Determinants of market participation among rural farmers in Mokokchung district, Nagaland: Regression analysis

Sashimatsung

Post-Doctoral Fellow (ICSSR, New Delhi)
Department of Economics, Nagaland University, Lumami

Abstract: *Despite the growth in agricultural market and gradual structural transformation, Nagaland still lacks behind in marketable surplus and market participation. The present study therefore aims to analyse the factors determining market participation among rural households in Mokokchung district, Nagaland. The study found that factors such as area, number of crops grown, income from diversification, storage facility, price, market infrastructure, access to market and farm training were prominent determinants having significant relationship with household market participation significant at 1% probability level.*
Key Words: *Market participation, determinants, rural household, regression*

I.   Introduction

Nagaland, the 16th State of the Indian Union is bounded by Myanmar on the East, Arunachal on the North, Assam on the West, and Manipur on the South. The state is basically an agricultural economy with over 70% of the population depending on agriculture. Traditional Jhum cultivation is the common agricultural practice in the State. Rice, millets, maize and pulses are the major crops of the state. During the last four years, food grain area has increased from 316.20 ha in 2014-15 to 337.20 ha in 2017-18. Simultaneously, the food grain production during the last four years was seen increased from 651.27 MT in 2014-15 to 727.11 MT in 2017-18. During recent times, most rural farmers were diverting towards horticulture and other high value crops that gives a higher level of income in the state (Jamir, 2009). Agricultural production is the means of livelihood for many rural households in the state. So, commercialization of rural farmers in agricultural sector is indispensable. The extent of market participation among rural farmers indicates level of commercialization since the marketed surplus reaches the urban consumers through market participation by the producing farm households (Apind, 2015). The main drawback in the state is the lack of infrastructure development in terms of production and storage, road and transport, network communication and information technology. Although Government of Nagaland focused on commercialization of agriculture as importance policy decision, market participation is still limited. Further studies relating to rural farmers market participation is scanty. The study therefore aims to identify the factors affecting market participation decision among small rural famers in Mokokchung district of Nagaland, India.

II.   Literature Review

Ogunleye and Oladeji (2007) found that majority of cocoa farmers were male (93.3%). About 90% of the cocoa farmers are in the age distribution of 46 years and above, and more than 70% of the farmers have been involved in this cocoa farming for more than 11 years. The factors associated with the choice of market channels are the time of payment, mode of payment, price of product, distance from farm, transportation cost and grading of product.

Geoffrey *et al.* (2013) found that age, gender, education level and pineapple yields significantly influenced pineapple marketing. The study recommends for holistic market participation among pineapple farmers, and proper marketing infrastructure. It suggests policy makers should increase the marketing knowledge and skill of pineapple farmers through mass media, extension service and other means of capacity building.

Omiti *et al.* (2009) in their study confirmed that distance indeed confines rural farmers to the perpetual production of low-value and less perishable commodities, particularly cereals such as maize. It was also established that market information plays a significant role in farmers' decision on how much output to make available to the market depending on the prevailing price and nearness of the specific market outlet. It suggests

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upgrading farm-to-market roads, better equipped retail market centers in the villages and encouraging rural farmers to produce and trade in high-value commodities.

Mustapha, Tanko and Abukari (2017) observed that female farmer, having access to credit, increase in farm size and household size were factors that discourage subsistence farming and encourages market-oriented farming in Kenya. It recommends the promotion of small scale farmer participation in marketing of their produce through improving access to credit, land reallocation and promotion of female farmers' commercial participation.

Osmani and Hossain (2015) in their study from Bangladesh found that farm size, household labour, income from livestock and farm income the main factors that affect the smallholder farmers' decision to participate in the output market. It further suggests development of market infrastructure, provision of marketing incentives to smallholder farmers and development of marketing information service to enhance commercialization of agriculture in Bangladesh.

Enete and Igbokwe (2009) found that access to market, improved market information especially on prices and total production increased market participation, while rising grain prices, younger and less educated heads of households as well as household size encouraged participation for buyers. Their study suggests that improved market access conditions and better market information would stimulate cassava marketed surpluses in sub-Saharan Africa.

Ogunleye (2018) attempts to examine the determinants of market participation among smallholders' rice farmers in major rice producing local government area of Ogun State, Nigeria. The result showed that 89% participated in the output market. The Probit regression results showed farm size, formal education, fertilizer application, land ownership through inheritance and cost of transportation as significant determinants of output market participation. The study recommends importance of fertilizer and land availability, and good transportation facilities in the region.

Achandi and Mujawamariya (2016) showed that the decisions to participate in the market were affected by area, yield, market distance and type of crops grown. It suggests enhancing rice varieties that meet consumer preferences, and good agricultural practices, including the use of fertilizers and other inputs, that can help in increasing yield and thus enhancing market participation.

Awotide, Karimov and Diagne (2016) in their study on market participation in Nigeria observed that gender of household head, access to improved seed, years of formal education, and average rice yield have positive and statistically significant on market participation. It suggests that any increase in the farms welfare will increase participation in the rice output markets.

Apind (2015) in his M.Sc thesis found that household size, off-farm income, grading, group marketing, source of market information, level of output, extension services accessed and access to credit significantly influenced the extent of rice marketing among the farmers in the study area. It suggests better price, market information, extension services and farmer friendly credit institutions to improve market participation in the study area.

Siziba *et al.* (2010) using OLS regression found that ownership of radio, livestock ownership, off-farm income, farm training and price information have positive relationship with market participation, while market distance showed negative impact on market participation.

Kiprop *et al.* (2019) aimed to investigate the role of farmer marketing groups among smallholder farmers in Baringo, Kenya. Their study found that collective action is predominantly determined by education level, household size, distance, cost of transport and price. The extent of market participation was positively related to education level and farm size, while off-farm income and the cost of farming have negative and significant relationship with market participation. The study suggests collective action with increased rural education and infrastructural facilities has the potential to strengthen market participation among smallholder farmers.

Martey, Al-Hassan and Kuwornu (2012) studies show that output price, farm size, access to extension services, market distance and market information determines the extent of commercialization. It further recommends better extension service, business orientation and market infrastructure to increase market participation.

Dessie *et al.* (2019) revealed that variables such as access to extension, yield, experience, off-farm income and market price significantly influenced the marketable supply of red pepper. The study recommends to strengthen local institutions and to develop knowledge, skill and attitudes of farmers and traders on technology adoption, production and marketing of spice in general and particularly in red pepper.

III. Methodology

Data Source: Both primary and secondary data were used in the present study. Secondary data were collected from the both published and unpublished source. Primary data were collected through pre-tested questionnaire. The study was conducted during the agriculture year 2018.

Study Area: Mokokchung district is one of the 12 districts of Nagaland State, India. It covers an area of 1,615 sq. km, and lies between 94.29 and 94.76 degrees longitude and 26.20 and 26.77 degrees latitude located at an elevation of 1326 meters above the sea level. It is bounded by Assam State to its North, Wokha district and Assam State to its West, Tuensang district to its East, and Zunheboto district to its South. The entire district is divided into nine administrative circles viz. Alongkima circle, Changtongya circle, Kupolong circle, Longchem circle, Mangkolemba circle, Chuchuyimlang circle, Ongpangkong North and Ongpankong South circle, and Tuli circle with Mokokchung as the district administrative head quarter. It is the third largest district in the state by population, and fourth largest by area. The district enjoys a salubrious climate between 19°C to 29°C. Heavy rainfall occurs between the months of May and August. September and October months influence occasional showers. The recorded average annual rainfall ranges from 2000 mm-2500 mm in the district.

Sample Design: A multistage purposive sampling technique was adopted for the sample survey. In the first place Mokokchung district was selected and in the second stage administrative circles were identified respectively. In the third stage, atleast one village was selected from each circle. And in the final stage, about 20-25 households were selected from each households involved in market participation. In brief, the study covers 9 administrative circles, 14 villages and 317 households.

Analytical Tools

Multiple Linear Regressions (MLR): The MLR[1] model is defined as:

$$Y_i = \alpha + \beta_1 X_{1i} + \beta_2 X_{2i} + \cdots + \beta_K X_{ki} + U_i$$

Where,

Y – Dependent variable

α – Constant term

β – Coefficients

X – Explanatory variables

U – Stochastic disturbance term

i – Number of observations

Correlation: The Karl Pearson's coefficient[2] of measuring the degree of correlation between two series is described as:

$$r = \frac{\sum xy}{N \sigma_x \sigma_y}$$

Where,

r – Correlation coefficient

x – (X – mean of X)

y – (Y – mean of Y)

σ_x – Standard deviation of series X

σ_y – Standard deviation of series Y

N – Number of observation

IV.   Results and Discussion

The main objective of this study is to determine the factors influencing market participation of rural farmers in Mokokchung district. The predictor variables age, education, household size, area, farm experience, number of crops grown, income from diversification, storage facility, price, market infrastructure, access to market, farm training and off-farm activities were assumed to have association with the predicted outcome.

To examine that there is significant association between the variables, a multiple[3] linear regression analysis was conducted to evaluate the prediction of dependent variable from the expected predictor variables which is presented in Table 1. The expected predictor variables were tested a priori to verify whether there was any violation of the assumptions of multiple linear regressions. As seen from the table, nine variables were found to be positive and significantly contributing to the dependent variable, $(p<\alpha)$ while four other variables viz. age, education, household size and off-farm activities showed expected signs but were statistically insignificant, $(p>\alpha)$. The model as a whole was significant to predict the change in household market participation at 1% level of significance, *F(13, 303)=361.744, p<0.001*. The Adjusted R^2 value was 0.937 which

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[1] Madala & Lahiri (2014). Ibid, p.127; Gujarati et al. (2016). Ibid, P.204

[2] Gupta (2014). Ibid, p.398-399

[3] Multiple linear regression with proportion of out sold, a proxy to market participation keeping all other predictor variables same was run in this model. The resultant outcome was convincing and better fitting the model, and the estimated results were as expected.

indicates 93.7% of the variations in household market participation are accounted by the linear combination of the predictor variables.

In the final model, the slop coefficients of area *(B=.096, t=4.884, p<.001)*, farm experience *(B=.003, t=1.697, p<.10)*, number of crops grown *(B=.051, t=4.160, p<.001)*, income from diversification *(B=.002, t=10.259, p<.001)*, storage facility *(B=.061, t=2.767, p<.006)*, price *(B=.474, t=17.847, p<.001)*, market infrastructure *(B=.045, t=2.550, p<.036)*, access to market *(B=.172, t=7.947, p<.001)* and farm training *(B=.119, t=5.837, p<.001)* showed positive and statistically significant relationship with market participation.

The coefficient for area was positive and statistically significant at 1% level. This implies that a unit change in area will increase market participation by 9.6 percent. This was as expected, since land is a critical production asset having direct bearing on marketable surplus. Martey, Al-Hassan & Kuwornu (2012), Osmani and Hossain (2015), Achandi & Mujawamariya (2016) and Kiprop *et al.* (2019) in their studies also found direct relationship between the farm size and household market participation. The Sr^2 value of .013 indicates 1.3% of the variance is uniquely accounted by area in the dependent variable, ceteris paribus.

The slope coefficient for farm experience showed positive and significant relationship with market participation, statistically significant at 10% level. That is, a unit increase in farm experience will increase market participation by 0.3 percent. Dessie *et al.* (2019) in their study also found a positive relationship between farm experience and market participation.

It is observed that the regression coefficient for number of crops grown have positive and significant relationship with market participation, statistically significant at 1% level. That is, a unit change in this predictor variable the predicted outcome will increase by 5.1 percent. In other words, as number of crops grown increases more crops will be available for sale. Sr^2 value of .059 indicates 5.9% of the variance in market participation is uniquely accounts for by number of crops grown, when all other variables are controlled.

Further regression coefficient for income from diversification showed positive relationship with market participation, and was statistically significant at 1% level. This implies that as income from diversification increases households were more likely to participate in the outlet markets. It inject positivity among rural farmers hence increase market participation. Osmani & Hossain (2015) in their study reported a similar result. Keeping all other variables constant, Sr^2 value of .145 indicates that 14.5% of the variance in market participation is uniquely accounted by income from diversification.

Household having access to storage facilities is expected to have positive impact on market participation. Regression estimates for storage facilities showed positive and significant relationship with market participation, statistically significant at 1% level. This indicates that a unit increase in storage facilities, the expected market participation will increase by 6.1 percent. As storage facility improves will likely to motivate rural farmers to increase output. Further, it reduces the risk of post-harvest loss. The result is in line with the findings of De & Chattopadhyay (2010) and Tefera *et al.* (2011). Keeping all other explanatory variables controlled, the variable storage facility uniquely accounts for 3.9% of the variance in market participation.

As expected, the regression coefficient for price showed positive association with market participation, and was statistically significant at 1% probability level. This indicates that a unit increase in price, the probability of market participation increases by 47.4 percent. Good remunerative price would undoubtedly ensure increase market participation among rural farmers. Enete & Igbokwe (2009), Martey, Al-Hassan & Kuwornu (2012), Dessie *et al.* (2019), Key, Sadoulet & Janvry (2000) and Geoffrey *et al.* (2013) showed positive relationship between the price and the proportion of output sold. Calculated Sr^2 value of .252 indicates 25.2% of the variance in the market participation is uniquely accounted for by price, ceteris paribus.

The regression coefficient for market infrastructure showed significant positive association with market participation, statistically significant at 1% probability level. This indicates that a predicted change in market infrastructure by one unit, the probability of market participation will increase by 4.5 percent. The result contours with the findings of Geoffrey *et al.* (2013), De & Chattopadhyay (2010) and Shilpi & Umali-Deininger (2007). Calculated Sr^2 value explains 3.6% of the variance in market participation is uniquely contributed by market infrastructure, when all other explanatory variables are controlled.

The slope coefficient for access to market showed positive and significant relationship with market participation, statistically significant at 1% level. This indicates that for one unit change in market accessibility, the probability for market participation will increase by 17.2 percent. In other words, respondents having access to market were more likely to participate in marketing as compared to respondents without having access to market. Similar results were reported in their studies by Enete & Igbokwe (2009), Siziba *et al.* (2011) and Achandi & Mujawamariya (2016). The estimated Sr^2 value indicates 11.2% of the variance in market participation is uniquely reported by access to market, ceteris paribus.

Table 1: Estimated multiple regression for determinants of market participation

Variables	Coefficients	Std. Error	t-value	Sr^2
Intercept	.050	.110	.457	-
Age	.002	.002	.947	.013
Education	-.001	.003	-.458	-.006
Household size	-.009	.010	-.921	-.013
Area	.096	.020	4.884*	.069
Farm experience	.003	.002	1.697**	.024
No. of crops grown	.051	.012	4.160*	.059
Income from diversification (ln)	.002	.000	10.259*	.145
Storage facility	.061	.022	2.767*	.039
Price	.474	.027	17.847*	.252
Market infrastructure	.045	.018	2.550*	.036
Access to market	.172	.022	7.947*	.112
Farm training	.119	.020	5.837*	.083
Off-farm activities	-.029	.024	-1.187	-.017

*$p< .01$;**$p< .10$
Adjusted R^2: .937
F: 361.744, $p< .001$
Source: Field Survey, 2018

Further, farm training showed positive and significant ($p<.001$) association with household market participation. This implies that respondents attending farm training were more likely to participate in the output market i.e. by 11.9% more when compared to respondents who did not attend farm training. The result is supported in the findings of Siziba *et al.* (2010) and Ruijs, Schweigman & Lutz (2004). Keeping all other explanatory variables controlled, farm training uniquely accounts for 8.3% of the variance in market participation.

Contrary to earlier expectations the explanatory variables age, education, household size and off-farm activities showed no significant association with market participation, $p>\alpha$. Moreover, education and household size showed negative impact on market participation.

For education, possible explanation could be respondents were mostly with elementary and secondary educations hence did not show any significant impact on market participation. For household size, other members of the households were mostly students therefore, could not contribute to household production activities. Hence, a unit increase in household size has a negative impact on market participation. Regression coefficient for off-farm activities showed negative relationship with market participation. However, the result was statistically insignificant, $p>\alpha$.

V.   Conclusion

From the study it is concluded that area, farm experience, number of crop grown, income from diversification, price, storage facilities, infrastructure, access to market and farm training are prominent factors having significant impact on market participation among rural households in Mokokchung district. Market participation is a critical issue for improving household food security and reducing poverty in a rural place like Mokokchung. The study therefore suggests strategies improving household capacity to improve production and marketed surplus through optimal allocation of existing resources and enhance productivity. Further, promotion of better access to credit facilities and market infrastructure would create financial capacity of rural farmers to purchase required agricultural inputs and other expenses. Considering these socio-economic parameters policy makers should address the problem of market participation among the farmers in the study area.

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