Cost and Return Economic Analysis for Ten Vegetable Crops Cultivated under Sorjan System

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Acronyms and Abbreviations

AAS	Agricultural Advisory Society
ACUS	Adarsha Chashi Unnayan Samity
ADB	Asian Development Bank
AVC	Agriculture Value Chain
CCB	Cash cost basis
DAE	Department of Agricultural Extension
DAI	Development Alternatives Incorporated
F/N	Farmer Name
FAO	Food and Agriculture Organization
FCB	Full cost basis
FTF	Feed the Future
ICEAFS	International conference on Environment, Agriculture and Food Sciences
IDE	International Development Enterprises
ILEIA	Centre for learning on sustainable agriculture
IRRI	International Rice Research Institute
Kg	Kilogram
MS Excel	Microsoft Excel
SPSS	Statistical Package for Social Science
t/ha	ton/hectare
Tk.	Taka
Tk/ha	Taka/ hectare
USAID	United States Agency for International Development

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Executive Summary

The sorjan cropping system is an intensive method of growing crops on alternate raised beds (ridges) and deep sinks (deep furrows). The sorjan farming system is a traditional farming system developed in central Java, Indonesia in the beginning of 20th century, which is widely used in submerged, salinity affected areas and tidal swamps. Currently, about 5,000 farmers are involved for sorjan farming system on about 4,000 acres of land with about 20 high value crops cultivation on the raised bed of the system during summer and winter seasons in Charfassion upazila of Bhola district within south central coastal region of the country. To gather information from farmers on yield, cost and return, and price, of those targeted crops during summer and winter seasons, AAS collected the relevant primary data from 39 sorjan farmers for cost and return analysis for the selected 10 existing sorjan crops in Charfassion upazila of Bhola district within south central coastal region of the country during 7-20 April 2016.

Average about 43.68 decimals land per sorjan system was observed in Charfassion upazila of Bhola district. Out of a total of 43.68 decimals land per sorjan system, of which average about 57.21% area (24.38 decimals) was observed under raised bed and 42.79% area (19.10 decimals) was observed under deep furrow.

Average about 27.55t/ha of fresh tomatoes yield was observed for hybrid early winter tomatoes production on the raised beds of sorjan system in Charfassion upazila of Bhola district during 2015-16 early winter season. Among the 10 involved sorjan vegetable crops, average gross-return of hybrid early winter tomato was calculated Tk.331, 604/ha (rank as 4) in counter to the average total cost of Tk.225, 636/ha and Tk.128, 148/ha on full cost basis and cash cost basis, respectively, for early winter tomatoes production. The average net-return was calculated Tk. 105,968/ha (rank as 3) on full cost basis and Tk.203, 456/ha (rank as 3) on cash cost basis for early winter tomatoes production. Average about Tk.12.25/kg sale price of tomatoes was observed at farm house for 2015-16 early winter tomatoes in Charfassion upazila of Bhola district.

Average about 25.32t/ha Cucumber yield was observed for hybrid cucumber production on the raised beds of sorjan system in Charfassion upazila of Bhola district during 2015 summer season. Among the 10 involved sorjan vegetable crops, average gross-return of hybrid cucumber was calculated Tk.304,603/ha (rank as 5) in contrast to the average total cost of Tk.238,361/ha and Tk.155,537/ha on full cost basis and cash cost basis, respectively, for hybrid cucumber production. The average net-return was calculated Tk.66,242/ha (rank as 6) on full cost basis and Tk.149,066/ha (rank as 6) on cash cost basis for cucumber production. Average about Tk.12.10/kg sale price was observed at farm house for cucumber during 2015 summer season in Charfassion upazila of Bhola district.

Average about 18.00t/ha Bitter gourd yield was observed for hybrid bitter gourd production on the raised beds of sorjan system in Charfassion upazila of Bhola district during 2015 summer season. Among the 10 involved sorjan vegetable crops, average gross-return of hybrid bitter gourd production was calculated Tk.380,081/ha (rank as 2) against to the average total cost of Tk.254,638/ha and Tk.152,742/ha on full cost basis and cash cost basis, respectively, for hybrid bitter gourd production. The average net-return was calculated Tk.125,442/ha (rank as 2) on full cost basis and Tk.227,338/ha (rank as 2) on cash cost basis for hybrid bitter gourd production.

Average about Tk. 21.50/kg sale price was observed at farm house for 2015 summer bitter gourd in Charfassion upazila of Bhola district.

Average about 9,900 Bottle gourd fruits yield per hectare was observed for hybrid bottle gourd production on the raised beds of sorjan system in Charfassion upazila of Bhola district during 2015 summer season. Among the 10 involved sorjan vegetable crops, average gross-return of hybrid bottle gourd production was calculated Tk.263,991/ha (rank as 7) in contrast to the average total cost of Tk.221,676/ha and Tk.147,142/ha on full cost basis and cash cost basis, respectively, for hybrid bottle gourd production. The average net-return was calculated Tk.42,315/ha (rank as 9) on full cost basis and Tk.116,849/ha (rank as 10) on cash cost basis for hybrid bottle gourd production. Average about Tk.27.00/fruit sale price was observed at farm house for bottle gourd during 2015 summer season in Charfassion upazila of Bhola district.

Average about 13,125 Ash gourd fruits yield per hectare was observed for hybrid ash gourd production on the raised bed of sorjan system in Charfassion upazila of Bhola district during 2015 summer season. Among the 10 involved sorjan vegetable crops, average gross-return of hybrid ash gourd production was calculated Tk.261,970/ha (rank as 8) in counter to the average total cost of Tk.217,647/ha and Tk.141,751/ha on full cost basis and cash cost basis, respectively, for hybrid ash gourd production. The average net-return was calculated Tk.44,322/ha (rank as 8) on full cost basis and Tk.120,219/ha (rank as 8) on cash cost basis for hybrid ash gourd production. Average about Tk.20.00/fruit sale price was observed at farm house for 2015 summer ash gourd in Charfassion upazila of Bhola district.

Average about 17.36t/ha Snake gourd yield was observed for hybrid snake gourd production on the raised beds of sorjan system in Charfassion upazila of Bhola district during 2015 summer season. Among the 10 involved sorjan vegetable crops, average gross-return of hybrid snake gourd production was calculated Tk.291,872/ha (rank as 6) in counter to the average total cost of Tk.219,350/ha and Tk.140,535/ha on full cost basis and cash cost basis, respectively, for hybrid snake gourd production. The average net-return was calculated Tk.72,521/ha (rank as 4) on full cost basis and Tk.151,337/ha (rank as 5) on cash cost basis for hybrid snake gourd production. Average about Tk.17.00/kg sale price was observed at farm house for snake gourd during 2015 summer season in Charfassion upazila of Bhola district.

Average about 27.70t/ha Sweet gourd yield was observed for hybrid sweet gourd production on the raised beds of sorjan system in Charfassion upazila of Bhola district during 2015 summer season. Among the 10 involved sorjan vegetable crops, average gross-return of hybrid sweet gourd production was calculated Tk.393,703/ha (rank as 1) in counter to the average total cost of Tk.256,063/ha and Tk.162,652/ha on full cost basis and cash cost basis, respectively, for hybrid sweet gourd production. The average net-return was calculated Tk.137,640/ha (rank as 1) on full cost basis and Tk.231,051/ha (rank as 1) on cash cost basis for hybrid Sweet gourd production. Average about Tk.14.33/kg sale price was observed at farm house for 2015 summer sweet gourd in Charfassion upazila of Bhola district.

Average about 15.63t/ha Country Bean yield was observed for country bean production on the raised beds of sorjan system in Charfassion upazila of Bhola district during 2015-16 early winter season. Among the 10 involved sorjan vegetable crops, average gross-return of country bean

production was calculated Tk.347, 484/ha (rank as 3) in contrast to the average total cost of Tk.286, 548/ha and Tk.180, 487/ha on full cost basis and cash cost basis, respectively, for country bean production. The average net-return was calculated Tk.60,936/ha (rank as 7) on full cost basis and Tk.166,997/ha (rank as 4) on cash cost basis for Country Bean production. Average about Tk.15.63/kg sale price was observed at farm house for country bean during 2015-16 winter season in Charfassion upazila of Bhola district.

Average about 14.83 t/ha Ridge gourd yield was observed for hybrid ridge gourd production on the raised beds of sorjan system in Charfassion upazila of Bhola district during 2015 summer season. Among the 10 involved sorjan vegetable crops, average gross-return of hybrid ridge gourd was calculated Tk.244,655/ha (rank as 10) in contrast to the average total cost of Tk.205,219/ha and Tk.125,430/ha on full cost basis and cash cost basis, respectively, for hybrid ridge gourd production. The average net-return was calculated Tk.39,436/ha (rank as 10) on full cost basis and Tk.119,225/ha (rank as 9) on cash cost basis for hybrid ridge gourd production. Average about Tk.16.67/kg sale price was observed at farm house for 2015 summer ridge gourd in Charfassion upazila of Bhola district.

Average about 12.00t/ha Sponge gourd yield was observed for hybrid sponge gourd production on the raised beds of sorjan system in Charfassion upazila of Bhola district during 2015 summer season. Among the 10 involved sorjan vegetable crops, average gross-return of hybrid sponge gourd was calculated Tk.259,874/ha (rank as 9) in contrast to the average total cost of Tk.190,558/ha and Tk.119,851/ha on full cost basis and cash cost basis, respectively, for hybrid sponge gourd production. The average net-return was calculated Tk.69,316/ha (rank as 5) on full cost basis and Tk.140,023/ha (rank as 7) on cash cost basis for hybrid sponge gourd production. Average about Tk.12.00/kg sale price was observed at farm house for Sponge gourd during 2015 summer season in Charfassion upazila of Bhola district.

Background

The sorjan cropping system is an intensive method of growing crops on alternate raised beds (ridges) and deep sinks (deep furrows). Sorjan is an Indonesian term referring to a cloth with color strips (Domingo and Hagerman, 1982 and Reijntjes, 2011). The sorjan farming system is a traditional farming system developed in central Java, Indonesia in the beginning of 20th century, which is widely used in submerged, salinity affected areas and tidal swamps. It consists of parallel ridges and furrows. The size of the ridges and furrows vary greatly from place to place and may be from two to fifteen meters wide. The size of the furrow is much more important for the sorjan farming system. It determines the hydrological function of the sorjan (ILEIA, 1991). The sorjan system is a traditional technology in Java where the population is high and space of cropping is limited. It is usually practiced in swampy or flooded areas where raised beds allow for growing dry land crops while rice or aquatic crops may be concurrently grown in the sinks. The improved environment associated especially with raised beds of the sorjan system favors the growth and yield of the dry land crop (Domingo and Hagerman, 1982).

The sorjan cropping system has several advantages. One of these is that the farmer can enrich his diet by raising food and otherwise may be beyond his means (Khan, 1981). Planting off-season, high-valued crops on sorjan brings higher market price. Tomato, one of the most profitable crops in the tropics (Domingo and Hagerman, 1982) and other high-valued dry land crops can be planted on the raised beds, simultaneously with low land rice or aquatic crops can be grown in the sinks in the sorjan system. This is possible because of improved drainage on the raised beds and water impoundment in the sinks. Meanwhile, rice and fish, rice only and fish only can be grown in the sinks (Domingo and Hagerman, 1982).

Under sorjan farming system, the land use system is agronomically and economically more productive, environmental friendly and well suited to the social environment of marginal low-lying coastal areas in the southwest of Sri Lanka. Support for construction of alternate bed and sink profile as well as for the extension of the necessary knowledge management is vital in developing and popularizing the sorjan farming system. The sorjan farming system would be able to provide the people with a variety of food and additional cash income, which would help to maintain active involvement of the people return. Sorjan farming is an integrated system of crop and fish cultivation in parallel beds and sinks. Lowland crops and fish are cultivated in sinks and upland crops on beds. Sorjan cultivation system basically functions with the integration of agriculture and aquaculture and the system may provide large member of beneficial attributes. The sorjan cultivation system is agronomically more productive and well suited to the socio-economic environment of marginal low-lying than rice-fish cultivation system (Dharamasena, 2004 and Yanti, et al 2003).

In certain places ridges are used for tree crops like guava, citrus, papaya, coconut etc. In this case, the ridges are frequently made in individually for each tree. The sorjan system increases the cropping index by an average of 227.5% as compared to non sorjan. Sorjan farmers obtained an income 2.2 times higher than non-sorjan farmers with 134% higher investment (ILEIA, 1991).

Sorjan farming system was introduced by IRRI as an adoption method to combat the impacts of climate change in south-central coastal region of Bangladesh during 2009-11 (Satter and Abedin, 2010). However, this method can be used as an adoption option to combat the impacts of climate change in southern coastal regions of Bangladesh.

Five trial plots on sorjan farming system were first established at five villages (Uttar Madras, Halimabad, Kulsom Bag and Abuganja) under four unions (Jinnaghar, Aminabad, Abdullahpur, and Aslampurj) in Charfassion upazila of Bhola district with Ridge gourd, Bitter gourd and Bottle gourd on the raised beds of the sorjan system with five innovative farmers (Abdus Satter Faruq, Solaiman Pannu, Aktar Hossain, Ziaul Ahsan and Moulana Yousuf Mollah) with support from Coast Trust under the funding support from Helen Killer International in collaboration with DAE (DAE Upazila Agriculture Office, Charfassion upazila, Bhola district) during 2001 summer season. Later, further initiative was undertaken on the establishment of high value cropping trial plots on sorjan system with support from IDE Bangladesh, FAO, ADB, Adarsha Chashi Unnayan Samity (ACUS) in collaboration with DAE from 2003. Based on the success of those trials on the sorjan farming system with high value crops, large number of farmers started sorjan farming system with high value vegetable crops in the surrounding villages of the four involved trials villages in Charfassion upazila, given emphasis on high value summer vegetable crops from 2005. Currently, about 5,000 farmers are involved for sorjan farming on about 4,000 acres of land with about 20 high value vegetable crops (most of them are hybrid varieties) cultivation on the raised beds of the sorjan system during summer and winter seasons and about 30% of the total sorjan farmers are engaged in fish culture in the deep furrows of the sorjan system in various unions of Charfassion upazila of Bhola district.

Purpose

Large number of high value crops are grown on the raised beds of sorjan system in Charfassion upazila of Bhola district, the latest information from farmers on yield, cost and return, and price of those targeted crops during winter and summer seasons should be available for the benefit of extensionists, specialists, project staff, traders, policymakers, exporters and relevant other users. Accordingly, AAS was undertaken an initiative to collect the relevant primary data for cost and return analysis of those targeted crops in Charfassion upazila of Bhola district in south central coastal region of the country during 7-20 April 2016.

Study area

Total of five villages (Uttar Madras, Aslampur, Char Afzal, Shiba and Uttar Shiba) were selected under four unions (Jinnaghar, Aslampur, Char Madras and Abdullahpur) in Charfassion upazila of Bhola district by the study team for conducting the study on cost and return analysis for dry land sorjan crops. Field data was collected from 39 successful sorjan farmers at five villages in Charfassion upazila of Bhola district. Bhola district is among USAID's Feed the Future (FTF) 20 working districts in southern regions of Bangladesh. The study area (Charfassion upazila) is illustrated in Figure.1

Data Collection, analysis and report preparation

AAS's trained staff collected primary data for cost and returns analysis for the selected ten crops from 39 successful sorjan farmers using one page structured questionnaire developed by AAS (Table.1). Thus, data were collected from the 39 successful sorjan farmers at the five villages in Charfassion upazila of Bhola district. Total of 39 successful sorjan farmers were interviewed, of which the highest number of farmers interviewed for 2015-16 early winter hybrid tomato (6 respondents) followed by 2015 summer hybrid cucumber and hybrid Bitter gourd (5

respondents for each crop), 2015 summer hybrid Bottle gourd, 2015 summer hybrid Snake gourd and 2015-16 winter country Bean (4 respondents for each crop), 2015 summer hybrid Sweet gourd, hybrid Ridge gourd and hybrid Sponge gourd (3 respondents for each crop) and 2015 summer hybrid Ash gourd (2 respondents). Thus, cost and return analysis was conducted for the selected ten sorjan vegetable crops (Tomato, Cucumber, Bitter gourd, Bottle gourd, Ash gourd, Snake gourd, Sweet gourd, Country Bean, Ridge gourd and Sponge gourd) for the final report preparation. Collected data were clean for analysis and entered in MS Excel spread sheet and analysis was done using MS Excel and SPSS.

Report summarizing costs and returns analysis for the ten sorjan vegetable crops from 39 interviewed farmers through using the following data categories and definitions:

(a) Cost of production (Tk./ha) for ten crops include costs for land preparation, labor, seed, fertilizer, pesticide, land rent, transportation, bamboo stick, rope, wire, net, platform (macha) for the involved crops and interest on working capital. The total cost is calculated on full cost basis (FCB) and cash cost basis (CCB) in taka per hectare.

(i) **Full cost includes:** 1. Land preparation, 2, Labour (100%), 3. Seed, 4. Fertilizer, 5. Pesticide, 6. Land rent, 7. Transportation, 8. Bamboo stick, 9. Rope, 10. Wire, 11. Net, 12. Platform (Macha) and 13. Interest on working capital

(ii) **Cash cost includes:** 1. Land preparation, 2, Labour (50%), 3. Seed, 4. Fertilizer, 5. Pesticide, 6. Transportation, 7. Bamboo stick, 8. Rope, 9. Wire, 10. Net, and 11. Platform (Macha), 12. Interest on working capital

(b) Gross return (Tk./ha) is calculated by valuing harvested 10 crops at the local market sale price.

(c) Net-return (Tk./ha) is calculated on full cost and cash cost basis.

(d) Cost-benefit ratios are estimated on full cost and cash cost basis.

(e) Yields (t/ha) are calculated from the respondent farmers and averaged for 10 involved crops.

(f) Crop produces cost (Tk./unit) is calculated from respondent farmers for each crops.

(g) Crop produces sale price (Tk./unit) is calculated from respondent farmers for each crops.

Average sorjan area, average raised bed area and deep furrow area of sorjan farming system are calculated from 5 farmers at 3 villages under 3 unions in Charfassion upazila of Bhola district (Table 1) and summary findings are presented in Table 2.

Table.1: Number of respondents for ten sorjan crops in Charfassion upazila of Bhola district during 2015 summer and 2015-16 winter seasons

SL #	Crop Name	Scientific Name	Cropping Season	Farmers (No.)
1	Tomato	*Lycopersicum esculentum*	2015-16 Early Winter	6
2	Cucumber	*Cucumis sativus*	2015 Summer	5
3	Bitter gourd	*Momordica charantia*	2015 Summer	5
4	Bottle gourd	*Lagenaria siceraria*	2015 Summer	4
5	Ash gourd	*Benincasa hispida*	2015 Summer	2
6	Snake gourd	*Trichosanthes anguina*	2015 Summer	4
7	Sweet gourd	*Cucurbita moschata*	2015 Summer	3
8	Country Bean	*Dolichos Lablab*	2015-16 Winter	4
9	Ridge gourd	*Luffa acutangula*	2015 Summer	3
10	Sponge gourd	*Luffa cylindrica*	2015 Summer	3
Total				**39**

Findings

I. Land use Status of Sorjan System

Table 2 presents the average sorjan area, raised bed area and deep furrow area of sorjan farming system in Charfassion upazila of Bhola district. Average about 43.68 decimals land per sorjan system was observed in Charfassion upazila of Bhola district. Out of a total of 43.68 decimals land per sorjan system, of which average about 57.21% area (24.38 decimals) was observed under raised bed and 42.79% area (19.10 decimals) was observed under low land furrow. Total sorjan area, total raised bed area and total deep furrow area of five respondent farmers in Charfassion upazila of Bhola district is presented in Annex.I.

Table.2: Sorjan area, raised bed area and deep furrow area of sorjan farming system in Charfassion upazila of Bhola district.

SL #	Item	Charfassion upazila, Bhola
1	Average sorjan area (Decimals)	43.68
2	Average raised bed area (Decimals)	24.38
3	% of sorjan area	57.21
4	Average deep furrow area (Decimals)	19.10
5	% of sorjan area	42.79

II Cost and Return of Vegetable Crops

Summary cost and return on ten sorjan vegetable crops are presented in Table.3-13 and the brief findings are presented below:

1. Early winter tomato

Table 3 presents the summary cost and return of early winter hybrid Tomato production on sorjan system during 2015-16 winter season in Charfassion upazila of Bhola district within south central coastal region of the country. Average about 27.55t/ha fresh tomatoes yield was observed for early winter hybrid tomato production in Charfassion upazila of Bhola district. Average gross-return was calculated Tk.331, 604/ha counter to the average total cost of Tk.225,636/ha and Tk.128,148/ha on full cost basis and cash cost basis, respectively, for early winter hybrid tomatoes production. The average net-returns were calculated Tk.105,968/ha and Tk.203,456/ha on full cost basis and cash cost basis, respectively, for early winter tomatoes production. Thus, about 92% higher net-return was calculated for cash cost basis (Tk.203,456/ha) than full cost basis (Tk.105,968/ha), for early winter tomato production. The higher cost benefit ratio was calculated on cash cost-basis (1:2.58) than full cost basis (1:1.47). The average per kg production cost of tomatoes was found higher for full cost basis (Tk.8.19/kg) than cash cost basis (Tk.4.65/kg). Average about Tk.12.25/kg sale price of tomatoes was observed for early winter season in Charfassion upazila of Bhola district. Low net-returns of tomatoes production on full cost basis (Tk.105, 968/ha) and cash cost basis (Tk.203,456/ha) were calculated mainly due to high production cost and low sale price of tomatoes.

Table.3: Summary cost and return analysis of early winter hybrid tomato production during 2015-16 winter season in Charfassion upazila of Bhola district

Item	Cost-return (Tk./ha)
A. Total cost	
(a) Full cost basis	225,636
(b) Cash cost basis	128,148
B. Gross and Net Return	
Gross return (Tk./ha)	331,604
Net-return (Tk./ha)	
(a) Full cost basis	105,968
(b) Cash cost basis	203,456
C. Cost Benefit Ratio	
(a) Full cost basis	1.47
(b) Cash cost basis	2.58
D. Yield, Cost & Sale Price	
(a) Yield (Kg/ha)	27,550
(b) Cost (Tk./kg)	
(i) Full cost basis	8.19
(ii) Cash cost basis	4.65
(c) Tomato sale price (Tk./kg)	12.25

2. Cucumber

Table 4 provides the summary cost and return of hybrid Cucumber production on sorjan system during 2015 summer season in Charfassion upazila of Bhola district within south central coastal region of the country. Average about 25.32t/ha cucumber yield was observed for hybrid cucumber production in Charfassion upazila of Bhola district. Average gross-return was calculated Tk.304, 603/ha in contrast to the average total cost of Tk.238, 361/ha and Tk.155,537/ha on full cost basis and cash cost basis, respectively, for hybrid cucumber production. The average net-returns were calculated Tk.66, 242/ha and Tk.149, 066/ha on full cost basis and cash cost basis, respectively, for cucumber production. Thus, about 125% higher net-return was calculated for cash cost basis (Tk.149, 066/ha) than full cost basis (Tk.66, 242/ha), for cucumber production. The higher cost benefit ratio was calculated on cash cost-basis (1:1.96) than full cost basis (1:1.28). The average per kg production cost of cucumber was found higher for full cost basis (Tk.9.41/kg) than cash cost basis (Tk.6.14/kg). Average about Tk.12.10/kg sale price was observed for cucumber during 2015 summer season in Charfassion upazila of Bhola district. Low net-returns of cucumber production on full cost basis (Tk.66,242/ha) and cash cost basis (Tk.149,066/ha) were calculated mainly due to high production cost and low sale price of cucumber.

Table.4: Summary cost and return analysis of hybrid cucumber production during 2015 summer season in Charfassion upazila of Bhola district

Item	Cost-return (Tk./ha)
A. Total cost	
(a) Full cost basis	238,361
(b) Cash cost basis	155,537
B. Gross and Net Return	
Gross return (Tk./ha)	304,603
Net-return (Tk./ha)	
(a) Full cost basis	66,242
(b) Cash cost basis	149,066
C. Cost Benefit Ratio	
(a) Full cost basis	1.28
(b) Cash cost basis	1.96
D. Yield, Cost & Sale Price	
(a) Yield (Kg/ha)	25,320
(b) Cost (Tk./kg)	
(i) Full cost basis	9.41
(ii) Cash cost basis	6.14
(c) Cucumber sale price (Tk./kg)	12.10

3. Bitter gourd

Table 5 provides the summary cost and return of hybrid Bitter gourd production on sorjan system during 2015 summer season in Charfassion upazila of Bhola district within south central

coastal region of the country. Average about 18.00t/ha Bitter gourd yield was observed for hybrid Bitter gourd production in Charfassion upazila of Bhola district. Average gross-return was calculated Tk.380,081/ha against to average total cost of Tk.254,638/ha and Tk.152,742/ha on full cost basis and cash cost basis, respectively, for hybrid Bitter gourd production. The average net-returns were calculated Tk.125,442/ha and Tk.227,338/ha on full cost basis and cash cost basis, respectively, for Bitter gourd production. Thus, about 81% higher net-return was calculated for cash cost basis (Tk.227,338/ha) than full cost basis (Tk.125,442/ha), for Bitter gourd production. The higher cost benefit ratio was calculated on cash cost-basis (1:2.49) than full cost basis (1:1.51). The average per kg Bitter gourd production cost was found higher for full cost basis (Tk.14.15/kg) than cash cost basis (Tk.8.49/kg). Average about Tk.21.50/kg sale price was observed for Bitter gourd during 2015 summer season in Charfassion upazila of Bhola district. Moderate net-returns of Bitter gourd production on full cost basis (Tk.125,442/ha) and cash cost basis (Tk.227,338/ha) were calculated mainly due to moderate bitter gourd yield and better sale price of Bitter gourd.

Table.5: Summary cost and return analysis of hybrid Bitter gourd production during 2015 summer season in Charfassion upazila of Bhola district

Item	Cost-return (Tk./ha)
A. Total cost	
(a) Full cost basis	254,638
(b) Cash cost basis	152,742
B. Gross and Net Return	
Gross return (Tk./ha)	380,081
Net-return (Tk./ha)	
(a) Full cost basis	125,442
(b) Cash cost basis	227,338
C. Cost Benefit Ratio	
(a) Full cost basis	1.51
(b) Cash cost basis	2.49
D. Yield, Cost & Sale Price	
(a) Yield (Kg/ha)	18,000
(b) Cost (Tk./kg)	
(i) Full cost basis	14.15
(ii) Cash cost basis	8.49
(c) Bitter gourd sale price (Tk./kg)	21.50

4. Bottle gourd

Table 6 provides the cost and return of hybrid Bottle gourd production on sorjan system during 2015 summer season in Charfassion upazila of Bhola district within south central coastal region of the country. Average about 9,900 Bottle gourd fruits per hectare was produced in Charfassion upazila of Bhola district. The average gross-return was calculated Tk.263,991/ha in contrast to

the average total cost of Tk.221,676/ha and Tk.147,142/ha on full cost basis and cash cost basis, respectively, for hybrid Bottle gourd production. The average net-returns were calculated Tk.42,315/ha and Tk.116,849/ha on full cost basis and cash cost basis, respectively, for Bottle gourd production. Thus, about 176% higher net-return was calculated for cash cost basis (Tk.116,849/ha) than full cost basis (Tk.42,315/ha), for Bottle gourd production. The higher cost benefit ratio was calculated on cash cost-basis (1:1.80) than full cost basis (1:1.20). The average per fruit Bottle gourd production cost was found higher for full cost basis (Tk.22.39/fruit) than cash cost basis (Tk.14.86/fruit). Average about Tk.27.00/fruit sale price was observed for Bottle gourd during 2015 summer season in Charfassion upazila of Bhola district. Low net-returns of Bottle gourd production on full cost basis (Tk.42,315/ha) and cash cost basis (Tk.116,849/ha) were calculated mainly due to low fruits production per hectare, high production cost and low sale price of Bottle gourd.

Table.6: Summary cost and return analysis of hybrid Bottle gourd production during 2015 summer season in Charfassion upazila of Bhola district

Item	Cost-return (Tk./ha)
A. Total cost	
(a) Full cost basis	221,676
(b) Cash cost basis	147,142
B. Gross and Net Return	
Gross return (Tk./ha)	263,991
Net-return (Tk./ha)	
(a) Full cost basis	42,315
(b) Cash cost basis	116,849
C. Cost Benefit Ratio	
(a) Full cost basis	1.20
(b) Cash cost basis	1.80
D. Yield, Cost & Sale Price	
(a) Yield (Fruits/ha)	9,900
(b) Cost (Tk./Fruit)	
(i) Full cost basis	22.39
(ii) Cash cost basis	14.86
(c) Bottle gourd sale price (Tk./Fruit)	27.00

5. Ash gourd

Table 7 provides the summary cost and return of hybrid Ash gourd production on sorjan system during 2015 summer season in Charfassion upazila of Bhola district within south central coastal region of the country. Average about 13,125 Ash gourd fruits per hectare was produced in Charfassion upazila of Bhola district. The average gross-return was calculated Tk.261,970/ha counter to the average total cost of Tk.217,647/ha and Tk.141,751/ha on full cost basis and cash cost basis, respectively, for hybrid Ash gourd production. The average net-returns were calculated Tk.44,322/ha and Tk.120,219/ha on full cost basis and cash cost basis, respectively, for Ash gourd production. Thus, about 171% higher net-return was calculated for cash cost

basis (Tk.120,219/ha) than full cost basis (Tk.44,322/ha), for Ash gourd production. The higher cost benefit ratio was calculated on cash cost-basis (1:1.85) than full cost basis (1:1.20). The average per fruit production cost of Ash gourd was found higher for full cost basis (Tk.16.58/fruit) than cash cost basis (Tk.10.80/fruit). Average about Tk.20.00/fruit sale price was observed for Ash gourd during 2015 summer season in Charfassion upazila of Bhola district. Low net-returns of Ash gourd production on full cost basis (Tk.44,322/ha) and cash cost basis (Tk.120,219/ha) were calculated mainly due to low fruits production per hectare, high production cost and low sale price of Ash gourd.

Table.7: Summary cost and return analysis of hybrid Ash gourd production during 2015 summer season in Charfassion upazila of Bhola district

Item	Cost-return (Tk./ha)
A. Total cost	
(a) Full cost basis	217,647
(b) Cash cost basis	141,751
B. Gross and Net Return	
Gross return (Tk./ha)	261,970
Net-return (Tk./ha)	
(a) Full cost basis	44,322
(b) Cash cost basis	120,219
C. Cost Benefit Ratio	
(a) Full cost basis	1.20
(b) Cash cost basis	1.85
D. Yield, Cost & Sale Price	
(a) Yield (Fruits/ha)	13,125
(b) Cost (Tk./Fruit)	
(i) Full cost basis	16.58
(ii) Cash cost basis	10.80
(c) Ash gourd sale price (Tk./Fruit)	20.00

6. Snake gourd

Table 8 presents the summary cost and return of hybrid Snake gourd production on sorjan system during 2015 summer season in Charfassion upazila of Bhola district within south central coastal region of the country. Average about 17.36t/ha snake gourd yield was observed for hybrid snake gourd production in Charfassion upazila of Bhola district. Average gross-return was calculated Tk.291,872/ha counter to the average total cost of Tk.219,350/ha and Tk.140,535/ha on full cost basis and cash cost basis, respectively, for hybrid snake gourd production. The average net-returns were calculated Tk.72,521/ha and Tk.151,337/ha on full cost basis and cash cost basis, respectively, for snake gourd production. Thus, about 109% higher net-return was calculated for cash cost basis (Tk.151,337/ha) than full cost basis

(Tk.72,521/ha), for Snake gourd production. The higher cost benefit ratio was calculated on cash cost basis (1:2.08) than full cost basis (1:1.34). The average per kg production cost of snake gourd was found higher for full cost basis (Tk.12.63/kg) than cash cost basis (Tk.8.09/kg). Average about Tk.17.00/kg sale price was observed for snake gourd during 2015 summer season in Charfassion upazila of Bhola district. Low net-returns of snake gourd production on full cost basis (Tk.72,521/ha) and cash cost basis (Tk.151,337/ha) were calculated mainly due to low snake gourd yield per hectare, high production cost and low sale price of snake gourd.

Table.8: Summary cost and return analysis of hybrid Snake gourd production during 2015 summer season in Charfassion upazila of Bhola district

Item	Cost-return (Tk./ha)
A. Total cost	
(a) Full cost basis	219,350
(b) Cash cost basis	140,535
B. Gross and Net Return	
Gross return (Tk./ha)	291,872
Net-return (Tk./ha)	
(a) Full cost basis	72,521
(b) Cash cost basis	151,337
C. Cost Benefit Ratio	
(a) Full cost basis	1.34
(b) Cash cost basis	2.08
D. Yield, Cost & Sale Price	
(a) Yield (Kg/ha)	17,363
(b) Cost (Tk./kg)	
(i) Full cost basis	12.63
(ii) Cash cost basis	8.09
(c) Snake gourd sale price (Tk./kg)	17.00

7. Sweet gourd

Table 9 presents the summary cost and return of hybrid Sweet gourd production on sorjan system during 2015 summer season in Charfassion upazila of Bhola district within south central coastal region of the country. Average about 27.70t/ha Sweet gourd yield was observed for hybrid Sweet gourd production in Charfassion upazila of Bhola district. Average gross-return was calculated Tk.393,703/ha counter to the average total cost of Tk.256,063/ha and Tk.162,652/ha on full cost basis and cash cost basis, respectively, for hybrid Sweet gourd production. The average net-returns were calculated Tk.137, 640/ha and Tk.231, 051/ha on full cost basis and cash cost basis, respectively, for Sweet gourd production. Thus, about 68% higher net-return was calculated for cash cost basis (Tk.231,051/ha) than full cost basis (Tk.137,640/ha), for Sweet gourd production. The higher cost benefit ratio was calculated on cash cost-basis (1:2.43) than full cost basis (1:1.54. The average per kg production cost of

Sweet gourd was found higher for full cost basis (Tk.9.24/kg) than cash cost basis (Tk.5.87/kg). Average about Tk.14.33/kg sale price was observed for Sweet gourd during 2015 summer season in Charfassion upazila of Bhola district. Moderately high net-returns of sweet gourd production on full cost basis (Tk.125,442/ha) and cash cost basis (Tk.227,338/ha) were calculated mainly due to harvested high yield and better sale price of sweet gourd.

Table.9: Summary cost and return analysis of hybrid Sweet gourd production during 2015 summer season in Charfassion upazila of Bhola district

Item	Cost-return (Tk./ha)
A. Total cost	
(a) Full cost basis	256,063
(b) Cash cost basis	162,652
B. Gross and Net Return	
Gross return (Tk./ha)	393,703
Net-return (Tk./ha)	
(a) Full cost basis	137,640
(b) Cash cost basis	231,051
C. Cost Benefit Ratio	
(a) Full cost basis	1.54
(b) Cash cost basis	2.43
D. Yield, Cost & Sale Price	
(a) Yield (Kg/ha)	27,700
(b) Cost (Tk./kg)	
(i) Full cost basis	9.24
(ii) Cash cost basis	5.87
(c) Sweet gourd sale price (Tk./kg)	14.33

8. Country Bean

Table 10 provides the summary cost and return of Country Bean production on sorjan system during 2015-16 winter season in Charfassion upazila of Bhola district within south central coastal region of the country. Average about 22.65t/ha Country Bean yield was observed for Country Bean production in Charfassion upazila of Bhola district. Average gross-return was calculated Tk.347,484/ha in contrast to the average total cost of Tk.286,548/ha and Tk.180,487/ha on full cost basis and cash cost basis, respectively, for hybrid Country Bean production. The average net-returns were calculated Tk.60,936/ha and Tk.166,997/ha on full cost basis and cash cost basis, respectively, for Country Bean production. Thus, about 174% higher net-return was calculated for cash cost basis (Tk.166,997/ha) than full cost basis (Tk.60,936/ha), for Country Bean production. The higher cost benefit ratio was calculated on cash cost-basis (1:1.93) than full cost basis (1:1.21). The average per kg production cost of Country Bean was found higher for full cost basis (Tk.12.65/kg) than cash cost basis (Tk.7.97/kg). Average about Tk.15.63/kg sale price was observed for Country Bean during

2015-16 winter season in Charfassion upazila of Bhola district. Low net-returns of country bean production on full cost basis (Tk.60,936/ha) and cash cost basis (Tk.166,997/ha) were calculated mainly due to high production cost and low sale price of country bean.

Table.10: Summary cost and return analysis of Country Bean production during 2015-16 winter season in Charfassion upazila of Bhola district

Item	Cost-return (Tk./ha)
A. Total cost	
(a) Full cost basis	286,548
(b) Cash cost basis	180,487
B. Gross and Net Return	
Gross return (Tk./ha)	347,484
Net-return (Tk./ha)	
(a) Full cost basis	60,936
(b) Cash cost basis	166,997
C. Cost Benefit Ratio	
(a) Full cost basis	1.21
(b) Cash cost basis	1.93
D. Yield, Cost & Sale Price	
(a) Yield (Kg/ha)	22,650
(b) Cost (Tk./kg)	
(i) Full cost basis	12.65
(ii) Cash cost basis	7.97
(c) Country Bean sale price (Tk./kg)	15.63

9. Ridge gourd

Table 11 presents the summary cost and return analysis of hybrid Ridge gourd production on sorjan system during 2015 summer season in Charfassion upazila of Bhola district within south central coastal region of the country. Average about 14.83 t/ha Ridge gourd yield was observed for hybrid Ridge gourd production in Charfassion upazila of Bhola district. Average gross-return was calculated Tk.244,655/ha in contrast to the average total cost of Tk.205,219/ha and Tk.125,430/ha on full cost and cash cost basis, respectively, for hybrid Ridge gourd production. The average net-return was calculated Tk.39,436/ha and Tk.119,225/ha on full cost basis and cash cost basis, respectively, for Ridge gourd production. Thus, about 202% higher net-return was calculated for cash cost basis (Tk.119,255/ha) than full cost basis (Tk.39,436/ha) for Ridge gourd production. The higher cost-benefit ratio was calculated on cash cost basis (1:1.95) than full cost basis (1:1.19). The average per kg production cost of Ridge gourd was found higher for full cost basis (Tk.13.84/kg) than cash cost basis (Tk.8.46/kg). Average about Tk.16.67/kg sale price was observed for Ridge gourd during 2015 summer season in Charfassion upazila of Bhola district. Low net-returns of Ridge gourd production on full cost basis (Tk.60, 936/ha) and

cash cost basis (Tk.166, 997/ha) were calculated mainly due to low Ridge gourd yield, high production cost and low sale price of Ridge gourd.

Table.11: Summary cost and return analysis of Ridge gourd production during 2015 summer season in Charfassion upazila of Bhola district

Item	Cost-return (Tk./ha)
A. Total cost	
(a) Full cost basis	205,219
(b) Cash cost basis	125,430
B. Gross and Net Return	
Gross return (Tk./ha)	244,655
Net-return (Tk./ha)	
(a) Full cost basis	39,436
(b) Cash cost basis	119,225
C. Cost Benefit Ratio	
(a) Full cost basis	1.19
(b) Cash cost basis	1.95
D. Yield, Cost & Sale Price	
(a) Yield (Kg/ha)	14,825
(b) Cost (Tk./kg)	
(i) Full cost basis	13.84
(ii) Cash cost basis	8.46
(c) Ridge gourd sale price (Tk./kg)	16.67

10. Sponge gourd

Table 12 presents the summary cost and return analysis of hybrid Sponge gourd production on sorjan system during 2015 summer season in Charfassion upazila of Bhola district within south central coastal region of the country. Average about 21.70t/ha Sponge gourd yield was observed for hybrid Sponge gourd production in Charfassion upazila of Bhola district. Average gross-return was calculated Tk.259,874/ha in contrast to the average total cost of Tk.190,558/ha and Tk.119,851/ha on full cost basis and cash cost basis, respectively, for Sponge gourd production. The average net-returns were calculated Tk.69, 316/ha and Tk.140, 023/ha on full cost basis and cash cost basis, respectively, for Sponge gourd production. Thus, about 102% higher net-return was calculated for cash cost basis (Tk.140,023/ha) than full cost basis (Tk.69,316/ha) for Sponge gourd production. The higher cost benefit ratio was calculated on cash cost-basis (1:2.18) than full cost basis (1:1.37). The average per kg production cost of Sponge gourd was found higher for full cost basis (Tk.8.78/kg) than cash cost basis (Tk.5.52/kg). Average about Tk.12.00/kg sale price was observed for Sponge gourd during 2015 summer season in Charfassion upazila of Bhola district. Low net-returns of sponge gourd production on full cost basis (Tk.69, 316/ha) and cash cost basis (Tk.140, 023/ha) were calculated mainly due to high production cost and low sale price of sponge gourd.

Table.12: Summary cost and return analysis of Sponge gourd production during 2015 summer season in Charfassion upazila of Bhola district

Item	Cost-return (Tk./ha)
A. Total cost	
(a) Full cost basis	190,558
(b) Cash cost basis	119,851
B. Gross and Net Return	
Gross return (Tk./ha)	259,874
Net-return (Tk./ha)	
(a) Full cost basis	69,316
(b) Cash cost basis	140,023
C. Cost Benefit Ratio	
(a) Full cost basis	1.37
(b) Cash cost basis	2.18
D. Yield, Cost & Sale Price	
(a) Yield (Kg/ha)	21,700
(b) Cost (Tk./kg)	
(i) Full cost basis	8.78
(ii) Cash cost basis	5.52
(c) Sponge gourd sale price (Tk./kg)	12.00

III. Crop Ranking

Table 13 presents the comparative ranking of 10 sorjan vegetable crops based on the net-returns under full cost and cash cost basis and gross-return during 2015 summer and 2015-16 winter seasons. Comparative crop ranking was accomplished based on the net-returns (full cost and cash cost basis) and gross-return for the involved 10 vegetable crops grown on raised beds of sorjan system in Charfassion upazila of Bhola district. The highest net-return on full cost basis was observed for Sweet gourd (Tk.137,640/ha) as rank1 followed by Bitter gourd (Tk.125,442/ha) as rank 2, early winter Tomato (Tk.105,968/ha) as rank 3, Snake gourd (Tk.72,521/ha) as rank 4, Sponge gourd (Tk.69,316/ha) as rank 5, Cucumber (Tk.66,242/ha) as rank 6, Country Bean (Tk.60,936/ha) as rank 7, Ash gourd (Tk.44,322/ha) as rank 8, Bottle gourd (Tk.42,315/ha) as rank 9, and Ridge gourd (Tk.39,436/ha) as rank 10. Similarly, the highest net-return on cash cost basis was observed for Sweet gourd (Tk.231,051/ha) rank as 1 followed by Bitter gourd (Tk.227,338/ha) rank as 2, early winter Tomato (Tk.203,456/ha) rank as 3, Country Bean (Tk.166,997/ha) rank as 4, Snake gourd (Tk.151,337/ha) rank as 5, Cucumber (Tk.149,066/ha) rank as 6, Sponge gourd (Tk.140,023/ha) rank as 7, Ash gourd (Tk.120,219/ha) rank as 8, Ridge gourd (Tk.119,225/ha) rank as 9 and Bottle gourd (Tk.116,849/ha) rank as 10.

Among the involved 10 sorjan vegetable crops, the highest gross-return was observed for Sweet gourd (Tk.393,703/ha) as rank 1 followed by Bitter gourd (Tk.380,081/ha) as rank 2, Country Bean (Tk.347,484/ha) as rank 3, early winter Tomato (Tk.331,604/ha) as rank 4,

Cucumber (Tk.304,603/ha) as rank 5, Snake gourd (Tk.291,872/ha) as rank 6, Bottle gourd (Tk.263,991/ha) as rank 7, Ash gourd (Tk.261,970/ha) as rank 8, Sponge gourd (Tk.259,874/ha) as rank 9 and Ridge gourd (Tk.244,655/ha) as rank 10.

In this ranking, top two crops were determined as high value cash crops and they are Sweet gourd followed by Bitter gourd on the ground of net-return under full cost and cash cost basis and gross-return in Charfassion upazila of Bhola district during 2015 summer season

Table.13: Comparative ranking of 10 Sorjan vegetable crops based on net-returns under full cost and cash cost basis and gross-return during 2015 summer and 2015-16 winter seasons

Crop	Net-return on full cost basis (Tk./ha)	Rank	Net-return on cash cost basis (Tk./ha)	Rank	Gross return (Tk./ha)	Rank
Tomato	105,968	**3**	203,456	**3**	331,604	**4**
Cucumber	66,242	6	149,066	6	304,603	**5**
Bitter gourd	125,442	**2**	227,338	**2**	380,081	**2**
Bottle gourd	42,315	9	116,849	10	263,991	7
Ash gourd	44,322	8	120,219	8	261,970	8
Snake gourd	72,521	**4**	151,337	**5**	291,872	6
Sweet gourd	137,640	**1**	231,051	**1**	393,703	**1**
Country Bean	60,936	7	166,997	**4**	347,484	**3**
Ridge gourd	39,436	10	119,225	9	244,655	10
Sponge gourd	69,316	**5**	140,023	7	259,874	9

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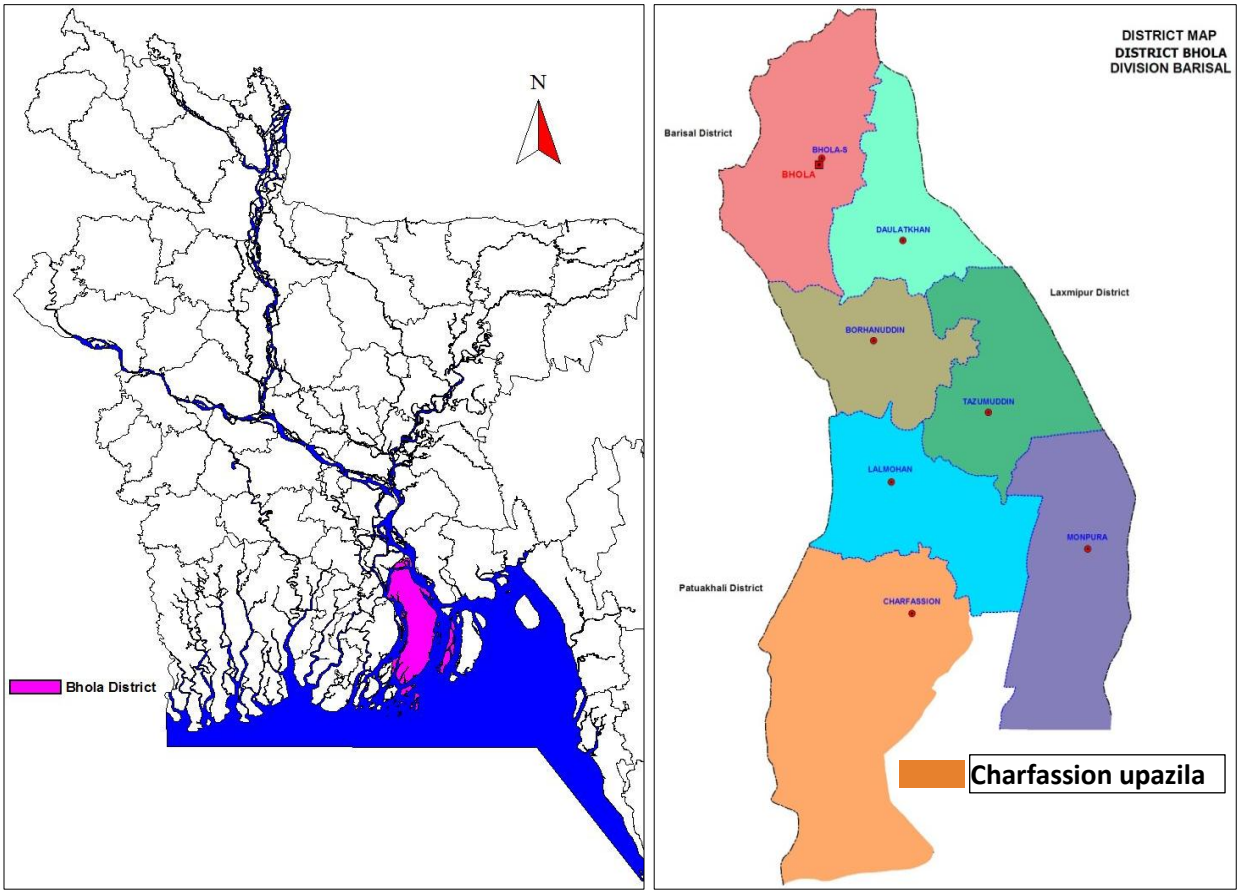
Figure.1 Location map of Charfassion upazila of Bhola district



Annex.1: Total sorjan area, bed (ridge) area and furrow area of sorjan farming system of five farmers in Charfassion upazila of Bhola district

SL #	Farmer	Total Sorjan area (decimals)	Total bed area (decimals)	% of total	Total furrow area (decimals)	% of total
1	Zahangir Majhi F/N: Haris Majhi Vill: Uttar Madras, Union: Jinnaghar	26.93	14.08	52.28	12.85	47.72
2	Md. Harun Gazi F/N: Nawab Ali Vill: Aslampur, Union: Aslampur	16.98	10.77	63.43	6.21	36.57
3	Hossain Chowkidar F/N: Golur Chowkider Vill: Aslampur, Union: Aslampur	86.53	48.94	56.56	37.59	43.44
4	Monir Miah F/N: Nur Mohammad Majhi Vill: Char Afzal Union: Char Madras	57.38	30.67	53.45	26.71	46.55
5	Mazid Mollah F/N: Khalilur Rahman Vill: Char Afzal Union: Char Madras	30.57	18.45	60.35	12.12	39.65
Average		**43.68**	**24.58**	**57.21**	**19.10**	**42.79**

Annex.2: Summary cost and return analysis of early winter hybrid tomato production during 2015-16 winter season in Charfassion upazila of Bhola district

SL#	Item	Average Cost-return (Tk/ha)
A. Cost		
1	Land Preparation	22,828.79
2	Labor	70,794.19
3	Seed	8,981.82
4	Fertilizer	28,735.58
5	Crop Protection	20,209.09
6	Land rent	28,068.18
7	Transportation	12,898.89
8	Bamboo Stick	3,243.43
9	Rope	21,082.32
10	Wire	10,728.28
11	Net	7,484.85
12	Interest on working capital	
	a) Full cost basis	8,793.45
	b) Cash cost basis	4,928.77
	Total Cost (A)	
	a) Full cost basis	225,635.75
	b) Cash cost basis	128,148.09
B. Gross and Net return:		
	Gross return (Tk./ha)	
	a) Main product (No.)	331,603.74
	b) By-product	0.00
	Total Gross return (Tk./ha)	331,603.74
	Net return (Tk./ha)	
	a) Full cost basis	105,967.99
	b) Cash cost basis	203,455.65
C. Cost Benefit Ratio		
	a) Full cost basis	1.47
	b) Cash cost basis	2.58
D. Yield, cost & sale price		
	(a) Yield (Kg/ha)	27,550.00
	(b) Cost (Tk./kg)	
	(i) Full cost basis	8.19
	(ii) Cash cost basis	4.65
	(c) Tomato Sale Price (Tk/Kg)	12.25

A. Full cost includes: 1. Land preparation, 2, Labour (100%), 3. Seed, 4. Fertilizer, 5. Pesticide, 6. Land rent, 7. Transportation, 8. Bamboo Stick, 9. Rope, 10. Wire, 11. Net, and 12. Interest on working capital

B. Cash cost includes: 1. Land preparation, 2, Labour (50%), 3. Seed, 4. Fertilizer, 5. Pesticide, 6. Transportation, 7. Bamboo Stick, 8. Rope, 9. Wire, 10. Net, and 11. Interest on working capital

Annex.3: Summary cost and return analysis of hybrid Cucumber production during 2015 summer season in Charfassion upazila of Bhola district

SL#	Item	Average Cost-return (Tk/ha)
A. Cost		
1	Land Preparation	20,508.48
2	Labor	59,130.30
3	Seed	11,436.85
4	Fertilizer	25,351.18
5	Crop Protection	14,969.70
6	Land rent	26,945.45
7	Transportation	12,634.42
8	Platform	58,217.15
9	Interest on working capital	
	a) Full cost basis	9,167.74
	b) Cash cost basis	5,982.19
	Total Cost (A)	
	a) Full cost basis	238,361.29
	b) Cash cost basis	155,536.95
B. Gross and Net return:		
	Gross return (Tk./ha)	
	a) Main product (No.)	304,603.39
	b) By-product	0.00
	Total Gross return (Tk./ha)	304,603.39
	Net return (Tk./ha)	
	a) Full cost basis	66,242.11
	b) Cash cost basis	149,066.45
C. Cost Benefit Ratio		
	a) Full cost basis	1.28
	b) Cash cost basis	1.96
D. Yield, cost & sale price		
	(a) Yield (Kg/ha)	25,320.00
	(b) Cost (Tk./kg)	
	(i) Full cost basis	9.41
	(ii) Cash cost basis	6.14
	(c) Cucumber Sale Price (Tk/Kg)	12.10

A. Full cost includes: 1. Land preparation, 2, Labour (100%), 3. Seed, 4. Fertilizer, 5. Pesticide, 6. Land rent, 7. Transportation, 8. Platform (Macha), and 9. Interest on working capital

B. Cash cost includes: 1. Land preparation, 2, Labour (50%), 3. Seed, 4. Fertilizer, 5. Pesticide, 6. Transportation, 7. Platform (Macha), and 8. Interest on working capital

Annex.4: Summary cost and return analysis of hybrid Bitter gourd production during 2015 summer season in Charfassion upazila of Bhola districts

SL#	Item	Average Cost-return (Tk/ha)
A. Cost		
1	Land Preparation	20,957.58
2	Labor	77,019.09
3	Seed	6,706.42
4	Fertilizer	24,595.21
5	Crop Protection	17,469.64
6	Land rent	25,448.48
7	Transportation	12,020.67
8	Platform	60,627.27
9	Interest on working capital	
	a) Full cost basis	9,793.77
	b) Cash cost basis	5,874.71
	Total Cost (A)	
	a) Full cost basis	254,638.14
	b) Cash cost basis	152,742.40
B. Gross and Net return:		
	Gross return (Tk./ha)	
	a) Main product (No.)	380,080.61
	b) By-product	0.00
	Total Gross return (Tk./ha)	380,080.61
	Net return (Tk./ha)	
	a) Full cost basis	125,442.47
	b) Cash cost basis	227,338.20
C. Cost Benefit Ratio		
	a) Full cost basis	1.51
	b) Cash cost basis	2.49
D. Yield, cost & sale price		
	(a) Yield (Kg/ha)	18,000.00
	(b) Cost (Tk./kg)	
	(i) Full cost basis	14.15
	(ii) Cash cost basis	8.49
	(c) Bitter gourd Sale Price (Tk/Kg)	21.50

A. Full cost includes: 1. Land preparation, 2, Labour (100%), 3. Seed, 4. Fertilizer, 5. Pesticide, 6. Land rent, 7. Transportation, 8. Platform (Macha), and 9. Interest on working capital

B. Cash cost includes: 1. Land preparation, 2, Labour (50%), 3. Seed, 4. Fertilizer, 5. Pesticide, 6. Transportation, 7. Platform (Macha), and 8. Interest on working capital

Annex.5: Summary cost and return analysis of hybrid Bottle gourd production during 2015 summer season in Charfassion upazila of Bhola district

SL#	Item	Average Cost-return (Tk/ha)
A. Cost		
1	Land Preparation	19,086.36
2	Labor	52,581.06
3	Seed	5,463.94
4	Fertilizer	12,686.82
5	Crop Protection	8,794.70
6	Irrigation	0.00
7	Land rent	26,196.97
8	Transportation	20,040.68
9	Platform	68,299.24
10	Rope	0.00
11	Wire	0.00
12	Interest on working capital	
	a) Full cost basis	8,525.99
	b) Cash cost basis	5,659.29
	Total Cost (A)	
	a) Full cost basis	221,675.76
	b) Cash cost basis	147,141.64
B. Gross and Net return:		
	Gross return (Tk./ha)	
	a) Main product (No.)	263,990.61
	b) By-product	0.00
	Total Gross return (Tk./ha)	263,990.61
	Net return (Tk./ha)	
	a) Full cost basis	42,314.84
	b) Cash cost basis	116,848.96
C. Cost Benefit Ratio		
	a) Full cost basis	1.20
	b) Cash cost basis	1.80
D. Yield, cost & sale price		
	(a) Yield (Fruits/ha)	9,900.00
	(b) Cost (Tk./Fruit)	
	(i) Full cost basis	22.39
	(ii) Cash cost basis	14.86
	(c) Bottle gourd Sale Price (Tk/Fruit)	27.00

A. Full cost includes: 1. Land preparation, 2, Labour (100%), 3. Seed, 4. Fertilizer, 5. Pesticide, 6. Land rent, 7. Transportation, 8. Platform (Macha), and 9. Interest on working capital

B. Cash cost includes: 1. Land preparation, 2, Labour (50%), 3. Seed, 4. Fertilizer, 5. Pesticide, 6. Transportation, 7. Platform (Macha), and 8. Interest on working capital

Annex.6: Summary cost and return analysis of hybrid Ash gourd production during 2015 summer season in Charfassion upazila of Bhola district

SL#	Item	Average Cost-return (Tk/ha)
A. Cost		
1	Land Preparation	20,583.33
2	Labor	52,393.94
3	Seed	5,987.88
4	Fertilizer	18,113.33
5	Crop Protection	8,233.33
6	Land rent	28,068.18
7	Transportation	12,275.15
8	Platform	63,621.21
9	Interest on working capital	
	a) Full cost basis	8,371.05
	b) Cash cost basis	5,451.96
	Total Cost (A)	
	a) Full cost basis	217,647.42
	b) Cash cost basis	141,751.05
B. Gross and Net return:		
	Gross return (Tk./ha)	
	a) Main product (No.)	261,969.70
	b) By-product	0.00
	Total Gross return (Tk./ha)	261,969.70
	Net return (Tk./ha)	
	a) Full cost basis	44,322.28
	b) Cash cost basis	120,218.64
C. Cost Benefit Ratio		
	a) Full cost basis	1.20
	b) Cash cost basis	1.85
D. Yield, cost & sale price		
	(a) Yield (Fruits/ha)	13,125.00
	(b) Cost (Tk./Fruit)	
	(i) Full cost basis	16.58
	(ii) Cash cost basis	10.80
	(c) Ash gourd Sale Price (Tk/Fruit)	20.00

A. Full cost includes: 1. Land preparation, 2, Labour (100%), 3. Seed, 4. Fertilizer, 5. Pesticide, 6. Land rent, 7. Transportation, 8. Platform (Macha), and 9. Interest on working capital

B. Cash cost includes: 1. Land preparation, 2, Labour (50%), 3. Seed, 4. Fertilizer, 5. Pesticide, 6. Transportation, 7. Platform (Macha), and 8. Interest on working capital

Annex.7: Summary cost and return analysis of hybrid Snake gourd production during 2015 summer season in Charfassion upazila of Bhola district

SL#	Item	Average Cost-return (Tk/ha)
A. Cost		
1	Land Preparation	20,583.33
2	Labor	55,200.76
3	Seed	6,006.59
4	Fertilizer	20,648.83
5	Crop Protection	11,882.20
6	Land rent	27,132.58
7	Transportation	12,387.42
8	Platform	57,071.97
9	Interest on working capital	
	a) Full cost basis	8,436.55
	b) Cash cost basis	5,405.18
	Total Cost (A)	
	a) Full cost basis	219,350.22
	b) Cash cost basis	140,534.77
B. Gross and Net return:		
	Gross return (Tk./ha)	
	a) Main product (No.)	291,871.67
	b) By-product	0.00
	Total Gross return (Tk./ha)	291,871.67
	Net return (Tk./ha)	
	a) Full cost basis	72,521.45
	b) Cash cost basis	151,336.90
C. Cost Benefit Ratio		
	a) Full cost basis	1.34
	b) Cash cost basis	2.08
D. Yield, cost & sale price		
	(a) Yield (Kg/ha)	17,362.50
	(b) Cost (Tk./kg)	
	(i) Full cost basis	12.63
	(ii) Cash cost basis	8.09
	(c) Snake gourd Sale Price (Tk/No.)	17.00

A. Full cost includes: 1. Land preparation, 2, Labour (100%), 3. Seed, 4. Fertilizer, 5. Pesticide, 6. Land rent, 7. Transportation, 8. Platform (Macha), and 9. Interest on working capital

B. Cash cost includes: 1. Land preparation, 2, Labour (50%), 3. Seed, 4. Fertilizer, 5. Pesticide, 6. Transportation, 7. Platform (Macha), and 8. Interest on working capital

Annex.8: Summary cost and return analysis of hybrid Sweet gourd production during 2015 summer season in Charfassion upazila of Bhola district

SL#	Item	Average Cost-return (Tk/ha)
A. Cost		
1	Land Preparation	24,949.49
2	Labor	64,868.69
3	Seed	7,983.84
4	Fertilizer	22,292.37
5	Crop Protection	6,362.12
6	Land rent	27,444.44
7	Transportation	18,712.12
8	Platform	73,601.01
9	Interest on working capital	
	a) Full cost basis	9,848.56
	b) Cash cost basis	6,255.84
	Total Cost (A)	
	a) Full cost basis	256,062.65
	b) Cash cost basis	162,651.75
B. Gross and Net return:		
	Gross return (Tk./ha)	
	a) Main product (No.)	393,703.03
	b) By-product	0.00
	Total Gross return (Tk./ha)	393,703.03
	Net return (Tk./ha)	
	a) Full cost basis	137,640.38
	b) Cash cost basis	231,051.28
C. Cost Benefit Ratio		
	a) Full cost basis	1.54
	b) Cash cost basis	2.43
D. Yield, cost & sale price		
	(a) Yield (Kg/ha)	27,700.00
	(b) Cost (Tk./kg)	
	(i) Full cost basis	9.24
	(ii) Cash cost basis	5.87
	(c) Sweet gourd Sale Price (Tk/No.)	14.33

A. Full cost includes: 1. Land preparation, 2, Labour (100%), 3. Seed, 4. Fertilizer, 5. Pesticide, 6. Land rent, 7. Transportation, 8. Platform (Macha), and 9. Interest on working capital

B. Cash cost includes: 1. Land preparation, 2, Labour (50%), 3. Seed, 4. Fertilizer, 5. Pesticide, 6. Transportation, 7. Platform (Macha), and 8. Interest on working capital

Annex.9: Summary cost and return analysis of Country Bean production during 2015-16 winter season in Charfassion upazila of Bhola district

SL#	Item	Average Cost-return (Tk/ha)
A. Cost		
1	Land Preparation	22,454.55
2	Labor	79,526.52
3	Seed	3,667.58
4	Fertilizer	19,544.81
5	Crop Protection	52,393.94
6	Land rent	29,003.79
7	Transportation	11,863.48
8	Platform	57,071.97
9	Interest on working capital	
	a) Full cost basis	11,021.07
	b) Cash cost basis	6,941.82
	Total Cost (A)	
	a) Full cost basis	286,547.69
	b) Cash cost basis	180,487.39
B. Gross and Net return:		
	Gross return (Tk./ha)	
	a) Main product (No.)	347,484.09
	b) By-product	0.00
	Total Gross return (Tk./ha)	347,484.09
	Net return (Tk./ha)	
	a) Full cost basis	60,936.40
	b) Cash cost basis	166,996.70
C. Cost Benefit Ratio		
	a) Full cost basis	1.21
	b) Cash cost basis	1.93
D. Yield, cost & sale price		
	(a) Yield (Kg/ha)	22,650.00
	(b) Cost (Tk./kg)	
	(i) Full cost basis	12.65
	(ii) Cash cost basis	7.97
	(c) Country Bean Sale Price (Tk/Kg)	15.63

A. Full cost includes: 1. Land preparation, 2, Labour (100%), 3. Seed, 4. Fertilizer, 5. Pesticide, 6. Land rent, 7. Transportation, 8. Platform (Macha), and 9. Interest on working capital

B. Cash cost includes: 1. Land preparation, 2, Labour (50%), 3. Seed, 4. Fertilizer, 5. Pesticide, 6. Transportation, 7. Platform (Macha), and 8. Interest on working capital

Annex.10: Summary cost and return analysis of hybrid Ridge gourd production during 2015 summer season in Charfassion upazila of Bhola district

SL#	Item	Average Cost-return (Tk/ha)
A. Cost		
1	Land Preparation	21,207.07
2	Labor	55,512.63
3	Seed	6,237.37
4	Fertilizer	19,061.41
5	Crop Protection	8,857.07
6	Land rent	26,196.97
7	Transportation	7,859.09
8	Platform	52,393.94
9	Interest on working capital	
	a) Full cost basis	7,893.02
	b) Cash cost basis	4,824.23
	Total Cost (A)	
	a) Full cost basis	205,218.58
	b) Cash cost basis	125,430.09
B. Gross and Net return:		
	Gross return (Tk./ha)	
	a) Main product (No.)	244,654.75
	b) By-product	0.00
	Total Gross return (Tk./ha)	244,654.75
	Net return (Tk./ha)	
	a) Full cost basis	39,436.17
	b) Cash cost basis	119,224.65
C. Cost Benefit Ratio		
	a) Full cost basis	1.19
	b) Cash cost basis	1.95
D. Yield, cost & sale price		
	(a) Yield (Kg/ha)	14,825.00
	(b) Cost (Tk./kg)	
	(i) Full cost basis	13.84
	(ii) Cash cost basis	8.46
	(c) Ridge gourd Sale Price (Tk/kg)	16.67

A. Full cost includes: 1. Land preparation, 2, Labour (100%), 3. Seed, 4. Fertilizer, 5. Pesticide, 6. Land rent, 7. Transportation, 8. Platform (Macha), and 9. Interest on working capital

B. Cash cost includes: 1. Land preparation, 2, Labour (50%), 3. Seed, 4. Fertilizer, 5. Pesticide, 6. Transportation, 7. Platform (Macha), and 8. Interest on working capital

Annex.11: Summary cost and return analysis of Sponge gourd production during 2015 summer season in Charfassion upazila of Bhola district

SL#	Item	Average Cost-return (Tk/ha)
A. Cost		
1	Land Preparation	16,217.17
2	Labor	51,770.20
3	Seed	4,141.62
4	Fertilizer	16,416.77
5	Crop Protection	5,863.13
6	Land rent	28,691.92
7	Transportation	8,981.82
8	Platform	51,146.46
9	Interest on working capital	
	a) Full cost basis	7,329.16
	b) Cash cost basis	4,609.67
	Total Cost (A)	
	a) Full cost basis	190,558.25
	b) Cash cost basis	119,851.39
B. Gross and Net return:		
	Gross return (Tk./ha)	
	a) Main product (No.)	259,873.94
	b) By-product	0.00
	Total Gross return (Tk./ha)	259,873.94
	Net return (Tk./ha)	
	a) Full cost basis	69,315.68
	b) Cash cost basis	140,022.55
C. Cost Benefit Ratio		
	a) Full cost basis	1.37
	b) Cash cost basis	2.18
D. Yield, cost & sale price		
	(a) Yield (Kg/ha)	21,700.00
	(b) Cost (Tk./kg)	
	(i) Full cost basis	8.78
	(ii) Cash cost basis	5.52
	(c) Sponge gourd Sale Price (Tk/kg)	12.00

A. Full cost includes: 1. Land preparation, 2, Labour (100%), 3. Seed, 4. Fertilizer, 5. Pesticide, 6. Land rent, 7. Transportation, 8. Platform (Macha), and 9. Interest on working capital

B. Cash cost includes: 1. Land preparation, 2, Labour (50%), 3. Seed, 4. Fertilizer, 5. Pesticide, 6. Transportation, 7. Platform (Macha), and 8. Interest on working capital

Annex.12: Sowing duration, harvesting duration, cropping season and scientific name of the ten sorjan crops during 2015 summer and 2015-16 winter seasons

SL #	Crop Name	Scientific Name	Sowing Duration	Harvesting Duration		Cropping Season
				Start	End	
1	Tomato	*Lycopersicum esculentum*	23/08/2015-01/09/2015	07/12/2015-15/12/2015	20/02/2016-30/02/2016	2015-16 Early Winter
2	Cucumber	*Cucumis sativus*	28/04/2015-25/06/2015	20/06/2015-20/08/2015	30/08/2015-28/10/2015	2015 Summer
3	Bitter gourd	*Momordica charantia*	18/04/2015-17/06/2015	20/06/2015-12/08/2015	01/09/2015-30/10/2015	2015 Summer
4	Bottle gourd	*Lagenaria siceraria*	15/05/2015-10/08/2015	04/08/2015-09/10/2015	25/10/2015-20/12/2015	2015 Summer
5	Ash gourd	*Benincasa hispida*	01/06/2015-08/06/2015	30/07/2015-04/08/2015	25/10/2015-04/11/2015	2015 Summer
6	Snake gourd	*Trichosanthes anguina*	12/04/2015-30/05/2015	30/07/2015-25/08/2015	25/09/2015-20/10/2015	2015 Summer
7	Sweet gourd	*Cucurbita moschata*	24/05/2015-19/07/2015	30/07/2015-25/08/2015	25/09/2015-20/10/2015	2015 Summer
8	Country Bean	*Dolichos Lablab*	04/08/2015-30/08/2015	14/11/2015-07/12/2015	31/01/2016-25/02/2016	2015-16 Winter
9	Ridge gourd	*Luffa acutangula*	01/06/2015-24/06/2015	20/07/2015-15/08/2015	25/09/2015-20/10/2015	2015 Summer
10	Sponge gourd	*Luffa cylindrica*	24/04/2015-28/04/2015	20/06/2015-24/06/2015	20/08/2015-25/08/2015	2015 Summer