Original Research Article

A Study on factors influencing the market participation decision of Paddy farmers in Odisha

ABSTRACT

There are maximum number of farmers are marginal and small in Odisha. They face various problems which restrict their way in to market and hinder them to take advantages of marketing opportunities. This research aims to survey the factors affecting the market participation of farmers and target to improve their income and livelihood. The study establishes its novelty in carrying out the research in the paddy farmers of Odisha focusing on all the categories of farmers. Earlier the study focused exclusively on small and marginal farmers across various study areas. The study attempts to transcend the scope of research as well as keeps future scope of research open. Objective of this paper explains the market participation decision of farmers and expresses the vital factors that influence the farmer's decision to participate in the market in Odisha. To study the relationship between the farmer's decision to participate in the market and the factors influencing this farmer's decision, a Probit regression model is used. The study uses primary data collected from 320 farmers of Ganjam, Kalahandi, Bargarh and Mayurbhanj District of Odisha. It has been discovered that the primary elements influencing a farmer's decision to participate in the market are farm size, household labour, amount of income, and farm income. From the standpoints of market engagement, the paper investigates the phenomena of paddy farmers in Odisha. The findings of this study have implications for the issues that must be resolved in order to motivate Odisha's paddy farmers to participate in the market. We propose that in order to promote development and contribute to food security, value addition, and general economic development, the government and policymakers of Odisha should design balanced policies for farmers and manage them appropriately.

Keywords: Paddy farmers, market participation, probit model

INTRODUCTION

Market participation of farmer is the consequence of economic development. It ensures better income and improved food security. The existence of market and improved market access are important for farmers as it promotes overall agricultural and economic development. Improved access to market is important to increase market participation and the extent of their participation. Farmers involved in traditional food crops depend on informal markets due to weak linkage with formal market. However, the participation rate of paddy farmers in the rice market remains low due to various constraints. They lack reliable market information. Paddy producers typically face a higher level of risk and transaction costs due to their limited production surpluses. Their decisions regarding the quantity of output to sell are mostly impacted by marketing data, product prices, and market distance. Studying the rice farmers' market involvement in Odisha can therefore have important consequences for the direction of future research. Odisha stands 4th in production (7.58 million tonnes) and the area under coverage (4.18 million hectares, 2013-14) of paddy in India. In Odisha, many varieties of paddy (Hybrid/HYV / Indigenous) are cultivated in almost all districts due to the suitability of agro climatic conditions. Out of 4.18 million hectares of Paddy acreage, the area under HYV is 3.71 million ha (88.8%) while 0.47 million ha (11.2%) is covered under local varieties. In view of decline in the share of Agriculture and Allied Sector to the state GDP (15.4%), agrarian distress, non-remunerative paddy farming, higher food grain prices and lower MSP, it would be reasonable to analyze the value chain of paddy to know share of paddy farmers for corrective action to strengthen the share. The value chain describes the sum total of activities required to move a commodity from the initial point of production to the final point of consumption.

MATERIALS AND METHODS

Odisha is divided into 4 Physiographic zones i.e. Coastal plains, Eastern Ghats, Central table-lands and Northern plateaus based on cropping pattern, soil types & rainfall. This study was conducted in this region. For this study, multi stage random sampling procedure was followed for selection of samples. At first, on the basis of highest area and production of cultivation of paddy four districts namely Ganjam, Kalahandi, Bargarh and Mayurbhanj were selected from the four Physiographic zones of Odisha. Secondly, in each selected district, two blocks were selected randomly. Thirdly, from each block two villages were selected randomly. From each village 20 numbers of farmers were selected at random in the ratio of 2:2:1 (marginal, small and large). Thus a total of 320 farmers were selected for the present study. Probit model is used to identify the various socio-economic and farm characteristics influencing the farmer's decision to take part in the market (Egbetokun and Omonona,2012).

Yi = f (Xi, Di)……....(1)

Where,

Yi = Market participation decision by a household

Xi = Continuous factors of market participation decision

Di = Qualitative factors of market participation decision (dummy)

In this study the market participation decision is estimated as Y = 1 if the household participates in output markets and Y = 0 otherwise.

Market Participation= Total value of crop sale /Total value of crop production

"Given the nature of market participation level, the farmers are said to be market participant if their proportion of value sold is more than 75%" (Goletti, 2005; Ohen *et al*., 2013). "Thus, it can be stated that the binary response variable as Y = 1 if the farmer's crop sales exceed a threshold or critical level of Y*(75%) and Y = 0 if Y ≤ Y*. The proportion of crop sold (say, above 75%) out of the total production in the production year can be used as the proxy of market participation during data collection period" (Moyo, 2010).

"Socioeconomic characteristics such as age, education, farm size, ownership of some assets and output were observed to have positive effect on market participation of various agricultural commodities" (Olwande, Mathenge, 2012; Omiti *et al*., 2009; Randela *et al*., 2008). "Following these studies, age, sex, education, farm size, household labor, non-farm income earning activates, access to credit, market information, value of produced crops, income from livestock, and non-farm income are used in Probit model as independent variables" (Osmani AG, Hossain E.2015). As a result, the Probit regression model is structured in the following way to discover the variables that influence market participation decisions:

$$Yi = \beta_0 + \beta_1X_1 + \beta_2X_2 + \beta_3X_3 + \beta_4X_4 + \beta_5X_5 + \beta_6X_6 + \beta_7X_7 + \beta_8X_8 + \beta_9X_9 + \beta_{10}X_{10} + \beta_{11}X_{11} + ui \ldots\ldots\ldots\ldots\ldots\ldots (2)$$

Where,

Yi refers to market participation decision by a household (Y=1, if farmers participate in the market, otherwise Y=0);

X1, X2,…....., X11 are explanatory variables that affect the market participation decision;

β0,……,β11 are parameters to be estimated; and ui is the stochastic disturbance term.

The Probit regression model adds the condition of normally distributed variables that can be formulated as:

Where, $Ii = \beta_0 + \beta_1X_1 + \ldots\ldots\ldots\ldots + \beta_{11}X_{11}$ = utility index (latent variable);

P(Y=1/X) = the probability of market participation;

Z = the standard normal variable, and

F = the standard normal CDF

RESULTS AND DISCUSSION

Table 1: Probit analysis for the decision of market participation by the farmers of Ganjam district

Variables	Coefficient	Std.Err.	Z-value	P >|z|
Sex	0.78	1.38	0.66	0.542
Age	-0.05	0.03	-0.61	0.523
Level of education	1.06***	0.07	-0.51	0.604
Farm size	0.70***	0.21	3.37	0.002
Household labour	-0.06	0.50	2.17	0.040
Non-farm activities	-0.55	0.60	-0.90	0.367
Use of credit	-0.37	0.60	-0.57	0.565
Market information	-0.80	0.63	-0.63	0.535
Non-farm income	-0.0000069	0.0000087	-0.75	0.534
Farm income	0.0000058*	0.0000073	1.78	0.079
Constant	-5.89	2.43	-1.74	
Log likelihood= -28.098735 LR chi2(11) = 83.03				

Prob.>chi2= 0.0000 Pseudo R2= 0.67970				

Note: *, ** and * indicates 1%, 5% and10% level of significance respectively.**

Table 2:Marginal effects of the explanatory variables used to estimate probit regression

Variables	dy/dx	Std.Err.	Z-value	P >|z|	x-bar
Sex	0.082	0.04	0.34	0.542	0.78
Age	-0.001	0.01	-0.51	0.523	36.05
Level of education	0.258***	0.02	-0.62	0.604	4.50
Farm size	0.168***	0.03	2.38	0.001	3.09
Household labour	-0.007	0.09	3.13	0.040	2.19
Non-farm activities	-0.107	0.17	-0.81	0.361	0.31
Use of credit	-0.061	0.10	-0.47	0.567	0.89
Market information	-0.080	0.13	-0.83	0.531	0.43
Non-farm income	-0.000001	0.0000011	-0.93	0.534	31986
Farm income	-0.000001*	0.0000009	1.66	0.078	15673
Observed probability	0.3				
Predicted probability	0.1066888 (at x-bar)				
Log likelihood= -21.072235 Number of obs.= 100 LR chi2(11)= 80.03 Prob.>chi2= 0.0000 Pseudo R2= 0.6750					

Note: *, ** and * indicates 1%, 5% and 10% level of significance respectively.**

The result of probit analysis is presented in the Table 1. From the table, it can be seen that the likelihood ratio statistics as indicated by chi-square statistics are highly significant (P <0.0000), which suggests that the model has a strong explanatory power. The Pseudo R2 is 0.6750 indicates that the specification fits the data well and the variables incorporated in the model explain 67% of the variation in the output variable. It also indicates that the estimated coefficients of the Probit regression shows that the explanatory variables– 'farm size', 'level of education' and 'farm income' positively and significantly influence the farmers' decision to participate.

According to the Probit estimation result in Table 1, the variable "farm size" has a positive impact on households' decisions to participate in the market and is statistically significant at the 1% level. This implies that the likelihood of a decision to commercialise the farm grows with farm size. This could be due to the role of farm size in boosting total production level and thus sales of surplus produce.

The Probit results show that 'level of education' has a positive effect, on the decision of households to participate in the output market. The positive relationship indicates that the increased education level of the household enables access to more information and new opportunities in various markets. This means that the education level of household head is very important in enhancing market participation rate.

The table further shows that 'farm income' is another important variable having significant positive impact on the decision to participate in the output market. It is statistically significant at 10%.

The marginal impacts of each variable on the anticipated probability of market involvement by households are reported in Table 2. A farm household's likelihood of participating in output markets is determined by the marginal effects findings of the Probit regression. According to the Probit regression's marginal effect report, a farmer's likelihood of participating in the output market improves by 17% as the size of his farm expands. According to the marginal effect, as the household's education level increases, there is a probability of about 26% that a farmer will participate in the output market.

Table 3:Probit analysis for the decision of market participation by the farmers of Kalahandi district

Variables	Coefficient	Std.Err.	Z-value	P >|z|
Sex	0.87	1.60	0.78	0.649
Age	-0.03	0.04	-0.91	0.623
Level of education	-0.05	0.08	-0.31	0.704
Farm size	0.70***	0.22	2.51	0.001
Household labour	1.08***	0.50	3.17	0.070
Non-farm activities	-0.56	0.60	-0.81	0.337
Use of credit	-0.34	0.60	-0.97	0.467
Market information	-0.42	0.63	-0.33	0.531
Non-farm income	-0.0000062	0.0000085	-0.74	0.634
Farm income	0.0000047*	0.0000073	1.68	0.068
Constant	-4.27	2.10	-1.98	

Log likelihood= -21.072235 LR chi2(11) = 80.03 Prob.>chi2= 0.0000 Pseudo R2= 0.6550				

Note: *, ** and * indicates 1%, 5% and10% level of significance respectively.**

Table 4: Marginal effects of the explanatory variables used to estimate probit regression

Variables	dy/dx	Std.Err.	Z-value	P >|z|	x-bar
Sex	0.092	0.07	0.64	0.649	0.98
Age	-0.003	0.01	-0.65	0.623	44.08
Level of education	-0.007	0.01	-0.53	0.704	5.40
Farm size	0.128***	0.05	3.31	0.001	4.07
Household labour	0.198**	0.09	2.17	0.070	1.17
Non-farm activities	-0.107	0.12	-0.91	0.337	0.58
Use of credit	-0.061	0.10	-0.57	0.467	0.43
Market information	-0.080	0.14	-0.63	0.531	0.66
Non-farm income	-0.000001	0.0000017	-0.73	0.634	37252
Farm income	-0.000001*	0.0000008	1.86	0.068	10411
Observed probability	0.3				
Predicted probability	0.1066888 (at x-bar)				
Log likelihood=-21.072235 Number of obs.= 100 LR chi2(11)= 80.03Prob.>chi2= 0.0000 Pseudo R2= 0.6550					

Note: *, ** and * indicates 1%, 5% and10% level of significance respectively.**

The result of probit analysis is presented in the Table 3. From the table, it can be seen that the likelihood ratio statistics as indicated by chi-square statistics are highly significant (P <0.0000). The Pseudo R2 is 0.6550 which explains 65% of the variation in the decision of market participation of farmers. Additionally, it shows that the variables "farm size," "household labour," and "farm income" have a positive and significant impact on the farmers' decision to participate in the market, according to the calculated coefficients of the Probit regression.

The Probit estimation result demonstrates that the variable "farm size" is statistically significant at the 1% level and has a favourable impact on households' decisions to participate in the market. This shows that as farm size increases, the likelihood of a commercialization decision also increases. “The result further shows that ‘household labour’ has a positive effect, at a significance level of 1%, on the decision of households to participate in the output market. The sign of the coefficient is positive and it means that if a farm family has more active labour, its probability for taking decision of participating in the output market increases.

The table also shows that ‘farm income’ is another important variable having significantly positive impact on the decision of smallholder farmers to participate in the output market. It is statistically significant at 10% level. This means that farmers’ decision on market entry is related to the amount of farm production” (Osmani AG, Hossain E.2015)..

Each variable's predicted marginal impacts are shown in Table 4. The results of the marginal effects estimates indicate the likelihood that a farm household will engage in output markets. According to the Probit regression's marginal effect report, a farmer's likelihood of participating in the output market improves by 13% as the size of his farm grows. If a farmer is able to secure a mean of one more active household worker, the marginal effect indicates that there is a probability of about 20% that he will participate in the output market.

Table 5: Probit Analysis for the decision of market participation by the farmers ofBargarh district

Variables	Coefficient	Std.Err.	Z-value	P >|z|
Sex	0.65	1.38	0.64	0.342
Age	-0.07	0.03	-0.61	0.323
Level of education	1.03***	0.07	-0.51	0.404
Farm size	0.98***	0.29	3.31	0.001
Household labour	-0.06	0.65	2.17	0.050
Non-farm activities	-0.49	0.69	-0.41	0.471
Use of credit	-0.78	0.60	-0.57	0.467
Market information	-0.88	0.43	-0.83	0.631
Non-farm income	-0.0000090	0.0000084	-0.53	0.334

Farm income	0.0000076*	0.0000073	1.38	0.071
Constant	-5.56	3.40	-1.68	
Log likelihood= -28.098735 LR chi2(11) = 83.03 Prob.>chi2= 0.0000 Pseudo R2= 0.69970				

Note: *, ** and * indicates 1%, 5% and10% level of significance respectively.**

Table 6: Marginal effects of the explanatory variables used to estimate probit regression

Variables	dy/dx	Std.Err.	Z-value	P >|z|	x-bar
Sex	0.092	0.07	0.65	0.342	0.98
Age	-0.003	0.01	-0.61	0.323	44.07
Level of education	-0.197***	0.01	-0.52	0.404	5.45
Farm size	0.138***	0.05	3.32	0.001	4.06
Household labour	0.198	0.08	2.18	0.050	1.17
Non-farm activities	-0.107	0.14	-0.92	0.471	0.58
Use of credit	-0.061	0.10	-0.58	0.467	0.47
Market information	-0.080	0.16	-0.63	0.631	0.66
Non-farm income	-0.000001	0.0000016	-0.73	0.334	37252
Farm income	-0.000001*	0.0000008	1.76	0.071	10411
Observed probability	0.3				
Predicted probability	0.1066888 (at x-bar)				
Log likelihood= -21.072235 Number of obs.= 100 LR chi2(11)= 80.03 Prob.>chi2= 0.0000 Pseudo R2= 0.6950					

Note: *, ** and * indicates 1%, 5% and10% level of significance respectively.**

The result of probit analysis is presented in the Table 5. From the table, it can be seen that the likelihood ratio statistics are highly significant (P <0.0000), suggesting the model has a strong explanatory power. The Pseudo R2 is 0.6950 which explains 69% of the variation in the decision of market participation of farmers. The fact that the explanatory variables "farm size," "level of income," and "farm income" greatly affect the farmers' decision to participate in the market is also indicated by the anticipated coefficients of the Probit regression.

In Table 6, the marginal effects of each variable are reported in table. According to the Probit regression's marginal effect report, a farmer's likelihood of participating in the output market improves by 14% as the size of his farm expands.

Table 7: Probit Analysis for the decision of market participation by the farmers of Mayurbhanj district

Variables	Coefficient	Std.Err.	Z-value	P >|z|
Sex	0.73	1.80	0.70	0.540
Age	-0.02	0.03	-0.61	0.523
Level of education	-0.07	0.07	-0.51	0.605
Farm size	0.50***	0.21	3.31	0.001
Household labour	1.03***	0.50	2.17	0.040
Non-farm activities	-0.59	0.60	-0.91	0.361
Use of credit	-0.34	0.60	-0.57	0.567
Market information	-0.76	0.63	-0.62	0.533
Non-farm income	-0.0000067	0.0000083	-0.74	0.534
Farm income	0.0000089*	0.0000073	1.78	0.077
Constant	-4.36	2.40	-1.77	
Log likelihood= -27.072235 LR chi2(11) = 77.03 Prob.>chi2= 0.0000 Pseudo R2= 0.5850				

Note: *, ** and * indicates 1%, 5% and10% level of significance respectively.**

Table 8: Marginal Effects of the Explanatory Variables Used to Estimate Probit Regression

Variables	dy/dx	Std.Err.	Z-value	P >|z|	x-bar
Sex	0.092	0.07	0.64	0.540	0.98
Age	-0.003	0.01	-0.61	0.523	44.07
Level of education	-0.007	0.01	-0.52	0.604	5.40
Farm size	0.158***	0.05	3.31	0.001	4.07
Household labour	0.258**	0.09	2.17	0.040	1.17
Non-farm activities	-0.107	0.12	-0.91	0.461	0.58
Use of credit	-0.061	0.10	-0.57	0.567	0.43
Market information	-0.080	0.14	-0.63	0.531	0.66
Non-farm income	-0.000002	0.0000014	-0.73	0.534	37252
Farm income	-0.000001*	0.0000007	1.77	0.078	10411
Observed probability	0.3				
Predicted probability	0.1066888 (at x-bar)				
Log likelihood= -21.072235 Number of obs.= 100					
LR chi2(11)= 80.03 Prob.>chi2= 0.0000 Pseudo R2= 0.5850					

Note: *, ** and * indicates 1%, 5% and10% level of significance respectively.**

From the table 7, it can be observed that the likelihood ratio statistics as indicated by chi-square statistics are highly significant (P <0.0000), suggesting the model has a strong explanatory power. The Pseudo R2 is 0.5850 explains 58% of the variation in the decision of market participation of farmers.

It means that the explanatory factors, "farm size," "family labour," and "farm income," positively and significantly influence the farmers' decision to participate in the market, according to the estimated coefficients.

The marginal impacts of each variable are displayed in Table 8. If a farmer's farm size grows, there is a 15% chance that he will participate in the output market, according to the Probit regression's marginal effect report. A farmer's likelihood of participating in the output market is further revealed by the marginal effect to be roughly 25%.

CONCLUSION

From probit analysis we can conclude that the explanatory variables- ‘level of income’, ‘household labour’, ‘farm size’ and ‘farm income’ have positive and significance influence on the farmer’s decision to participate in the market with crop sale. As farm size increases the probability of decision for market participation increases. The likelihood that a farm household will participate in output markets is revealed by the marginal effects of probit regression. If a farmer's farm size expands, there is a 16 percent chance that he will participate in the output market, according to the marginal effect report of the probit regression in Ganjam district. The marginal effect reveals that there is a probability of approximately 25% market participation in the output market if there is increase in education level of the household heads enables access to more information and new opportunities in various markets for their product. The marginal impact estimates for Kalahandi district indicate that a farmer's likelihood of participating in the output market improves by 13% as farm size increases. If a farmer's farm size grows, there is a 14 percent chance that he will participate in the output market, according to the marginal impact results in the Bargarh district. If a farmer's farm size grows, there is a 15% chance that he will participate in the output market, according to the marginal effect report of the probit regression in Mayurbhanj district. If a paddy farmer is able to secure a mean of one additional active household labour, the marginal effects finding indicates that there is a likelihood of about 25% that he will participate in the output market.

Selling of agricultural produce enacts an important role in sustainable development, food security and poverty alleviation mainly in rural areas. Inadequate rice farmers need to improve their cunning through demonstrate different training programme given by extension services. Rice production is directly proportionate to the farmer’s income so that its productivity increased. We can come up with important policy implications by the study. As level of education, farm size, household labour and farm income have significant influence on decision of market participation by farmers policy measure should be directed in this direction. The study recommends that upgrading roads and reduce the transportation cost to promote market participation. Based on this research different policy for rice farmers should be provided by Government. Also Government should improve the necessary activities in rice marketing policy not only enhancing accessibilities for the smallholder rice farmers, but also rice sales and can be developed the market participation of farmer. This study suggests the government to increase the income of paddy grower so that they participate in the market largely. Government should give more attention to the value added product so that they increased their income. In future research, it is necessary to focus on the modern technological development on farmer participation in the market and the innovative factors that influence added value. In view of lower coverage of farmers under MSP Program and more occurrence of distress sale by majority farmers of Odisha, value added products of rice, should be promoted through SHGs, FPOs and MSME units in organized manner. The

study establishes its novelty in carrying out the research in the paddy farmers of Odisha focusing on all the categories of farmers. Earlier the study focused exclusively on small and marginal farmers across various study areas. The study attempts to transcend the scope of research as well as keeps future scope of research open.

Consent

As per international standard or university standard, respondents' written consent has been collected and preserved by the author(s).

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