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ORIGINAL RESEARCH ARTICLE

Market participation among smallholder dairy farmers in Oyo State, Nigeria

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ABSTRACT

Despite the involvement of government in dairy production, smallholder dairy farmers in Nigeria are still faced with remarkable marketing related problems which affect the extent of their participation in the agricultural production system. In this study, the determinants of market participation among smallholder farmers in Iseyin local government area of Oyo state were examined. The objectives of the study were to assess the market channel options, participation level and factors/constraints affecting dairy farmers' participation. A multistage sampling procedure was used to select 132 respondents. Data were analyzed using descriptive statistics and Heckman two-stage regression model. The age of dairy farming household was 58±4 years, 96.21% were males and 93.18% were married with an average household size of 8 years and dairy experience of 37±5 years. While household size (β = 1.16), land size (β = 0.71), educational status (β = -0.47) and contact with extension agents (β = -2.11) influenced market participation of the dairy farmers, herd size (β = 5.50) and dairy farming experience (β = 1.66) influenced the extent of participation. Milk quality, fluctuating prices of milk, market risk and poor motivation from government were the most pressing constraints faced by these farmers. An evaluation of existing educational policy on farmers needs to be embarked upon while the capacity of extension services should be improved.

Keywords: Smallholder dairy farmers, Market Participation, Dairy production

INTRODUCTION

Agriculture still plays an important role in the Nigerian economy though the contribution is quite low as compared to other non-agricultural products especially petroleum. However the unstable trend in its contribution to the GDP in terms of real growth and development, input of agriculture cannot be relegated to the background (NBS, 2013). Nigeria is the leading livestock producer in Central and West Africa with a population of 34.5million goats, 22.1million sheep, 100 million poultry and cattle herds estimated at over 16 million (FAO, 2011). Dairy farming which forms a part of the livestock sector encompasses breeding and management of the dairy cattle for the production of milk and various dairy products such as cheese, cream, yoghurt, butter etc. The Central Bank of Nigeria (2010) reported that Nigeria is the largest producer of milk in West Africa and the third largest cow milk producers in Africa with about 900,000 milking cows. The report further revealed that total domestic milk production was estimated at 1.3 billion litres which is valued at about $3 billion in 2006, but only 600,000 liters (valued $1.5 million) entered into the formal market while the remaining volume of milk was either consumed within families or traded informally among the producing communities.

Unfortunately, despite the potentials of this sector to the Nigerian agricultural economy, the country is still a net importer of milk (Nzeka 2007). The market participation of local dairy farmers in Nigeria without the exception of Oyo state have been on the decrease owing to various constraints ranging from poor infrastructure, lack of market information and lack of improved technology (Oyediji, 2013). Furthermore, Foraminifera (2010) has shown in a markets research that local production of milk is less than 1% of the total annual demand and this has been estimated at 1.45 billion litres, making the total milk consumption in Nigeria (Oyo state inclusive) less than 10 litres per head whereas the global average is about 40 litres per head. This is due to the underdevelopment of the Nigerian dairy sector, neglect and non-encouragement of the local dairy farmers whose participation in the market

will not only help increase agricultural production but also set opportunities for income generation for both the farmers and Nigeria at large.Over the years, studies have examined increasing agricultural productivity, efficiency and promoting sustainable intensification for small-scale dairy farmers (Annatte, 2006; Ayanwuyi *et al.,* 2012; Ogunniyi *et al*., 2014) with little attention paid to the level of market participation. The few studies such as Alene *et al*. (2008) and Shittu (2008) that examined market participation of farmers in Kenya and Sokoto state, Nigeria underestimated the problem of selection bias. This study therefore controlled for the problem using the Heckman Selection model.

This study also provided empirical information on the factors that affect the extent of market participation among the dairy farmers and suggested appropriate interventions that could be put in place by policy makers to militate against low participation in markets by dairy farmers in Oyo state.

MATERIALS AND METHODS

Study Area

Oyo state approximately has a land area of 28,454 square kilometres, it lies between latitude 8° 11 N and longitude 3° E. It has an estimated total population of 6,617,720 (National Population Commission, 2007) with a population density of 211 people per square kilometres and its population makes up 4% of the Nigeria's total population. Iseyin is located in the western part of Oyo State, approximately 100 kilometres north of Ibadan. The city is estimated to have a population of 236,000.

Sampling technique

A multistage sampling technique was employed for this study. The first stage involved the purposive selection of Iseyin local government due to the abundance of cattle, and its potential in terms of milk production, processing and marketing in Oyo state. The second stage involved the random selection of five wards out of the 11 wards in the local government as delineated by Nigerian Population Commission (NPC, 2007). The third stage involved the random selection of 2 villages from each of the wards selected. In the final stage, 132dairy farmers were randomly selected for the study.

Sources and Method of Data Collection

Primary data were collected for the purpose of the study using a well-structured questionnaire administered to smallholder dairy farmers in the study area and also by personally interviewing the head of households using a well-structured schedule. Data that were sought include socio economic characteristics (such as age, sex, level of education, marital status, household size, occupation e.t.c), labour cost, ownership of vehicles, access to credit and membership in groups, institutional factors (like distance to market, access to information and contact with extension workers) and existing constraints.

Method of analysis

Descriptive statistics (percentages and frequencies) was used to analyze the socio-economic characteristics (gender, household size, education, asset endowment, institutional services such as credit, extension, etc) of the small holder dairy farmers. A two-step analytical approach (Heckman, 1990) consisting of a probit and an ordinary least squares regression was used and this combined the decision to participate and the intensity of participation in the markets. The Heckman model deals with a sample selection problem by computing a selection term from the first equation and including it as a regressor to correct for self-selection in the second stage. This model predicts the probability that an individual household participate or does not in the market oriented system, and the Inverse Mills Ratio (IMR) is obtained. The Ordinary Least Squares (OLS) regression equation including the IMR (λ) as a regressor is estimated for the volume of milk sold. The purpose of the IMR is to account for sample selection in the study so that the estimates would be unbiased. The second equation is referred to as the outcome equation. It is estimated using the OLS. The first and the second models incorporate the same variables except that the second model includes some other variables suggested by (Wooldridge, 2006) as exclusion restriction variables.

$$Pr\left(Z_I = {}^{1}/_{W_i, a}\right) = \varphi\left(h(w_{i,}a)\right) + \sum i \text{ -- (1)}$$

where Z_i is an indicator variable equal to unity for households that own livestock, the w is a vector of factors affecting market participation, the α is a vector of coefficients to be estimated. φ is the standard normal cumulative distribution function, , and εi is the error term assumed to be distributed normally with a mean of zero and a variance σ^2. The variable Z_i takes the value of 1 if the marginal utility the household i gets from participating in market is greater than zero, and zero otherwise. So we have:

$$Z_i = \alpha w_i + v_i \quad \text{--- (2)}$$

Where Z_i is the latent level of utility the household gets from livestock ownership (i.e., market participation, $v_i \sim N(0,1)$

$Z_i = 1 \; if \; Z_i > 0$ -- (3)

$Z_i = 0 \; if \; Z_i \leq 0$ -- (4)

In the second step, the inverse of mills ratio (IMR) is added as a repressor in the sales function regarding level of participation in order to correct for potential selection bias. If only the households who participate in the market are included in the second step, the IMR is computed as following

$$\lambda = \Phi \frac{(h(wi,\alpha)}{\Phi(wi,\alpha)} \text{ ----- (5)}$$

Where Φ is the normal probability density function. The second-stage (sales) equation is then given by:

$$E\left(Y_i / Z = 1\right) = f(X_i, \beta) + \gamma \frac{\varphi(h(w_i \alpha))}{\varphi(W_i \propto)} \text{ --- (6)}$$

Where E is the expectation operator, Y is the (continuous) extent of market participation, or sales, x is a vector of independent variables affecting sales, and β is the vector of the corresponding coefficients to be estimated.

So *Yi* can be expressed as following:

$$Y_i * = \beta x_i + \gamma \lambda_i + u_i \text{ --- (7)}$$

Where $u_i \sim N(0, \sigma_u)$. Y_i is only observed for cattle owners (*Zi*= 1), in which case $Y_i = Y_i$. The market participation regression and the milk sales regression were jointly estimated by full maximum likelihood using the Heckman procedure in STATA

Table 1: Hypothesized Factors influencing Market Participation.

X_1 = age	X_1 = Age
X_2 = Household size	X_2= Household size
X_3 = Education status	X_3= Education status
X_4 = Herd size	X_4 = Land size
X_5 = Land size	X_5 = Dairy experience
X_6 = Dairy experience	X_6 =Extension agent visit
X_7 = Extension agent visit	X_7= membership of association (yes = 1, otherwise = 0).
X_8= collection centre proximity	

Table 2: Socio- Economic Characteristics of Respondents

Variables	Frequency	Percentage
Gender		
Male	127	96.21
Female	5	3.79
Marital status		
Single	4	3.03
Married	123	93.18
Widowed	5	3.79
Educational status		
No Formal education	83	69.75
Primary	28	23.53
Secondary	7	5.88
Tertiary	1	0.84
Primary occupation		
Cattle rarer	128	99.22
Crop	1	0.78
Less than 30 years	3	2.21
Age		
30-45 years	4	2.94
46-60 years	69	50.74
Greater than 60	60	44.11
Market channels		
Local Market	92	69.70
Contract Selling	37	28.03
Farm gate	3	2.27

Exogenous variables used in the regression model

The following are the independent variables used in 1st and 2nd stages hypothesized as determining factors affecting market participation and the level of market participation respectively.

Result and Discussion

The socioeconomics characteristics of the dairy farmers are presented in Table 2. Majority of the dairy farmers (96.2%) were male with about 50.7% within the age group of 46-60 years.A large number of the respondents were married (93.18%). Among the dairy farmers in the study area, education was very low as majority of the farmers (69.75%) had no formal education. More than half (69.70%) of the respondents made use of local market channel as medium of selling their produce. The primary occupation of majority (99.22%) of the respondents was cattle rearing.

Constraints towards Market Participation

In examining the pertinent constraints towards effective market participation, milk quality standards, prices of milk, access to credit facilities, marketing risk and poor motivation from government were found to be the major constraints militating against dairy farmer's market participation in the study area. Furthermore, it was found that for majority of the dairy farmers, nearness to market (55.30%), high transportation cost (65.91%), lack of marketing information (57.96%), limited number of collection centers (57.58%), lack of improved technology (61.54%), lack of labor (71.21%) and high cost of production (73.85%) did not serve as constraints to their participation in markets. This is in line with the findings of Shittu, 2008.

Table 3: Distribution of Respondents Based on Constraints

Constraints	Yes		No	
	Frequency	Percentage	Frequency	Percentage
Nearness to market	59	44.70	73	55.30
High transport cost	45	34/09	87	65.91
Milk quality standard	80	60.61	52	39.39
Lack of marketing information	55	42.31	75	57.69
Pricing of milk	92	70.23	39	29.77
Access to Credit	80	62.99	47	37.01
Limited numbers of collection centres	56	42.42	76	57.58
Lack of improved technology	50	38.46	80	61.54
Marketing risk	98	74.81	33	25.19
Access to resources	62	48.44	66	51.56
Lack of government support	99	75.00	33	25.00
Lack of Labour	38	28.79	94	71.21
High cost of production	34	26.15	96	73.85

Table 4: 1st and 2nd stage Heckman Regression Model Results.

Variables	Coefficient	t-value	p-value	Variable	Coefficient	t-value	p-value
Age	-0.00	-0.01	0.990	**Age**	0.13	0.10	0.92
Household size	1.16	1.76***	0.078	**Household size**	5.28	1.80***	0.07
Educational status	-0.47	-1.73***	0.084	**Educational years**	-0.49	-0.21	0.84
Herd size	-0.03	-1.11	0.266	**Herd size**	5.50	3.85*	0.00
Land size	0.71	1.98**	0.048	**Land size**	10.16	2.96*	0.00
Dairy experience	0.01	0.35	0.750	**Dairy experience**	1.66	2.96*	0.00
Extension agent visit	-2.11	1.76**	0.079	**Extension agent visit**	-13.89	-0.73	0.47
Collection centre proximity	0.47	1.35	0.17	**Credit accessibility**	52.10	1.34	0.18
				Membership of society	-1.04	-0.06	0.95

*Source: Field Survey2014 * Significant at 1% ** significant at 5% ***significant at 10%.*

Factors influencing the decision to participate and extent of participation in market

The results of the Heckman selection model used to estimate factors influencing the decision to participate and level of participation in market are shown in Table 4. Household size was found to positively influence the decision of market participation of the dairy farmer. By implication, a unit increase in the household size, increase the decision of the dairy farmers to participate in market by 1.16 units. It is expected that an increase in the level of education should increases the probability of farmers to participate in market as it will help farmers develop better skills and ability to analyze market situations. However, contrary to expectation education had a negative influence on farmer's participation as an increase in the number of educated dairy farmers decreased the probability of participating in markets by 0.47 units. This could be attributed to low level of education in the study area (see Table 1). Furthermore, a unit increases in land size increase the likelihood of participating by 0.71 units while a marginal increase in dairy experience increased the probability of market participation by 1.66 units. This is in line with the findings of Lawrence *et al*, 2014.

The second stage of the Heckman selection model estimated the extent of participation of dairy farmers in the study area. Household size, herd size, land size and dairy farming experience were the statistically significant variables that determined the extent of market participation of the dairy farmers. Household size was found to increase the extent of participation by 5.24 units. This implies that household members might be a source of labor which can enhance the productivity and then further increase the extent of participation. The estimates also revealed that a unit increase in the herd size increased the rate of participation of dairy farmers by 5.50 units. Land size and dairy experience also had a positive relationship with the extent of participation at one percent level of significance. An increase in the available land for rearing cattle and years of experience among the dairy farmers increased the extent of market participation of the farmers by 10.16 and 1.66 units, respectively. This is consistent with the findings of Ohen (2013).

CONCLUSION AND RECOMMENDATION

Household size, land size, herd size and dairy experience were identified as factors affecting dairy farmer's participation and their extent of participation. Also farmers were affected by some constraints that hindered their market participation rate. The constraints include milk quality standard, pricing of milk, access to credit facilities, marketing risks and poor motivation from the government. Market participation is therefore crucial to improving local dairy production, developing

the local dairy industry and reducing the importation of dairy products. This in turn will help increase farmers income and improve the welfare of dairy farmers. It is therefore necessary to develop and improve the production and market participation of the dairy farmers in order to meet the demand for dairy products in Nigeria and reduce importation the importation of these products. This would involve reviewing existing educational policy as far as farmers are concerned, improving market infrastructure, increasing the numbers of milk collection centers and creation of comfortable environment for processing and marketing milk products. Extension worker-farmer ratio should be improved to enhance better service delivery by the agents.This will foster dissemination of information and the farmers can easily adapt to the new techniques and innovation.

Conflict of interest: Authors declare that no competing interests exist.

References

Alene A.D, Manyong VM, OmanyaG,Mignouna HD, BokangaM,Odhiambo G (2008). Smallholder market participation under Transactions costs: Maize supply and fertilizer demand in Kenya.*Food Pol. 33(4):318-28*.

Annatte and Ogundipe (2006).Study of Benefits and Costs of Kaduna Pilot Dairy Project, Nigeria.

Ayanwuyi, Emmanuel, Adedeji, Tosin Ademola, Olatilewa Mufuiliatu (2012).Contribution of dairy farming to household welfare in Edu local government area of Kwara state, Nigeria.

Central Bank of Nigeria (2010):Annual report 2010. CBN, Lagos, Nigeria.

FAO (Food and Agriculture Organization of the United Nations).2011. Agricultural development

Forminifera Market Research (2010): Investment Opportunities in Nigeria.

Heckman, J., (1990) Varieties of selection bias. American Economic ReviewPapers and Proceedings 80 313-318.

Lawrence Olusola, OparindeAdebiyi ,GregoryDaramola (2014), Determinants of Market Participation by Maize Farmers in Ondo State, Nigeria.*Livestock Research for Rural Development 26 (7) 2014*.

National Population Censor (2007): Annual Report of the National Censor 2007.

NBS {Nigeria Bureau of Statistics} (2013). Annual Report of General Household and National Survey

Nzeka (2007), Nigeria Market Development Reports Nigeria's Dairy Market Participation of Rural People in Dairy Enterprise in a Selected Area of Bangladesh

Ogunniyi L. T., Adepoju A. A., Olagunju F. I., Ojedokun I. K. And Ganiyu M. O.(2014).Efficiency and Livestock Production in Oyo State of Nigeria.*AnimSciAdv2014, 4(1): 690-698*

Ohen, S. B(2013),Analysis of Market Participation by Rice Farmers in Southern Nigeria

Shittu , A.U. Junaidu, U.M. Chafe, A.A. Magaji1, O.O. Faleke1, M.D. Salihu, A. Jibril, M.A. Mahmud (2008).A survey on current milk production and pricing in Sokoto state, Nigeria.