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PANIKACHU (*Calocasis esculenta L. Schott*) CULTIVATION IN SOME SELECTED AREAS OF BANGLADESH: AN AGRO-ECONOMIC PROFILE

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Abstract

Panikachu is a nutritious vegetable contributing to the total supply of vegetables during the summer in Bangladesh. Many farmers cultivate this crop from their innovative ideas. Researchers are unable to formulate adequate research design for its varietal improvement and technology packages. Therefore, the study was conducted in two panikachu growing districts, namely Joypurhat and Jessore during February 2011 to know the profitability of panikachu cultivation. In total, 100 panikachu farmers were selected of which 50 farmers from each area were selected randomly to collect primary data. The results indicated that the costs of panikachu cultivation were Tk. 2,67,726 and Tk. 1,84,530 per hectare on total cost and variable cost basis, respectively. The major share of total cost was for human labour (45%), land use (17%), and fertilizer (15%). The yield for rhizome and stolon were 24.94 tons and 23.29 tons per hectare. The gross margin and net returns were Tk. 2,06,058 and Tk. 1,22,862 per hectare. The benefit cost ratios was 1.46. Human labour, manure, urea, TSP, MoP, insecticides, and irrigation had positive effect on the yield of panikachu. Lack of technical knowledge about improved cultivation practices, non-availability of HYV seedling, and low price of product were major constraints to panikachu cultivation.

Keywords: Panikachu, input use pattern, gross margin, net return, BCR.

Introduction

Panikachu (*Calocasis esculenta L. Schott*) is an important edible aroid in Bangladesh. It contributes to the total supply of bulky vegetables during the summer when the supply of other vegetables becomes scarce in the market. Panikachu is generally grown almost all over Bangladesh, but its production is more concentrated in the districts of Chittagong, Norail, Serajgonj, Bogra, Joypurhat, Pabna, Tangail, Dinajpur, Jessore, Jamalpur, Sylhet, and Kishoregonj (BBS, 2008). As a root crop, it compares favourably in terms of nutritional value with other root crops, such as cassava, yam, sweet potato, 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 favourable for panikachu cultivation.

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The demand of panikachu is increasing day by day, but very little attempt has been made for its technological development for higher production in any part of our country. Farmers are cultivating this crop from their innovative ideas regarding adaptability of local cultivars, fertilizer dose, and other agronomic practices. Not only that, 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:

(i) To know the existing agronomic practices of panikachu cultivation at farm level;

(ii) To estimate the economic profitability of panikachu cultivation;

(iii) To determine the input - output relationship of panikachu cultivation; and

(iv) To find out the constraints to its higher production.

Materials and Method

Sampling technique: A multi-stage sampling technique was followed in this study to select study areas and sample farmers. In first stage of sampling, two panikachu growing districts Joypurhat and Jessore were selected purposively. In the second stage, Pachbibi *upazila* under Joypurhat District and Bagarpara *upazila* under Jessore District were selected for sample survey. In the third stage, a complete list of panikachu growers were collected from each *upazila* and finally a total of 100 panikachu farmers taking 50 farmers from each *upazila* were selected by random sampling technique.

Method of data collection: Data for the present study were collected from sample panikachu farmers through face to face interview method using a pre-tested interview schedule. Field level data were colleted by the researcher with the help of trained enumerators for the period of February 2011.

Analytical techniques: Both fixed cost and variable cost were taken into account in calculating cost of panikachu cultivation. Land use cost was calculated on the basis of per year existing lease value of land. The profitability of panikachu cultivation was examined on the basis of gross margin, net return, and benefit cost analysis. The collected data were edited, summarized, tabulated, and analyzed to fulfill the objectives of the study. Tabular method using descriptive statistics was mostly used in 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:

$$Y = AX_1^{b1}X_2^{b2} \text{ ---------- } X_n^{bn}e^{ui}$$

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

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

The empirical production function model was the following:

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

Where,

Y= Gross return (Tk/ha)
X_1 = Cost of human labour (Tk/ha)
X_2 = Cost of sucker (Tk/ha)
X_3 = Cost of manure (Tk/ha)
X_4 = Cost of urea (Tk/ha)
X_5 = Cost of TSP (Tk/ha)
X_6 = Cost of MoP (Tk/ha)
X_7 = Irrigation cost (Tk/ha)
X_8 = Cost of insecticides (Tk/ha)
a = Intercept
b_1, b_2 ---------- b_9 = Coefficients of the respective variables to be estimated.
U_i = Error term

Results and Discussion

Agronomic practices

All the agronomic practices are shown in Table 1. The farmers ploughed 5.5 times followed by laddering of 2.5 times for the preparation of panikachu land. Panikachu is being grown in Bangladesh during the kharif season. In India, the planting is normally done in the rainy season and it could be grown any time if irrigation facilities are available (Bose and Som, 1996). But in the study area, the planting time was February to March. Panikachu propagated by suckers and sucker was planted in rows. The farmers in the study areas performed some intercultural operations like weeding, spraying, and irrigating the crop. The number of weedings, insecticide spraying, and irrigation per farm were 11, 9, and 5.5, respectively. The harvesting time of stolen started in the month of May and continued up to the month of November. The harvesting time of rhizome was November to December.

Table 1. Agronomic practices in panikachu cultivation in different study areas.

Agronomic practices	Joypurhat	Jessore	All areas
No. of ploughings	5	6	5.5
No. of ladderings	2	3	2.5
Time of plantings	February –March	February –March	February –March
No. of weedings	12	10	11
No. of irrigations	8	10	9
No. of sprayings	6	5	5.5
Time of harvesting:			
Rhizome	November-December	November-December	November-December
Stolen	May-November	May-November	May-November

Input use pattern

The number of human labour used for cultivating panikachu was 808 man days per hectare. The use of human labour was found higher in Joypurhat than in Jessore area. The cost of land preparation was Tk. 6564 per hectare (Table 2). The average number of suckers was 23275 per hectare, which was lower than the recommended rate of sucker (37000/ha). The farmers in the study area used 11.49 tons of manure per hectare. The farmers also used chemical fertilizers like urea, TSP, MoP at the rate of 889 kg, 624 kg, 268 kg per hectare which were higher than the recommended fertilizer dose[*]. The reason of using higher dose of chemical fertilizer was might be due to ignorance of the farmer.

Table 2. Input use pattern of panikachu cultivation in different study areas.

Inputs	Joypurhat	Jessore	All areas
Human labour (man-day/ha)	817	799	808
Family	271	247	259
Hired	546	552	549
Land preparation cost (Tk/ha)	6081	7047	6564
Suckers (No./ha)	22877	23674	23275
Organic manure (kg/ha)	19535	3459	11497
Fertilizers(kg/ha)			
Urea	950	828	889
TSP	640	607	624
MP	306	230	268
Zipsum	232	320	276
Zinc Sulphate	28	105	66

[*] The recommended doses of urea, TSP and MoP are 150kg/ha, 125 kg/ha and 175 kg/ha, respectively (TCRC, 2008).

Cost of panikachu cultivation

The cost of panikachu cultivation included different variables and fixed costs. The cost of hired labour, land preparation, suckers, organic manure, chemical fertilizers, insecticides and irrigation, interest on operating capital were considered as variable costs. The cost of family labour and land use were considered as fixed costs. The costs of panikachu cultivation were Tk. 267726 and Tk. 184530 per hectare on full cost and variable cost basis, respectively. The major share of total cost was for human labour (45%), land use (17%) and fertilizer (15%). The cost of cultivation of panikachu in Joypurhat was found higher than Jessore due to higher cost of land use, sucker and human labour cost (Table 3).

Table 3. Cost of cultivation of panikachu in different study areas.

(Figure in Tk./ha)

Items	Joypurhat	Jessore	All areas
A. Variable costs	**185308 (68)**	**183752 (69)**	**184530 (69)**
Land preparation	6081 (2)	7047 (3)	6564 (2)
Hired labour	82025 (30)	82833 (31)	82429 (31)
Suckers	17158 (6)	11836 (4)	14497 (5)
Organic manure	9767 (4)	1729 (1)	5748 (3)
Fertilizers:	38589 (14)	42570 (16)	40579 (15)
Urea	11396	10513	10954
TSP	15371	15913	15642
MP	7051	5708	6380
Zipsum	1396	1766	1581
Zinc Sulphate	3374	8670	6022
Insecticides/pesticides	6501 (2)	5359 (2)	5930 (2)
Irrigation	15668 (6)	22644 (8)	19156 (7)
Int. on operation capital	9518 (4)	9731 (4)	9624 (4)
B. Fixed cost	**85624 (32)**	**80769 (31)**	**83196 (31)**
Land use cost	44909 (17)	43711 (17)	44310 (17)
Family labour	40715 (15)	37057 (14)	38886 (14)
C. Full cost (A+B)	**270932 (100)**	**264521 (100)**	**267726 (100)**

Figures within parenthesis indicate % of total cost

Note: Price of fertilizers: Cowdung = Tk. 0.50/kg, Urea = Tk.12/kg, TSP = Tk.25/kg and MoP = Tk. 23.8/kg.

Profitability of panikachu cultivation

Yield data included some marketable portion of petiole with rhizome and stolon. The average yield for rhizome and stolon were 24.94 tons and 23.29 tons per hectare, respectively. The yield of rhizome (25.20 t/ha) was found higher in Jessore than Joypurhat mainly due to better land preparation and more population of sucker. On the other hand, the yield of stolon (23.74 t/ha) was found higher in Joypurhat than Jessore due to higher use of manure and fertilizers (Table 4). The gross return of panikachu cultivation was estimated to be Tk. 390588 per hectare. The gross margin and net return were Tk. 206058 and Tk. 122862 per hectare. Gross margin and net return were found higher in Joypurhat than Jessore due to higher gross return. The benefit cost ratios were 1.46 and 2.11 on full cost and variable cost basis respectively (Table 5).

Table 4. Yield of panikachu in different study areas.

Study area	Wt of rhizome (g/plant)	Wt of stolon (g/plant)	Yield of rhizome (t/ha)*	Yield of stolon (t/ha)
Joypurhat	1250	1202	24.68	23.74
Jessore	1149	1039	25.20	22.84
All areas	1199	1121	24.94	23.29

*Weight of rhizome including marketable portion of petiole

Table 5. Profitability of panikachu production in different study areas.

(*Amount in Taka/ha*)

Items	Joypurhat	Jessore	All areas
Gross return:	394602	386573	390588
Rhizome	33057	37809	35433
Stolon	353264	342694	347979
Sucker	8281	6070	7176
Total variable cost	185308	183752	184530
Total cost	270932	264521	267726
Gross margin	209294	202821	206058
Net return	123670	122052	122862
Benefit cost ratio			
Full cost basis	1.47	1.46	1.46
Variable cost basis	2.12	2.10	2.11

Factors affecting panikachu yield

In order to determine the contribution of some inputs for panikachu production, Cobb- Douglas production function was used. The estimated values of co-

efficient and related statistics of Cobb- Douglas production function are presented in Table 6. It is clear from the model that the co-efficient of human labour, urea, TSP, and insecticides were positively significant at 1% level indicate that 1% increase in human labour, urea, TSP, and insecticides cost would increase the return of panikachu by 0.001%, 0.005%, 0.002%, and 0.009%, respectively, keeping other factors constant. The co-efficient of manure was positively significant at 5% level indicated that 1% increase in manure cost would increase the return of panikachu by 0.007% keeping other factors constant. The co-efficient of MoP and irrigation were positively significant at 10% level indicating that 1% increase in MoP and irrigation cost would increase the return of panikachu by 0.007% and 0.004%, respectively, keeping other factors constant.

Table 6. Estimated coefficients and their related statistics of production function for panikachu cultivation.

Explanatory variables	Co- efficient	t-value
Constant (a) :	482680***	5.48
Human Labour (X_1)	0.001***	6.11
Sucker (X_2)	0.003ns	1.02
Manure (X_3)	0.007**	2.44
Urea (X_4)	0.005***	4.83
TSP (X_5)	0.002***	4.04
MP (X_6)	0.007*	1.84
Irrigation (X_7)	0.004*	1.93
Insecticides (X_8)	0.009***	12.48
R^2	0.64	
F	82.072***	

Note: ***, ** and * indicate significant at 1%, 5% and 10% level, respectively.

The value of coefficient of determination (R^2) was 0.64, which indicated that around 64% of the variation in yield was explained by the independent variables included in the model. The F-value was found 82.07 which was significant at 1% level implying that the variation of yield mainly depends on the explanatory variables included in the model.

Constraints to panikachu cultivation

The respondent farmers were asked about the constraints of panikachu cultivation. In this regard, more than one answer was given by the respondents. The answer was arranged in rank value. It was observed that lack of technical knowledge about improved cultivation practices was the first ranked constraint to

panikachu cultivation followed by non-availability of HYV seedling at proper time, low market price, and infestation of insects and diseases (Table 7).

Table 7. Constraints of panikachu cultivation in different study areas.

Constraints	Rank value		
	Joypurhat	Jessore	All areas
1. Lack of technical knowledge about improved cultivation practices	1	1	1
2. Non- availability of HYV seedling	2	2	2
3. Low price of product	3	3	3
4. Infestation of insects and diseases	1	4	4

Conclusion

From the above discussions, it may be concluded that panikachu is a profitable crop at farm level. The farmers in the study areas followed traditional but innovative techniques for producing this crop and used local improved variety. Human labour, manure, urea, TSP, MoP, irrigation, and insecticides had positive effect on the yield of panikachu in the study areas. Lack of technical knowledge about improved cultivation practices of panikachu, non-availability of HYV seedling, low price of product, and infestation of insects and diseases were major constraints in panikachu cultivation.

Recommendations

Based on the findings of the study, the following recommendations were undertaken for the improvement of panikachu cultivation:

1) Farmers' training on panikachu cultivation should be organized by government and non-government organizations to develop technical knowledge of the farmers about improved cultivation practices of panikachu.
2) High yielding varieties of panikachu seedling should be made available to the farmers' level at proper time. For this reason, Government should encourage BARI scientists to develop HYV seedling of panikachu.
3) The price of stolon and rhizome of panikachu was very low in the study areas mainly due to some fraudulent traders. To overcome this problems, co-operative marketing system should be established among the farmers to sell their products.
4) More intensive research should be undertaken by the BARI scientists to develop disease and insect-pest resistant seedling in the near future.

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