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Profitability and Resources Use Efficiency of Ash Gourd Production in Some Selected Areas of Bangladesh

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Abstract: Per hectare gross cost of Ash gourd production in farmers field found to be Tk. 52140 and Tk 50317, while net return above cash cost and full cost were 44789, 51553 and 27460, Tk 33283 in Gazipur and Hathazari, respectively. The study indicated that selected factors of production have sufficient impact on Ash gourd production. It also revealed that farmers allocated inputs for Ahs gourd production inefficiently. The farmers used inputs excessively and some inputs were underutilized so that there was ample opportunity to increase production by reorganizing and using all the factors of production efficiently.

Key word: Ash gourd, profitability, resource use efficiency

Introduction

The agro-climatic situations of Bangladesh are suitable for the Cultivation of a large variety of crops. About 80% of the gross cropped area is at present confined to the production of rice and wheat. The existing crop production system is inadequate to ensure balance food of the people. Realizing the above situation Fifth Five Year Plan has categorically emphasized to introduce diversified cropping system in free upland areas in summer season for non-rice crops, so as to facilitate introduction of third crop on the land under irrigated condition. The government of Bangladesh has placed much emphasis on increasing employment opportunities and income of the formers (FFYP, 1997). In Bangladesh small landholders generally grow vegetable. In the census of 1980-84, it was found that about 20% vegetable area was found occupied by non-farm holdings while the shares of small, medium and large holdings were 42, 40 and 16 of the total vegetable area, respectively (BBS, 1985). According to the Yearbook of Agricultural Statistics (1997) the area under vegetables production was about 185.16 hectares. Ash gourd production was about 29.48 ton in 1994-95 and it increased to 32.69 ton in 1996-97 (BBS, 1998).

Ash gourds have very wide domestic market. The cultivation of this vegetable wills increase farm employment and income. Therefore, Ash gourd may be considered, as a diversified corp. Ash gourd is generally cultivated in most of the tropical countries. It is generally grown on a small scale all over the Country. The immature fruits in cooked as a vegetables, but when it is ripen used for preparing sweet meats known as petha and mash cake. It contains vitamin A and is also a good source of vitamin B and C. It is considered to be as great medicinal value (Yawalkar, 1985). The rate of expansion of Ash gourd acreage and improvement of their yield will depends upon its economic performance, especially on its profitability. Economic viability is on of the important criteria for assessing the suitability of a new crop technology. Profitability will give direction of adjustment required in the long run to improve the level of economic efficiency by resource allocation. In this situation the structure of cost related with Ash gourd cultivation is important. But information on profitability and efficiency of resources used in Ash gourd production is scarce. Since there is no available previous related study on gourd for this reason there presents findings of same season growing vegetables previous study. Anwar (1998) observed that per hectare, net return of pointed gourd and teasel gourd was Tk 55850 and Tk 71320 on full cost basis and Tk 62072 and Tk 79115 on cash cost basis respectively, which were higher than that of gourd. The ratios of MVP and MFC for human labor, seed, fertilizer were greater than one and positive indicating that there were ample scope for expanding the cultivation of pointed gourd, and teasel gourd to increase per hectare output by using more of these inputs. In case of labor and fertilizer the findings of the present study is similar but in case of seed used it was contrast with this study. Shewli (1993) found that production co-efficient of using human labor, seeds were significant for white gourd, and seeds and manure were significant for snake gourd, though the findings of the present study give the similar result in case of human labor and manure, but not in case of seed. The present study has therefore, given emphasis particularly on gourd, keeping this in view, the objectives of the present study is I) to determine the profitability of gourd and ii) to estimate the resource use efficiency in some selected areas of Bangladesh.

Materials and Methods

Two villages namely Pajulia and Jubra under Gazipur sadar thana and Hathazari thana of Chittagong distinct, respectively were selected for the study during the period of mid July to mid August 1999. Stratified random sampling technique with proportional allocation was adopted. A total of 60 gourd growers were selected randomly from the total vegetable growers in the study area whereas 30 from the listed vegetable growers of Gazipur and 30 from the listed 150 vegetable growers of that Hathazari. Data were collected from the sample farmers through field survey using predestined interview schedules.

Analytical techniques: Cob-Douglas production function of the following type was used in this study

$$Y = ax_1^{b1}x_2^{b2}x_3^{b3}x_4^{b4}x_5^{b5}e^{u}$$

The above function was linearized in the logarithmic form as follows:

$$LnY = Lna + b_1Lnx_1 + b_2Lnx_2 + b_3Lnx_3 + b_4L_4x_4 + b_5L_5x_5 + U_i$$

Where

Y = Return per hectare in taka
a = Constant or intercept value
x_1 = Human labor cost in taka
x_2 = Seed cost per hectare in taka
x_3 = Manure cost per hectare in taka
x_4 = Urea cost per hectare in taka
x_5 = TSP cost per hectare in taka
b_1....b_5 are production elasticity (E) of the respective inputs

Management factor was not included in the model because specification and measurement of management factor is almost impossible particularly in peasant agriculture where a farm operator is both a laborer and a manager and the farm and the household constitutes an inseparable complex. Other independent variables like animal labor, land quality, soil condition, time of sowing etc., which might have affected vegetable production, was excluded from the model because of unavailability of data.

The marginal value product (MVPs) was calculated by using the following formula:

$$E = \frac{dy}{dx_i} \times \frac{x_i}{y_i}$$

$$\text{or, } MPPx_i = \frac{dy}{dx_i} = E \frac{y}{x_i}$$

$$MVPx_i = MPPx_i Py$$

Where value of gross yield of gourd
x_i = Mean value of different variable inputs
(I = 1, 2, 3,.....5)

Net return analysis: To determine profit of gourd cultivation, the equation is proposes by Dillon and Hardber (1980), was used. The equation is as follows:

$\pi_i = Py_iY_i - \Sigma(Px_{ij}X_{ji}) - TFC$
Where
π_i = Profit per hectare from ith farmers output in taka,
Py_i = Per unit price of output in taka
Y_i = Total quantity per hectare of ith farmers output (metric ton)
Px_{ij} = Per unit price of jth input used for producing ith farmers output in taka.
X_{ij} = Total quantity per hectare of jth input used for producing of ith farmers output.
T.F.C = Total fixed cost involved in producing per hectare output.
I = The number of individual produced gourd.
j = The number of relevant individual inputs used for producing gourd.

Results and Discussion

Nature and extent of technology use: Ash gourd seedlings were raised by the sample growers by sowing the seeds in the seed bed. Farmers used the home supplied and purchased seed. Before transplanting the seeding, land was prepared by four to five plowings and laddering. After a few days, pit was dogged by following 3 x 2.5 m^2 spacing. The spacing of pit and seedlings varied from farmer to farmer. The average number of pit and seedlings varied from farmers to farmer. Per hectare average number of pit and seedlings were found 1112 and 1505 respectively. After complication of the pit digging, farmers applied chemical fertilizers and manure as basal dose.
After two to three days of basal fertilizer application, the farmers transplanted 23-30 days old seedlings in the pit. Number of seedling per pit ranged from 2 to 3. The farmer's transplanted the seedlings during the month of May 1999. Thereafter, support and macha preparation was done by bamboo.

Cost and return of gourd production: The input use and its associated costs, Yield Return and Benefit Cost Ratio (BCR) from gourd production are presented in Table 1.Table reveals that per hectare used of human labor on an average were 299 man-days at Gazipur and 233 man-days at Hathazari, per hectare human labor cost was Tk.14885 and Tk.15145 of which 17.70 and 18.34% was home supplied at Gazipur and Hathazari respectively. This was the highest proportion of total cost in gourd production. Per hectare cost of human labor was higher at Gazipur than at Hathazari. At Hathazari, most of the farmers was tenant, they used higher rate of labor than Gazipur. It may be cause of higher labor cost at Hathazari than Gazipur. Per hectare cost of animal power was higher at Hahazari (Tk 3600/ha) than that of Gazipur (Tk 3400/ha). It may be cause of more number of plowing for land preparation is required at Hathazari than Gazipur. It was found that per hectare seed used for gourd was 2.21 and 1.46 kg at Gazipur and Hathazari respectively. At Gazipur most of the farmers used home supplied seed, which had low germination rate, but at Hathazari most of the farmers used purchased seed, which had high germination rate. Per hectare seed used for gourd production was higher at Gazipur than Hathazari. The rate of application of manure used were 12.46 ton/ha and 17.75-ton/ha, Fertilizer were 550 and 555 kg/ha (Urea 233 and 239 kg/ha, TSP 205 and 212 kg/ha) at Gazipur and Hathazari, respectively whereas the recommended doze for gourd production of manure was 17.75 ton/ha and of fertilizer was 375 kg/ha. It was found that per hectare cost of irrigation was higher at Gazipur (Tk 7407/ha) than Hathazari (Tk 3895/ha). At Gazipur most of the gourd growers produced gourd in irrigated condition, but at Hathazari most of the farmers produced in rain-fed condition. It may be the cause of higher irrigation cost at Gazipur than Hathazari. The cost of macha preparation is the additional cost of gourd production. But the amount of macha preparation cost was not negligible, which covers 14.96% at Gazipur and 15.51% in Hathazari of total cost. It was found that per hectare cost of macha preparation was higher at Gazipur (Tk 9088/ha) than Hathazari (Tk 7803/ha). Prices of bamboo were less at Hathazari than Gazipur. Cost of macha therefore was higher at Gazipur than cost at Hathazari. It was second highest component of the total cost. It was found from the result that at Hathazari area farmers used more of all the inputs except seed than Gazipur farmers whereas per hectare yield of gourd production was higher at Gazipur (16.72 ton/ha) than Hathazari (15.92 ton/ha). It indicates that land of Gazipur is more suitable for gourd production than Hathazari. Net return per hectare was Tk.27460 and Tk.33283 on the full cost and Tk.44789 and Tk.51553 on the cash basis at Gazipur and Hathazari respectively. Fakharul *et al*. (1996): found that per hectare gross return for producing gourd was Tk.67249 with a net return of Tk. 41190 which was lower than present study for both locations. Benefit cost ratio for Ash gourd cultivation was 2.29 and 1.53 at Gazipur and 2.61 and 1.66 at Hathazari, in cash cost and full cost basis, respectively.

Effect of input use on Ash gourd production: Estimated values of the co-efficient and related statistics of Cobb-Douglas production of Ash gourd are presented in Table 2. Resource use efficiency can be ascertained from the parameter derived from a production function model. "Production function is a technical and mathematical relationship describing the manner and extent to which a particular product depends upon the quantities of input (s) or service (s) used" (Johal and Kapur, 1979). There are various types of production function such as, Cobb-Douglas production function, Quadratic production function, Constant Elasticity of Substitution (CES) production function, polynomial production function etc. It has long been accepted that none of the production function is unequivocally superior to other in all circumstances. But there are some functions, which are more appropriate than other in some circumstances. It is generally argued that the Cobb-Douglas production function is more appropriate in the context of agricultural production.
Since the function takes the form of multiple linear regressions in logarithm, it can be solved by the procedure of ordinary least square (OLS) and it is an "efficient user" of the degree of freedom. The regression Co-efficient of Cobb-Douglas production function represents production elasticity and if all the independent variables related to the production are taken into account, the sum of the production elasticity indicates whether the production process as a whole yields increasing, constant or decreasing return to scale.
Table 2 shows the value of the co-efficient of multiple determinations. The adjusted R^2 was 0.79 which indicate that 79% of the variation in return was explained by the independent variables included in the model.
The F-value of gourd equations was highly significant at 1% level of confidence, implying that the specification of the model was fairly accurate (Table 2).

Human labor: Production function analysis revealed the coefficient of labor have expected sign for Ash gourd production. The positive co-efficient for labor indicate that use more labor can increase return from gourd. The value of co-efficient was 0.636,

Table 1: Per hectare cost and returns of gourd in Gazipur and Hathazari, 1998-99

Item	Quantity/ha		Cost/return (Tk/ha)		% of Total cost/Return	
	Gazipur	Hathazari	Gazipur	Hathazari	Gazipur	Hathazari
Human Labor (man-days/ha^{-1})	229.00	233.00	14885.00	15145.00	29.05	30.10
Family	117.00	142.00	7605.00	9230.00	17.70	18.34
Hired	112.00	91.00	7280.00	5915.00	11.35	11.74
Animal labor (pair-days/ha^{-1})	29.00	30.00	3480.00	3600.00	6.90	7.15
Family	24.00	26.00	2880.00	3120.00	5.98	6.20
Hired	5.00	4.00	600.00	480.00	0.92	0.95
Seeds (kg/ha^{-1})	2.21	1.46	885.00	583.00	1.12	1.16
Owned	0.88	0.52	350.00	208.00	4.23	4.39
Purchased	1.33	0.94	535.00	375.00	0.72	0.75
Manure (ton/ha^{-1})	12.46	17.75	3115.00	4437.00	8.51	8.82
Owned	3.38	0.89	950.00	223.00	0.43	0.44
Purchased	8.66	16.86	2165.00	4214.00	8.08	8.37
Fertilizer (kg/ha^{-1})	555.00	555.00	5817.00	5862.00	11.24	11.65
Urea	233.00	239.00	1398.00	1434.00	2.75	2.85
T.S.P	205.00	212.00	3075.00	3180.00	6.10	6.32
M.P	112.00	104.00	1344.00	1248.00	2.39	2.48
Irrigation			7407.00	3895.00	7.47	7.74
Insecticide			1919.00	3503.00	6.72	6.96
Land use			4848.00	4848.00	9.30	9.63
Macha			9088.00	7803.00	14.96	15.51
Interest on operating capital			696.00	641.00	1.23	1.27
Gross Cost (Tk/ha^{-1})			52140.00	50317.00	100.00	100.00
Yield (Ton/ha)			16.70	15.92		
Gross return (Tk/ha^{-1})			79600.00	83600.00		
Net return (Tk/ha^{-1})						
Cash cost			44788.00	51553.00		
Full cost			27460.00	33283.00		
B.C.R						
Cash cost			2.28	2.60		
Full cost			1.53	1.16		

BCR = Benefit cost ratio, TSP = Triple super phasphate, MP = Murate of potash

Table 2: Estimated coefficients and related statistics of cobb-dogglas production function

Explanatory variables	Cobb-Douglas co-efficiants Ash gourd
Intercept	-9.204091
Human labor (x1)	0.636(4.922)***
Seed (x2)	-0.0785(-2.386)**
Manure (x3)	0.0875(3.311)***
Urea (x4)	0.557(6.472)***
TSP (x5)	1.01(9.653)***
R^{20}	0.89
Adjusted R^2	0.79
F	555.83***

Figure within parenthesis indicate t-values, *** Significant at 1% level ** Significant at 5% level, * Significant at 10% level

Table 3: Marginal productivity and resource use efficiency of gourd cultivation

Parameters	Inputs				
	Human Labor(X_1)	Seed(X_2)	Manure(X_3)	Urea(X_4)	TSP(X_5)
MPP	0.329	-0.3225	0.098	0.287	0.535
MVP	1645.20	-1612.55	491.7	1435.66	2677.31
MFC	65.00	500.00	250.0	6.00	15.00
MVP/MFC	25.31	-3.23	1.97	239.28	178.48

MFC = Marginal factor cost, MPP = Marginal physical product, MVP = marginal value product

which was significant at for 1% level. It revealed that 1% increase in human labor keeping other factors constant would increase the gross return by 0.636% of gourd.

Seed: The magnitude of the regression co-efficient of seed was 0.0785. The coefficient was significant but have unexpected negative sign. It expressed that 1% increase of this input, keeping other factors constant, would result 0.0785% decrease of gross return. This variable had negative production elasticity indicate that farmers might have over used of seed for Ash gourd production.

Manure: The regression coefficient of manure for Ash gourd was positive and significant at 1% level of significance. This means that an 1% increase of this input, keeping the other factors constant, would result increase gross return by 0.0875%.

Urea: The regression co-efficient of urea for Ash gourd had positive sign and was significant at 1% level, indicating that 1% increase in this input; other factor remaining constant would result in an increase of gross return of Ash gourd by 0.557%.

T.S.P: The production co-efficient of TSP showed positive effect on gross return for Ash gourd and was significant at 1% level. The value of the co-efficient implied that 1% increase of this input, keeping other factors constant would result in an increase of gross return of Ash gourd by 1.01%.

Efficiency of Resource Use: To attain the goal of profit maximization, through efficient resource allocation, one should use the variable resources so long as the value of the added product is greater than the cost of the added amount of the resources in producing it. The resources are considered to be efficiently used and profit will be maximized when the ratio of MVP to MFC approaches one, or in other words, MVP and MFC for each input is equal (MVP = MFC).

To examine the ability of gourd farmers to allocate their resources in increasing the yield of these vegetable, the ratio of MVP to MFC for each input was calculated by some algebraic manipulation of

the estimated Cobb-Douglas function. Marginal physical product (MPP) refers to the change in output due to the change in one unit of input. When MPP is measured in monetary term then it is called marginal value product (MVP). It was observed that the ratios of MVP and MFC for labor (x_1), manure (x_3), urea (x_4) and TSP (x_5) were greater than one and positive indicating that there were ample opportunities to increase per hectare return by using increasing cost of these inputs. For seed (x_2) the ratio was negative indicating inefficient use of this input. Fakharul, *et al*. (1996): found that the ratios of MVP and MFC for human labor, and TSP were greater than one and positive indicating that there exist ample opportunities for gourd farmers to increase yield by using more of this inputs which is consistent with the present study. Whereas in case of urea used the findings contrast with the present study.

Table 3 indicates that none of the ratio of marginal value product to marginal factor cost was equal to one. This implying that the farmers in the study area had failed to show their relative efficiency in using the resources for okra and gourd vegetables.

Ash gourd is a very popular vegetable in Bangladesh from long ago. Rural people have been producing this vegetable in homestead area as well as in crops field. Now a days Ash gourd is cultivated commercially in farmer's field. The study indicates that gourd is a profitable crop as well as very sensitive to rate of in put used. It was found that the yield of gourd was positively related with resources under consideration except, seed. The findings indicate that more profit can be obtained increasing use of selected inputs, except, seed. It also reveals that sample farmers were unable to utilize their resources efficiently. Sometimes they used selected inputs (seed) excessively and some times they used lower than required doses (labor, manure, urea, TSP). So, there is opportunity to increase Ash gourd production and profitability to meet rising need of vegetable by increasing of the necessary inputs efficiently.

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