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PROFITABILITY OF SOME BARI RELEASED CROP VARIETIES IN SOME LOCATIONS OF BANGLADESH

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Abstract

An attempt was made to assess the costs and returns from the cultivation of selected crops in different locations. Fifty farmers were selected for collecting data for each crop through random sampling for the year 2006-07. Study revealed that per hectare total costs were Tk. 51341, Tk. 32275, Tk. 20983, Tk. 27819, Tk. 63012, Tk. 61928, Tk. 87828, Tk. 65163, and Tk. 57775 for the cultivation of maize, groundnut, mungbean, sweet potato, cabbage, cauliflower, tomato, cucumber, and okra, respectively. Sample farmers received Tk. 31280, Tk. 23221, Tk. 12957, Tk. 70981, Tk. 56546, Tk. 72820, Tk. 247076, Tk. 61437 and Tk. 94822 per hectare as net returns from the cultivation of maize, groundnut, mungbean, sweet potato, cabbage, cauliflower, tomato, cucumber, and okra, respectively. The benefit cost ratios over total costs were 1.61, 1.72, 1.62, 3.55, 1.90, 2.17, 3.72, 1.94, and 2.64 for the cultivation of maize, groundnut, mungbean, sweet potato, cabbage, cauliflower, tomato, cucumber, and okra, respectively. High costs of fertilizers and insecticides were the major constraints to higher production for most of the crops as mentioned by the sample farmers.

Keywords: Profitability, crops, locations.

Introduction

Bangladesh has made substantial progress towards achieving its goal of foodgrain self-sufficiency. This achievement has been based on a substantial intensification of agriculture: modern rice varieties now account for almost half of the rice area; an increasing proportion of land is double- or triple- cropped; and use of chemical fertilizers has become double since the early 1980s. Continued and accelerated agricultural growth will require intensification to continue. But this intensification created problem for productivity. Because farmers do not follow the crop rotations which damage soil fertility. Therefore, minor crops should be produced if they are profitable. The present study takes an attempt to investigate this issue considering nine crops: maize, groundnut, mungbean, sweet potato, cabbage, cauliflower, tomato, cucumber, and okra.

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Maize is one of the oldest crops in the world. It is the highest yielding grain crop having multiple uses. At present, maize is gaining popularity to the farmers due to its high productivity potential and demand for poultry feed in Bangladesh. It is evident that the area and production of maize increased about 48% and 49%, respectively, in the year 2007-2008 from the previous year (BBS, 2008).

Groundnut is cultivated mostly in marginal lands during both in summer and winter seasons in Bangladesh. Its area and production have steadily dropped over the past decade. Area and production of groundnut increased about 17% and 29%, respectively, in 2007-2008 compared to the year 2002- 2003. Again, groundnut occupies only about 10% of the total area under all oil crops and contributes about 7% to the total oil seed production in 2007- 2008 (BBS, 2008). Apart from the fact that the groundnut is an excellent oil crop, it is a good source of protein, nutritious fodder for the cattle, and profitable cash crop to the farmers.

The mungbean is a leguminous species or pulse crop grown principally for its protein-rich edible seeds. Pulses are important world food crops because they provide an inexpensive source of vegetable dietary protein. In densely populated areas like Bangladesh, the economy does not support large-scale production and utilization of animal protein. Therefore, the protein in people's diets may be augmented by supplementation with the rich pulse grains in Bangladesh. The area under mungbean in Bangladesh was 60000 acres with the production of 21000 M. tons which was about 10% of total pulse area and production during the year 2007-2008 (BBS, 2008). Area and production of mungbean decreased about 45% and 30%, respectively, in 2007- 2008 compared to the year 2002-2003.

Sweet potatoes are mainly utilized as human foodstuff. In the tropics, the major portion of the crop is eaten straight from the ground as a vegetable, after boiling, baking or frying. The area and production under sweet potato was 78000 acres and 307000 M. tons in Bangladesh during the year 2007-2008 (BBS, 2008). Area and production of sweet potato decreased about 14% and 8%, respectively in 2007- 2008 compared to that in the year 2002- 2003.

Cabbage is one of the most economically important member of genus Brassica. It is the most popular vegetable around the world in respect of area, production, and availability almost round the year (Swiader *et al.*, 1992). The production in Bangladesh under cabbage increased 79% in 2007-2008 compared to 2002-2003 (BBS, 2008). It covers about 3% production under vegetable crops in 2007-2008 (BBS, 2008). Besides its nutritive value, it is a profitable cash crop for the farmers in Bangladesh.

Cauliflower is one of the most important favourite vegetable crop grown throughout the country and relished by most of the people. In comparison to other vegetables, its cultivation needs more and regular care to get better quality

of curds. Out of a total of 159994 ha of land under winter vegetables, cauliflower occupies 8% area. The production (156000 M. ton) of cauliflower increased 86% in 2007- 2008 compared to 2002-2003. It covers 2% production in the total vegetable production in 2007-2008 (BBS, 2008).

Tomato is one of the most popular vegetables grown all over the country. The production of tomato in our country was about 143000 M. tons in 2007-2008 (BBS, 2008). It increased 40% of tomato production in 2007-2008 compared to 2002-2003. It is a very good source of income to small and marginal farmers and contributes to the nutrition of the consumer.

Cucumber is one of the oldest vegetable crops grown widely throughout the country, tropical and sub-tropical parts of the world (Singh *et al.*, 2004). Fruits are eaten raw with salt and pepper at the immature and mature stages. Mostly, the small fruits are used for pickling and big fruits are used for salads and for cooking curries. It is a good source of vitamin B and C. The production of cucumber in the country was about 37000 M. tons in 2007- 2008 (BBS, 2008).

Okra is an important vegetable crop of rainy as well as summer seasons. Its pods are mainly used for vegetables in curries. Fruits have 2% protein and are also a good source of minerals like calcium and magnesium. They also contain potash and iodine. The production of okra was 39000 M. tons during the year 2007-2008 having about 4% share in the total summer vegetable production (BBS, 2008).

Profitability of a crop depends on yield, price of the product, and cost of inputs as well. Any variation in any of the above factors obviously will change the profitability. It is changed over time, place and management level. In the past, several studies have been undertaken on different crops and reported in different years. Only two times, consolidated reports on profitability of major crops were published by BARI in Bangladesh. At present, very little information is available on economic profitability of different crops in Bangladesh. Due to lack of information on these, the policy makers also can not adopt appropriate policy regarding its extension and development. Therefore, it is realized that there is demand from policy makers, extension agents, and researchers to provide information on profitability of some BARI released crop varieties in Bangladesh.

Objectives

The objectives of this study were:

1. to assess the costs and returns of selected BARI released crop varieties measuring the level of input used by the sample farmers; and
2. to identify the constraints to producing those crops.

Methodology

Nine crops, such as maize, groundnut, mungbean, sweet potato, cabbage, cauliflower, tomato, cucumber, and okra were selected for this study. The study was conducted in Hatibanda Upazila of Lalmonirhat district for maize, Homna and Titas Upazila of Comilla district for groundnut, Kamalnagar Upazila of lakshmipur district for mungbean and sweet potato, Sadar Upazila of Jessore district for cabbage and cauliflower, Chandina Upazila of Comilla district for tomato, Sadar Upazila of Bogia district for cucumber and Shatkania Upazila of Chittagong district for okra. The districts and the Upazilas were selected purposively due to the high production regions of selected crops. From the population, 50 farmers were selected randomly for each crop for the year 2006-07. Data for the present study were collected through pre-designed and pre-tested interview schedules. Data were collected between February and April 2007. After necessary adjustments, collected data were analyzed to achieve the stipulated objectives of the study. Calculation of costs and returns were done based on the prevailing market price of each inputs and outputs for all crops in each location. Tabular methods of analysis using averages, percentages, ratios etc. were done for the study.

Results and Discussion

Maize is one of the most important crops in terms of making flour for human consumption and as well in terms of poultry feed. Groundnut is an excellent oil crop, it is a good source of protein, nutritious and fodder for the cattle, and profitable cash crop to the farmers. Pulses are also important food crops because they provide an inexpensive source of protein.

Maize is a profitable cash crop for the farmers. From the present study, it was observed that the total cost of maize production was Tk. 51341/ha of which variable cost was Tk. 33141/ha and fixed cost was Tk. 18200/ha (Table 1). Total return was Tk. 82621/ha including value of grains and by product. Study revealed that the sample farmers received Tk. 49480/ha as gross margin and Tk. 31280/ha as net returns for the production of maize. Benefit cost ratios were 2.49 and 1.61 over variable and total costs, respectively (Table 1). On the average, human labour used was 185 man-days/ha, seed 20 kg/ha, urea 348 kg/ha, TSP 200 kg/ha, MP 171kg/ha, gypsum 82 kg/ha, and zinc 9 kg/ha for the production of maize by the sample farmers. Most of the inputs, such as urea, TSP, MP, gypsum, and zinc were used lower doses by the sample farmers compared to recommended doses (Table 3).

It was found from the study that total costs of groundnut production by the sample farmers was Tk. 32275/ha, of which variable cost was Tk. 20775/ha and fixed cost was Tk. 11500/ha (Table 1). Total returns from the production of groundnut was Tk.55496/ha, while gross margin was Tk. 34721/ha and net return

was Tk. 23221/ha. The benefit cost ratios over variable costs was 2.67 and over total costs was 1.72. The study observed that the sample farmers employed 95 man-days/ha of human labour for the production of groundnut. The use of seed was 1.07 kg/ha, urea 50 kg/ha, TSP 167 kg/ha, MP 100 kg/ha, gypsum 45kg/ha and zinc 7 kg/ha and they were higher than the recommended doses (Table 3).

Table 1. Per hectare production cost and return of maize, groundnut, mungbean, sweet potato and cabbage cultivation.

Parameter	Taka/ha				
	Maize	Groundnut	Mungbean	Sweet Potato	Cabbage
A. Total Variable Costs	33141	20775	9991	18069	37449
Land preparation	4359	3151	2943	3476	2567
Hired labour	9000	3000	2375	3420	6444
Seed	3639	3639	1629	4799	12526
Cow-dung	1465	-	841	1755	1465
Urea	2088	319	255	430	1758
TSP	3200	2672	1196	1776	2800
MP	2565	2404	199	1225	2670
Gypsum	380	235	-	-	305
Zink	539	518	-	-	420
Borax	231	-	-	-	110
Pesticides	255	1095	553	877	1250
Irrigation	4850	3385	-	-	4490
Interest on operating capital	570	357	153	311	644
B. Total Fixed Costs	18200	11500	10992	9750	25563
i. Family labour	9500	6500	3325	4750	17063
ii. Rental value of land	8700	5000	7667	5000	8500
C. Total Costs (A+ B)	51341	32275	20983	27819	63012
D. Total Returns	82621	55496	33940	98800	119558
i. Value of grains (yield: 6980/kg/ha)	73639				
ii. Value of by- product	8982				
E. Gross Margin (D-A)	49480	34721	23949	80731	82109
F. Net Returns (D- C)	31280	23221	12957	70981	56546
G. Benefit Costs Ratio:					
1. Over variable cost	2.49	2.67	3.40	5.46	3.19
ii. Over total cost	1.61	1.72	1.62	3.55	1.90

Source: Field survey, 2008

Note: Interest on operating capital has been calculated @ 7% interest for 3 months period for all crops and vegetables

Table 2. Per hectare production cost and return of cauliflower, tomato, cucumber and okra cultivation.

Parameter	Taka/ha			
	Cauliflower	Tomato	Cucumber	Okra
A. Total Variable Costs	39656	55923	37580	34455
Land preparation	3096	3255	1461	3525
Hired labour	5219	10665	5615	7560
Seed	13576	13272	8131	4800
Cow-dung	1095	3437	5663	382
Oil cake	-	-	745	-
Ash	-	-	27	-
Urea	1596	9900	888	1494
TSP	2592	5904	2862	4554
MP	2895	-	2528	2574
Gypsum	685	-	450	-
Zink	1140	-	-	-
Borax	110	-	-	63
DAP	-	-	1122	-
Pesticides	1452	4058	4192	5461
Irrigation	5517	4470	3250	3449
Interest on operating capital	682	962	646	593
B. Total Fixed Costs	22272	31905	27583	23320
i. Family labour	14872	15455	10098	15120
ii. Rental value of land	7400	8600	8500	8200
iii. Supporting sticks	-	7850	8985	57775
C. Total Costs (A+ B)	61928	87828	65163	
D. Total Returns	134748	327054	126600	152597
i. Value of grains (yield: 6980/kg/ha)				
ii. Value of by- product				
E. Gross Margin (D- A)	95092	271131	89020	118142
F. Net Returns (D- C)	72820	247076	61437	94822
G. Benefit Costs Ratio:				
i. Over variable cost	3.40	5.85	3.37	4.43
ii. Over total cost	2.17	3.72	1.94	2.64

Source: Field survey, 2008

It is evident from the Table 1 that the total costs of mungbean cultivation was Tk. 20983/ha, of which variable cost was Tk. 9991/ha and fixed cost was Tk. 10992/ha. The total return was Tk. 33940/ha, whereas gross margins was Tk. 23949/ha and net return was Tk. 12957/ha. Benefit costs ratios for the cultivation of mungbean by the sample farmers were 3.40 and 1.62 over variable costs and total costs, respectively (Table 1). Islam *et al.* (2008) found BCRs for mungbean 2.53 on variable cost basis and 3.56 on cash cost basis which indicated the reliability of the finding of present study. Levels of major inputs for the cultivation of mungbean were: human labour 60 man-days/ha, seed 30 kg/ha, urea 36 kg/ha, TSP 48 kg/ha, and MP 10 kg/ha. Most of the inputs used were lower than the recommended doses (Table 3).

Table 3. Level of input use for the cultivation of maize, groundnut, mungbean, sweet potato, and cabbage in study area.

Name of the inputs	Maie		Groundnut		Mungbean		Sweet potato		Cabbage	
	Dozed used	Rec. dozes	Dozed used	Rec. dozes	Dozed used	Rec. dozes	Dozed used	Rec. dozes	Dozed used	Rec. dozes
Human (man-days/ha)	185	-	95	-	60	-	86	-	235	-
Seed (kg/ha)	20	19-21	107	95-100	30	25-30	57023	56000	293	300-350
Urea (kg/ha)	348	500-580	50	20-30	36	40-50	62	140-160	175	200-250
TSP (kg/ha)	200	260-300	167	150-170	48	80-85	80	120-130	178	250-300
MP (kg/ha)	171	185-210	100	80-90	10	30-35	49	160-190	61	-
Gypsum (kg/ha)	82	210-235	45	160-180	-	-	-	-	7	-
Zink (kg/ha)	9	12-15	7	4-5	-	-	-	-	2	-
Borax (kg/ha)	4	5-8	-	-	-	-	-	-	0.957	5-10
Cow-dung (t/ha)	483	-	-	-	1.01	-	2.02	8.10	-	-

*Number of vines per ha

Vegetables

Bangladesh produces a wide variety of tropical and sub-tropical vegetables. There is significant potential to develop vegetable production in Bangladesh. Vegetables compare very favourably to other crops in profitability terms and the future performance of the sector will largely determine how successful the country is in diversifying its agricultural production base and achieving higher

agricultural growth rates (Ateng, 1998; Mahmud *et al.*, 2000). Diversification into vegetable crops and increasing commercialization can support the development of the agricultural sector in several ways. Commercialization is characterized by households moving from subsistence systems into semi-commercial and commercial systems (with the main objective of achieving food self-sufficiency), thereby maximizing profits and generating surplus (Pingali and Rosegrant, 1995). Keeping mind this, the farmers produce vegetables and take benefits from high price compared to other crops. In this study, sweet potato, cabbage, cauliflower, tomato, cucumber, and okra considered for investigating profitability point of view.

Present study observed that the total costs of sweet potato cultivation by the sample farmers was Tk. 27819/ha, of which Tk.18069/ha and Tk. 9750/ha were variable costs and fixed costs, respectively (Table 1). The total return received by the farmers was Tk. 98800/ha, while gross margins was Tk. 80731/ha, and net returns was Tk. 70981/ha. The benefit costs ratios were 5.46 and 3.55 over variable costs and total cost respectively. In the cultivation of sweet potato, sample farmers employed 86 man-days/ha of human labour, 57023 no. of vines as seeds, 62 kg/ha urea, 80 kg/ha TSP, and 49 kg/ha MP and they were mostly lower than the recommended doses (Table 3).

The study revealed that the total cost was Tk. 63012/ha for the cultivation of cabbage. Out of a total costs, variable costs was Tk. 37449/ha and fixed cost was Tk. 25563/ha (Table I). It was found from the same table that the total return was Tk. 119558/ha, from which farmers received Tk. 82109/ha as gross margins and Tk. 56546/ha as net returns. The benefit costs ratios over variable cost was 3.19 and over total cost was 1.90. Levels of inputs used by the sample farmers were: human labour 235 man-days/ha, urea 293kg/ha, TSP 175 kg/ha, MP 178 kg/ha, gypsum 61 kg/ha, zinc 7 kg/ha, and borax 2 kg/ha, which were lower but closer to the recommended doses (Table 3).

The total cost of cauliflower cultivation was Tk. 61928/ha, while, variable cost was Tk. 39656/ha and fixed cost was Tk. 22272/ha (Table 2). In the present study, sample farmers received Tk. 134748/ha as total returns, however, gross margin was Tk. 95092/ha and net return was Tk. 72820/ha. The benefit costs ratios were 3.40 and 2.17 over variable costs and total costs, respectively. For the cultivation of cauliflower, human labour requirement was 201 man-days/ha, urea was 266 kg/ha, TSP 162 kg/ha, MP 193 kg/ha, which were more or less equal to the recommended doses (Table 4).

Table 4. Level of input use for the cultivation of cauliflower, tomato, cucumber, and okra in study area.

Name of the inputs	Cauliflower		Tomato		Cucumber		Okra	
	Dozed used	Rec. dozes	Dozed used	Rec. dozes	Dozed used	Rec. dozes	Dozed used	Rec. dozes
Human (man-days/ha)	201	-	261	-	157	-	189	-
Seed (kg/ha)	-	-	43246**	-			6	4-5
Urea (kg/ha)	266	250-300	513	500-600	148	Data not available	249	100-160
TSP (kg/ha)	162	150-200	396	400-500	159		207	35-55
MP (kg/ha)	193	200-250	246	200-300	158		143	52-80
Gypsum (kg/ha)	137	-	-	-	90		-	-
Zinc (kg/ha)	19	-	-	-			-	-
Borax (kg/ha)	2	-	-	-			1	-
Cow-dung (t/ha)	2.78	15-20	-	-	0.0396		0.955	-

** Seedlings per ha

It was found from the study that the total costs of tomato cultivation was Tk. 87828/ha in which variable cost was Tk. 55923/ha and fixed cost was Tk. 31905/ha. The total returns received by the sample farmers was Tk. 327054/ha while Tk. 271131/ha was received as gross margin and Tk. 247076/ha as net return (Table 2). The benefit costs ratios were found 5.85 and 3.72 over variable costs and total costs, respectively, which are supported by the findings of Karim *et al.* (2009). They found that BCR for summer tomato was 4.19 on full cost basis and 5.09 on cash cost basis. Levels of inputs used by the sample farmers were: human labour 261 man-days/ha, urea 513 kg/ha, TSP 396 kg/ha, and MP 246 kg/ha, which were roughly equal to the recommended doses (Table 4).

The present study revealed that the total cost of cucumber cultivation by the sample farmers was Tk. 65163/ha, of which variable cost was Tk. 37580/ha, and fixed cost was 27583/ha (Table 2). Total returns was Tk. 126600/ha, however, gross margin was Tk.89020/ha and net return was Tk. 61437/ha with the benefit costs ratios of 3.37 and 1.94 over variable costs and total costs, respectively. In the cultivation of cucumber, human labour employment was 157 man-days/ha, and the use of urea was 148 kg/ha, TSP 159 kg/ha, MP 158 kg/ha, and gypsum 90 kg/ha (Table 4).

Table 5. Constraints to higher production of selected BARI released crop varieties.

Name of the crops	Constraints	Rank
Maize:	• High cost of fertilizers and insecticides	1
	• High cost of Irrigation	2
Groundnut:	• High cost of fertilizers and it was not available in time	1
Mungbean:	• High incidence of insects and pests attack	1
Sweet potato:	• Lack of availability of fertilizers and vines	1
Cabbage:	• High cost of fertilizers and insecticides	1
	• High cost of irrigation	2
Cauliflower:	• High cost seeds	1
	• High cost of fertilizers and are not available in time	2
Tomato	• High cost of fertilizers and was not available in time	1
	• High cost of irrigation	2
Cucumber:	• High cost of fertilizer and insecticides	1
Okra:	• Scarcity of good quality seeds	1
	• High incidence of insects and pests attack	2
	• High cost of fertilizers and insecticides	3

It was found from the present study that the total costs of okra cultivation for the sample farmers was Tk. 57775/ha of which Tk. 34455/ha was variable costs and Tk. 23320/ha was fixed costs. Sample farmers received Tk. 152597/ha as total returns, while Tk. 118142/ha was received as gross margins and Tk. 94822/ha as net returns (Table 2). The benefit costs ratios were 4.43 and 2.64 over variable costs and total costs, respectively. Human labour requirement for the cultivation of okra was 189 man-days/ha and application of urea was at the rate of 249 kg/ha, TSP was 207 kg/ha, and MP was 143 kg/ha (Table 4).

Constraints

Although all crops and vegetables were observed to be profitable, there are several constraints to its higher production. To identify constraints, farmers were asked a couple of questions. Thereafter, the constraints were edited and summarized to arrive at only few problems. These constraints were arranged in rank value. It is revealed from the Table 5 that high cost of fertilizer and insecticide was first ranked constraints to maize, groundnut, cabbage, and tomato production. High incidence of insects and pests attack, lack of availability of fertilizer and vines, high cost of seeds, scarcity of good quality seeds were the first constraints to mungbean, sweet potato, cauliflower, and okra production. It was followed by high cost of irrigation to maize, cabbage, and tomato cultivation followed by high incidence of insects and pests attack to okra cultivation.

Conclusions

The benefit cost ratios of maize, groundnut, mungbean, sweet potato, cabbage, cauliflower, tomato, cucumber, and okra were found 2.49, 2.67, 3.40, 5.46, 3.19, 3.40, 5.85, 3.37, and 4.43 over variable cost and 1.61, 1.72, 1.62, 3.55, and 1.90, 2.17, 3.72, 1.94, 2.64 over total cost, respectively. It is, therefore, evident from the findings of the study that the cultivation of all the selected crops and vegetables are profitable to the farmers. Cultivation of tomato requires highest costs (Tk. 87828/ha) and receives highest net returns (Tk. 247076/ha) as well as highest benefit cost ratios (5.85 over variable costs and 3.72 over total costs) among all the crops and vegetables, tomato cultivation is also a labour intensive crop. It was also found from the study that the total costs of vegetables i.e., cabbage, cauliflower, tomato, cucumber, and okra cultivation were Tk.63012/ha, Tk.61928/ha, Tk.87828/ha, Tk.65163/ha, and Tk.57775/ha, respectively, as well as received the returns of these vegetables 119558, 134748, 327054, 126600, 152597, respectively, which were higher compared to other crops maize, groundnut, mungbean, and sweet potato. Farmers face problems generally, with the high cost of fertilizers and their availability in time for the cultivation of studied crops.

Policy implications

- Research institutions, DAE and other related GO/NGO institutions should produce good quality seeds of okra, maize, etc. available to the farmers at reasonable price. Vegetable Section of BARI can take an initiative for supply of BARI cauliflower, tomato, etc. seeds to the farmers through OFRD.
- It may be difficult to cultivate tomato, cucumber, cauliflower for the poor/small farmers as it required higher input costs. Capital may be supplemented to the poor/small farmers for these vegetables cultivation through credit giving agencies with low interest rate and easy terms and condition.
- Policy makers should be given attention to minimize inputs i.e. fertilizers, insecticides cost through input subsidy to cultivate maize, groundnut, cabbage, and tomato and maximize the output price by any means.
- The small, medium, and marginal farmers in the study area can cultivate groundnut, mungbean, and sweet potato easily as it required lower inputs cost which enhances profit. The large farmers may cultivate vegetables i.e. tomato, cauliflower, and okra etc. by utilizing more capital for receiving high gross margin.

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