end product	
	End value	2790		farmer adds	88%	of total costs till end product	
	oil (14@120)		1680				
	cake(23@45)		1035				
	by-product stems		75				

4.9 Support functions and actors

Business Development Services

There are no dedicated business service providers for mustard farmers. Farmers expect that information about cultivation should come from public extension service providers free of cost. Thus there is limited scope to promote transacted extension services to the farmers.

However, few farmers seeking to sell seeds do look for information on current market prices which can help them decide in which market they should sell. Most of the farmers have access to mobile phones but are still constrained in accessing sources of information. Community Information Centres (CIC) by Grameen Phone and Call centres by Bangla Link could be widely accessed by farmers for information on market prices. Prices are available from several large markets for the main crops and from Dhaka market for vegetables. The AIS Krishi call centre provides information on production technologies, while DAE and BARI have extensive internet platforms with information on cultivation practices.

Embedded Business Services

Mustard crops are vulnerable to weather, diseases and insects. Most of the pesticide manufacturing and marketing companies like Bayer Crop Science, Syngenta Auto Crops and ACI have their operations in the broader project area but not inside the polders. The private seed companies including Krishibid Seeds, ACI Seeds and Siddik seeds are represented by their dealers and retailer network.

Farmers have no, or do not, access reliable sources of information regarding improved seed varieties and cultivation practices from competent sources. Due to a lack of institutional support farmers have to rely on input traders for seeds, fertilizers and pesticide supply and use. The input traders are generally aware of pesticides' impact against cost but business objectives prevail. Seed dealers can advise about seed rate and can share the performance of seeds from his previous farmer-clients. Promotion of recommended varieties will have to precede this.

Research

Bangladesh Agriculture Research Institute (BARI) has an Oil Seed Research Centre at Ishwardi, Pabna. They regularly introduce new high yielding mustard seed varieties and recommend improved production technologies. BARI so far promoted 17 varieties for mustard of which 2-3 varieties are recommended for southern coastal region. Another institute promoting new mustard seeds is the Bangladesh Institute of Nuclear Agriculture (BINA). They have introduced 8 varieties for mustard. DAE demonstrates the suitable varieties.

State Owned Enterprise Involvement – BADC and BCIC

Bangladesh Agricultural Development Corporation (BADC) is engaged in the supply of seeds at farmer level through its vast network of dealers. But its access to the polder region is very limited. BADC markets different mustard varieties. In order to get seeds, timely local level dealers have to place the demand well ahead of seed sowing. As there is little demand for mustard seeds local level input traders are not inclined to maintain inventory of good quality mustard seeds. As a result, the appropriate HYV seeds are often not available in the local input selling shops.

A similar organisation is Bangladesh Chemical Industries Corporation (BCIC) that is responsible for the manufacturing and distribution of fertiliser to its selected dealers. Generally, the coastal farmers are reluctant to use fertilizers, while the actual mustard cultivation season is considered the off-season for agro-inputs business in the Patuakhali region. That why the dealers refrain from stocking fertilizers. BCIC provide fertilizers to their limited number of registered/licenced dealers in bulk, but most of them (BCIC dealers) are not much involved with retailing.

Tillage, Irrigation and labour services:

Tillage services are important to ensure the timely land preparation in mustard cultivation. Some WMGs have received power tillers (PTs) from FAO. They are using these PTs to provide tillage services to farmers, generally through leasing private operators. Other PT service providers are also present in the market. The supply of tillage services is not problem in mustard production as its demand is at a lean period of crop cultivation. Generally speaking there are enough power tillers available in the locality. In this area tillage service costs are Tk.2,500/acre including seed sowing (local unit Tk1500/Kurha). That's identical to the rate for mung bean ploughing but involves 3-4 passes instead of 2-3 for mung bean.

Labour is not a problem for mustard cultivation as at the time of seed sowing no hiring of labour is required and harvesting time is not a problem as it is a lean demand period for agri-labour. Having said so, mustard cultivation creates an opportunity for agri-labour during lean labour demand periods.

Irrigation pump services demand attention. In the polders, there are no specific irrigation service providers for mustard or any other crops. Mustard farmers usually do not apply irrigation (flood), but some farmers express their interest to practice irrigation. Some farmers possess LLPs generally used for fish ponds. Also

some WMGs have received LLPs in the agricultural mechanisation package from FAO. Farmers usually prefer to use scarce irrigation water for another crop like Watermelon. This crop is an alternative to the mustard-mung bean combination, requires frequent irrigations using a different technology (canal), is more profitable but also riskier.

Training and Information on Technical Issues

Training and Information on technical issues regarding improved varieties of mustard seed, improved production practices, and post-harvest processing can be obtained from DAE, OFRD of BARI and BINA. In addition, sometimes university scientists are available to provide support.

DAE is supportive in the promotion of high yielding mustard cultivation particularly in the Patuakhali region. Their upazilla level officials have shown interest and provide technical support to mustard farmers with respect to good production practices. It will take additional efforts to bring them to the producer groups as they have a busy schedule and are often engaged in different (non-agricultural) activities.

Transportation

BGP working Polders are connected with upazila and district city Patuakhali by road transportation and waterways while its connection with the Barguna district head quarter is rather difficult. The roads inside the polder leading to the main road to Patuakhali are although often narrow, marked by potholes and mostly unpaved. As a result, transportation is not always easy and efficient, and in other words expensive. It can be concluded that, farmers have to sell their limited quantities of produce in nearby markets to avoid transportation hassles and to save time and money. On the other hand, farias and paikers bulk to lower transaction costs and maintain business relations with large beparies and arots in Patuakhali, Golachipa and Amtali. Different types of vehicles can be arranged to transport agricultural commodities at varying rental rates. The transportation cost from Patuakhali arot to Pabna where mills are situated, is Tk.18,000-20,000 for a 10-12 ton truck based on the road condition, traffic, ferry crossings and political situations. From Boga and Komlagonj river ports, mustard can also be transported by boat to Munshigonj and Dhaka.

Access to Finance

There are bank branches and NGOs offices inside the polders, along with many B-Kash centres. Through all of these, cash transactions are possible. In addition, government commercial banks like Krishi bank have an agriculture loan product with low interest. In reality and due to different practical problems, farmers generally do not feel encouraged to go for a government loan. Sometimes arots provide credit to beparies/paikers purchasing mustard. When millers/arotder provide credit to paikers to procure mustard in the local markets in order to assure a certain supply, such funding in the system has an impact on the prices in local markets with limited supply, to the benefit of the farmers.

4.10 Business Enabling Environment (BEE) and its Actors

Government Policies/MoA

The government has a policy to provide support to the expansion of mustard cultivation as oilseeds. At present government has to spend huge foreign currency amounts to import edible oil (soya and palm oil) to meet the increasing demand for edible oil. There are the subsidies for inputs (seeds, fertiliser), and the support to extension and research.

As part of government, DAE is providing support by demonstrations to expand the mustard cultivation. Concerned government agencies (DAE-for extension/practice, BADC-seed/minor irrigation, DAM-market information/price) might become more effective in encouraging production of mustard if imports are better

tuned to supply-demand conditions. The price fluctuations in the market demotivate the farmers while these seem due to random imports of edible oil as well as mustard. So, import policies and actions may need to be re-examined.

Government can play a vital role in encouraging the development of additional new varieties which are feasible to coastal agro-ecological conditions. Government could support the establishment of a commodity standard (fair and transparent) for different types of agricultural produce. Finally, Government can take initiatives to ensure that farmers get timely fertiliser deliveries and fair access to appropriate agricultural loan products, at the set low interest rates.

Seed Certification Agency (SCA)

The Seed Certification Agency is the only legal authority on behalf of government to certify seed quality. The objective of SCA is to control the quality of seed production and to certify it for marketing. With its aim to control seed quality, SCA can play a vital role in mustard production. SCA can contribute to its promotion by guarding on quality seed production and maintaining a desired standards of mustard seeds.

National Seed Board (NSB)

The National Seed Board (NSB) has the responsibility to permit the release of new crop varieties. So, NSB can contribute to mustard production through providing quick registration of new varieties, which are suitable for cultivation in the coastal agro-ecological context.

Union Parishad/Local Government

In some places where the Union Parishad is the owner of the hat/local bazar the UP also controls the hat tax/toll. In such cases the UP can make a policy favouring mustard marketing by allowing a lowered tax/toll. Moreover, as local government the UP can play a vital role in the selling and buying of mustard in all markets under its jurisdiction by intervening when illegal taxes are demanded. Finally, the UP can play important role on quality seed marketing in its area by its authority to withdraw trade licenses in cases where retailers sell adulterated seeds or fertilisers.

Market/Hat Committee

Market committees can support the trading of mustard in their market in various ways. Market committees can provide security to the distant/big buyers who come from outside with money. Market committees can also lower or abolish taxes on mustard selling & buying in the market during the initial stages of production encouragement. Finally, market committees can ensure fair weighing, and can provide protection to the farmers/buyers from any type of cheating activities.

5. Findings, problems and interventions

Summary of findings

In Table-9 a summary is provided for the cultivation of mustard of the findings related to the behavioural characteristics of farmer actors and market linkages.

Table 9
Findings related to cultivation, farmers and market linkages

Cultivation	Farmer actor behaviours	Market linkage behaviour characteristics
Land preparation and sowing	<ul style="list-style-type: none"> Late due to T-Aman practices Number of tillage passes unclear Line sowing is labour intensive 	<ul style="list-style-type: none"> Tillage services and sowing labour generally available in this period. PTOS is not equipped for such small seeds
Seed	<ul style="list-style-type: none"> Little known of recommended varieties and their short duration and yield characteristics Farmers seek information sources on a rather ad hoc basis 	<ul style="list-style-type: none"> No or limitedly available and/or timely available seed amongst seed traders Few retailers at polder level and private company retailers more expensive than BADC Retailers have ICT access but are unaware of sources of information
Fertiliser	<ul style="list-style-type: none"> Not applied or dosage TSP, Urea and MOP unclear Have to pay more than fixed prices 	<ul style="list-style-type: none"> Dealers and retailers refrain from stocking in off-season production periods Retailers have ICT access but are unaware of sources of information
Irrigation	<ul style="list-style-type: none"> Required but depends on fresh water availability 	<ul style="list-style-type: none"> Water resource management to consider fresh water storage in water bodies Low lift pumps are available
Pollination	<ul style="list-style-type: none"> No apiculture in the area, insufficient other crops to be commercially feasible 	<ul style="list-style-type: none"> Sufficient natural bees appear to be present
Weeding	<ul style="list-style-type: none"> Not undertaken, very difficult in a broadcasted crop 	<ul style="list-style-type: none"> No other demands in the polder on labour during this season
Pest Management	<ul style="list-style-type: none"> Over dosage of insecticides Inadequate knowledge of diseases, remedial products and IPM 	<ul style="list-style-type: none"> Limited # of retailers with knowledge of mustard diseases and remedial products. Retailers after own advantage only
Harvesting techniques	<ul style="list-style-type: none"> Stacking or heaping and sun drying pose little problems Better understanding of quality/price relation required 	<ul style="list-style-type: none"> Oil content influenced by harvesting technology
Post harvesting	<ul style="list-style-type: none"> Use of sheet is required to avoid impurities 	<ul style="list-style-type: none"> Available and demonstrated in mung bean production
Processing	<ul style="list-style-type: none"> Return product lower due to poor crushing efficiency technology at local millers 	<ul style="list-style-type: none"> Sufficient capacity available but no new investments and technology improvements Horizontal integration, and no interest by processors in vertical integration (high stock financing costs)
Marketing	<ul style="list-style-type: none"> Sufficient local demand for oil and oil cake. Farmers seek market information but have weak buyer network 	<ul style="list-style-type: none"> Several faria and paiker available with fair margins High transportation costs due to poor infrastructure

Cultivation	Farmer actor behaviours	Market linkage behaviour characteristics
		<ul style="list-style-type: none"> Volumes too small to bulk and interest distant market buyers Information sources exist but access is constrained.
Financing	<ul style="list-style-type: none"> Small acreage for home consumption limits crop funding requirements Farmers finance the storage of seeds over the year before crushing 	<ul style="list-style-type: none"> Middlemen buy cash from farmers Arrotder fund the system by providing credit to their procuring middlemen
Gender involvement	<ul style="list-style-type: none"> Mustard so far did not feature in household decision making Mustard cultivation requires additional labour input at (post)-harvesting 	<ul style="list-style-type: none"> Women empowerment comparable to other crops, home consumption offers opportunity to lower HH expenditure Labour migration leads to increasing feminisation of agricultural production



Figure 14 Maturing Mustard Field end of January 2017

5.1 Summary of Key Findings, Constraints faced and Preliminary Intervention Options

	Findings	Constraints(Problems)	Probable Interventions
1	<ul style="list-style-type: none"> Land preparation and seed sowing can't take place at optimal time and lead to limited production acreage 	<ul style="list-style-type: none"> Poor WRM arrangements at catchment Limited area of medium-high land available in polder Cultivate long duration T-Aman rice, and do so late as well Two steps harvesting system in rice (straw left standing in the field) 	<ul style="list-style-type: none"> Workable institutional arrangement at catchment to be established Habituate small internal water management practices Explore and introduce coastal feasible short duration HYV rice varieties Increase awareness on modern rice cultivation practices Promote cropping system intensity benefits and introduce production planning
2	<ul style="list-style-type: none"> Farmers (Primary producers) have limited knowledge of mustard cultivation practices 	<ul style="list-style-type: none"> Mustard is not a conventional crop to Patuakhali farmers Opportunity of short duration varieties is not recognized by farmers Attention by extension services is limited to demonstrations 	<ul style="list-style-type: none"> Explore and introduce feasible short duration HYV mustard varieties Horizontal learning on mustard cultivation demonstration Draft Mustard FFS curriculum and support DAE FFS Provision for incentive to first mover mustard farmers linked to short duration rice Networking for information is enhanced and ICT promoted to overcome access constraints
3	<ul style="list-style-type: none"> Productivity lags on potential (no intensive production practices) 	<ul style="list-style-type: none"> Lack of knowledge of recommended practices Inadequate quantities or inappropriate inputs used Insufficient insight in benefits of intensification Sub-optimal use of capital (apparently minimizes financial risks in crop production cost) 	<ul style="list-style-type: none"> Improve farmer understanding on crop budget/gross margin of mustard cultivation Gross margin calculations on demonstrations Introduction on record keeping, risk considerations and farm/ household decision making
4	<ul style="list-style-type: none"> Farmers do not use appropriate seed variety 	<ul style="list-style-type: none"> Lack of farmers' awareness on modern seeds variety Insufficient attention of extension services Unavailability in seed supply systems 	<ul style="list-style-type: none"> Stimulate further demonstrations based on cropping system intensity Promote knowledge of short duration varieties and on germination quality through extension services Aggregate demand for seed in locality, negotiate and arrange on basis of increased bargaining power
5	<ul style="list-style-type: none"> Input suppliers unaware and lacking interest due to low demand 	<ul style="list-style-type: none"> Poor supply chain of required inputs Farmer demand for inputs off-season and small quantities 	<ul style="list-style-type: none"> Enhance understanding of input suppliers of mustard cultivation (workshops) Aggregate demand for inputs on the basis of local production and sales plan and facilitate collective action Networking between farmers and input suppliers and use of mobile phones is facilitated
6	<ul style="list-style-type: none"> Irrigation water scarcity during production season, required to boost productivity 	<ul style="list-style-type: none"> WRM arrangements at catchment level fail Present water infrastructure only allows limited amount of fresh water to be stored Insufficient attention to operation of the infra according to production planning and to regular maintenance 	<ul style="list-style-type: none"> Identify areas feasible to store fresh water with improved water resource management (re-excavation of khals and canals) Enhance small scale water management activities Workable institutional arrangement at catchment to be established (proper handling of sluices, inlets) Organise collective actions on water infrastructure maintenance (removal of water hyacinth)
7	<ul style="list-style-type: none"> Opportunities to capture more of total market value created 	<ul style="list-style-type: none"> Still very small volumes being produced Inadequate accessing of market information Satisfied with home consumption of oil and oilcake Weak farmers network with buyers 	<ul style="list-style-type: none"> Build farmers network with market actors Strengthen farmer's hand by mobile phone use for market information Integrate faria function when volume is sufficient to justify bulking Seek options to lower transportation costs for bulk Focus on oil content of quality production
8	<ul style="list-style-type: none"> Local crushing 	<ul style="list-style-type: none"> Equipment of local crushers dates from more than 10 years 	<ul style="list-style-type: none"> Development of miller entrepreneurship

	technology is inefficient in terms of oil production	ago <ul style="list-style-type: none"> • Technology leaves a lot of oil in the oilcake • Millers not aware varieties with high oil content • Millers do not seek to integrate marketing functions 	<ul style="list-style-type: none"> ☞ Improve technology efficiency of local crusher/miller ☞ Assess feasibility of integrated milling operation by group of farmers
9	▪ Limitations in the service providers	<ul style="list-style-type: none"> • Limited attention from extension – research nexus for coastal zone cropping systems • Limited interest to supply the coastal zone with inputs during ‘off-season’ 	<ul style="list-style-type: none"> ☞ Seek awareness among research/extension family for remaining limitations of available varieties to adopt cropping system ☞ Improve networking with respective dealers, heighten awareness of farmer demands and arrange coordinated input purchases
10	▪ Several constraints in the Business Enabling Environment	<ul style="list-style-type: none"> • Support policies are not always effective • Market functions are distorted by varying or illegal taxes/levies • Licensed dealers adulterate inputs without consequences 	<ul style="list-style-type: none"> ☞ Advocate improvement in attention to coastal zone cropping systems, fertiliser distribution and supply-demand balancing by oilseeds and edible oil imports. ☞ Advocate appropriate tax regimes and ban illegal actions, and adulteration in the market system
11	▪ Additional labour input requirement from women	<ul style="list-style-type: none"> • Additional labour input unlikely to lead to women empowerment • Cognisance to be taken of the feminisation of agriculture 	<ul style="list-style-type: none"> ☞ Involve women in extension on cultivation practices and market orientation, especially post-harvesting and quality/price relation ☞ Stimulate HH-decision making, and record-keeping ☞ Enhance access to information by ICT ☞ Encourage ownership over home-consumption transactions



Figure 15: Mustard crop condition 1 February 2017

Annex 1. Annexures

1.1 List of consultancy service providers (Research and Extension)

Sl. #	Name	Designation	Institute	Mobile no.
1	Dr. Md. Shahidul Islam (Badsha)	PSO	OFRD, Patuakhali	01716145752
2	Dr. Md. Mostafizur Rahman	PSO	BARI, (farm in-charge, Lebukhali Patuakhali)	0712752253
3	Md. Abdul Mannan	UAO	Galachipa, Amtali	01716066265
4	Md. Badrul Alom	UAO	Amtali, Barguna	01718365612
5	Mr. Sanjib Mredha	UAO	Patuakhali Sadar	01722096969

*** PSO (Principal Scientific Officer), OFRD = On-Farm Research Division of BARI

1.2 List of Seed Dealers (polder level)

Sl. #	Name of Seed dealer	Business place	Mobile no.
1.	Md. Delowar Hossen Molla	Badura Bazar	01920061317
2.	Md. Al amin Hawlader	Badura Bazar	01728395520
3.	Md. Zahangir Khan	Mudir Hat	
4.	Md. Eunos Mian	Amkhola Bazar	01740549282
5.	Md. Mannan	Amkhola Bazar	01770565875
6	Ahsan Munir	M/s. Master Seed House, Fakirhat bazar	
7	MA Jamal	M/s. Howlader Store, Sonakhali	
8	Majibur Rahman	Patuakhali Sadar	01718400140
9	Amal Chandra Mali	Patuakhali Sadar	01740927212
10	Uttam Hawlader	Patuakhali Sadar	01718920133
11	Tuhin Hawlader	Patuakhali Sadar	01718205135
12	Abdul Goni Hawlader	Khekuani Bazer	
13	Sona Mia Mridha	Khekuani Bazer	
14	Tajem Mridha	Khekuani Bazer	
15	Wahab Akan	Amtali Bazar	01713959440
16	Habibur Rahman	Amtali Bazar	01719971973

1.3 List of Fertilizer and pesticide Dealers (polder level)

Sl. #	Name of Dealer	Father's Name/ Enterprise	Name of Market	Mobile no.
1.	Md. Delowar Hossen Molla	Md. Abul Kasem Molla	Badura Bazar	01920061317
2.	Md. Al amin Hawlader	Md. Ruhul Amin Hawlader	Badura Bazar	01728395520
3.	Md. Zahangir Khan	Md. Seraj Khan	Mudir Hat	
4.	Md. Samsul Haque	Md. Abul Hasem	Mudir Hat	
5.	Md. Eunos Mian	Md. Eusuf Sikder	Amkhola Bazar	01740549282
6.	Md. Taslim Mredha	Abdul Sabhan Mredha	Amkhola Bazar	
7.	Md. Monsef Sikder	Md. Kadam Ali Sikder	Baw Bazar	
8.	Md. Nasir	Md. Siddikur Rahman	Baw Bazar	
9.	Md. Shahjada Sikder	Md. Moslem Uddin	Amkhola Bazar	01733134734
10	Nizam Uddin	Bishmilla Store	Mahishkata Bazar	01745139297
11	Abu Sayed	M/S Sayed Traders	Mahishkata Bazar	01713964981
12	Kabir Hossain	Kabir Store	Amtali	01920592183
13	Mosharef Hossain	Mredha Enterprise	Bandhghat	01713954878
14	Manowar Hawlader	Mim Store	Patuakhali	01729646351
15	Abu Taleb	Mredha Enterprise	Khaserhat	01749300249

1.4 List of mustard buyers (Farias/Beparies)

Sl. #	Name of Dealer	Address	Mobile no.
1.	Md. Alom	Badura Bazar	01721479904
2.	Md. Nazir Hossain	Mudirhat	01759647675
3.	Md. Mazibur	Bashbunia	01731252578

4.	Abu Taleb	Badura Bazar	01721424531
5.	Ashab Ali Mredha	Kalibari	01724124693
6.	Nasir Uddin	Amtali	01712138780
7.	Md. Eunush	Chunakhali	01725173175
8.	Mannaf Fakir	Charkhali	01727465295
9.	Nasir Pada	Amrhagachia	01734143558
10	Jasim Uddin	Amkhola Bazar	01740583219
11	Jalil Hawlader	Badura Bazar	01731252587
12	Shahid	Dakshin Chailabunia	01722810751

1.5 List of mustard Arotiders

Sl. #	Name of Dealer	Name of Enterprise	Address	Mobile no.
1.	Nasir Uddin Hawlader	M/S Zinia Enterprise	Amtali	01712138780
2.	Shajahan		Amtali	01712703964
3.	Tapan das		Barguna	01734347374
4.	Gautam		Barguna	01747500876
5.	Rashid Khandaker	Khandaker Traders	Patuakhali	01727465295
6.	Altab Fakir	Saiful Rice Agency	Fatulla, Patuakhali	01728131545
7.	Halim Mian		Amtali	01721653779
8.	Basir Hawlader	Hawlader Enterprise	Amtali	01712540490
9.	Ruhul Amin Hawlader	M/S Amin Traders	Patuakhali	01712214356

1.1 List of mustard crushing Mills

SL	Name	Address	Mobile #	Remarks
1	Modern Oil Mill	Powerhouse road, Patuakhali	01735630724	Local level processor
2	Popular Oil Mill	Powerhouse road, Patuakhali	01812472497	Local level processor
3	Nur Oil Mill	Powerhouse road, Patuakhali	01729000518	Local level processor
4	Khalifa Oil Mill	Sakharia Bazar, Amtoli	01719936182	Local level processor
5	Bhandari Flour Mill	Badghat, Patuakhali	01726561947	Local level processor
6	Sikder Flour and Oil Mill	Siddik Barhi Stand, Amtali	01716463493	Local level processor
7	Wasim Sarder	Hazikhali Bazar, Patuakhali	01729538238	Local level processor
8	Rubel Mridha	Khaserhat, Patuakhali	01713952371	Local level processor
9	Ruhul Amin Sarder	Khaserhat, Patuakhali	01767417917	Local level processor
10	Hafez Nur Azim	Uttar Bazarghona, Patuakhali	01715194453	Local level processor
11	Sahid Talukder	Auliapur, Patuakhali	01718607341	Local level processor
12	Basir Kazi	Basak Bazar, Patuakhali	01719437441	Local level processor
13	Nasir Hawlader	Basak Bazar, Patuakhali	01689554713	Local level processor
14	Zia Mistri	Hazikhali Bazar, Patuakhali	01749338613	Local level processor