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AN ECONOMIC STUDY ON PANIKACHU PRODUCTION IN JESSORE DISTRICT

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Abstract

The study was undertaken to assess the input use pattern, cost of production, economic profitability, and contribution of different factors of Panikachu production in Jessore dictrict of Bangladesh. The study area were purposively selected and a total of 60 panikachu growers taking 30 from each upazila. Total quantity of different input of human labor, seedling, manure, insecticide, irrigation and fertilizer were 910 man days/ha, 37895 no./ha, 10000 Tk ha^{-1}, 13044 Tk ha^{-1}, 25989 Tk ha^{-1} and 2974 Kg ha^{-1} respectively. Total cost of production of Panikachu was 358966 Tk ha-1 where 316537 Tk ha^{-1} was variable cost and fixed cost was 42429 Tk ha^{-1}. Among the cost item labor cost was the high as 50.69% and fertilizer cost 17.43 % cost of production. The yield of rhizome and stolon were 50 ton and 35 ton ha^{-1}. The average gross return was calculated as Tk 655000 ha^{-1}. The net margin of Panikachu cultivation was 296034 Tk ha^{-1}. On the average, benefit cost ratio was 1.82 on full cost basis and 2.07 on cash cost basis. All the co-efficient of human labor, seedling, urea and MoP were positive and significant impact on the yield of Panikachu production. The coefficient of determination was 0.57. Ninety five percent farmers mentioned that they faced insects and disease infestation at Panikachu cultivation.

Keywords: Economic, panikachu, production

Introduction

Panikachu (*Colocasia esculenta L.* Schott) is an important edible aroid in Bangladesh. It is one of the popular vegetables at summer season in Bangladesh. It belongs to the family Araceae and it is grown as a substance food crop throughout tropical and subtropical regions of the world. Panikachu is generally grown almost all over Bangladesh, but its production is more concentrated in the districts of Chittagong, Narail, Sirajgonj, Bogra, Joypurhat, Pabna, Tangail, Dinajpur, Jessore, Jamalpur, Sylhet and Kishorgonj (BBS, 2013). It contributes to the total supply of bulky vegetables during the summer when the supply of other vegetables becomes scarce in the market (Haque *et al.* 2013). As a root crop, it compares favorably in terms of nutritional value with other root crops, such as cassava, yam, sweetpotato and other edible aroids. It contains over 25% carbohydrates (Rashid and Danichi, 1979). Most parts of this vegetable, such as leaves, stolon, rhizome and stems contain protein, carbohydrate and calorie. The soil and climatic condition of Bangladesh are highly favorable for panikachu cultivation.

Latiraj (BARI panikachu 1) is one of the released aroids variety of Bangladesh Agricultural Research Institute which was released in 1980. It cultivates almost all over the country but Jessore is the vital region of latiraj growing area of Bangladesh. The demand for panikachu is increasing day by day, but very little attempt has been made for its technological development in order to increase production. Due to lack of information at farmers' level on panikachu production, the researchers are facing difficulties to formulate adequate research design for its varietal improvement as well as for the development of a complete technology package.

With this view in mind, the present study has been designed with the following objectives:

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- To estimate the input use pattern of panikachu cultivation.
- To estimate the economic profitability of panikachu cultivation,
- To estimate the contribution of different factors to the production of panikachu; and
- To identify the constraints of production and marketing of panikachu at farm level.

Materials and Methods

Sample size and sampling technique

The present study was conducted at two upazilla namely Bagharpara and Sadar upazilla of Jessore district. The study area was purposively selected considering the higher concentration of panikachu cultivation. The study was carried out using field survey method. A total of 60 farmers taking 30 from each upazila were randomly selected for the interview. Necessary information regarding the study was collected based on input costs, price, yields, etc.

Method of data collection

Data were collected through pre- tested questionnaire during the period March-April of 2015. Field investigators collected the field level data under the direct supervision of the researcher. The unit of data collection was a single panikachu plot of each selected farmers where detailed information regarding this crop cultivation were taken and analysis was done on ha^{-1} basis. The data were also collected from the traders of different markets.

Analytical techniques

Both fixed cost and variable cost were taken into account in calculating the cost of panikachu cultivation. Land use cost was calculated on the basis of $year^{-1}$ existing lease value of land. The profitability of panikachu cultivation was estimated on the basis of gross margin, net return and benefit cost analysis. The categories were developed based on the percentage of respondent farmers with respect to each technology. Collected data were edited, summarized, tabulated and analyzed to fulfill the objectives of the study. Descriptive statistics using averages, percentages and ratios were used in presenting the results of the study. Cobb-Douglas production function model was used to estimate the contribution of factors to panikachu cultivation. The functional form of the Cobb-Douglas production function model is given below.

$$Y = AX_1^{b1}X_2^{b2} \dots\dots\dots\dots\dots X_n^{bn}\, e^{ui}$$

The production function was converted to logarithmic form so that it could be solved by least square method i.e.

$$\ln Y = a + b_1 \ln X_1 + b_2 \ln X_2 \dots\dots\dots\dots\dots\dots + b_n \ln X_n + U_i$$

The empirical production function model is as follows:

$$\ln Y = a + b_1 \ln X_1 + b_2 \ln X_2 + b_3 \ln X_3 + b_4 \ln X_4 + b_5 \ln X_5 + b_6 \ln X_6 + b_7 \ln X_7 + b_8 \ln X_8 + U_i$$

Where, Y= Gross return ($Kgha^{-1}$), X_1 = Human Labour (man-days ha^{-1}), X_2 = Seedling (No. ha^{-1}), X_3 = Urea ($Kgha^{-1}$), X_4 = TSP ($Kgha^{-1}$) , X_5 = MP ($Kgha^{-1}$), X_6 = Zipsum ($Kgha^{-1}$), X_7 = Boron ($Kgha^{-1}$), X_8 = Manure ($Kgha^{-1}$), a = Intercept,

$b_1, b_2 \dots\dots\dots\dots b_8$ = Coefficients of the respective variables to be estimated,

U_i = Error term.

Results and Discussion

The results are presented and discussed below regarding production of panikachu in the study areas specifically. Panikachu was grown in Jessore during the summer season. Farmers in this study area ploughed 5 to 6 times for land preparation. It was propagated by suckers and planted by rows in the months of February to March. Farmers performed some intercultural operation like weeding, spraying and irrigating etc. The harvesting time of stolon started in the month of May and continued up to the month of November to December. Panikachu production is a labor intensive crop. Its need many labors for the production as well as maintenance. Moreover, farmers applied

different types of fertilizer such as Urea, TSP, MOP, Zipsum, Boron and manure for its higher production. Farmers also used insecticide and pesticide for preventing insects and diseases infestation. It had high marketing demand due to off season crop. The gross margin, net margin and yield was high as a off season crop.

Input use pattern

The human labor used for producing panikachu was found to be 910 man-days ha^{-1} (Table 1). Land preparation cost was 7145 Tk ha^{-1}. Seedling was used 37895 no. ha^{-1} for cultivating panikachu. The total quantity of fertilizer require was 2974 Kg ha^{-1} of which urea, TSP, MP, Zipsum and Boron were 1011 Kg ha^{-1}, 1076 Kg ha^{-1}, 629 Kg ha^{-1}, 230 Kgha^{-1} and 28 Kg ha^{-1} respectively. . Total cowdung was used 10000 kg ha^{-1} during land preparation. Farmers spend 13044 Tk ha^{-1} for insecticide use and 25989 Tk ha^{-1} for irrigation purpose.

Table 1. Input use pattern for Panikachu cultivation

Items	Quantity
Human labor (man-day ha^{-1})	910
Land preparation cost (Tk ha^{-1})	7145
Seedling (no. ha^{-1})	37895
Fertilizer (Kg ha^{-1})	2974
Urea(Kg ha^{-1})	1011
TSP(Kg ha^{-1})	1076
MOP(Kg ha^{-1})	629
Zipsum (Kg ha^{-1})	230
Boron (Kg ha^{-1})	28
Manure (Tk ha^{-1})	10000
Insecticide (Kg ha^{-1})	13044
Irrigation (Tk ha^{-1})	25989

Cost and return

For calculating the cost of cultivation of panikachu, all variable costs like human labor, land preparation, seed, manures, fertilizers, pesticide and irrigation were calculated ha^{-1} basis. The fixed cost of panikachu cultivation included cost of land use and interest on operating capital. The cost of land use was calculated on the basis of lease value of land. The total cost included fixed cost and variable cost. Total cost of production of panikachu was 358966 Tkha^{-1} whereas 316537 Tk ha^{-1} is variable cost and fixed cost is 42429 Tk ha^{-1} (Table 2). Among the cost items labor cost is the high as 50.69% and fertilizer cost incurs 17.43% of total cost. Other variable cost items were land preparation cost, seedling, manure, insecticide, irrigation which were 2.00 %, 5.8 0%, 1.39%, 3.63% and 7.24% of total cost respectively.

Table 2. Cost of panikachu cultivation in the study area

Particular	Cost (Tk ha^{-1})	% of total cost
A. Variable cost (Tk)		
Labor	181951	50.69
Land preparation	7145	2.00
Seedling	20847	5.80
Fertilizer	62561	17.43
Manure	5000	1.39
Insecticide	13044	3.63
Irrigation	25989	7.24
Total variable cost (Tk)	316537	88.18
B. Fixed cost		
Land use	21000	5.85
Interest on operating capital	21429	5.97
Total fixed cost	42429	11.82
C. Total cost (A+B)	358966	100.00

Profitability of panikachu cultivation

Return was calculated by multiplying volume of production with its price. Return per hectare of panikachu cultivation is shown in Table 3. The average yield of stolon and rhizome were 35 ton ha^{-1} and 50 ton ha^{-1} respectively. The average gross return from stolon was calculated as 630000 Tk ha^{-1} and from rhizome it was 25000 Tkha^{-1}. The average price of stolon was 18 Tk kg^{-1}. The average gross margin was 338463 Tk ha^{-1} and net margin was 296034 Tk ha^{-1}. On an average, benefit cost ratio was found to be 1.82 on full cost basis and 2.07 on cash cost basis.

Table 3. Profitability of Panikachu production

Particular	Cost and return (Tkha^{-1})
Total variable cost	316537
Total cost	358966
Yield- stolon (ton ha^{-1})	35
Rhizome (ton ha^{-1})	50
Average selling price of stolon(Tk kg^{-1})	18
Average selling price of rhizome (Tk $kg^{-1)}$	0.5
Gross return from stolon	630000
Gross return from rhizome	25000
Total return	655000
Gross margin	338463
Net margin	296034
Benefit cost ratio	
Full cost basis	1.82
Variable cost basis	2.07

Contribution of different inputs to Panikachu production

For producing Panikachu different types of variable inputs were employed. Initially eight variables were included. Estimated values of coefficients and related statistics of Cobb-Douglas production function are presented in Table 4. The coefficient of determination (R^2) tells how well the sample regression line fits the data (Gujarati, 1995). All the co-efficient of labor, seedling, urea, TSP and MP were positive and significant at 1% level, indicated that 1% increase in the use of labor, seedling, urea, TSP and MP, keeping other factors remaining constant would increase the yield of stolon by 0.188%, 0.041%, 0.022%, 0.05% and 0.003% respectively. Zypsum, boron and manure application had negative but significant impact on the yield of stolon. The coefficient of determination (R^2) was 0.57, which indicates that around 57 percent of the variations in gross return were explained by the independent variables included in the model. The F-value of the equation is significant at 1% level implying that the variation in gross return from latiraj production mainly depends upon the independent variables included in the model.

Table 4. Estimated coefficients and their related statistics of production function for panikachu

Explanatory variables	Co-efficient	t-values
Intercept	1.747	1.36
Labor (X_1)	0.188	1.30
Seedling (X_2)	0.041	0.41
Urea (X_3)	0.022	0.22
TSP (X_4)	0.055	1.07
M0P (X_5)	0.003	0.19
Zipsum (X_6)	-0.024	-1.11
Boron (X_7)	-0.104	-1.73
Manure (X_8)	-0.001	-0.01
R^2	0.57	
F value	1.19	

Constraints of panikachu cultivation

Panikachu cultivation is the most profitable crop. Farmers reported that insect infestation mainly *prodonia* caterpillar is the main problem in Panikachu cultivation. . Ninety five percent farmers complained that they face insect and disease infestation problems in panikachu cultivation (Table 5). It reduces the yield of stolon. High price of seed and fertilizer is another problem faced by the farmer. About 75% farmer comments that they face high price of input and 60% farmers mention low price of products as a problem of panikachu production. The farmer had no marketing problem in the study area due to high demand for stolon.

Table 5. Constraints of panikachu production

SI No	Constraints	Percent of farmers
1	Infestation of insects and diseases (foot rot)	95
2	High price of inputs	75
3	Low price of products	60

The study assessed the level of production of latiraj (BARI Panikachu 1) at farm level. The productivity of Panikachu is high. The gross margin, net return and BCR are high. Human labor, seedling, urea, TSP, MP and manure had positive and significant effect on Panikachu cultivation. Insect infestation mainly *Prodonia* caterpillar and foot rot disease were the main problem in the Panikachu cultivation. The farmer had no marketing problem in the study area due to high demand for stolon.

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