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Characterization of farm households in terms of market accessibility- A case study in West Tripura district of Tripura

Kalyan Bhattacharyya✉ and Lungkudailiu Malangmeih

Department of Agricultural Economics, Faculty of Agriculture, Bidhan Chandra KrishiViswavidyalaya, Mohanpur-741252, West Bengal.

✉Corresponding author: kbh_bckv@rediffmail.com

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ABSTRACT

In this study focus has been given on characterization of farm households in terms of market accessibility and identification of factors determining input purchasing behavior in West Tripura district of Tripura state. It refers to an exhaustive survey covering 100 sample farms during the period 2011-12.The study area has witnessed by low intensity of cropping (119%) though more than 90% of the net area gets irrigation which implies that farmers are lagging much behind the adoption of modern technologies and practices. The factors determining the input purchasing behavior have been examined. The sample farms were classified into two groups namely, market-prone and market-averse groups on the basis of involvement of farmers in output market. The study reveals that 40% of the sample farmers do not have proper market access and remain beyond the orbit of market forces. Characteristics of groups have also been identified by Linear Discriminant Analysis (LDA) method.

Keywords: Marketed surplus, Market-prone, market-averse, Linear Discriminant Analysis, Key inputs.

Farm income could be augmented either through extensive cultivation i.e. by bringing more land under cultivation or through intensive agriculture by increasing productivity through adoption of modern technologies and practices suitable for the area. Rapid growth of population compels the economy to introduce more land in non-farm sector in order to meet-up the non-food demand as well as unemployment. This has created a threat to the farm sector fueled by rapid decreasing in land-man ratio year by year. Net return maximization objective will not serve as a basis of welfare maximization of rural households. Farmers should look forward to maximize the net return of their farms at the higher production possibility frontier. To attain the new production possibility frontier, farmers should adopt modern technologies and practices which entails a significant level of demand in their input schedule. Accumulation of such inputs in their production process depends on the magnitude of farmers' involvement in input market. Farmers' involvement in input market serves as an indicator that a farm is responding towards the new production possibility. Involvement of farmers in input and output markets are of principle significance to the livelihood strategy of rural households where a complex relationship exists between market accessibility and technologies. Accessibility of farmers in the market is analytically equivalent to a production technology which implies that market participation choices are similar to technology adoption choices. On the other hand, farmer's production technology choices fundamentally affect its market participation choices by affecting its productivity. Thus promoting technological advance is essential to inducing broader-based market participation and aggregate

supply response to price-based policy instruments. Emphasizing the close interdependence between farmer's participation in input markets and technologies, the returns to adoption of improved production technologies is fundamentally influenced by the characteristics of farm households. Individual producers always have an incentive to adopt a cost-reducing technology. But the gains from adoption depend on supply of farm inputs and also awareness of farmers towards the adoption of improved technologies and practices. The knowledge of input-output relationship is an important parameter in attending the new frontier production function. It may be assumed as a priori event that farmers have the inherent capacity as well as ability to understand the out turn of expectation from their experience and their interactive exposure to the natural phenomenon. But in reality, inter-farm variation in the magnitude of market orientation of farm households is dictated by constellation of factors which need to be identified.

Objectives

In this study, focus has been made to identify, classify and characterize the farm households according to accessibility to markets and to identify the factors determining it.

Materials and Methods

This study is addressed to West Tripura district which is one of the agriculturedominated districts of Tripura. Out of 22 blocks, one block namely Jirania R. D has been selected on the basis of simple random sampling without replacement (SRSWOR). Three (3) villages namely Asampara, Devinagar and Durganagar have been selected from the total number of villages comprising in the block on the basis of same sampling design adopted for the selection of the block. One hundred (100) sample farms representing the ultimate sampling unit have been chosen in accordance with SRSWOR from the total number of enlisted farms spread over selected villages. Frequency distribution of the 100 farms according to the size of operational holding is furnished in Table 1.

The reference year of the study was 2011-12 agricultural year. Data have been collected from primary source and pulled from selected farmers on the basis of personal interrogating during the period January 2012 to May 2013 with a structured and pre-tested schedule.

Table 1. Distribution of Sample Farmers according to Size of Operational Holding

Size of operational holding (acre)	Number of farmers	Average size of farms
Up to 1.00	30	0.847
>1.00 to 2.00	44	1.614
>2.00 to 3.00	20	2.806
>3.00	6	4.400
Total	100	1.790

Linear Discriminant Analysis (LDA) has been used to classify the cases into groups using a discriminate prediction equation, also to test theory by observing whether cases are classified as predicted and to investigate difference between or among groups in most parsimonious way. Determinination of the percent of variance in the dependent variable by the independents and to assess the relative importance of the independent variables in classifying the dependent variables has also been explained by this method.

LDA has two steps-

An F test (Wilk'slamda) is used to test if the discriminant model as a whole is significant.

If the F test shows significance then the individual independent variables are assessed to see which differ significantly in the mean by group and these are used to classify the dependent variables.

Dependent variables

Observation in terms of proportion of produce marketed has been defined as the dependent variable which is estimated as:

$$P_i = \left(\sum_{J=1}^{k} p_j q_j^{'} \Big/ \sum_{J=1}^{k} p_j q_j \right)$$

Where, P_i is proportion of produce marketed by ith farm.

p_j is price of jth crop (₹ /Kg.).

q'_j is the amount of jth crop marketed.

q j is the amount of jth crop output.

The ratio between marketed surplus and total production has been considered to represent the proportion of M/S to total production of individual farmer. The farmers whose involvement in output market in less than 50% is termed as zero (0) group and the farmers belong to 1 (one), the other group, whose involvement in output market is 50% and above.

Independent variables

Some important economicfactors have been taken in this model as explanatory actors to explain the characteristics of farms in terms of market accessibility. Area under paddy (X1), income from crop and livestock enterprises as percentage of the total income of farm (X2), area under commercial crop as percentage to total cropped area (X3), percentage value of commercial crops to total value of crop and livestock enterprises(X4), expenditure on key inputs for paddy cultivation (X5), percentage of hired human labour used in paddy cultivation(X6), percentage area under paddy to total cropped area(X7) and value of paddy crop to total value of crops (X8) have been considered as independent factors. Expenditure of seed per acre, manure and fertilizer, pesticide and irrigation has been considered as the expenditure on key input. Same price constellation has been used to estimate the expenditure of key inputs in order to reveal the inter-farm variations in the level of factorsas these factors are not additive in nature.

In order to identify the factors discriminatingthe groups, the function used is given by

$$Z = \sum_{i=1}^{k} \lambda_i x_i$$

Where,

k = Number of independent factors

Let d_i is the difference between means of xi

S_j is the variance covariance matrix

λ_i is the determinant function co-efficient

The λ'_s are obtained by solving the system of equations

$(\lambda_i)(S_{ij}) = d_i$

To test the discriminant power of the function, the test statistics

$$T.S = \frac{n_1 n_2 (n_1 + n_2 - k - 1)}{k(n_1 + n_2)(n_1 + n_2 - 2)} \times D^2$$

Where, D^2 is the Mahalnobis function and obtained as n1 and n2 are sampled sizes.

$$D^2 = \lambda_i d_i$$

The test statistics follows F distribution with K and $(n_1 + n_2 - k - 1)$ degrees of freedom.

Results and Discussion

An insight into the relevant agro-economic profile of the selected farmswhich is expected to provide a ground of the present studydeserves careful examination in this context.

Table 2. Net and Gross Area and Intensity of Cropping under Irrigated and Un-irrigated Lands (in acre)

Size group (acre)	Up to 1.00	>1.00 to 2.00	>2.00 to 3.00	>3.00	All farms
Net area sown	22.56 (1.80)	60.33 (6.66)	47.33 (7.46)	24.33 (1.00)	154.56 (16.93)
Current fallow	0.37 (0.67)	0.87 (3.16)	0.63 (0.70)	0.40 (0.67)	2.27 (5.20)
Cultivated area	22.93 (2.47)	61.20 (9.82)	47.96 (8.16)	24.73 (1.67)	156.83 (22.13)
percent of cultivated area under current fallow	4.09	5.67	2.37	4.05	4.17
Gross area	26,67 (4.83)	81.86 (9.13)	52.53 (7.87)	26.27 (2.10)	187.33 (23.93)
Intensity of cropping	1.16 (1.95)	1.34 (0.93)	1.09 (0.96)	1.06 (1.26)	1.19 (1.08)
Net area under irrigation as% to net sown area in size group	92.61	90.04	86.37	96.05	90.12
Gross area under irrigation as% to gross cropped area	84.65	90.02	86.97	92.59	88.69

Note. Figures in parenthesis indicate the respective magnitude of un-irrigated land.

The average intensity of cropping of the selected farms under irrigated culture is found to be 1.19 whereas more than 90% of net area received

irrigation as can be seen in Table 2. It implies that farmers in the selected area are lagging much behind the adoption of modern technologies and practices in order to maximize the net revenue of the farm.

Table-3 shows the distribution of farmers according to the classification across different crops. The sample area is dominated by paddy crop grown by the farmers. Jute is the main commercial crop grown in the sample farms as the total produce of the crop is usually brought to market for cash realization. The percentage of Market-prone farmers is higher than the market-averse farmers in general.

Table 3. Crop-wise Distribution of Market-averse and Market-prone Farmers

Crops	Market-averse	Market-prone	Total
Autumn Paddy	40(40)	60(60)	100(100)
Winter Paddy	40(40)	60(60)	100(100)
Summer Paddy	7(50)	7(50)	14(100)
Jute	14(26)	40(74)	54(100)
Potato	7(18.92)	30(81.08)	37(100)
Cauliflower	4(13.33)	26(86.66)	30(100)
Chilli	7(29.16)	17(70.83)	24(100)
Brinjal	7(70)	3(30)	10(100)
Tomato	17(100)	0	17(100)
Cabbage	7(35)	13(65)	20(100)
Ladies finger	4(40)	6(60)	10(100)

Note: Figures in parenthesis show percentage of the respective rows.

The proportional area under principal crops along with break-up falling under two groups is presented in Table 4. The sample area is dominated by rice crop which occupies 68% of the gross cropped area followed by jute occupying 9% and potato covering 6% of the gross cropped area.

It is estimated from the detail break-up of the crop profile that about 73% of the total gross area is under market-prone irrespective of crops grown. Market-prone area is largely found for paddy crop grown in pre-kharif and kharif season followed by jute, potato, chilli etc. On the other, only market-averse is noticed for tomato crop.

Out of 100 farmers, only 14 farmers were growing summer paddy whereas autumn paddy and winter

Table 4. Crop-wise Proportional Area to Total Gross Cropped Area under Market-averse and Market-prone Areas

Crop	Proportional area to total gross area	Market-averse (acre)	Market – prone (acre)
Autumn Paddy	0.321	0.086 (26.79)	0.235 (73.21)
Winter Paddy	0.335	0.100 (29.85)	0.235 (70.15)
Summer Paddy	0.026	0.008 (30.77)	0.018 (69.23)
Jute	0.096	0.015 (15.62)	0.081 (84.38)
Potato	0.059	0.008 (13.56)	0.051 (86.44)
Cauliflower	0.086	0.003 (03.00)	0.083 (97.00)
Chilli	0.033	0.010 (30.30)	0.023 (69.70)
Brinjal	0.019	0.008 (42.10)	0.011 (57.90)
Tomato	0.025	0.025(100.00)	0
Cabbage	0.024	0.011 (45.83)	0.013 (54.17)
Ladies finger	0.006	0.001 (16.67)	0.005 (83.33)

Note: Figures in parentheses indicate percentage of cropped area under different market classifications to total cropped area of the sample farmers.

paddy were grown in all the farms. From the previous table (Table 6), it was found that 40% of the paddy farmers were market averse, making it group 1 and the remaining 60% of the paddy growers were market prone i.e group 2. An attempt has been made to compare and construct the various economic characteristics between the two groups. Special attempt has been made to test the hypothesis that group-means in terms of area under paddy (X_1), income fromcrop and livestock enterprises as percentage of the total income of farm (X_2), area under commercial crop as percentage to total cropped area (X_3), percentage value of commercial crops to total value of crop and livestock enterprises (X_4), expenditure on key inputs for paddy cultivation (X_5), percentage of hired human labour used in paddy cultivation (X_6), percentage area under paddy to total cropped area (X_7) and value of paddy crop to total value of crops (X_8) do not vary.

A close look at the Table 5 revealed that, value of the Wilks' Lambda for most of the selected economic characteristics are significant. Estimated significant F-values reinforce the same observation.

Table 5.Test of Equality of Group-means

Variables	Wilks' Lambda	F	df_1	df_2	Significance level
X_1	0.692	12.488	1	98	.001
X_2	0.499	28.095	1	98	.000
X_3	0.903	2.99	1	98	.094
X_4	0.858	4.631	1	98	.040
X_5	0.661	14.341	1	98	.001
X_6	0.656	14.708	1	98	.001
X_7	0.891	3.437	1	98	.074
X_8	0.850	4.948	1	98	.034

The test of equality of group-means for selected variables is displayed in Table-6. It indicates that the mean area under paddy between the two groups is statistically significant at 1% probability level. It is also observed from the table that the mean area under paddy for market averse group is 1.03 acre and that of market prone group is 1.74 acre. Surprisingly no significant difference in terms of percentage area under commercial crops between the two groups has been observed in this study. Crop statistics on this characteristics show that the mean values of percentage area under commercial crops in two groups are 34.66% and 44.15% respectively. The mean value of the first group i.e. market averse farms has been intercepted by wide fluctuations among the farms of the group. Variability in terms of proportional area under cash crops also varied in case of market prone group. Thus it may be inferred that both the groups are heterogeneous in composition.

In other words, these characteristics cannot be taken as a distinct character bifurcating the two groups under comparison. Similar type of observation has been found for the characteristic indicator of percentage area under paddy to total cropped area for obvious reason. The other characteristic variables including X_1, X_2, X_4, X_5, X_6 and X_8 are dividers between the two groups. An interesting finding of the study is that paddy growers who have 30% higher income from commercial crops (to total crops) were more accessible to market. The pattern of expenditure on key inputs between the two groups is significant at 1% probability level. The mean value of cash expenditure on key inputs of the market-prone group is nearly double the expenditure of the other group. The market-prone group shows that higher outlay of expenditures on labour (89%) compares to that of the market-averse group (68%).

Table 6. Group Statistics

Marketed Surplous	Variables	Mean	Standard Deviation
Group-1	X_1	1.035	0.458
	X_2	45.930	14.531
	X_3	34.664	20.085
	X_4	23.79	13.500
	X_5	6991.105	4027.337
	X_6	68.532	16.362
	X_7	75.074	15.288
	X_8	76.983	13.951
Group-2	X_1	1.741	0.581
	X_2	70.238	10.620
	X_3	44.153	9.745
	X_4	31.643	6.317
	X_5	13801.88	5278.492
	X_6	89.847	13.895
	X_7	67.836	5.432
	X_8	68.322	7.338
All farms	X_1	1.459	0.634
	X_2	60.515	17.115
	X_3	40.357	15.200
	X_4	28.50	10.384
	X_5	11077.571	5831.129
	X_6	81.321	18.098
	X_7	70.731	10.907
	X_8	71.786	11.136

Conclusion

The study highlights that a good number of sampled farmers (40%) are still not very exposed to markets and are remained beyond the orbit of market forces. To augment the economy of Tripura, suitable measures are required to make them market oriented. There is also need for thorough study for identifying the bottlenecks of the farmers to be involved in input as well as output market.

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