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Department of Agricultural Extension (DAE)

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# Technical Note 13 Water melon production & fish culture in Mini Pond polder-22, Durgapur, Khulna,

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# List of Abbreviations

BWDB	Bangladesh Water Development Board
BDT	Bangladeshi Taka
DAE	Department of Agriculture Extension
FFD	Farmer Field Day
FFS	Farmer Field School
FO	FFS Organizer
MOP	Muriate of Potash
SAAO	Sub Assistant Agriculture Officer
TSP	Triple Super Phosphate
WMG	WMG = Water Management Group

# Executive Summary

Water melon and fish culture in mini pond FFS was conducted from May, 2015 to April, 2016 at Durgapur village under Polder 22. A total of 23 water melon plots along with 23 mini ponds were established using “learning by doing process”. Fish fingerlings were stocked on August, 2015. An average pond size was 3.6 decimals and plot size for water melon cultivation was 13 decimals. Silver barb (Shorputi) and Mono sex tilapia was stocked in all ponds. Stocking density was in the pond was 100/decimal (50 Shorputi and 50 Tilapia). Average sold and average consumed amount of total fish was 35% and 65% respectively. It was reported by each farmer that fish consumption was increased through this intervention compared to previous year. Farmers used rice bran and sometimes oil cake as fish feed from their own sources. The fish production was 5.29kg/decimal (1.3 ton/ha). Fish production cost was BDT 222/decimal fish with net profit of BDT 307/decimal.

Three varieties (Ganga, Badsha and Dragon) of water melon were cultivated. Total estimated investment for 1 acre land is BDT 23805.00 for Water melon. Average production of Water melon was 6.11mt/acre. Net return from 1 Acre land was BDT 96768. Average sold and average consumed amount of total Water melon was 94% and 6% respectively. The major amount of Water melon was sold to Arotdar in Khulna. Some small amount was sold at local market where price was comparatively lower compared to Arotdar. Weight of one Water melon was taken during selling at local market that ranged 4kg-9 kg.

Average investment for vegetable production on pond dike was BDT 60/farmer. Vegetable variety was Yard long bean, Okra and Sweet gourd. The net income from vegetable was BDT 342/per farmer. Average sold and average consumed amount of total vegetable was 15% and 85% respectively. Family consumption was 16-55 kg depending on production amount.

Out of the 23 farmers, 7 were female. Mostly they were involved in cleaning the weeds at pond dike, 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 water melon, fish and vegetable).

The constraint for implementation of this model was water melon cultivation was delayed due to prolonged raining. Besides this insufficient water depth resulted early harvesting of fishes in some ponds. Food consumption has apparently increased through in taking more fish, vegetable and water melon. This gradually seemed to be increasing the standard of living by selling produces and also increased choice level and economic ability through this model.

# 1. Background



Figure 1: Water melon plots at Durgapur

The village Durgapur at Paikgacha Upazila of Polder 22 under Khulna district is an area where there is scope of fish culture in mini ponds as well producing different crops like Water melon, sesame, garlic and many other crops. Mini pond has a great importance for fish culture in a small scale and food production for family consumption especially at poor household levels. Cropping pattern of this village is dominated by saline water for 5-7 months in a year. Most of the farmers used to cultivate mainly sesame as a field crop which was not profitable due to poor yield, low market demand and price. Due to crisis of fresh water, they can cultivate neither white fish, vegetable nor Water melon. The farmers who have the Gher, cultivate brackish water prawn (Bagda). Blue Gold Program shared the ideas of *mini pond fish culture - vegetables - Water melon* model with some members of the local WMG. Water melon is mainly a cash crop in our country. It requires sweet water for cultivation.

The above said model was practiced by the Syedkhali WMG through FFS approach in 2014/2015 (see the report of Syedkhali) that yielded a promising result. It started with ponds and fish in 2014 and then water melon in early 2015. From the learning and experience of Syedkhali, Blue Gold Program took initiatives to replicate this similar model at Duragpur. Here a FFS was formed with 23 interested farmers. Each farmer excavated or re-excavated a mini pond adjacent to the proposed water melon plot. There were 23 mini ponds that covered a total of 83 decimals of land. Each of the pond size was 2 to 6 decimal with average water depth of 5-6 ft. Some ponds were separated by dike from Water melon plot and few ponds are without dikes which were located either to the corner of the area or to the border areas. Farmers reserved this pond with fresh water during monsoon. These mini ponds were suitable for fast growing fish species like Mono sex tilapia and Shorputi. Pond dike was considered for vegetable production based on feasibility. Water melon was considered as the main crop in this model with other crop like lady finger, Spinach, Sweet gourd and Yard long bean.

## 1.1 Objectives

- To ensure irrigation with fresh Water for Water melon production
- To utilize mini pond for small scale aquaculture
- Vegetable production on pond's dike
- To introduce new cropping pattern (*Mini pond fish culture - Vegetables - Water melon*)
- Create new employment opportunity and
- Increase food production, consumption and income.

## 2. METHODOLOGY:



Figure 2: One trial Farmer is seen at water melon plots



Figure 3: Water melon at harvesting stage

Blue Gold Program took initiatives to organize the participants to form a FFS. Durgapur village was selected in consultation with local DAE staff and representatives of concern WMG. After community meeting, draft list of participants was prepared by FO. FO completed house to house visit. Based on farmer's interest and available resources (land for Water melon, mini pond facilities), all of 23 participants were finalized and endorsed by WMG Executive members.

FFS was formed on 30 May 2015. Fish Expert of Blue Gold Program, FO and local SAAO provided technical support through learning session aiming to prepare land for Water melon, excavation/re-excavation of mini pond to reserve sweet Water and preparation of dike for cropping. The members of FFS were trained up on improved cultivation method of Water melon, fish culture and vegetable production. Land preparation, irrigation, fertilizer application, pest management and weeding were emphasized for Water melon cultivation. Similarly liming, fertilizer application, releasing of fingerlings, supplementary feeding, disease prevention and partial harvesting was focused for fish culture. Farmers received fingerling, seed (both vegetable and Water melon), fertilizer and lime as required for this activity. Farmer contributed fish feed (rice bran and mustard oil cake) from their own sources.

Blue Gold Program provided necessary technical and inputs support through FFS approach. Each farmer stocked 100 fingerling (Silver barb 50 and Mono sex Tilapia 50) per decimal in the month of August, 2015. Seed of four types of vegetable was sown in the month of September, 2015 on the dikes. Seed of Water melon was sown by each farmer at the adjacent land of mini ponds in March 2016. This was late because of land was wet for excessive rainfall. Regular follow up was ensured by Blue Gold Program staff. Blue Gold staff and Sub Assistant Agriculture Officer (SAAO)-DAE jointly facilitated technical sessions. The FFS was closed formally through organizing a FFD on 19 May 2016 and result was shared in front of present audience. Total 75 persons were present including community people, farmers and representatives from different institutes (WMG and local school). At the FFD, FFS farmers shared learnings, key achievements and displayed produces from their field.

### 2.1 DATA COLLECTION

The data was collected time to time by FOs through-

- Field visit
- Interview with farmers and
- Sharing with involved Blue Gold Program and DAE staff.

### 2.2 INPUT SUPPORT BY BLUE GOLD PROGRAM

#### a) Inputs provided to each of the farmers for fish production:

- i) Fingerling (each species 50/decimal)
  - Mono sex tilapia : (7-8 cm during stocking)
  - Shorputi (Silver barb): 8-9 cm during stocking)

ii) Fertilizer

- Urea (150g/decimal)
- TSP (100g/decimal)

iii) Lime: 1kg/decimal.

***b) Inputs (Seeds) provided to each farmers for vegetable production***

- Gourd 2 small packets (10g)
- Bitter gourd 2 small packets (20g)
- Sweet gourd 1 small packet (10g)
- Yard long bean 1 small pack (10g).

***c) Inputs (seeds and fertilizer) provided to each farmer for Water melon production is shown***

***below.***

- Seed of Water melon (5 g seed)
- TSP 2 kg
- MOP 2 kg.



### 3. ACHIEVEMENTS AND ANALYSIS



Figure 4: One mini pond for fish cultivation

#### 3.1 Fish cultivation:

Cultivation period for fish was 7 months. Fish feed was supplied by each farmer from their own sources. Data was collected from individual farmer on investment and return on fish cultivation when most of the farmers completed final harvesting of fish. Initial average weight of Shorputi was 8g and Mono sex Tilapia was 7g during stocking at pond. Average weight of Shorputi and Tilapia were 125g and 70g respectively during harvesting. Growth of Shorputi ranged 90g- 200g and while Tilapia ranged 50- 100g during harvesting. Details investment and return by pond owners were as in Table 1. A case study on one individual farmer was prepared and it is attached as Annex 1.

Table 1: Individual investment vs. return at a glance from fish production

SN	Name of participant (s)	Area of pond (decimal)	# of finger ling released	Total Input cost (BDT)	Harvested * amount of fish (Kg)	Value of produced fish (BDT)	Net return (BDT)
1	Amulla Mondol	5	500	1124	52	5200	4076
2	Shishir Sarker	5	500	1124	40	4000	2876
3	Narayan Mondal	5	500	1124	48	4800	3676
4	Aruna Sarder	3	300	674	17	1700	1025
5	Bikash Tikader	3	300	674	20	2000	1325
6	Monoranjon	3	300	674	22	2200	1525
7	Nitai Tikader	3	300	674	17	1700	1025
8	Hiramon Tikader	3	300	674	20	2000	1325
9	Aroti Sarder	4	400	900	19	1900	1000
10	Sabita Roftan	3	300	674	17	1700	1025
11	Gopal Sarker	3	300	674	18	1800	1125
12	Dipok Mondal	4	400	900	20	2000	1100
13	Bithika Mondal	5	500	1124	21	2100	976
14	Krishna Pada	3	300	674	12	1200	525
15	Shorosbati	3	300	674	13	1300	625
16	Gobinda Mondal	3	300	674	12	1200	525
17	Shosangko Mondal	6	600	1144	20	2000	856
18	Monju Rani	5	500	1124	15	1500	376
19	Sanjoy Mondal	3	300	674	11	1100	425

20	Maloti Sarder	3	300	674	10	1000	325
21	Jotindronath Sarder	3	300	674	12	1200	525
22	Sujit Mondal	3	300	674	9	900	225
23	Tapan Sarker	2	200	450	7	800	350
	<b>Total</b>	<b>83</b>	<b>8300</b>	<b>18450</b>	<b>439</b>	<b>44000</b>	<b>25550</b>

\* Average sold price of fish BDT 100/kg, cost of production BDT 42/kg, Net benefit BDT 58/kg.

Average fish production was 5.29kg/decimal. Fourteen farmers used 70% of produced fish for family consumption in an average and rest of the produced fish was sold at local market. Nine farmers production was up to 15 kg or below who consumed 100%. We found a gross nutritional enhancement for all family members of each farmer. Because these farmers consumed 7-35kg fish for their family. Though the production seems to be small amount but it has a significantly importance in nutritional aspects. As per farmer's opinion, fish consumption was increased through this intervention compared to previous year. Farmers used rice bran and sometimes oil cake as fish feed from their own sources. It is calculated as investment in the table 1. It is noted that due to use of pond water for irrigation of main crop, Water melon the depth of pond water decreased which resulted less amount of fish production of 9 farmers.

### 3.2 Vegetable production

Vegetables were cultivated at the dikes for 3 months. Data was collected from individual farmer on investment and return. Detail investment and return by farmer were as follows (Table 2).

**Table 2: Investment Vs return at a glance from Vegetable production at pond dike**

SN	Name of participants	Input cost* (BDT)	Value of produced vegetable (BDT)	Net return (BDT)
1	Amulla Mondol	60	950	890
2	Shishir Sarker	60	400	340
3	Narayan Mondal	60	740	680
4	Aruna Sarder	60	285	225
5	Bikash Tikader	60	250	190
6	Monoranjon	60	450	390
7	Nitai Tikader	60	400	340
8	Hiramon Tikader	60	550	490
9	Aroti Sarder	60	650	590
10	Sabita Roftan	60	200	140
11	Gopal Sarker	60	355	295
12	Dipok Mondal	60	222	162
13	Bithika Mondal	60	280	220
14	Krishna Pada	60	220	160
15	Shorosbati	60	180	120
16	Gobinda Mondal	60	230	170
17	Shosanko Mondal	60	900	840
18	Monju Rani	60	340	280
19	Sanjoy Mondal	60	260	200
20	Maloti Sarder	60	490	430
21	Jotindronath Sarder	60	340	280
22	Sujit Mondal	60	420	360
23	Tapan Sarker	60	150	90
	<b>Total</b>	<b>1380</b>	<b>9262</b>	<b>7882</b>

Only seed support was provided to farmers from Blue Gold Program end for vegetable production on mini pond dike. Table 2 shows the value of produced vegetable ranged Tk150- Tk950. There was a significant variation of production as number of pond dike was not similar for each farmer. Based on feasibility, 1-3 dikes were used by farmers for vegetable production. Major use of produced vegetable was family consumption while a small amount was sold at local market. Family consumption by each family ranged 16-55 kg depending on size of dikes.

### 3.3 Water melon cultivation

The cultivation period Water melon was only 3 months. Data was collected from individual farmer on investment and return. Details investment and return by farmer were as indicated in the Table 3.

**Table 3: Investment Vs return at a glance from Water Melon**

SN	Name of participants	Land area (Decimal)	Input cost (BDT)	Total production* (BDT)	Sold value of Water melon** (BDT)	Net return (BDT)
1	Amulla Mondol	16	3872	960	19200	15328
2	Shishir Sarker	13	3146	780	15600	12454
3	Narayan Mondal	12	2908	720	14400	11492
4	Aruna Sarder	10	2421	608	12160	8739
5	Bikash Tikader	15	3630	905	18100	14470
6	Monoranjon	15	3634	900	18000	14366
7	Nitai Tikader	10	2420	640	12800	10380
8	Hiramon Tikader	12	2904	720	14400	11496
9	Aroti Sarder	15	2630	940	18800	16170
10	Sabita Roftan	10	2424	600	12000	9576
11	Gopal Sarker	13	3146	780	15600	12454
12	Dipok Mondal	20	4841	1240	24800	19959
13	Bithika Mondal	18	4356	1080	21600	17244
14	Krishna Pada	10	2420	604	12080	9660
15	Shorosbati	13	3135	785	15700	12565
16	Gobinda Mondal	12	2760	725	14500	11740
17	Shosangko Mondal	15	3654	940	18800	15146
18	Monju Rani	12	2761	722	14440	11659
19	Sanjoy Mondal	15	3654	960	19200	11679
20	Maloti Sarder	10	2650	640	12800	10150
21	Jotindronath Sarder	8	1936	481	9620	7684
22	Sujit Mondal	15	3455	940	18800	15345
23	Tapan Sarker	10	2420	600	12000	9580
	<b>Total</b>	<b>299</b>	<b>71177</b>	<b>18270</b>	<b>365400</b>	<b>289336</b>

\*Average sold price BDT20/kg, estimated consumption was about 50-80 kg/family.

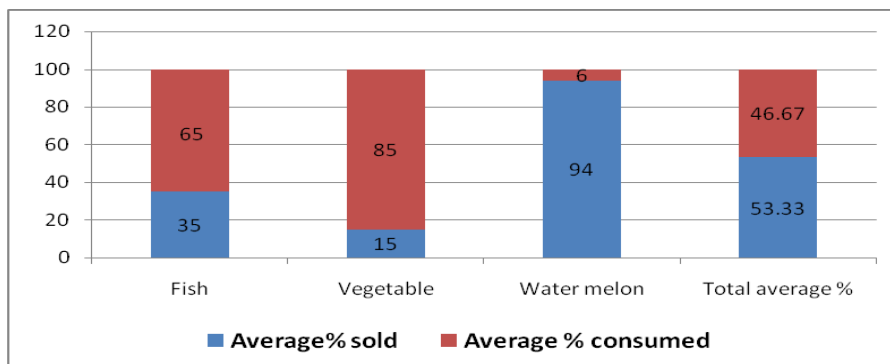
Farmers provided cow dung and irrigation facility for water melon. On the basis of the above input cost, total estimated investment for 1 Acre land is BDT23805.00 for Water melon. Average production of Water melon was 6.11mt/acre. The large amount of Water melon was sold to Arot<sup>dar</sup> in Khulna.

Some small amount was sold at local market where price was comparatively lower compared to Arot<sup>dar</sup>. Weight of one Water melon was taken during selling at local market that ranged 4kg-9 kg. The investment and return of all farmers have been shown



**Figure 5: Farmers are happy with water melon**

in graph 1. Farmers expressed their satisfaction on yield of Water melon as well as fish production from this model. Though return of fish was not nearer to Water melon but farmers were able to irrigate their crops from the mini pond. A graph is constructed below on the sale and family consumption status of all farmers (Graph 1).



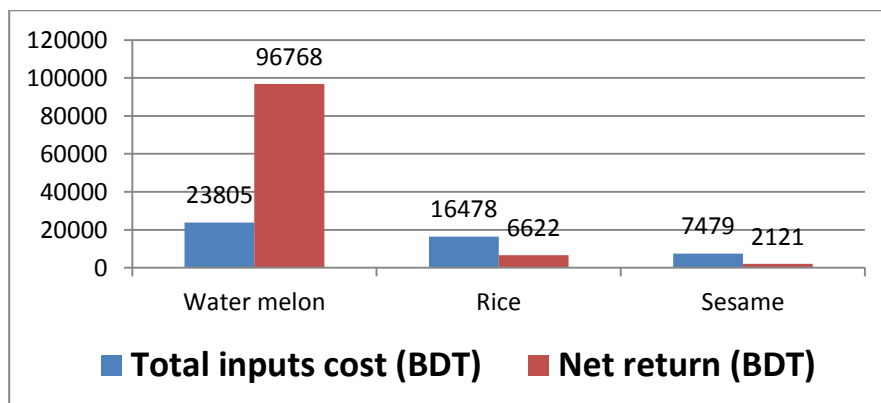
**Graph 1: The sale and family consumption status of fish, vegetables and Water melon**

The Graph 1 showed that minimum consumption was for Water melon but its return or sold value was the highest than the other products. The highest consumption was found for vegetables (85%) followed by fishes (65%) that indicates the good nutritional status of the household members. This model brought financial benefit as well as positive changes in nutritional aspects for each farm family.

### 3.4 An analogy: comparative analysis on rice and sesame with water melon production

The study area is not suitable for Boro rice due to salinity problem but few farmers have some practice with T. Amon during rain fed season and On the other hand, sesame farmers could not do well due flash flood and wet land for the last 2 consecutive seasons. Water melon was introduced there experimentally which was very profitable and promising.

For a comparative study we collected data on Rice, Sesame and Water melon production on 1 Acre (100 decimals) of land under the members of FFS. Based on collected data and information, details cost-benefit analysis has been done as shown in Graph 2.



**Graph 2: Investment and net return on Water melon, rice and sesame**

The study showed that rice cultivation yielded net return of BDT 6622 while gross return was BDT 23100. Similarly sesame cultivation yielded net return of BDT 2121 while gross return was Tk 9600. But there is a significant gap between investment and return in Water melon cultivation, i.e. investment is less (BDT 23805) and return is very much higher (BDT 96768). The data generated on one Acre of land was prepared as per farmers opinion who was involved in either rice or sesame production of Durgapur before FFS with water melon and mini pond model. For ready reference, details collected information is attached in Annex 2.

### **3.5 Estimated rice loss calculation for mini pond cultivation**

#### **3.5.1 Rice production**

Gross return from 1 Acre land: BDT 23100

Net return from 1 Acre land: BDT 6622

#### **3.5.2 Fish production**

Fish pond re-excavated total area: 0.83 Acre (83 decimal)

Gross return from 0.83 Acre of land: BDT 44000

Gross return from 1 Acre: BDT 53012

Net return from 0.83 Acre: BDT 25550

Net return from 1 Acre: BDT 30783.

This calculation shows that farmers loss nothing for rice through mini pond excavation. From 1 Acre of land their net return was BDT 6622 from rice and BDT 30783 from fish.

### **3.6 Major findings and observations**

- Growth of Shorputi was faster than that of Tilapia.
- Seasonal pond is suitable for the production of Shorputi and Tilapia.
- Mini pond and Water melon model created special interest among neighboring farmers.
- Production of Dragon variety of Water melon was good compared to other two varieties.
- Women played a vital role especially to irrigate Water melon.
- This model created scope for consumption fish and vegetables as well as fruits at house hold level and made availability at the local market.
- FFS farmers including some community farmers are very much interested to follow this model.
- On the basis of output, FFS farmers including some community farmers are planning to cultivate Water melon in next season.

## 4. Conclusion and recommendations

- Fish - Water melon- Vegetable model was found a profitable model.
- The above model enhanced nutritional security and availability of food at local market.
- Irrigation facility from the mini pond could be available for crop production.
- Irrigation management was very important for the production of Water melon in a profitable manner.
- For Mono sex Tilapia culture, regular application of supplementary feed is important to grow more fish.
- Regular follow up and technical support use useful for enhanced production.
- Blue Gold should share these findings formally through a meeting with DAE.
- Blue Gold Program and DAE staff should jointly create a continuous follow up mechanism in order to continue this profitable model.



## A. Annex

### A.1. Case Study



#### Mini pond and Water melon: A Success by Shoshangko

Durgapur is a village at Paikgacha Upazila under Khulna District. Shoshangko Mondal is a poor farmer dwelling in this village under Polder-22. His father died when he was only 4 years. He has one sister with poor mother. His father left only 60 decimals land including a small house. This land was not sufficient for their livelihood because of salinity and frequent crisis of water. This poor family had to face misery for their livelihood. Shoshangko got poor scope for education. From the age of 12, he was compelled to sell labor mainly in local agricultural land for livelihood. Later on he acted as driver to run rickshaw van followed by power tiller. He got married with Ronita Mondal at the age of 20. Now he has two sons and one daughter. Yet they did not get rid of poverty with family size 5.



Blue Gold Program started its operation in 2014 at Polder-22 aiming to ensure water management by community as well as reduction of poverty through improved agricultural farming. At this stage, farmers were used to culture Bagda and a few Golda in their gher. White fish culture was not profitable because of salinity as water remains in saline condition between October-March in each year. Shoshangko was enrolled with Mini pond and Water melon FFS managed by Blue Gold Program in May 2015. He received training on fish culture in mini pond, vegetable production on pond dike and water melon cultivation. After training, he re-excavated his small ditch and converted to a small pond of 6 decimals. He cultivated water melon at his land (50 decimals) with reserved sweet water at this mini pond. Blue Gold started the water melon FFS as to introduce water melon as a new profitable crop by using reserve sweet water along with fish and vegetable cultivation on pond dike. Before this the land was used for cultivation of sesame for a long time. But it was not profitable as yield was not good.



Shoshangko earned this year BDT 900 from vegetable selling. His family consumed 7 Gourds, 5 Sweet gourds, 3 Kg Long yard bean and 3Kg Bitter gourd. This vegetable was cultivated on the dike of mini pond. Similarly his family consumed 8 kg fish and expects 12 kg remaining fish in the pond. Market value of remaining fish is BDT 1200. On 15/05/2016, he sold 900 pieces of Water melon for BDT 27500 in Khulna. From farm gate and selling at local market, he earned BDT 8000 for selling 286 pieces of Water melon. His gross income is BDT 36700 from all produces from this model. His total investment was 16000. This shows a net profit of BDT 20700 (excluding consumed produces) that takes total 7 months periods. This model seems more profitable compared to sesame cultivation. Shoshangko opined "Profit was double compare to sesame cultivation". Cultivation of water melon was late as field was water logged. He is very happy with his production in this season. Now his elder son reads in class nine, younger son in class one and daughter in class seven. He says "Blue Gold has opened my eyes as there was no source of sweet water for Water melon cultivation". He added "Now I have sweet water in the pond so no problem to cultivate Water melon in the next season". Profit shown here might be not a huge amount but the learning derived is significant for Shoshangko's family and his

neighbors. About 40 farmers visited water melon cultivation and mini pond. They showed their keen interest and learnt from Shoshangko how water melon was cultivated there along with fish and vegetable.

## A.2. Details collected cost- benefit information on 1 Acre land

### 1. Rice Production:

#### Investment particulars

• Land preparation:	BDT2100.00 (3-4 plough)
• Seedbed preparation:	BDT 600 (6-9 decimals)
• Rice seed:	BDT 900.00 (15 kg)
• Pesticide: Basudin/Furadan for seedbed)	BDT 108.00 (600gm)
• Fertilizer: seedbed)	BDT 51.00 (3 kg Urea for
• Top dressing of pesticide: Sumithion/Virtaco)	BDT 140.00 (30gm)
• Seedling uprooting & transplantation	BDT 3600.00 (12 labors)
• TSP	BDT 450.00 (18kg)
• MOP	BDT 225.00 (15kg)
• Urea top dressing	BDT 357.00 (21 kg at 15 DAT)
	BDT 357.00 (at booting stage)
• Pesticide: twice, total 60gm)	BDT 840.00 (Virtaco 30gm)
• Weeding:	BDT 1800.00 (Once)
• Rice harvesting	BDT 2700.00 (4.5 mounds paddy)
• Threshing and winnowing	BDT 2250.00 (6 labors)
<b>Total investment</b>	<b>BDT 16478.00</b>

#### Return

Rice 45 Mounds	BDT 22500.00
Rice straw	BDT 600.00
<b>Total gross return</b>	<b>BDT 23100.00</b>
<b>Net return</b>	<b>BDT6622.00</b>

### 2. Sesame production:

#### Investment particulars

• Land preparation:	BDT 2100.00
• Seed:	BDT 240.00 (1kg)
• Fertilizer:	BDT 375.00 (TSP 15kg)
	BDT 225.00 (MOP 15kg)
	BDT 255.00 (Urea 15kg)
• Sesame harvesting	BDT 1800.00 (6 labors)
• Transportation	BDT 900.00
• Threshing	BDT 1800.00 (6 labors)
<b>Total investment</b>	<b>BDT 7479.00</b>

#### Return

Sesame 6 Mounds	BDT 9600.00
<b>Total return</b>	<b>BDT 9600.00</b>
<b>Net return</b>	<b>BDT2121.00</b>