

Economic determinants of rice marketing decisions among smallholder rural farming households, Federal Capital Territory, Nigeria

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Abstract

This study determined the economic determinants of rice marketing decisions among smallholder rural farming households, Federal Capital Territory, Nigeria. Data were obtained from primary source for this study. Data were collected through the use of well-structured questionnaire. The questionnaires were administered to two hundred and seven (207) smallholder rural rice farming households. Multi-stage sampling technique was adopted. Data were analyzed using Descriptive Statistics, Heckman Two Stage Model (Probit Model, and (OLS) Regression). The results of the Heckman two stage selection equation Probit model in the first stage revealed that educational level of the household head ($P<0.05$), farm size ($P<0.01$), extension services ($P<0.05$), price information ($P<0.01$), and marketing experience ($P<0.01$) were among the significant factors influencing market participation. The results of the second stage OLS model showed that the significant factors influencing the extent of market participation regarding how much quantity of rice sold in a given market include: education of the household head ($P<0.10$), quantity of rice output harvested ($P<0.01$), and expected price of rice output ($P<0.05$). The coefficient of the multiple determinations (R^2) was 0.849. This showed that the exogenous or explanatory variables included in the model explained about 85% variations in the quantity of rice sold in a given market. This study therefore, recommends that; smallholder farmers should be encouraged by providing them with credit facilities to influence their decision to produce marketable surplus to enable them participate in rice marketing, new innovations and technology that targets increased productivity should be promoted, provision of adequate extension officers is needed, input market supply for storage facilities should be made accessible to farmers, provision of rice processing equipment should be made available, effort to empower women should be designed, contract marketing should be encouraged, and information dissemination via communication devices for increased market participation and increased value sold among rice farmers should be a priority to eradicate poverty and improve livelihood of smallholder farmers. The study also provides insight into required policies and actions to be taken by government and NGOs to encourage market participation, eradicate poverty, provide food security and improve livelihood among smallholder rural rice farming households.

Keywords: Determinants, Rice, Marketing, Decisions, Smallholder farmers, Heckman two stage

INTRODUCTION

Agriculture employs the largest part of labour in many sub-Saharan African (SSA), with the appreciable potential for improving food security and poverty reduction (World Bank, 2008). It employs about 62% of the population of Sub-Saharan

Africa and generates 27% of GDP for the African countries, with most of the poor people living in villages (FAO, 2006; World Bank, 2008). In Nigeria, agricultural sector is the main stay of the economy providing primary means of employment and contributes about 60% to the nation's (GDP) (FAO, 2009).

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It provides about 100% of Nigerian food's requirements, raw materials to industries, and foreign exchange earnings for the country amongst others (Abu et al., 2001). The agricultural sector is characterized and made up of high number of smallholder farmers' participation and provides a source of income and the only means of livelihood to about 80% of the population (World Bank, 2008). Thus, the agricultural sector has influence on the income of rural farmers, it minimizes poverty, and provides food security to the vulnerable group of persons. Research has shown that about 70 percent of the rural poor smallholder farming households living in SSA depends on agriculture for provision of livelihood and food security for the family directly or indirectly (IFAD, 2012). The agricultural sector is also linked with other sectors like processing industries and other factor markets (land, labour and capital). Much involvement in agriculture by smallholder farmers reduces food prices and also provides benefit for the poor people living in urban areas (Pender and Dawit, 2007). Agricultural marketing plays important and significant role in the area of production, consumption of products and the entire economy in general (Mirie and Zemedu, 2018). Rice (*Oryza sativa L.*) is the world's most valuable and important food product, as research has shown that about three billion people world-wide consume rice every day and that the increasing rate of consumption makes most countries import dependent on rice including Nigeria (Agbogo et al., 2013). Research revealed that the nutritional content of rice contains 27% of the dietary energy supply and 20% of the protein intake (Edoka et al. 2009). Rice is mostly used in the preparation of different kinds of local dishes that are cooked and eaten in almost every home, especially during the period of festivities and ceremonial occasions (Ekeleme et al. 2008). Rice marketing comprises of all the activities involved in moving rice from the farm gate to final consumers (Bassey et al, 2013). Asogwa and Okwoche (2012) argued that marketing covers all business functions including production and production decision such that decisions on variety of crops to grow and sale are marketing decisions. Most smallholder farmers' activities that involved decisions about farm operations starts with the family as a planning center for deliberations about decisions and all the process of implementation of all the planned decisions. Most of the marketing decisions by small-holder farmers are regarding whether the farmers will sell their farm produce or not to sell at all and how much quantity of rice output to be taken to the market for sell (Ekeleme et al,2008). These types of decisions making will determine the market participation level among small-holder farmers. Policy formulation for commercial transformation of smallholder farmers are often targeted in order to promote smallholder farmers' involvement in marketing activities (Gebremedhin and Jaleta, 2013). Salami and Brixionva (2010) asserted that improved market participation by smallholder farming households is a key precondition for transformation of agricultural sector from small scale agriculture to large scale agricultural production. Commercialization of agriculture can help in addressing the issue of poverty and the challenges of income that is confronting majority of the smallholder rice farming households in the rural areas (Alene et al., 2008). With liberalization of rice sector, farmers will be able to make a useful decision that may lead to increase in output and their market participation, and therefore make them to sell their rice at the various available market outlets (Alene et al,2008).

Barret (2008) reported that accumulation of private assets by smallholder farmers, provision of functional public infrastructure facilities and services are the major rudimentary prerequisites that smallholder farmers in rural area need to have in place to enable them to shift from subsistence or small scale level of production to large scale of production and have marketable surplus for sale. Farmers' choice of market channel is a very important aspect in market participation decision. Smallholder farmers have many alternative market channels where they can choose for selling their agricultural produce (USAID, 2010). Increasing participation in agricultural markets is one of the key factor to lift rural households out of poverty in Sub-Saharan African countries (Heltberg and Tarp 2002; Balagtas and Coulibaly, 2007). Rural farming households are thus the main focus for food security and poverty alleviation policies formulation. Despite these, smallholder farmers' participation in rice market is low due to various challenges (Makhura, 2001). Therefore, it is important to note that the determinants influencing farmers' market participation behavior in order to take appropriate policy actions. Smallholder farming households are facing problems on how to have physical access to markets and also lack adequate information about market (Magingxa and Kamar, 2003). However, according to (Mirie and Zemedu, 2018), smallholder farmers could not have access to information, other services, adequate mechanization, technological knowhow and access to capital. These factors hinder them from having large capacity to produce surpluses and participate in marketing effectively (Bonabana, 2013). The weak performance and inappropriate operation of the agricultural markets has been observed to be the major challenges that brought hindrances to the development of agriculture and the economy in general. Most of the farmers that are involved in old and traditional method of rice production depend generally on informal markets and local markets due to weak or lack of proper linkages with the available formal markets which will fetch them profitable income. The level of participation rate among smallholder farmers in the rice market remains low due to numerous constraints beyond their control (Makura, 2002). According to (Torero,2011) due to small surpluses in production by smallholder farmers they are also generally exposed to a higher level of degree of transactional costs and risks involved. Most of the smallholder rural farmers sell their produce at farm gate and nearby village markets. Their decisions on the quantity of output to sell are mostly influenced by marketing information, prices of the produce, and distance measured in kilometers to the market (Omiti et al.,2009). However, other drawback for smallholder farmers in the rural area is that most of them lack knowledge on agricultural marketing and as a result of the constraints, most of the crops produced are sold at lower prices at farm gate, village market or in local markets (Gyau et al.,2006). Non-guaranteed access to markets for farm produce and inability to acquire of farm inputs is also another major challenge confronting the smallholder farming households in the rural areas (Gyau et al,2006). Countries that has highest number of smallholder farmers are classified among low-income countries (Lowder et al, 2016). Smallholder farmers usually encounter two major decisions, the desire to meet up with food security requirements for the family and the quest to produce enough marketable surpluses, these small holder farmers are not only considered as small scale and their

subsistence production level but they are also characterized by lack of linkage to market information system outside their communities where they live. Previous studies indicate that smallholder farming households always find it difficult to participate in rice markets due so many challenges that reduce their access to incentives for market participation, which may be clearly reflected in hidden charges that create more bottle necks in accessing markets and production assets more difficult (Makhura *et al.*, 2001). Most of the rural farmers lack adequate means to surmount the costs of entering the rice market, such as assets, and access to information (Barrett, 2008; Uchezuba *et al.*, 2009). Barret (2008), postulate that ability to private asset accumulation, access to public infrastructure, and available services are the prerequisites for smallholder farmers to move from subsistence level of production to commercial level that will make them produce marketable surplus. Effects of market participation are likely to be heterogeneous in nature, which suggest that not all participants may benefit in the same way from market participation (Kassie., 2014). Increase in profitability for farmers as a result of making appropriate marketing decisions may lead them to alter their perception toward large production, invest in more productive assets, adopt new agricultural innovations and trending technologies that will improve household welfare (Jensen, 2010).

Agricultural produce from smallholder farmers in Nigeria often suffer lost after harvest due to poor postharvest management, spoilage unavailability of storage facilities, and inability to access good markets for their produce. This is occurring mainly because reasonable number of smallholder rice farmers are facing technical challenges which involves socio- economic and institutional factors that are influencing market participation. Marketing infrastructure in rural areas is poorly developed, most of the smallholder farmers could not have support from various organizations that serve as their representatives and serve them (Ohen *et al.*, 2013). As a result of these numerous factors lack of incentives reduces smallholder farmers' participation in formal markets. Because of the reduction in formal market participation among small holder farmers, it makes it difficult for these farmers to migrate from subsistence to commercial level of farming and thus, it leads to decline in economic development. Specifically, Information on the extent to which institutional, socio-economic, and technical factors influence the marketing decisions among smallholder rice farmers in Federal Capital Territory, Nigeria are lacking. To increase market participation and incomes of the smallholder rural households will require understanding about the factors that are influencing smallholder market participation and the level of participation among the farmers. However, very few literatures show empirically studies that investigated the some of the factors influencing smallholder rice farmers' market participation in Nigeria just as other Countries in SSA (Rios *et al.*, 2009; Asfaw., 2012). The inadequacy of information regarding the extent of market participation among smallholder farmers is the main basis for this study. The study attempt to fill the knowledge gaps. Hence, the purpose of this study is to analyze economic determinants of rice marketing decisions among smallholder rural farming households in Federal Capital Territory, Nigeria.

Research Questions

This research work provided answers to the following research questions;

- (i) What are the socioeconomic characteristics of the sampled rice farmers in the Federal Capital Territory?
- (ii) What are the factors influencing smallholder rice farmers' decisions to participate in rice marketing?
- (iii) What are the determinants of rice farmers' household's decision regarding how much rice to sell in a given market?

Objectives of the Study

The broad objective of this study was to analyze the economic determinants of rice marketing decisions among smallholder rural farming households in Federal Capital Territory, Nigeria. The specific objectives were to:

- (i) identify the socioeconomic characteristics of the sampled rice farmers in Abuja, Nigeria
- (ii) evaluate the factors influencing the smallholder rice farmers' decision to participate in rice marketing,
- (iii) evaluate the determinants of rice farmers' household's decision regarding how much rice to sell in a given market,

MATERIAL AND METHODS

The study area

This study was conducted in Federal Capital Territory, Nigeria. Federal Capital Territory was created and carved out in 1976 from the Kaduna, Niger, Kwara and Plateau States. Federal Capital Territory has a boundary with Kaduna State to North and Kogi State to the South. It is also bounded to the East and West by Nasarawa and Niger States respectively. There are six Area Councils in FCT, namely: Abaji, Bwari, Gwagwalada, Kuje, Kwali and Abuja Municipal Area Councils (Figure 4). Abuja is located within Latitudes 7° 20' North of Equator and Longitudes 7° 45' and 8° 39'. It lies on 416m above sea level, the city has a tropical climate in winter there is much less rainfall than in summer. The average annual temperature is 26.1 °c. In a year, the average rainfall is 1331mm and average humidity of 34%. Abuja has total land area of about 8,000 Sq Kilometers with a total population of 776,298 people as at the 2006 census (NPC, 2006). It is predominantly characterized by grassy savannah region, thus it has potentials to produce both root crops and tubers such as yam and cassava. It can also produce and sustains legumes such as (groundnut & cowpea); and other grains (maize, sorghum & rice); seeds and nuts (melon seeds & benniseed); fruits and vegetable. Beside crop production, the rural communities in the federal Capital Territory also rear livestock such as sheep, goat, pigs, cattle and poultry birds at subsistence and commercial level. The main vegetation of the study area is Guinea-savannah (Dawan, 2000)

Sampling technique and sample size

Sampling of the area involved purposive selection of FCT, due to the concentration of rice farming in the area, and proximity of the area to the base of the researcher. Sampling of the respondents was done using a Multi-stage sampling technique. First stage, two (2) area councils were selected using simple random sampling technique, the six (6) area

councils were written on a piece of paper placed in a box, the papers were well shuffled, out of the six (6), two (2) area councils were picked and selected. The area councils selected were: Kuje and Kwali. Second stage, a simple random sampling technique was used to select three (3) from ten (10) wards from each area council. Third stage, a simple random and proportionate sampling technique was used. The simple random sample was accomplished using a Table of random

numbers. The probability proportionates to the sample size sampling technique as used by Cochran (1977) was adopted. A total sample frame of 5,400 farmers were available, and a total sample size of 207 respondents as calculated from equation 1 and shown in Table 01 were selected for interview. The required sample size (207) was determined as used by Cochran (1977), Mugenda and Mugenda (2003) is shown below:

$$n = \frac{pqZ^2}{e^2} = 207 \dots \dots \dots (1)$$

Where,
 n= Sample Size
 p=0.16
 q=0.84
 Z=1.96(α = 0.05)
 e = 0.05 Allowable Error

Method of data collection

Primary data were used. Data were collected with the use of questionnaires. The questionnaire was pre-tested on selected farmers to evaluate the appropriateness of the design, clarity, and relevance of the questions. The appropriate modifications were made on the pre-tested questionnaire in order to capture the relevant information related to the study objectives. The questionnaire was validated and appropriate reliability test was carried out. Five (5) enumerators were recruited and trained on the content of the questionnaire and interviewing process. In each of the Area Council, two (2) Agricultural Extension Agents who are familiar with the geographic and socio-economic characteristics of the people was recruited, trained and mobilized as enumerators. Thereafter, Primary data were collected through the administration of structured questionnaire by a team of trained enumerators to 207 sampled smallholder rice farming households in the study area.

SPSS version 20 and STATA version 12 computer application programs were used to process the data. Descriptive statistics and Inferential statistics or econometric analysis were used for analyzing the collected data from the field. The following analytical tools were used to achieve the stated objectives of the study:

- (i) Descriptive Statistics
- (ii) Heckman Two Stage Model
 - (a) Probit Model Analysis
 - (b) Ordinary Least Squares (OLS) Regression
- (iii) T- Test Analysis
- (iv) Z- Test Analysis

Descriptive statistics

In order to characterize the socioeconomic characteristics of the sampled respondents, descriptive statistics were employed to have summary description of the data collected such as means, minimum and maximum values, frequencies distribution, percentages and standard deviations were used to classify, describe and examine farmers socio-economic, and market characteristics of the smallholder rice farming households.

Method of data analysis

Data collected from the field were collated, edited, coded, and cleaned to ensure consistency, uniformity, and accuracy. Data were entered into computer software for analysis. Both

Heckman two-stage model

(a) Probit Model Analysis

The Probit Model is stated thus:

$$Y = f(X_1, X_2, X_3, X_4, X_5, X_6, X_7, X_8, X_9, X_{10}, X_{11}, X_{12}, X_{13}, X_{14}, X_{15}, U_i) \dots \dots \dots (2)$$

$$Y_i = b_0 + \sum_{i=1}^{15} b_i X_i + e_i \dots \dots \dots (3)$$

The explicit function is stated thus:

$$Y_i = b_0 + b_1 X_1 \dots \dots + b_{15} X_{15} + e_i \dots \dots \dots (4)$$

$$Y_{ij} = \alpha_0 + \alpha_1 X_1 + \alpha_2 X_2 + \alpha_3 X_3 + \alpha_4 X_4 + \alpha_5 X_5 + \alpha_6 X_6 + \alpha_7 X_7 + \alpha_8 X_8 + \alpha_9 X_9 + \alpha_{10} X_{10} + \alpha_{11} X_{11} + \alpha_{12} X_{12} + \alpha_{13} X_{13} + \alpha_{14} X_{14} + \alpha_{15} X_{15} + e_i \dots \dots \dots (5)$$

Where,
 Y_i =Dichotomous Response Variable (1, if Respondents Sell Rice in a given Market; 0, Otherwise)
 X₁ = Age of Household Head (Years)
 X₂ = Gender Dummy (1, Male; 0, Female)
 X₃ = Educational Level (Number of Years Spent in School)
 X₄ = Household Size (Number of Persons)

X₅ = Household Income (Naira)
 X₆ = Expected Price of Output (Naira)
 X₇ = Farm Size (Hectares)
 X₈ =Access Credit Dummy (1, Yes; 0, Otherwise)
 X₉ = Extension Services Dummy (Number of Extension Contact in a Month)
 X₁₀ = Primary Occupation (1, Farmer;2, Businessman; 3, Employed)

X_{11} = Ownership of Bicycle (1, Yes; 0, Otherwise)
 X_{12} = Price Information Dummy (1, Yes; 0, Otherwise)
 X_{13} = Quantity Harvested (Rice Output) (Kg)
 X_{14} = Market Cooperative Organization Dummy (1, Yes; 0, Otherwise)
 X_{15} = Marketing Experience (Years)
 b_0 = Constant Term
 $b_0 - b_{15}$ = Regression Coefficients
 e_i = Error Term
 This was used to achieve specific objective one (i)
The Inverse Mill Ratio (IMR)
 The Inverse Mill Ratio (λ_i) was estimated and stated thus:

$$\lambda_i = \frac{\phi\left(\frac{Z_{ij}}{\sigma_u}\right)}{\Phi\left(\frac{Z_{ij}}{\sigma_u}\right)} \dots \dots \dots (6)$$

Where,
 λ_i = Inverse Mill Ratio (IMR)
 ϕ = Standard Normal Density Function, and
 Φ = Standard Normal Cumulative Distribution Function.
 This was used to achieve specific objective two (ii)
(b) Ordinary Least Square Model (OLS)
 The Ordinary Least Square Regression model is stated thus:

$$Y = b_0 + \sum_{i=1}^{18} b_i X_i + e_i \dots \dots \dots (7)$$

The explicit function is stated:

$$Y_{ij} = \alpha_0 + \alpha_1 X_1 + \alpha_2 X_2 + \alpha_3 X_3 + \alpha_4 X_4 + \alpha_5 X_5 + \alpha_6 X_6 + \alpha_7 X_7 + \alpha_8 X_8 + \alpha_9 X_9 + \alpha_{10} X_{10} + \alpha_{11} X_{11} + \alpha_{12} X_{12} + \alpha_{13} X_{13} + \alpha_{14} X_{14} + \alpha_{15} X_{15} + \alpha_{16} X_{16} + \alpha_{18} X_{18} + e_i \dots (8)$$

Where,
 Y_i = Quantity of Rice Sold (Kg)
 X_i = Age of Household Head (Years)
 X_2 = Gender Dummy (1, Male; 0, Female)
 X_3 = Educational Level (Number of Years Spent in School)
 X_4 = Household Size (Number of Persons)
 X_5 = Farm Size (Hectares)
 X_6 = Household Income (Naira)
 X_7 = Price Information Dummy (1, Yes; 0, Otherwise)
 X_8 = Contract Marketing Dummy (1= Yes, 0= Otherwise)
 X_9 = Ownership of Bicycle Dummy (1, Yes; 0, Otherwise)
 X_{10} = Rice Output (Kg)
 X_{11} = Marketing Information Dummy (1, Yes; 0, Otherwise)
 X_{12} = Expected Price of Rice Output (Naira/Kg)
 X_{13} = Access to the Credit Dummy (1, Yes; 0, Otherwise)
 X_{14} = Extension Services Dummy (Number of Extension Contact per Month)
 X_{15} = Primary Occupation (1, Farmer; 2, Businessman, 3, Employed)
 X_{16} = Market Cooperative Organization Dummy (1, Yes; 0, Otherwise)
 X_{17} = Marketing Experience (Years)
 X_{18} = Inverse Mill Ratio (Units)
 e_i = Error- Term
 b_0 = Constant Term
 $b_1 - b_{18}$ = Regression Coefficients
 Three functions (Linear, Semi-Log, and Double-Log) was fitted. The best fit was selected using: -
 (i) the Coefficient of Multiple Determinations (R^2)
 (ii) F-Value;
 (iii) t-Ratio
 (iv) Significance of regression coefficients relative to a priori expectations.
 This was used to achieve specific objective three (iii)

while 14% were female. This indicates that farming activities were common among men which could be as a result of drudgery and energetic efforts required in carry out the farm activities. This result is consistent with Mirie and Zemedu (2018) who reported that 85.7% out of the total sampled smallholder farmers, were male headed households, and 14.3% were female headed farming households. The results also agreed with Benard (2015) who asserted that 20% of the sampled rice farmers were female headed households. About 74.4% of the sampled rice farmers were married, while 16.4% were single. The results further revealed that 78.3% of sampled rural rice farming households head had farming as their main occupation and source of livelihood. Furthermore, 50.2% of the sampled smallholder rural farming households head had no formal education, while 20.3% had primary education, while 14.5% attained the level of secondary education. Household heads that attained high level of education are most likely to participate in marketing decisions that may lead to market participation because with increased level of education, utilization of market information and new innovation on rice production and marketing opportunities tend to be higher. Formal education of the smallholder tends to improve managerial ability, capability of the farmer and competence for successful implementation of improved production technology, processing, and marketing activities. This result is in line with the findings of Makhura *et al.* (2001) who asserted that human capital development represented by household heads formal education is reported to lead into increase in household heads understanding of market dynamics and therefore improve marketing decisions of the smallholder farmers. About 38.6% of the sampled respondents were within the age ranges of 41-50 years, while 26.6% were between the age ranges of 31-40 years. The mean age of the sampled smallholder rice farmers was 43 years. The implication of this result implies that most of the rice farmers were young and in their active age of productivity. This result is consistent with Geoffrey (2014) who posited that market participation reduces as the age of farmers increases because the older farmers are known to be risk averse and slow in adopting technology used in farming. Barrett *et al.* (2007) also reported that younger farmers tend to participated more in the marketing of rice because they are more receptive to new ideas, adopting new technology and risk averse than the older farmers. About 51.2% of the sampled rural rice farming households had a household size ranges between 1-5 members, while 39.1% had 6-10 persons per household. The average household size of the rice market participants was 6 persons per household. This result is in agreement with Geoffrey (2014) who

RESULTS AND DISCUSSION
Socio-economic characteristics of the sampled smallholder rural rice farming households

Table 01 shows the results of the analysis of the socio-economic characteristics of the sampled smallholder rural rice farming households. The results of the outcome of the analysis show that majority (86%) of the sampled rice farmers were male,

reported that families with the larger household size negatively influences the extent of market participation of farmers. This is in line with findings Mwema *et al* (2013) reported that the larger the sizes of the households the more of the farm produce will be held for home consumption. The mean rice farming experience was 7 years. This result is consistent with Alabi *et al* (2012) and Alabi *et al.*, (2016) who found that sampled farmers had an average of 10 years farming experience. They further observed that farmers experience in farming could contribute positively or negatively to technology adoption, while sometimes farmers that are used to one particular way of farming may find it difficult to from old way to another or adopt new innovations. However, experience can also contribute positively since farmers can share their experience with other farmers.

Table 1. Socio-Economic Characteristics of Smallholder Rural Rice Farming Households

Variables	Frequency	Percentage (%)
Household Head		
Sex	178	86
Male	29	14
Female		
Marital Status		
Single	34	16.4
Married	154	74.4
Divorced	4	1.9
Widow	9	4.3
Widower	6	2.9
Occupation		
Farming	162	78.3
Formally	27	13
Employed	18	8.7
Business		
Educational Level		
Primary School	42	20.3
Secondary School	31	15
Tertiary Institution	30	14.5
No Formal Education	104	50.2
Age (Years)		
≤ 20	5	2.4
21-30	26	12.6
31-40	55	26.6
41-50	80	38.6
51 and above	41	19.8
Mean	43	
Household Size (Number)		
1-5	106	51.2
6-10	81	39.1
11-15	11	5.3
16 and above	9	4.3
Mean	6	
Farming Experience (Years)		
1-5	124	59.9
6-10	45	21.7
11-15	19	9.2
16-20	13	6.3
21 and above	6	2.9
Mean	7	
Total	207	100

Source: Field Survey (2019)

Marketing variables of smallholder rural farming households

Table 02 shows that 67.1% of the sampled rice farming households had a farm size of between 1-2 hectares of farm land, while 21.7% had between 3-4 hectares of farm land. The average farm size cultivated by the sampled rice farmers was 2.4 hectares. About 10.1% of the sampled respondents had access to formal credit, while 89.9% of the sampled smallholder rice farmers could not have access to formal credit facilities. The reason for the low percentages of the respondents who didn't had access to formal credit services could be due to high interest rate charged by the commercial banks and financial institutions. This is in line with findings of Assefa (2009) who indicated that farmers needs credit facilities to purchase different inputs to enhance the quantity and quality of production, and the short repayment period as well as the high interest rate of the services was not suitable for marketing activities. Also, 66.2% of the sampled small scale rice farmers had access to extension services. Access to extension services could lead to increase in rice production and marketing and it's also a very necessary tool that could lead to revitalizing and enhancing smallholder rice farming commercialization. This result is contrary to Geoffrey (2014) who reported that only 5% of the market participants had access to extension services. Having access to extension services through extension officers plays an important role in empowering the farmers with production and marketing information. Majority (87.9%) of the rural rice farming households were not members of any market cooperative organizations, only 12.1% belongs to one form of organization or the other. Being a member of a farmer group or association is very important to farmers it them bargaining power and serves as a major source of information. This is consistent with Geoffrey (2014) who stated that marketing as a group is more essential because it facilitates information access and exchange among the members which also reduces the transactional cost and hence increases the extent of market participation. Poulton *et al.* (2006) argued that belonging to a group, empower smallholder farming households to bargain and negotiate for better price and trading term. It could be seen that 62.3% of the smallholder rural rice farmers who produce rice did not participate in rice marketing, while 37.7% participated in rice marketing. This market participation rate found in Nigeria seems very low compared to the evidence shown in the literature from other parts of Africa on some other food crops. The relative low participation rate noticed here may translates to non-intervention by government for rice commercialization in the county compared to other parts of the country. This is in line with the findings of Serge (2012) who indicated that none of the sampled farmers had benefited from government programs for commercialization of rice and this translates into a very low market participation rate in the county. The results in Table 5 further depicted that 20.8% of the rural rice farming households sold their rice at farm gate, while 34.4% sold at local market, and 29.5% sold their rice

produce at urban market. This implies that most of the market participants sold their rice at local market and urban market and had access to good price information. This is in line with results of Geoffrey (2014) who reported that price information helps in acquiring the prices, price conditions, and market participants.

Table 2. Marketing Variables of Smallholder Rural Rice Farming Households

Variable	Frequency	Percentage (%)
Farm Size (Ha)		
1 – 2	139	67.1
3-4	45	21.7
5-6	14	6.8
7 and above	9	4.3
Mean	2.4	
Access to Credit Facilities		
Yes	21	10.1
No	186	89.9
Source of Credit		
Commercial bank	6	2.9
Friends	25	12.1
Relatives	5	2.4
None	171	82.6
Access to Extension Services		
No	70	33.8
Yes	137	66.2
Market Organization Membership		
No	25	12.1
Yes	182	87.9
Market Participation		
No	129	62.3
Yes	78	37.7
Access to Good Road		
Yes	88	42.5
No	119	57.5
Marketing Outlet		
Farm Gate	43	20.8
Rural Market	32	15.4
Local Market	71	34.3
Urban Market	61	29.5
Total	207	100

Source: Field Survey (2019)

Institutional variables of smallholder rural rice farming households

Table 03 revealed that majority 67.1 % of the rural farming households had access to market information, while 32.9% could not have access to any market information. More so, 31.4% of the sampled rural rice farming households accessed price information before they sale their farm produce. This implies that some smallholder farmers' participants, had access to price information prior to selling of their produce. About 68.6% of the rural rice farming households grow rice for both sale and consumption. Furthermore, 60.4% of the smallholder rice farmers were engaged in formal market, while 10.6% and 15.5% sold their rice through informal market and contract market respectively. Involving in contract marketing is perceived to be one of the major source of ready market for the

farmers. This result confirmed the report of Benard (2015) who reported in his study that only 21% of the smallholder

farmers embraced contract marketing strategy. Also, 69.6% of the rural rice farming households could not have access to improved seed varieties, while only 30.4% had access to improved seed. About 94.7% of the sampled smallholder rural rice farming households do not engaged in contract farming. Contract farming encourages farmers to produce more output. The mode of land acquisition is mostly (60.9%) through inheritance, while 7.7% and 23.7% acquired their land through purchase, hired and gift. About 65.2% of rural rice farming households had mobile phones, while 53.1% owned a radio/TV. Farmers that have ownership of a radio could reduce information search costs and also improves access to extension information. The survey further shows that 30.4% of the sampled smallholder rural rice farming households owned Bicycle. Ownership of a bicycle increases the likelihood of rice farming households to participate in local and urban markets because of ease in accessing the means of transporting their rice produce to the market. Table 03 further reported that 68.6% of the respondents used motor vehicle to transport their produce to the market. Ownership of assets among smallholder farmers shows that market participants had more assets than non-market participants. This result is in agreement with findings of Moono (2015) who asserted that there is a minimum level or threshold for farmers to own asset to escape from the poverty trap this because asset ownership could enable farming households to increase their farm output and have marketable surplus.

Table 3. Institutional Variables of Smallholder Rural Rice Farming

Variable	Frequency	Percentage (%)
Access to Market Information		
No	68	32.9
Yes	139	67.1
Information Prior to Sell		
Yes	65	31.4
No	142	68.6
Source of Information		
Media	11	5.3
Marketing	20	9.7
Group	1	5
Internet	20	9.7
Mobile Phone	57	27.5
Extension	94	45.4
Officers	4	1.9
Co Farmers		
None		
Reason for Growing Rice		
Sale	34	16.4
Home	31	15
Consumption	142	68.6
Sale and Home Consumption		
Marketing Arrangement		
Formal Market	125	60.4
Informal	22	10.6
Market	32	15.5
Contractual	28	13.5
Market		
None		
Location of Sales		
Farm Gate	29	14
Around the Village	41	19.8
Road Side	1	5
Nearest Market	109	52.7
Contract Farming		
No	196	94.7
Yes	11	5.3
Mode of Land Acquisition		
Inheritance	126	60.9
Purchase	16	7.7
Gift	49	23.7
Hired	16	7.7

Table 3. Continued

Variable	Frequency	Percentage (%)
Own Mobile Phone		
No	72	34.8
Yes	135	65.2
Ownership of Radio/TV		
No	97	46.9
Yes	110	53.1
Ownership of Bicycle		
No	144	69.6
Yes	63	30.4
Means of Transportation		
Motor Vehicle	142	68.6
Motorcycle	62	30
Ox-Cate	3	1.4
Total	207	100

Source: Field Survey (2019)

Factors influencing the smallholder farmers decision to participate in rice marketing in Abuja, Nigeria

Table 04 presents the results of the factors influencing the decision making of the smallholder rural farming households to participate in rice marketing. The results of the Heckman two stage, Probit model (First Stage) shows that age of the household head of the smallholder rice farmers was significant at ($P < 0.01$), and its related negatively to market participation. The reason why the variable had a negative sign could be because older farmers tend to be risk sensitive, than the younger farmers. The marginal effect for age of the household head was (-0.01115) implying that a unit increase in the age of the household head farmer by 1 year will results in the decrease in the probability of the farmers' decision to participate in rice marketing by 1.11%. This is in line with Akidi *et al.* (2018) who reported that this could be due to its marginal diminishing effect on production as farmers age increases. The older smallholder farmers found it difficult to travel to the market because of the relatively long distances to the place where market is located, if they don't have any means of transportation they would end up selling their rice produce at the farm gate that offered very low prices for their produce, and this could discourage them from market participation. On the other hand, according to Enete and Igbokwe (2009) who argued that younger smallholder household heads were more flexible regarding adoption of new technology and innovations both in terms of those that would improve their productivity and enhance their marketing at a lower transactional cost. Akidi *et al.* (2018) also observed that younger farmers were expected to be progressive in terms of technology, more receptive to new ideas about farming and to better understand the benefits of commercialization of agricultural production. Educational level of the household head influences smallholder farmers' decision positively to participate in rice market as expected in the a priori expectation and was significant at ($P < 0.05$). Farmers with high level of education are most likely to

participate in rice marketing, the marginal effect of education was 0.046. The implication of this result is that a unit increase in the level of education of the rice farmers would result in an increase in the probability of participating in market by 4.6%. The positive relationship indicates that an increase in education level of the household heads will enable them to easily have access to more information regarding marketing and new opportunities in various markets for their products. This is in agreement with findings of Nyein *et al.* (2018) who observed that the education level of household head plays a vital role in enhancing market participation rate among smallholder farming households as it enables them to have access of acquiring new ideas and modern techniques of modern agricultural production, and therefore enhance and increase their market surplus. Household size is also positive and related with market participation. This is consistent with the findings of Alene *et al.* (2008) and Ouma *et al.* (2010) who observed that larger households have more family labor that are helpful not only in the production of rice, but also in the commercialization of rice so that transaction costs appear to be reduced for larger household which encourage them to participate in the market. However, this is not sufficient to encourage farmers to increase household size. This result contradicts findings of Nyein *et al.* (2018) they opined that farmers with larger family sizes could not produce enough marketable surplus beyond their family consumption needs. Therefore, large households in rural areas would have fewer agricultural products for the market. He further explained that the smallholder rice farmers who had large household size had a higher probability of not participating in market. As the number of family members' increases, the number of people to feed also increases hence the responsibility of providing food for feeding them. This gives the necessity for farmer to withhold more farm produce for home consumption preventing them from having marketable surplus. Expected price of output influence market participation negatively. This result is contrary to the findings of Key *et al.* (2000) who reported that, the expected price level of output is very significant in making decision to participate in marketing of rice, because producers will only enter the market when they are able to cover their transaction costs.

Table 04 further revealed that farm size significantly influences market participation positively ($P < 0.01$). This indicates that a unit increase in farm size by 1ha will result in the farmers' likelihood to participate in rice marketing by 5.8%. This could be due to the importance and the role of farm size in increasing and boosting total production level and thus marketable sales of surplus produce. Moreover, rice farming households with larger farmland size could allocate part of their land for food crop production giving them better position to participate in the output market. This is in line with the findings of Ohen *et al.* (2013). Access to credit facilities also influence market participation negatively and was significant at ($P < 0.05$) probability level. The marginal effect of the access to credit was (-0.22579). This indicates that a unit increase in access to credit

will result in the decrease or less likelihood in the probability of market participation by 23%. This contradicts the findings of Gicheha *et al.* (2015) who reported that access to credit had a positive influence on market participation. Household heads who had access to financial credit facilities, were more likely to participate in group and collective marketing. The variable could be negative because farmers that had access to credit would have used the credit facilities for other family needs rather than farm investment, some farmers may even marry extra wife with the accessed credit, leaving them with inability to produce marketable surplus to participate in the market. This result is also in line with the findings of Lerman (2004) who observed that credit facilities play a crucial role that enhance and link smallholder farmers to networks that facilitate access to price information, modern technology, and essential inputs used in production. The farmer may use the credit to pay children school fees or build houses making the farmer less likely to participate in the rice market. This result is not in agreement with Mirie and Zemedu (2018) who suggested that farmers access to credit improves their financial capacity to buy improved inputs, thereby increasing production which is reflected in increase in total output with marketable surplus. This finding is also contrary to Ashenafi (2010) who reported that credit access by farmers had positive and significant influence on farmers' decision to participate in the marketing of grains and the quantity sold. Extension services was also significant and positively influence the decision of smallholder rice farming households to participate in rice marketing at ($P < 0.05$). The marginal effect 0.142 implies that a unit increase in the access to extension services results in the increase in probability of smallholder rural rice farming households market participation by 14.2%. The results also revealed that a unit increase in the number of extension visit by one day in a month increases the probability of participation in rice market by 14 days at 5% confidence level in the study area. Educating farmers through extension services play a major role in sourcing and providing information to farmers both on production and marketing. This result is in line with Benard (2015) who found that extension contact significantly influences the extent of market participation among smallholder rice farmers. Ownership of a bicycle increase the likelihood of participation in rice market. Farmers that owns a bicycle, has higher probability of participating in the market by 0.253%. This finding is consistent with the results of Olawande and Mathenge (2011) who reported that farmers that had ownership of transport equipment were significantly associated with agricultural market participation among poor smallholder rural farming households. Price information was positive and significant at ($P < 0.01$). Access to price information is positive because households with price information are more likely to make informed decision on whether to participate in marketing or not. The marginal effect of price information was (0.1816) implying that a unit increase in additional information would increase the likelihood of market participation by 18.2%.

Having access to price information is a vital instrument and play an effective role during marketing because it informs the farmers about marketing situations. Farmers who have access to price information before marketing their products tend to sell more of their produce than those without price information. These findings are consistent with research results of Key *et al* (2000) and Alene *et al*, (2008) both observed that the existence of positive relationship between the price and the proportion of sales and confirmed price to be an incentive to sell. Quantity of rice output harvested influence the decision to enter the market negatively. This result implies that the higher quantity of output harvested decreases the likelihood but not significantly on market participation. This result is contrary to Mather *et al*. (2011) who reported that higher outputs increase the likelihood of market participation because it enables households to have a marketable surplus. The variable could be negative because even if the quantity of output harvested is in surplus, it doesn't influence the decision of the farmer to participate in rice market

because the expected price cannot cover the production and transactional cost. This is also contrary with findings of Nyein *et al* (2018) who indicated that higher output of rice could drive market participation because farmers with high productivity capacity have a surplus output to sell in the market. The result is consistent with Komarek (2010) who reported that the quantity of output is more significant on the intensity and extent of market participation unlike on the decision to participate or enter the market. Marketing experience influence market participation positively and significant at ($P < 0.01$). The marginal effect of marketing experience was (0.0329). This indicates that a unit increase by one year in marketing experience of the farmer will result in increase in the likelihood of a farmer to participate in rice market by 3.29%. The Log likelihood for the model was -9569, LR $\chi^2(15)$ was 81.93, $\text{Prob} > \chi^2 = 0.000$, Pseudo $R^2 = 0.22998$. This implies that the model was highly significant.

Table 4. Results of the Heckman Two Stage Selection Equation, Probit Model

Variables	Coefficients	$\frac{\delta y}{\delta x}$	Standard Error	Z	$P > Z $
Age of Household Head	-0.0429703*	-0.01115	0.0135942	-3.16	0.002
Sex	-0.1441175	-0.0373957	0.3269802	-0.44	0.659
Educational Level	0.1789855**	0.0464433	0.094844	1.89	0.059
Household Size	0.01202	0.003119	0.031032	0.39	0.699
Household Income	5.34e-07	1.39e-07	1.70e-06	0.31	0.754
Expected Price	-0.0000128	-3.31e-06	0.0000187	-0.68	0.495
Farm Size	0.2245052*	0.0582548	0.0742896	3.02	0.003
Access to Credit	-0.870161**	-0.22579	0.400409	-2.17	0.030
Extension Services	0.5456575**	0.1415876	0.2431628	2.24	0.025
Occupation	0.1353927	0.0351318	0.1746205	0.78	0.438
Ownership of Bicycle	0.0097501	0.00253	0.2358997	0.04	0.967
Price Information	0.6996892*	0.1815559	0.2596858	2.69	0.007
Quantity of Rice Output Harvested	-2.27e-06	-5.89e-07	9.24e-06	-0.25	0.806
Market Organization	0.4033851	0.1046707	0.3308677	1.22	0.223
Marketing Experience	0.1271491*	0.0329927	0.0309381	4.11	0.000
Constant	-0.8098869		0.7484254	-1.08	0.279
Number of Obs =	207				
Log likelihood =	-95.69417				
LR Chi2 (15) =	81.93				
Prob > Chi2 =	0.0000				
Pseudo R2 =	0.2998				

Source: Field Survey Data (2019)

Note; *, **, *** Significant at 1%, 5% and 10% Probability Levels Respectively

Extent of market participation regarding how much quantity of rice is sold

The extent of market participation shows the proportion between the quantity of output sold by farmers and the total quantity of output harvested. This proportion serve as a proxy measure of the level of commercialization attained among the smallholder rice farmers. The results presented in Table 09 indicates the extent of market participation regarding how much quantity of rice is sold among the smallholder rural farmers in the study area. averagely, farmers sold 78% of their rice output collectively. The minimum level of the extent of market participation among the farmers was 4.20%, while some of the farmers sold all their rice produce giving a maximum level of the extent of market participation of 100% by selling all the quantity produced. Consequently, approximately 15% of rice harvested in the study area was used for home consumption by farmers and, or shared some with relatives, friends and well-wishers. The maximum level of the extent of market participation of about 78% shows a significant level of commercialization among the smallholder rice farmers. This also shows that rice is mostly grown majorly for commercial purpose in the area, nonetheless rice is one of the staple crop among the smallholder producing farming households. Therefore, rice is a significant crop which plays vital role in contributing to the farmers as the major source of household income and providing nutritious food for the family. Rice is highly contributing to the livelihoods of smallholder rural farming households significantly.

Table 5. Extent of market participation regarding how much quantity of rice is sold

Variable	Mean	Standard Dev	Minimum	Maximum
Total output Harvested (Kg)	3,049	395.22 (kg)	150	15000
Quantity Sold (Kg)	2379.565	3027.50	100	15000
Proportion Sold (Kg)	0.78		0.042	1
Percentages	78.0		4.20	100

Source: Field Survey (2019)

Determinants of market participation regarding how much quantity of rice sold in a given market among smallholder farmers.

Table 06 shows the results of the second stage of the Heckman two step equation (OLS Model). In order to identify the determinants influencing the extent of market participation regarding how much quantity of rice is sold, OLS regression was estimated. The results show that age of the households' head negatively but not significantly influence market participation, the coefficients of age (-0.089) implies that as the farmer advances in age by one year, it results in the decrease in the quantity of rice sold by 8.9kg. This is because when household's heads get older and older, they tend to give out their land for rent or they change to the production of crops that are of lesser labour intensity; also the younger farmers are more dynamic to new ideas and they are less risk minded than the older farmers. This finding is in line with Mirie and Zemedu (2018) and Adugna (2009) they both found and reported in their work that age of households' head had negative influence on farmers' marketable surplus. Educational level of the household head influence how much quantity of rice to sell in a given market negatively and was significant at 10% probability level. The coefficient of education level was (-0.053). This implies that a unit increase in the level of education by 1% will results in the decrease in the marketable surplus and the quantity of rice sold by 5.3%. Any farmer that acquire education is believed to give him necessary knowledge that can be used in gathering information, interpret the information and make productive, and marketing decision for profit maximization. Education is related with how much quantity of rice is sold because as educational level increases farmers ability to post harvest handling activities increase, and strengthened the relationship between the quantity sold and the expected price, an educated farmer would not sell their rice if the expected price won't cover their production and transactional cost and earned profit. This result is in line with Serge (2012) who found that the negative sign observed translates to the existence and awareness of market imperfection in the rice markets in the study area which further reduces their likelihood regarding the decision on how much quantity of rice to be sold. The coefficient of farm size is not statistically significant but positively influence the quantity sold indicating that farmers with larger farm size produce more crops and marketable surpluses. Similarly, such results were also reported by Boughton *et al.* (2007) and Alene *et al.* (2008) respectively. The coefficient of household's non-farm income influence negatively the decisions on the extent of market participation and how much quantity of rice is sold. Non-farm income had negative coefficient value of (-0.041), this indicates that a unit

increase in the households' income results in the decrease in the marketable surplus and the quantity sold by 4.1%. This finding is consistent with the result of Davis *et al* (2013) who revealed that farmers with high non-farm income were likely not to participate in the rice market. Contract marketing positively influences the quantity of rice sold by smallholder rice farmers. A unit increase in contract marketing result in 67.2% increase in the proportion of the quantity of rice sold. This indicates that farmers that operates contract marketing sell more of rice produce because of availability of ready market from the takers. This finding is consistent with Jari and Fraser (2009) who found that an increase in formal market participation by smallholder farmers with the availability of contractual agreement and emerging farmers in the Kat river valley, South Africa. Quantity of rice harvested positively and significantly influences decision on market participation of rice to sell by a farmer at ($P < 0.01$). The coefficient of quantity of output harvested was (0.964), this signifies that a unit increase 1Kg in output harvested was associated with additional increase in the proportion of marketable surplus by 96.4%. The positive sign implies that the quantity of rice sold in the market would increase as farmer increases rice production output. This is a clear indication which could be explained by a fact that smallholder farmers that produce more rice would have more marketable surplus to sell. This result is consistent with the findings of Reyes *et al* (2012) who reported that farmers with large quantity of rice would have surpluses rice to sell in a given market. This results also agree with the findings of Mirie and Zemedu (2018) who indicated that a household who produce more agricultural products will also supply more quantity to the market or when the production of agricultural products in a particular year is favorable, the higher the amount of products that would be sold in the market. This result is also in line with the findings of Habtamu (2015), Amare (2014), Rehima (2006), and Assefa (2009) who observed that the greater the quantity of output of farm produce the higher the quantity that would be carried to the market for sell by the smallholder farmers. Ayelech (2011), Muhammed (2011), and Abraham (2013) were also in agreement with the results of this study. Table 09 further revealed that expected price of rice output negatively and significantly ($P < 0.05$) influences how much quantity of rice is sold in a given market. The coefficient of the expected price was (-0.052). This shows that a unit increase in the expected price of rice Naira/50kg bag in a given market results in the decrease of 5.2% in the quantity and available surplus sold by smallholder rural rice farming households. This result disagrees with findings Nyein *et al.* (2018) who reported that the price of output of rice per bag/kg had a significant effect on the rice sales in quantity by the farmers, the results of their

study also revealed that high market prices of rice output will enhance the rice farmers' ability and willingness to invest and produce more rice output, which will enable them to increase the proportion of rice to be sold by smallholder farmers in the market. The results of this study contradicts this report, because its only when there is marketable surplus before a farmer can increase the proportion of how much rice to be sold in a given market. This result is also contrary to Olawande and Mathenge (2011) who reported that farmers will sell more quantities of their farm produce when the market price of the commodity will cover their cost of production, other expenses and also provide profit. Marketing cooperative organization positively influence how much quantity of rice is sold but not a significant factor. The results indicate that farmer organizations play a vital role in network mobilizing social network and information sharing process that enable farmers to access information as a group and reduces fixed costs of transaction in rice marketing and production. This result is in

agreement with Nyein *et al.* (2018), who reported that being a member of a farmer organization improves farmers' knowledge of understanding the methods of rice cultivation technologies and provides more information about the output market price and consequently increasing the profit. This result is also consistent with findings of Hill *et al* (2008) and World Bank (2008) both indicated that farmer organizations can improve market access, lower transaction costs and increase profits of smallholder farmers by offsetting diseconomies of scale. Inverse Mill Ratio (Lambda) had negative coefficient. This result is in agreement with Mirie and Zemedu (2018) who indicated that sample selection bias, involving existence of some unobservable farmer characteristics determines farmers' participation in agricultural products market and thereby affecting marketable surplus. The coefficient of the multiple determinations (R^2) was 0.849. This implies that the explanatory variables included in the model explained about 85% variations in the quantity of rice sold in a given market.

Table 6. Results of the Heckman Two-Step Outcome Equation (OLS, Model)

Variables	Coefficients	Std Error	t-value	P > t
(Constant)	0.425	0.227	1.874***	0 .063
Age in Years	-0.089	0.101	0.881	0.379
Gender	-0.041	0.165	0.165	0.804
Educational Level	-0.053	0.032	-1.646***	0.102
Household Size	-0.063	0.052	-0.228	0.221
Farm Size	0.011	0.069	0.155	0.877
Non-Farm Household Income	-0.041	0.079	-0.528	0.598
Price Information	0.03	0.083	0.232	0.457
Contract Farming	0.672	0.542	0.176	0.046
Ownership of Bicycle	0.0328	0.068	0.561	0.078
Rice Output Harvested	0.964	0.041	23.756*	0.000
Market Information	0.076	0.112	0.427	0.243
Expected Price of Output	-0.052	0.026	-1.997**	0.470
Access to Credit	-0.0093	0.032	-0.291	0.621
Extension Contact	0.016	0.043	0.372	0.936
Primary Occupation	-0.005	0.109	0.045	0.936
Marketing Organization	0.07	0.05	1.400	0.83
Marketing Experience	0.045	0.043	1.046	0.301
Inverse Mill Ratio	-0.012	0.026	-0.459	0.647
R Square	0.849			
Adjusted R Square	0.839			
F-Value	78.060			

Source: Field Survey Data (2019) Note; * Significant at 1% ** Significant at 5% *** Significant at 10% Probability Levels.

CONCLUSION AND RECOMMENDATIONS

This study evaluated the economic determinants of rice marketing decisions among smallholder rural rice farming households in Federal Capital Territory, Nigeria. Based on the findings emanating from this study, the study concludes that: The significant determinants influencing market participation by the smallholder rural rice farming households include: age of farmer, educational level, farm size, extension contact, price information, and marketing experience. Communication assets has a great impact on smallholder farmer's participation in

market, which suggest that having access to market information results in increased agricultural output and hence improved market participation among rice farmers. Furthermore, male farmers participated more in the rice marketing. The significant determining factors influencing how much quantity of rice sold in a given market were: education of the household head, quantity of rice output harvested, and expected price of the rice output. Therefore, the study recommends that smallholder farmers ability and capacity to produce at large scale for more marketable surplus

stand out as a most critical factor to improve smallholder household rice market participation, level of participation should be encouraged. New innovations and technologies that target increased agricultural productivity should be promoted. In addition, government should also consider advances in knowledge through training in farm production and farm business management for increased productivity, and market participation through provision of adequate extension officers to train farmers on modern agricultural production. It appears that “quantity harvested” is a significant driving force for market participation and the decisions about the value of the quantity sold. Therefore, developing the efforts to increase production capabilities among smallholder rice farming households is very important. More specifically, the development of the input value chain supply market should be encouraged among farmers in order to make improved seeds varieties and inorganic fertilizers more accessible to smallholder rice farmers. Dissemination of information through available communication devices such as radio/TV, mobile phones, internet and social medias is very significant which will bring great potential for increased rice production, market participation and decisions on value sold. Improving access to market and price information through appropriate sources and channels, and making them easier to access by smallholder farmers could lower the market transaction costs associated with searching for trading partners, contracting, and enhancing market participation among the rice farming households. Policies geared towards enabling farmers to access and utilize Use of communication and information technologies offers exciting new opportunities to smallholder farmers and presents an opportunity to resolve the market information problems commonly encountered in Nigeria.

CONFLICT OF INTEREST

Authors declare no conflict of interest

AUTHOR CONTRIBUTION

All authors contributed together in all aspect of the development of the manuscript, the authors jointly contributed in data collection, data analysis and interpretation of result as well as the final report writing.

ETHICAL APPROVAL

There is no ethical restriction as to the use of the findings from this research article therefore, the article can be used publicly with proper citation of the original authors.

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DATA AVAILABILITY

The data which support these findings are available based on request from the corresponding author, the data are not available publicly but it will be made available on request

CONSENT FOR PUBLICATION

I the undersigned give the consent for publication of this article in this journal of which the text materials, tables and figure will available online in both print and soft copy, everyone can read and pint the material for learning and sharing of knowledge.

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