Reprint **ISSN 1991-3036 (Web Version)**

International Journal of Sustainable Crop Production (IJSCP)

(*Int. J. Sustain. Crop Prod.*)

Volume: 9 **Issue: 1** **February 2014**

Int. J. Sustain. Crop Prod. 9(1): 29-34 (February 2014)

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M.M.A. SARKAR AND F. YESMIN

An International Scientific Research Publisher

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ISSN-1991-3036 (Online)
Int. J. Sustain. Crop Prod. 9(1):29-34(February 2014)

PROFITABILITY OF POTATO CULTIVATION IN SOME SELECTED AREAS OF RANGPUR DISTRICT IN BANGLADESH

M.M.A. SARKAR[1*] AND F. YESMIN[2]

[1]Manager (Operation), Apex Organic Soya Industries Limited, Gobindaganj, Gaibandha;
[2]Officer, Sonali Bank Limited, Fulbaria, Mymensingh.

*Corresponding author & address: Md. Mohsin Ali Sarkar, E-mail: mohsinsarkar.bau@gmail.com
Accept for publication on 20 January 2014

ABSTRACT

Sarkar MMA, Yesmin F (2014) Profitability of potato cultivation in some selected areas of Rangpur district in Bangladesh. *Int. J. Sustain. Crop Prod.* 9(1), 11-15.

Profitability of potato cultivation was studied in some selected areas of Rangpur district from winter and summer season of 2012-2013. Sixty farmers were selected randomly from the population using simple random sampling. Among the sixty selected farmers, 24 were marginal, 22 were small and 14 were medium. A Cobb-Douglas production function model was also applied to estimate the contribution of key variables to production processes of potato. The major findings of the study are that the cultivation of potato is a profitable business, and the medium farms are more profitable than the small and marginal. The study reveals that total costs of potato per hectare were the highest for marginal farms (BDT 58600) and the lowest for small farms (BDT 57114). On the return side, net return of potato was BDT 34245 for marginal farms, BDT 47971 for small farms and BDT 61227 for medium farms. The benefit cost ratio of marginal, small and medium farmers were 1.58, 1.87 and 2.07, respectively. The study also indicates that the medium farms were most profitable compared to others. Per hectare production cost of potato production was BDT 57912 for all farm categories in the study area. Per hectare gross margin of potato cultivation under marginal, small and medium farms were BDT 48337, BDT 62140 and BDT 73035, respectively. Estimated benefit cost ratios indicated that return over per taka investment was higher for medium farmers which was BDT 2.07 followed by small (BDT 1.87) and marginal farmers (BDT 1.58). So, positive relationship was observed between benefit and cost ratio and farm size. On the basis of group total lack of quality seed is an acute problem for potato production. So, supply of quality seed is the first suggestion that was given by the farmers in the study area.

Key words: *profitability, potato, cobb-douglas production function, benefit cost ratio, Bangladesh*

INTRODUCTION

Bangladesh is mainly an agricultural based country dominated by crop production and agriculture is the main stay of economy of Bangladesh. Bangladesh enjoys generally a sub-tropical monsoon climate with sufficient sunlight and reserved soil moisture that favor crops growth both in summer and winter. Therefore, it is famous for growing large variety of tropical crops including potato.

Potato was introduced in this subcontinent in the sixteenth century. It was grown then in small plots as a vegetable. It has been grown in Bangladesh since at least 19th century. By the 1920s, the first commercial production of this crop was established in the country (Islam 1983). Potato production is highly profitable and it could provide cash money to farmers. In terms of profitability, potato production was more attractive than any other winter vegetables. Per unit yield and gross return of potato were found higher than other competitive crops (Akhter *et al.* 2001). Low productivity per unit area of cultivated land due to the use of traditional inputs and methods in the production system has been an important constraint on national food self-sufficiency (Hoque 1978). Hence, it is evident that Bangladesh needs the development of her agriculture sector, so that its population can lead better life. The area of Bangladesh is about 14.29 million hectares of which 66 percent is cultivated. 15 percent is utilized for forest and the rest 19 percent is covered by homesteads, rivers, tidal creeks, lakes, ponds, roads etc. (Ahmed 1982). So, there is little scope left to increase agriculture output by putting new land under cultivation. Increase in agriculture output can be attained, however, by using high yielding varieties (HYV) and adopting improves culture management practices. Among all crops, potato is one of the most import crops whose production is high among all the vegetable (BBS 2000). The farmers who used quality seeds obtained higher yield and profile. Scarcity of quality seeds compelled some farmers to use the inferior seeds (Huq 1998). Potatoes have tremendous potential to be used as substitute for rice and as an industrial crop for export earnings as well as import substitution. Per capita and total production of potatoes in the developed world is much higher than Bangladesh. Per capita potato production in our country is only 23.8 kg, whereas it varies from lowest of 68 kg in Argentina to the highest of 963 kg in Poland. However the trend of per capita consumption of potatoes in our country is gradually increasing every year (Khan 2002). It is one of the important sources of carbohydrates and it contains an appreciable amount of vitamin B and C and some other materials (Thompson and Kelly, 1957).

The government of Bangladesh has placed much emphasis on vegetable production in order to meet year round nutritional and caloric demand of the growing population and also for increasing employment opportunities and income of the farmer. Increasing area allocation to winter potato may fulfill the government objectives. Before giving out policy options on increasing potato production, relevant and adequate information on potato production in farm level is required. Some economic investigation on potato cultivation in Bangladesh were undertaken by private and government organizations in order provide the feed backs to policy makers, researchers, extension workers and farmers which however, were not adequate. In Bangladesh farmers' experience on improved potato variety cultivation is considered limited. Agricultural production policy

decisions in Bangladesh are constrained by lack of information on profitability of growing different agricultural crops. In this regard, the present study is an attempt to analysis and compares the relative profitability of HYV potatoes according to farm size, the effect of varies inputs used in potato production and the cultural practices that are followed by the potato growers. The study will help to diagnose the problems and update farmer's knowledge on HYV potato production technology. Which in turn, will help them making right decision with regard to resource allocation. The findings of the study will generate basic economic data on the production practices of potato.

Therefore, the specific objectives of this present study were to identify the problems and evaluate the profitability of potato cultivation across farm size and also to suggest policy implications for improvement of potato production in the Rangpur district of Bangladesh.

METHODOLOGY

Selection of the study area

Production economics investigation is generally done by selecting an area where the concerned crop is grown widely. Rangpur district was selected particularly as it is one of the leading potatoes producing areas of Bangladesh. A preliminary survey was conducted in some villages of Rangpur sadar thana under Rangpur district to gather knowledge about the potato production, productivity and efficiency of the potato growers. After preliminary visit three village's namely Uttor Tumput, Dhakin Tumput and Fatemanogor were selected randomly as the study area.

Period of the study

The period of the data collection covered from winter and summer season of 2012-2013.

Selection of the sample and sampling techniques

A random sampling technique was applied for selecting sample. Through random sampling 60 farmers were selected for the study. Among the 60 farmers, 24 were marginal, 22 were small and 14 were medium. Farm size was arbitrarily classified on the basis of their land where they produce potato and other crops. Farmers having 50 decimal lands were considered as marginal farmers, 51 to 100 decimal as small farmers while those having 101 and above lands as medium farmers. It should be noted that no lands or having less than 50 decimal lands were not included in the present study.

Preparation of survey schedule

In conformity with the objectives of the study, a preliminary survey questionnaire was designed for recording data from the farmers. After pretesting, the questionnaire necessary corrections and modifications were made and then the questionnaire was finalized. The questions were arranged in logical sequences.

Methods of collecting data

The data for the present study were collected from primary and secondary sources. Primary data were collected by the researcher himself through personal interview with the respondents. To attain accuracy and reliability of data, care and caution were taken in data collection. Before interviewing, the aims and objectives of the study were explained to each and every owner of the potato growers.

Processing and analysis of data

Collected data were scrutinized and summarized for the purpose of tabulation. Data were transferred to a master sheet and complied with a view to facilitating classified. Two techniques of analysis were used in this study, tabular and statistical. Analysis by tabular techniques included socio-economic characteristics of potato farmers, classification of size of potato land, production practices, inputs used and returns of potato farmers. Statistical analysis was used to show the effect of inputs used and other related factors of potato cultivation. Enterprise costing and gross margin analysis technique was used for calculating costs and returns for potato cultivation.

Cobb-Douglas production function model

The stochastic production function which is used for the potato producers was specified as:

$$\ln Y_i = \beta_0 + \beta_1 \ln(X_1) + \beta_2 \ln(X_2) + \beta_3 \ln(X_3) + \beta_4 \ln(X_4) + \beta_5 \ln(X_5) + \beta_6 \ln(X_6) + \beta_7 \ln(X_7) + \beta_8 \ln(X_8) + \beta_9 \ln(X_9)$$

Where,

ln = Natural logarithm
Y = Gross return (Taka/ha)
β_0 = Constant or intercept value
X_1 = Total seed cost (Taka/ha)
X_2 = Pest management cost (Taka/ha)
X_3 = Cost of fertilizer (Taka/ha)
X_4 = Cost of family labor (Taka/ha)
X_5 = Cost of mechanical power (Taka/ha)
X_6 = Land use cost (Taka/ha)
X_7 = Variety dummy 1if HYV, 0 otherwise
X_8 = Extension contact dummy 1 if contacted, 0 otherwise
X_9 = Total return from potato (Taka/ha)

RESULTS AND DISCUSSION

Profitability analysis

Profitability analysis was done through gross margin, net return and benefit cost ratio. For estimating the profitability indicators different types of cost were calculated.

Human labor cost

Human labor cost was one of the most important cost items of potato production in the study area. Cost of human labor is presented in Table 1. Total human labor cost/ha was BDT 8536 for all farm categories. Per hectare labor cost was highest for marginal farm category which was BDT 9300 followed by small (BDT 8089) and medium farmers (BDT 7931). So, there was a negative relationship between labor cost and farm size.

Mechanical power cost

The use of power tiller was increasing rapidly in the study area and farmers widely used mechanical power for their land preparation. Mechanical power such as power tiller owner supplies fuel as well as an operator for land preparation. The owner charged a fixed amount of money as service charge for using tiller, which BDT 250 per bigha (local unit) land preparation for single tillage. Per hectare power tiller cost for potato cultivation under marginal, small and medium farmers were BDT 3041, BDT 3245 and BDT 3369, respectively. Positive relationship was also observed between the variable of mechanical power cost and farm size (Table 1).

Cost of seed

Per hectare total cost of seed potato under marginal, small and medium farmers were BDT 24568, BDT 22465 and BDT 22618, respectively. The seed cost was lower for small farmers than the marginal and medium farmers (Table 1). In all farm category total seed cost was BDT 23342 (52%) in total variable costs. Another study showed that the seed cost was 60% of the total variable cost of potato production (Hoque *et al.* 2006).

Cost of fertilizer

Per hectare total fertilizer cost for potato cultivation under marginal, small and medium farmers were BDT 7994, BDT 9844 and BDT 10710, respectively (Table 1). From this table it may be evident that total cost of fertilizer for medium was higher than the small and marginal farmers.

Cost of pesticide and insecticides

It was found that per hectare cost of pesticide and insecticides for potato production under marginal, small and medium farmers were BDT 2773, BDT 2506 and BDT 2535, respectively. From this table it may be conclude that cost of pesticide and insecticides for marginal farm size was higher than the small and medium farms (Table 1).

Cost of Irrigation

The total irrigation cost for marginal, small and medium farmers were BDT 1694, BDT 1537and BDT 1549, respectively. The cost for marginal farms for irrigation was higher than medium and small farmers (Table 1).

Interest on operating capital

In the study, the amount of money needed to meet the expense on hired or purchased inputs was treated as operating cost. Interest cost was computed at the rate of 12 percent per annum. It was assumed that if farmers would take loans from a bank, they would have to pay interest at the above-mentioned rate. Since all expenses were not incurred at the beginning of the production process, rather they were spent throughout the whole production period the cost of operating was, therefore, computed by using the following formula:

$$\text{Interest on operating capital} = \frac{\text{Operating Capital} \times \text{Rate of interest} \times \text{Time considered}}{2}$$

The interest on operating capital on an average was BDT 334, BDT 448 and BDT 541for potato under marginal, small and medium (Table 1).

Cost of land use

Per hectare land use cost of potato cultivation were BDT 8896, BDT 8980 and BDT 8736 under marginal, small and medium farms, respectively. These results indicate that per hectare land use cost of potato cultivation was comparatively higher for small farmers than the medium and marginal farmers (Table 1).

Total cost

Total cost was the summation of total variable cost and total fixed cost. Per hectare cost of potato production was BDT 57912 for all farm categories in the study area. Total cost was highest for marginal farmers (BDT 58600) followed by medium farmers (BDT 57989) and small farmers (BDT 57114) (Table 1).

Table 1. Different types of cost of potato production of different farmers according to farm size

Cost per hectare	Farm size*			All Farm
	Marginal	Small	Medium	
Total Variable Costs	**44508 ±1484****	**44431±1972**	**46792±3913**	**45013±1514**
Hired labor	4104±519	4386±116	5470±253	4526±159
Mechanical power	3041±65	3245±65	3369±205	3192±62
Seed cost	24568±2029	22465±621	22618±797	23342±604
Urea cost	1849±143	1946±234	2425±665	2019±200
TSP cost	3000±286	4278±1140	3703±1349	3633±683
MP cost	3145±252	3620±709	4582±1724	3655±549
Total fertilizer costs	7994±687	9844±1982	10710±3132	9307±1304
Pesticides & insecticides cost	2773±260	2506±79	2535±100	2619±77
Irrigation cost	1694±148	1537±50	1549±41	1603±45
Interest on operating capital cost	334±24	448±33	541±65	424±26
Total Fixed Costs	**14092±2591**	**12683±1066**	**11197±1237**	**12899±1058**
Family labor	5196±300	3703±133	2461±177	4010±160
Land use cost per ha.	8896±277	8980±208	8736±277	8889±142
Total Costs	**58600±3981**	**57114±1574**	**57989±4049**	**57912±1537**

*Farm size: Marginal (50 decimal), small (51 - 100 decimal) and medium (101 decimal and above)
**Mean ± S.E (Standard Error)

Total variable cost

Total variable cost was estimated adding all the variable costs such as hired labor cost, mechanical power cost, seed cost, cost of urea, TSP, MP, cost of pesticide and insecticides, cost of irrigation. In all farm category total variable cost was BDT. 45013. In monetary terms marginal farmers incurred BDT 44508 whereas small and medium farmers incurred BDT 44431 and BDT 46792, respectively. So, there was negative relationship between farm size and total variable cost (Table 2).

Total fixed cost

Total fixed cost was the summation of all fixed cost which was family labor cost and land rent. In all farm categories total fixed cost was BDT 12899. In monetary terms marginal farmers incurred highest amount of fixed cost which was BDT 14092 followed by small (BDT 12683) and medium farmers (BDT 11197). In the study area, fixed cost was highest for marginal farmers followed small and medium farmers (Table 2).

Gross return of potato production

Per hectare gross return of potato production under marginal, small and medium farms are shown in Table 4. Gross return per hectare consisted of the value of main product. Per hectare return was calculated by multiplying the total amount of products by their respective average market price. The average market price of potato was BDT 5.70 per kg. Per hectare gross return of potato cultivation under marginal, small and medium farms were BDT 92845, BDT 106571 and BDT 119827 respectively which indicate that per hectare gross return of medium farms were higher than small and marginal farms (Table 2). Another study showed in different pictures, the per hectare gross returns were BDT 101859, 102359 and 101389 for small, medium and large categories of farmers respectively (Arif 1998) which indicates that per hectare gross return of medium farms were higher than large and small farmers.

Gross margin

Per hectare gross margin of potato production under marginal, small and medium farms are given in Table 2. Gross margin was estimated as the difference between gross return and total variable cost. The argument for using the gross margin analysis is that the farmers of Bangladesh are more interested to know their return over variable cost. For short run analysis as well as for farm planning, the gross margin analysis is widely used and this analysis is easily understandable to the farmers because of its simplicity. Gross margin of potato cultivation under marginal, small and medium farms were BDT 48337, BDT 62140 and BDT 73035 per hectare, respectively (Table 2). It indicates that the gross margin was highest in medium farms followed by small and marginal farms.

Net return and benefit cost ratio (BCR)

Net returns of potato cultivation under marginal, small and medium farms were BDT 34245, BDT 47971 and BDT 61227 per hectare, respectively (Table 2), which indicates that net return was highest in medium farms than small and marginal farms. Return over per Taka investment or Benefit-cost-ratio (undiscounted) was calculated as a ratio of gross return to total cost. Benefit cost ratio (BCR) of potato cultivation under marginal, small and medium farmers were 1.58, 1.87 and 2.07 per hectare, respectively (Table 4); implying that production of potato under medium farms was more profitable than the small and marginal farmers. Benefit cost

ratios was higher for medium farmers which was BDT. 2.07 followed by small (BDT 1.87) and marginal farmers (BDT 1.58). So, positive relationship was observed between benefit and cost ratio and farm size. In opposite picture was found in Arif (1998) who showed that net returns were BDT 37607, 37179 and 36617 for small, medium and large farmers respectively which indicates that net return was highest in small farms than large and medium farms.

Table 2. Farmers total return, total cost, gross margin, net return and benefit cost ratio according to farm size

Cost and return	Farm size*			Group Total
	Marginal	Small	Medium	
Total return/ha	92845±4881**	106571±3308	119827±3241	104174±3895
Total variable cost/ha	44508±1484	44431±1472	46792±1913	45013±1514
Total fixed cost/ ha	14092±1591	12683±1066	11197±1237	12899±1058
Gross margin/ha	48337±3567	62140±3593	73035±6371	59161±3792
Net return/ha	34245±4401	47971±3455	61227±5218	45574±3563
Benefit cost ratio	1.58±0.12	1.87±0.12	2.07±0.14	1.80±0.12

*Farm size: Marginal (50 decimal), small (51 - 100 decimal) and medium (101 decimal and above)

**Mean ± S.E (Standard Error)

Problems faced by the farmers in cultivating potato

Three categories of problems and constraints such as economic, technical and natural have been identified in the study area. The economic problems are lack of fund, high price of input etc. Technical constraints are lack of quality seed, lack of insecticides and lack of Government attention etc. Natural constraints are infestation of diseases and pests. Lack of quality seed was the 1st problem in the study area followed by lack of adequate fund, lower market price, high rate of input price, lack of fertilizer in time, lack of insecticides and pesticides, lack of Government attention and more infestation of diseases and pests (Table 3).

Table 3. Problems and constraints of potato production

Production problem	All Farm	
	Mean	Rank
Lack of quality seed	9.37	1
Lack of adequate fund	8.93	2
Lower market price	8.35	3
High rate of input price	6.79	4
Lack of fertilizer in time	6.24	5
Lack of insecticides & pesticides	5.86	6
Lack of Government attention	5.06	7
More infestation of diseases & pests	4.71	8

Suggestions given by the farmers to overcome the problems in cultivating potato

In the study area, the farmers were given freedom to give their suggestion for overcoming the existing problems related to the potato cultivation. They suggested various measures. These suggestions are need quality seed, credit support should be provided by the Government, market price should be ensure by the Govt., to reduce input price, available fertilizer, available insecticides and pesticides and Government attention (Table 4). Quality seed was the 1st probable suggestions to overcome the problems in the study area.

Table 4. Suggestions to overcome the problems

Solutions to overcome problem	All Farm	
	Mean	Rank
Need quality seed	9.54	1
Credit support should be provided by the Govt.	9.11	2
Market price should be ensure by the Govt.	8.22	3
To reduce input price	7.14	4
Available fertilizer	6.32	5
Available insecticides & pesticides	5.54	6
Government attention	5.01	7

CONCLUSION

This study was done to evaluate the profitability of potato production in greater Rangpur region of Bangladesh. The major findings of the study are cultivation of potato is a profitable business, but the medium farmer is more profitable than the small and marginal farmers. The study reveals that a total cost of potato production per hectare was the highest for marginal farms and lowest for small farms. On the return side, net return of potato

was highest for medium farmers than small and marginal farmers. The BCR was comparatively higher for medium farmers than small and marginal farmers. So, positive relationship was observed between BCR and farm size. Lack of quality seed is a key problem for potato production in the study area. So, supply of quality seed is the first suggestion that was given by the farmers in the study area. Finally, it will be helpful to the planners and policy makers in formulating micro or macro level policy for the development of potato production in the country.

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