



EFFECTS OF NIGER STATE RICE INVESTMENT CONSORTIUM PROJECT ON COMMERCIALIZATION LEVELS OF SMALLHOLDER FARMERS IN NIGER STATE, NIGERIA

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ABSTRACT

The study assessed the effects of Niger State Rice Investment Consortium (NSRIC) project on commercialization levels of smallholder rice farmers in Niger State, Nigeria. A total sample size of 234; made up of 117 participants and 117 non-participants drawn from 12 localities in three (3) Local Government Areas (LGAs) were selected through multi-stage sampling technique. Data were collected from primary source using well-structured questionnaire administered by the researcher and with the assistance of well-trained enumerators from the Niger State Bureau of Statistics (NSBS). Data were analyzed using descriptive statistics, household commercialization index (HCI), Tobit regression model and Henry Garrett technique. The result showed that the respondents were in their productive age with mean age of 39 and 44 years of participants and non-participants, respectively; and also, the participants (80.34%) and non-participants (81.22%) were married. The result further revealed the mean farm size of 2.0ha and 1.84ha for participants and non-participants, respectively. The result of HCI revealed the mean household commercialization indices of 67.25%, 31.57% and 49.41% for participant, non-participant and pooled sample, respectively. The Tobit regression analysis disclosed that the coefficients of household size and extension contact were negative but however, significantly influenced smallholder level of rice commercialization. The coefficient of gender, farm size, quantity of rice produced, NSRIC project participant, access to market information, unit price of product, irrigation, access to tractorization and training were positive and significantly influenced smallholder rice commercialization. The costs and returns analysis revealed that the farmers earned ₦123,684.08 and ₦46,872.14 for participants and non-participants, respectively. It was recommended that governments at all levels should develop appropriate policies and strategies to promote the commercialization of smallholder Agriculture in the State and farmers themselves should form and maintain effective farmer groups to take advantage of better market prices for their products through their collective bargaining power.

Keywords: Commercialization, Consortium, Niger State, Rice, Smallholder.

INTRODUCTION

Agriculture plays a significant role in livelihoods, employment, income, growth, food security, poverty alleviation, socio-economic development and environmental sustainability in developing countries (World Bank, 2008; and Pingali, 2010; and International Fund for Agricultural Development-International Food Policy Research Institute (IFAD-IFPRI, 2011). The history of economic development in other regions of the world indicates that agricultural



productivity growth has been the major source of sustained improvement in rural welfare (Jayne *et al.*, 2011). Agriculture contributes more than 30% to annual Gross Domestic Product (GDP), employs about 70% of the total labour force, accounts for over 90% of the non-oil exports and provides over 80% of the food need of Nigeria (Adenegan *et al.*, 2013). The contributions of agriculture to rural and overall economic development notwithstanding, Nigeria's potential with respect to stallholder commercialization is largely untapped and the current status of agriculture is a source of major concern (Awotide and Akerele, 2010).

The agricultural sector is dominated by resource poor smallholder farmers, often solely engaged in subsistence farming activities, while the agribusiness sector is in its infancy. This is to say that, despite its importance, Nigerian agriculture has to a large extent, not diverted itself from most of the characteristics of the peasant economy that were prominent in the pre-independence period (Adewumi and Omotesho, 2002). Food and Fibre shortages resulting in under-nourishment of people and under-capacity utilization of industries have become the rule rather than exception. Jayne *et al.* (2012) reported that increasing per capita food production and raising rural incomes are arguably the greatest challenges facing sub-Saharan Africa and the developing world more generally. Barret (2008) asserted that the smallholder farmers who engage in subsistence agriculture have low marketable surplus causing them to be in low equilibrium poverty trap. However, many developing countries have not fully utilized agriculture for its multiple functions (Pingali, 2010).

Awotide and Akerele (2010) posited that the poor performance of African agriculture (Nigeria inclusive) signifies that the continent has been lagging behind in adapting to the structural transformation of the international agro-food market which has opened up new business opportunities for developing-country producers, while at the same time increasing competitive pressure (Organization for Economic Co-operation and Development Centre [OECD], 2007). Rios *et al.* (2008) also reported that the poorest people in the world are farmers with low agricultural productivity and low commercialization levels. Increasing either one could help to improve the other, and both could boost rural economies and living standards: higher productivity levels could drive commercialization levels since households with higher productivity are more likely to have crop surpluses above their immediate consumption needs (Rios *et al.*, 2008).

The subsistence oriented smallholders have the greatest need to commercialize to satisfy growing demand and partake in the resultant incomes-mediated benefits (Kirsten *et al.*, 2012). Furthermore, a significant leap that African agriculture needs to make to reduce poverty and ensure food security is to graduate from the low productivity subsistence farming to high level commercial production (Siziba *et al.*, 2011). Agricultural commercialization is viewed as the process by which farmers increase their productivity by producing more output per unit of land (and labour), produce and thus increase their market participation with the attendant beneficial effect of higher incomes and living standards (Jayne *et al.*, 2011). Consistent with this, therefore, any pathway that can lift large numbers of the rural poor households out of poverty will require some form of transformation of smallholder agriculture into a more commercialized production system (Oluwande and Mathenge, 2012), which is key towards economic growth and development for many agriculture dependent farmers in developing countries (World Bank, 2008 and Mitiku, 2014).

As the agricultural sector in developing countries transforms towards commercialization, smallholder farmers require systems that are responsive to their needs: access to markets, market information, market intelligence, substitution of physical capital for labour and increased use of purchased inputs, fewer and larger farming units, the need for substantial more capital-both in aggregate and on a per farm basis and effective farmer



organization (Jagwe *et al.*, 2010). In the same vein, the deliberate introduction of modern technologies and provision of various supports from the government authorities, non-governmental organizations, agricultural production system in many developing countries is turning to be a commercialized one (Ataul *et al.*, 2014). Indeed, policies for commercial transformation of smallholder agriculture are often aimed at promoting household market participation (Gebremedhin and Jaleta, 2013).

Salami *et al.* (2010) added that improved market participation is a strategic precondition for transformation of the agricultural sector from subsistence to commercial production. Many countries and international development agencies give due concern to intensification and commercialization of smallholder farming as a means of achieving poverty reduction and thus have reflected it in their official policies (Poulton and Leavy, 2007). In line with these policy thrust, the Federal Government of Nigeria (FGN) in recent times has consistently promoted the increasing commercialization of agricultural production through its different schemes, policies and programmes.

Consistent with this, and in order to enhance productivity and commercialization in agriculture, the Niger State Government (NGSG) is deliberately taking advantage of the diverse agricultural resource endowments to develop an agricultural sector that will guarantee food security, reduce rural poverty and accelerate economic development of the State (Niger State Vision 3:2020, 2008). The Niger State vision 3:2020 plan was conceived to revitalize and regenerate the agriculture sector in partnership with the private sector to emerge as the major pillar of economic growth. Similarly, the new Agriculture Regeneration Programme will be undertaken, aimed at greater orientation towards increasing agricultural production and commercialization of smallholder agriculture (Niger State Vision 3:2020, 2008). The Niger State Rice Investment Consortium Project was established to promote smallholder commercialization of agricultural production and changing the mindset of the farmers towards viewing agriculture as a business (Ministry of Agriculture and Rural Development, 2014).

In developing countries, smallholder farmers find it challenging to participate in the market due to the presence of a wide range of constraints and barriers which inhibit their incentives to commercialize (Okoye *et al.*, 2016). In Nigeria, smallholder agricultural commercialization is constrained by various factors including small size of operations, weak technical capacity, high vulnerability to risks and uncertainty, inadequate capital, lack of economies of scale as well as high transaction costs and marketing risks (Macharia *et al.*, 2014). However, there is also the prevalence of commercialization in subsistence agriculture where farm households supply certain proportion of their output to the market from their subsistence level. Nwachukwu and Ezeh (2007) opined that, despite the participation of smallholder farmers in commercialization of subsistence agricultural economy, more than 800 million people throughout the world and particularly in developing countries do not still have enough food to meet their basic nutritional needs. Therefore, meeting the challenge of improving commercialization levels and rural incomes in Nigeria will require deliberate policies aimed at transformation of the predominantly subsistence, low-income and low-productivity farming systems to a commercialized and market-oriented system.

Nonetheless, as part of the efforts to enhance productivity and commercialization in agriculture, as well as bridge the widening nutritional gap and persistent food insecurity in Nigeria, the government developed policies to commercialize agriculture with the main objectives of improving the efficiency of agricultural production systems as well as improving access to markets for targeted value chains among small and medium scale commercial farms (Nwachukwu and Ezeh, 2007). Consistent with these policies thrusts and in the urge for transforming the subsistence-oriented production system based on the concept of Commercial



Agriculture Development Programme (CADP) that encourages smallholder farmers to become market oriented (National Bureau of Statistics [NBS], 2010). In addition, the Growth Enhancement Programme (GEP) of the Agricultural Transformation Agenda (ATA) and the Anchor Borrowers Programme seek to increase competitiveness and enhance integration of farmers into domestic and international markets and create economic linkage between smallholder farmers and reputable large-scale processors with a view to increasing agricultural output and significantly improving capacity utilization of processors (Federal Ministry of Agriculture and Rural Development [FMARD], 2011; and Central Bank of Nigeria Anchor Borrowers' Programme [ABP], 2016). The aim is to enhance Nigeria's comparative advantage and translate it into competitive advantage in producing the needed volumes and quality of commodities on a timely basis, reduce the level of poverty among smallholder farmers and assist rural smallholder farmers to graduate from subsistence to commercial production levels.

In line with these policy thrusts, the Niger State Rice Investment Consortium (NSRIC) project is a deliberate policy by Niger State Government to transform the predominantly smallholder subsistence agricultural production system to a modernized and commercial oriented system. It was on this premise that the study assessed the effects of Niger State Rice Investment Consortium (NSRIC) project on commercialization levels of smallholder rice farmers. The specific objectives were to: describe the socio-economic characteristics of NSRIC project participating and non-participating smallholder farmers; estimate the commercialization levels of NSRIC project participating and non-participating smallholder rice farmers; assess the determinants of agricultural commercialization of smallholder rice farmers; and estimate the costs and returns associated with smallholder rice farmers under the project.

MATERIALS AND METHODS

The Study Area

The study was conducted in Niger State, Nigeria; specifically in three sample Local Government Area (LGAs) of Gbako, Lavun and Wushishi. The State lies on latitude $8^{\circ}20'N$ and Longitude $3^{\circ}30'E$ and $7^{\circ}40'E$. The State is bordered to the North by Zamfara State, West by Kebbi State, South ByKogi State, South-West by Kwara State, North-East by Kaduna State and South-East by Federal Capital Territory. The State also has an International boundary with the Republic of Benin, along Agwara and Borgu LGAs to the North-West (Niger State Bureau of Statistics, NSBS; 2014).

Niger State is one of the largest States in terms of land mass in Nigeria, covering about $86,000\text{km}^2$ (8.6million hectares), representing 9.3% of the total land area of the country, and out of which 85% is arable (Niger State Vision 3:2020, 2008). Similarly, an estimated 80% of the $86,000\text{km}^2$ of the land area is suitable for agriculture (arable) and the range of crop species that can be produced is wide, given the soil texture and climatic condition. Furthermore, the State has an estimated 682,331 hectares of irrigable land of which only 25% has been developed. Only 105,556 hectares is put to use annually with about 26, 500 hectares being cultivated during the dry season (Niger State Vision 3:2020, 2008).

The 2006 National Population and Housing Census in Nigeria put Niger State's population as 3,954,772 comprising of 2,004, 350 males and 1,950,422 females. The estimated projection of population based on 3% growth rate per annum is 5,168,063 made up of 2,619,268 males and 2,548,795 females in 2015. Niger State experiences distinct dry and wet seasons with annual rainfall varying from 1,100 mm in the Northern parts to 1,600 mm in the Southern parts. The average annual number of raining days ranges between 187 and 220 days. The vegetation of the State is mainly Southern Guinea Savanna. The vegetation supports the



cultivation of root crops and grains. The average minimum temperature is 26⁰C while the average maximum temperature is 36⁰C. The mean humidity ranges between 60% (January to February) and 80% (June to September). The topography of Niger State is characterized by gentle undulating plains with a few low-lying valleys, which terminates to form streams at the lowest levels.

Generally, the fertile soil and the hydrology of the State permits the cultivation of most of Nigeria staple crops and still allows sufficient opportunities for grazing, freshwater fishing and forestry development (Ndanitsa, 2005). The major rivers in the State are the Rivers Niger, Kaduna, Chanchaga, Mariga, Gbako, Gurara, and their numerous tributaries (NSBS, 2014; and Niger State Vision 3:2020, 2008).

The majority of the population in the State (about 85%) is smallholder farmers, while others constituting (15%) are involved in vocations such as white-collar jobs, business, craft and arts. Agriculture is one of the major occupations, as over 90% of the rural populace is involved in farming. Baba (2004) had earlier reported that farming is the principal occupation of the rural communities in Niger State and Nigeria at large. Accordingly, a large proportion of the people in the study area are smallholder farmers, who are predominantly involved in farming and trading. They grow arable crops like maize, yam, cassava, millet, rice, plantain, fruits/vegetables, and also engaged in small scale poultry, goat, sheep, cattle and fish farming (NSBS, 2014; Niger State Vision 3:2020, 2008). There are three major ethnic groups in the State namely; Nupe, Gbagyi and Hausa. Other tribal groups in the State are in minority, and include, Kadara, Koro, Baraba, Kakanda, Gana-gana, Dibo, Kambari, Kamuku, Pangu, Dukkawa, Gwada and Ingwai (NSBS, 2014; Niger State Vision 3:2020, 2008).

Sampling Procedure and Sample Size

A multi-stage sampling procedure was adopted to draw up sample for the study. The first stage involved purposive selection of six (6) LGAs noted for their level of involvement and participation in the NSRIC project (project area). The LGAs are Agaie, Edati, Gbako, Katcha, Lavun and Wushishi. The second stage involved the random selection of three (3) LGAs also based on the participation in NSRIC project. The LGA include Gbako, Lavun and Wushishi. The third stage involved the selection of two villages each from the three (3) LGA selected, making a total of twelve (12) villages. The fourth stage involved the stratification of the respondents into NSRIC project participating and NSRIC project non-participating smallholder rice farmers based on the list of participants that was accessed from NSRIC Project Implementation Office (PIO) and village listing survey of 2014 from Ministry of Agriculture and Rural Development.

This sampling procedure was applied to project non-participants who live in nearby villages outside the NSRIC project villages but with socio-economic and biophysical characteristics comparable to the NSRIC project villages and in the same LGAs. This stratification provided a good control group for comparing participants and non-participants. Finally, 10% of the smallholder rice farmers were randomly selected from each of the villages-following Usman (2013); Akinola *et al.* (2013) and Mutabazi *et al.* (2013). A total of two hundred and fifty (250) questionnaires were distributed comprising 130 for NSRIC project participants and 120 non-participants. In all, a total of 234 were retrieved (117 for NSRIC project participants and 117 for non-participants, respectively (Table 1).



Table 1: Household Sampling Frame and Size

Category	LGAs	Villages	Sample Frame	Sample Size @10%
Participants	Gbako	Edozhigi	200	20
		Gbadafu	190	19
	Lavun	Gbara	220	22
		Sheshibikun	202	20
	Wushishi	Wushishi	160	16
		TunganKawo	190	19
Non-Participants	Gbako	Sheshiko	202	20
		WuyaSuman	190	19
	Lavun	Latiko	202	20
		Sossa	220	22
	Wushishi	Rogota	170	17
		Kasakogi	190	19
		Total	12	2,336

Source: NSRIC and VLS, 2016

Method of Data Collection

Both primary and secondary data were employed for this study. Primary data were collected with the aid of well-structured questionnaire and pre-test questionnaire. Information elicited for include, household socio-economic profiles of the NSRIC project participating and non-participating smallholder rice farmers such as age, gender, marital status, farm size, educational status, years of farming experience, access to extension services, crop enterprises, access to credit, crop production estimates, agricultural input usage and costs, output levels, prices as well as commercialization constraints facing the smallholder rice farmers in the study area. Secondary data on the other hand, were obtained from Niger State Ministry of Agriculture and Rural Development, Niger State Bureau of Statistics and Niger State Agricultural Mechanization Development Authority on LGAs and villages as well as on village listing survey. Data collection for the study lasted for three (3) months (August to October, 2015). Data collection was carried out by the researcher assisted by trained enumerators.

Analytical Techniques

Descriptive statistical and economic tools were used in analyzing the data collected. These tools include descriptive statistics, household commercialization index, Tobit censored regression and farm budget model. Descriptive statistics such as frequency distribution tables, cross tabulations, averages/means, and percentages were employed to summarize the data on socio-economic variables of smallholder rice farmers in the study area. Household commercialization index was used to investigate the level of commercialization among smallholder rice farmers. The Tobit regression analysis model was used to investigate the determinants of agricultural commercialization among smallholder rice farmers. The farm budget model was used to estimate the costs and returns associated with smallholder rice farming. The Ordinary Least Square (OLS) was used to estimate the effect of NSRIC project on income of smallholder rice farmers, and the Henry Garrett’s Ranking Technique was used to assess the commercialization constraints faced by smallholder rice farmers in the study area.

The Household Commercialization Index (HCI) was employed in assessing the level of commercialization among smallholder farmers in the study area. The HCI (defined as the sum of the value of household crop sales as a proportion of the value of household crop sales expressed in percentage terms); measures the extent to which household crop production is oriented toward the market. Furthermore, the HCI measures the ratio of the gross value of crop



sales by household i in year j to the gross value of all crops produced by the same household i in the same year j expressed as a percentage. If the index is zero, it would signify a totally subsistence oriented household and if the index is close to 100, it would signify the higher degree of commercialization. HCI is expressed mathematically as:

$$HCI_i = \left[\frac{\text{Gross value of crop sales hh } i \text{ year } j}{\text{Gross value of all crop production hhi year } j} \right] \times 100 \quad \dots(1)$$

where;

HCI_i = the extent of i th household commercialization level. That is, it measures the degree to which a household sells its output to market. The index captures the variation in terms of the intensity of crop commercialization across households. For the study, commercialization level is grouped into three categories; low (25% output sold), medium (26% - 50% of output sold) and high with >50% of output sold (World Bank, 2007; and Martey, 2012).

Tobit model was selected in this study because of its decomposability into two different types of elasticity that enable us to determine not only the decision to participate in the market (commercialization), but also to determine the intensity of commercialization. Tobit model assumes that both the decision to commercialize and the level of commercialization are determined by the same variables and those variables that increase the probability of commercialization also increase the amount of sales. The tobit model was adopted to assess the determinants of the decision to participate in the market (Commercialize) as well as the intensity of commercialization by smallholder rice farmers. Most studies have modeled agricultural commercialization as a two-step analytical approaches involving the undesirable decision to commercialize and the observed degree or extent of commercialization. Tobit model parameters do not directly correspond to changes in the dependent variables brought about by changes in independent variables. The marginal effect on the level/intensity of commercialization due to changes in the explanatory variable is given by:

$$\left(\delta_\epsilon \left[\frac{y_i}{x_i} \right] \right) / (\delta x_i) / \left(\frac{\beta Q x_i}{\partial} \right) \quad \dots(2)$$

The Marginal effects also account for the probability of being commercialized. A Tobit model provides a single coefficient for each independent variable despite two distinct types of dependent variables (censored and uncensored).

The tobit model is appropriate when the dependent variable is censored at some upper or lower bounds as an artifact of how the data were collected (Sebatta *et al.*, 2013; and Kabiti *et al.*, 2016). The Tobit model assumes that the observed dependent variable y , for observations $i=1, \dots, n$ satisfy:

$$y_i \text{ Max} = (y_i^*, 0) \quad \dots(3)$$

where; the y_i^* are latent variables generated by the classical regression model:

$$y_i^* = \beta_0 + \beta_1 X_1 + \beta_2 X_2 + \beta_3 X_3 + \dots + \beta_k X_k + \mu_i \quad \dots(4)$$

$$y_i = \begin{cases} y_i^* & \text{if } y_i^* > 0 \\ 0 & \text{if } y_i^* \leq 0 \end{cases} \quad \dots(5)$$

$$y_i^* = \beta_0 + X\beta_1 + \mu_i, X \sim N(0, \delta^2) \quad \dots(6)$$

As proposed by Tobin (1958), the model describes the relationship between non-negative dependent variable y_i^* and an independent variable (or vector) X_i . Tobit model assumes that there is a latent or unobserved variable y_i^* which linearly depends on X_i via a parameter β which determines the relationship between the independent variable X_i and the



latent variable. Furthermore, there is a normally distributed error term μ_i to capture random influence on this relationship.

The empirical model to assess the unobservable decision to commercialize and the intensity of agricultural commercialization of participating and non-participating smallholder rice farmers is specified as:

$$y_i^* = \beta_0 + \beta_1 AGEHH + \beta_2 GEND + \beta_3 MAST + \beta_4 EDUHH + \beta_5 HHSI + \beta_6 FEXP + \beta_7 FMSIZ + \beta_8 EXTCNT + \beta_9 MASSOC + \beta_{10} CQTY + \beta_{11} CRDT + \beta_{12} MKTFO + \beta_{13} PRICE + \beta_{14} NSRIC + \beta_{15} DISMKT + \beta_{16} IRR + \beta_{17} MECH + \beta_{18} TRAIN \dots(7)$$

where;

y_i^* = the dependent variable representing (HCL), X_i = a vector of independent variables, and β = a vector of unknown coefficients and μ_i = the error term assumed to be normal with zero mean and constant variance.

y_i^* = Household commercialization index

β_0 = Constant

$\beta_1 - \beta_{18}$ = Coefficients estimated

X_1 = Age of the farmer (in years)

X_2 = Sex of the Household head (Male = 1, Female = 0)

X_3 = Marital Status (married = 1, Otherwise = 0)

X_4 = Level of Education (in years)

X_5 = Household size (in Numbers)

X_6 = Farming Experience (in years)

X_7 = Farm size (ha)

X_8 = Extension Services (Number of contacts)

X_9 = Membership of cooperative (member = 1, non-member = 0)

X_{10} = Quantity of crops produced (in kg)

X_{11} = Access to credit (Access = 1, Otherwise = 0).

X_{12} = Access to market information (Access = 1, Otherwise = 0)

X_{13} = Unit price of output (₦)

X_{14} = NSRIC Project (participating = 1, Not-participating = 0)

X_{15} = Distance to market (in km)

X_{16} = Access to irrigation (Access = 1, Otherwise = 0)

X_{17} = Access to mechanization (Access = 1, Otherwise = 0)

X_{18} = Training and Capacity building (Number of trainings)

To estimate the cost and returns associated with smallholder rice farming enterprise in the study area, farm budget model using Net Farm Income (NFI) analysis was employed. The farm budgeting technique involving the use of Gross Margin (GM) and NFI to determine the profitability of production and is conventionally operationalized leading to the determination of costs and revenue or return for a given production period. It is expressed as:

$$NFI = GFI - TVC - TFC \dots(8)$$

$$GM = TR - TVC \dots(9)$$

where; NFI = net farm income; GFI = gross farm income; TVC = total variable cost; and TFC = total fixed cost.



RESULTS AND DISCUSSION

Socio-economic Characteristics of the Respondents

Table 2 present the socio-economic characteristics of the Niger State Rice Investment Consortium Project participating and non-participating smallholder rice farmers. Gender is the physical, biological and social condition of being male or female. The result shows that most of the respondents were male with 81.20 and 94.02% for NSRIC participant and non-participant, respectively. This finding explains the large representation of male heads in both samples. This finding agrees with the study by Adenegan *et al.* (2013) which claimed that a typical Nigerian farming system is predominantly dominated by men. This is also in consonance with the finding of Martey *et al.* (2012) who reported that sex of household head captures the differences in market orientation between males and females; with males assumed to have a higher propensity to participate in markets than females. Age is an important variable of consideration when determining the quality of labour employed in any enterprise. It is the length of past life spent. Majority of the respondents were within the age brackets of 31 – 50 years with 57.27% and 52.13% for NSRIC project participant and non-participant, respectively. The mean age of the respondents was 38.42 and 44.10 years for participants and non-participants, respectively, implying that the respondents sampled were in their productive age and were full of vigour and strength to carry out high labour demanding nature of farming activities. This could positively influence productivity and consequently high volume of sales and hence, market participation (commercialization). This result validates that of Sigei *et al.* (2013), who reported that younger people participated more in the market because they are more receptive to new ideas and are less risk averse than the older people. Therefore, the age of the household head becomes an important factor in the behaviour of the farmers towards production and level of commercialization in the study area.

With regards to marital status of respondents, majorities (80.77%) were found to be married, that is, participants (80.34%) and non-participants (81.22%). The implication of this finding is that they utilized family members to provide cheap source of labour (family labour) to work on the farm. This act increased their productivity to favour high marketable surplus (agricultural commercialization). This finding is in agreement with Oparinde and Daramola (2014) who reported that being married affords the farmers the opportunity of getting cheap source of family labour to work on the farm, therefore leading to enhancement of market participation. Meanwhile, Baba and Etuk (1991) and Baba and Wando (1998) explained that the implication of the large household size is that household expenditure tends to draw more on family income so that only a meager sum is saved and invested eventually on farming and this may affect the ethics of commercialization.

Table 2 also presenting the educational level of respondents revealed that 12.82% and 42.74% of NSRIC participants and non-participants had no formal education, respectively. About three quarter of the respondents had one form of formal education or the other with secondary education (40.17% and 32.48% for participants and non-participants, respectively) and primary education (17.09% and 18.80% for participants and non-participants, respectively). Furthermore, only 29.91% and 5.98% for participants and non-participants had tertiary education. Smallholder rice farmers that participate in NSRIC project were more educated than non-participant households. The farmers' level of education is very important in agricultural productivity and market participation as it enhances farmer's access to information and proper use of inputs, leading to higher marketable surplus and hence increased commercialization, and this is consistent with the findings of Boniphace *et al.* (2014) and Oparinde and Daramola (2014).



Table 2: Socio-economic Characteristics of the Respondents

	NSRIC Participant		NSRIC Non-participant		Pooled	
	Frequency	Percentage	Frequency	Percentage	Frequency	Percentage
Age						
21 – 30	30	25.00	12	10.26	43	17.98
31 – 40	34	29.06	20	17.09	54	23.08
41 – 50	33	28.21	41	35.04	74	31.62
> 50	20	17.09	37	37.61	64	27.35
Total	117	100.00	117	100.00	234	100.00
Mean	39		44		42	
Sex						
Male	95	81.20	110	94.02	205	87.61
Female	22	18.80	7	5.98	29	12.39
Total	117	100.00	117	100.00	234	100.00
Marital Status						
Married	94	80.34	95	81.22	189	80.77
Single	23	19.66	22	18.80	45	19.23
Total	117	100.00	117	100.00	234	100.00
Educational Level						
Non Formal Education	15	12.82	50	42.74	65	27.78
Primary Education	20	17.09	22	18.80	42	17.95
Secondary Education	47	40.17	38	32.48	85	36.32
Tertiary Education	35	29.91	7	5.98	42	17.95
Total	117	100.00	117	100.00	234	100.00
Years of Experience						
1 – 10	44	37.61	23	19.66	67	28.63
11 – 20	52	44.44	31	26.50	83	25.47
21 – 30	19	16.24	48	41.03	67	28.63
31 – 40	2	1.17	15	12.82	17	7.26
Total	177	100.00	117	100.00	234	100.00
Mean	16		23		9	
Membership of Farmer Organization						
Yes	100	85.47	47	40.17	147	62.82
No	17	14.53	70	59.83	87	37.18
Total	117	100.00	117	100.00	234	100.00

Source: Field survey, 2016

The distribution of respondents according to years of farming enterprise requires both time on the process and training in the activities. Osuntogun (2000) noted that several factors are known to affect the credit needs of farmers; prominent among these is their past experience. Majority of respondents (82.05% and 46.16% participants and non-participants, respectively) had years of experience ranging between 1-20 years. The mean years of farming experience was 16 and 23 years for participants and non-participants, respectively. Years of experience for non-participants was found to be significantly different from that of participants. The reason advanced for this could be that, the longer farmers have engaged in the farming experience, the harder it will take for them to adopt new ideas which could bring about improvement in their level of output; consistent with the findings of Nwachukwu *et al.* (2014).

Membership of organization by respondents shows that more than half of the pooled (62.82%) were members of one farmers' association or the other, while 37.18% were not members. In addition, within each category, greater percentages of participants (85.47%) were members of farmers' association while majorities (59.83%) of non-participants were not members of any farmers' association. This finding reveals that participating in farmers'



association/organization has potential benefits, ranging from securing better prices for the produce, lower prices for inputs, better loan access and repayment capacity, better access to extension education (making available technical assistance and technology) that allows participating farmers harvest higher yields and is in line with the findings of Oparinda and Daramola (2014).

Table 2: Socio-economic Characteristics of the Respondents Cont'd.

	NSRIC Participant		NSRIC Non-participant		Pooled	
	Frequency	Percentage	Frequency	Percentage	Frequency	Percentage
Extension Contact						
No contact	20	17.09	57	48.72	77	32.91
Fortnightly	11	9.40	0	0.00	11	4.70
Monthly	28	23.93	7	5.98	35	14.96
Quarterly	57	48.72	40	34.19	97	41.45
Annually	1	0.58	13	11.11	14	5.98
Total	117	100.00	117	100.00	234	100.00
Household Size						
1 – 5	25	21.37	21	17.95	46	19.66
6 – 10	56	47.86	35	29.91	91	38.89
11 – 15	34	29.06	45	38.46	79	33.73
16 – 20	2	1.17	15	12.82	17	7.26
21 – 25	0	0	1	0.85	1	0.43
Total	117	100.00	117	100.00	234	100.00
Mean	8.71		10.61		10	
Farm Size						
0.1 – 1.0	11	9.40	13	11.11	24	10.26
1.1 – 20	94	80.34	10.0	85.47	194	82.91
2.1 – 3.0	10	8.55	3	2.56	13	5.56
3.1 – 4.0	2	1.71	1	0.85	3	1.28
Total	117	100.00	117	100.00	234	100.00
Mean	2		1.84		1.92	

Source: Field survey, 2016

Table 2 further showed frequency distribution of extension visits in the study area. From the sampled farmers, majority (82.91% and 51.28%) of participants and non-participants, respectively, reported having extension service contact at different levels of frequency, while 17.09% and 48.72% participants and non-participants, respectively had no extension service contact. One way to transform subsistence-oriented farming into market-oriented farming system is through the provision of functional extension service delivery system. This finding is in consistent with the findings of Abu (2015) and Agwu *et al.* (2013) who both reported that extension services extended from the provision of technical advice on farming issues, such as what to produce and when to produce to facilitating access to input supplies, the provision of market information and capacity building training to farmers. Household size is the number of people living in a house as a unit, or feeding from the same pot (NPC, 2007). The importance of large family size in a household especially in traditional agriculture was expressed by Olufe (1988), in his study of resource productivity in food crop production in Kwara State, Nigeria. According to the study, family labour accounted for a significant proportion of total labour force used in traditional agriculture, thereby enabling the cultivation of large hectare of farmlands and reducing the cost of hiring labour for farm operation. Table 2 is also the result of the distribution of respondents according to household size. The result reveals that majority of the respondents (69.23% and 47.86%) of participants and non-participants, respectively, had



household size of 1-10 persons, while 30.23% and 52.13% of participants and non-participants had a household size above 11 persons. The mean household sizes were 9 and 11 for participants and non-participants, respectively. Preponderance of large household size is a characteristic of the poor rural areas (Eboh, 1995).

Traditional agriculture is labour intensive. Much of the labour is needed in post harvest activities, such as processing, distribution and marketing. However, large households with more dependents are likely to have a lower level of commercialization due to increased household consumption. This is evident in the observation of Agwu *et al.* (2012) that the decision to sell is preceded by a decision to consume. Moreso, Baba and Etuk (1991) and Baba and Wando (1998) explained that the implication of the large household size is that household expenditure tends to draw more on family income, so that only a meager sum is saved and invested eventually on farming, and for the borrowed capital, this is likely to affect the repayment capacity of the respondent.

The area of farmland under cultivation by the respondents is shown in Table 2. Result indicates that 89.74% and 96.58% of participants and non-participants, respectively, had farm size less than or equal to 2 hectares. On the other hand, 2.1 to 4.0 hectares were cultivated by 10.23% and 3.41% of participants and non-participants, respectively. The mean farm size was 2.0 hectares and 1.85 hectares for participants and non-participants, respectively. This depicts the respondents as typical smallholders which could negatively affect mechanization and commercialization; as larger farm sizes serves as an incentive to produce surplus for market. This is in agreement with the findings of Martey *et al.* (2012) and Oluwande and Mathenge (2010) who observed that large farm size, when well managed, has positive influence on output market access since it enables farmers to generate production surpluses for the market.

Household Commercialization Index

Table 3 present the household commercialization index (HCL) of the sampled farmers. The proportion of rice sold by majority of NSRIC participants (71.79%) producing households ranged from 51-75 whereas proportion of rice sold by 76.92% of non-participant producing households ranged from 26-50. The mean household commercialization indices were 67.25%, 32.57% and 49.41% for participant, non-participant and pooled sample, respectively. The household commercialization index indicates that 67.25%, 31.57% and 49.41% for participant, non-participant and pooled sample, respectively. The household commercialization index indicates that 67.25%, 31.57% and 49.41% of total production is sold by the participant, non-participant and pooled sample households, respectively. Thus, NSRIC project participating households are considered moderately commercialized, as their sales' percentage is well above the midpoint but less than the threshold level (75%). The result further revealed that household commercialization index ranges from 0% to 86.86% through the study area. This indicate that the most commercialized farmers sell about 86.86% of the total produced rice and the least commercialized household did not sell at all. This result is in consistent with the findings of Ele (2013) and Osmani and Hossain (2015) who reported that the degree of commercialization in Nigeria is moderately high (about 60.40%). However, the finding validates that of Ndanitsa (2005) in his study of *fadama* crop production in Niger State, Nigeria, who revealed that most output (rice) by farm households goes into family consumption and gift to friends/relatives.



Table 3: Household Commercialization Levels

HCL	NSRIC Participant		NSRIC Non-Participant		Pooled	
	Frequency	Percentage	Frequency	Percentage	Frequency	Percentage
0.0-25	0	0.00	15	12.82	15	6.41
26-50	7	5.98	90	76.92	97	41.45
51-75	84	71.79	12	10.26	96	41.03
76-100	26	22.22	0	0.00	26	11.11
Total	117	100.00	117	100.00	234	100.00
Mean	67.25		31.75		49.41	
Minimum	44.05		0.00		0.00	
Maximum	86.85		54.76		86.85	
Standard Deviation	9.56		12.03		20.91	

Source: Field survey, 2016

Categorization of household commercialization levels

The result of the categorization of the level of commercialization of respondents is presented in Table 4. The estimates of the levels of rice commercialization were used to characterize farmers according to low, medium and high commercial farmers. Abera (2015) categorized households who sell 25% and below of their output as low commercial farmers, those who sell between 26 and 50% as medium commercial farmers, and above 50% as high commercial farmers. Following these categorization, sampled households in the study area were categorized. Accordingly, result of the analysis in Table 4 indicates that 0 and 29.91% of participants and non-participants are categorized as low commercial farmers, respectively. This implies that most non-participants of NSRIC were low commercial farmers than the participants. Furthermore, 5.98% and 66.67% of participants and non-participants are categorized as medium commercial farmers. With respect to high commercial farmers, 94.02% and 3.42% of participants and non-participants are categorized as high commercial farmers, respectively. This is an indication that more NSRIC project participants are high commercial farmers than non-participants. These categorization means that the smallholder rice farmers in the study area that are fully commercialized are producing mainly for the market for income generation, which those that are commercializing on a medium scale are producing both for consumption and for sale, while those that are not commercialization at all are producing mainly for consumption, in line with the findings for Osmani *et al.* (2014) and Kabiti *et al.* (2016).

Table 4: Categorization of Commercial Levels

HCL	NSRIC Participant		NSRIC Non-Participant		Pooled	
	Frequency	Percentage	Frequency	Percentage	Frequency	Percentage
Low	0	0.00	35	29.91	35	14.94
Medium	7	5.98	78	66.67	85	36.32
High	110	94.02	4	3.42	114	48.72
Total	117	100.00	117	100.00		100.00

Source: Field survey, 2016

Determinants of Smallholder Rice Commercialization

The estimated coefficient of the determinants of smallholder rice commercialization as well as the marginal effects is presented in Table 5. The diagnostic statistics of the model such as the F-value and Pseudo R² were high and significant at (P<0.000) which indicates that the



explanatory variables included in the Tobit model jointly influence the level of rice commercialization as well as indicating the goodness of fit of the model. The results obtainable from the Tobit model are the Maximum Likelihood Estimates (MLE) and the marginal effects. The marginal effects indicate the rice commercialization levels resulting from a unit change in the explanatory variables. The level of rice commercialization of smallholder households is significantly determined by gender, household size, farm size, extension contact, quantity produced, project participation, access to market information, unit price, irrigation, access to tractors and training.

The coefficient of sex is positive and significantly influenced smallholder households' rice commercialization levels ($\beta = 0.04, P < 0.043$). The result shows that gender of household head is significantly associated with increase in the level of rice commercialization. This is in line with the finding of Berhanu and Moti (2010) who both found that male headed households were more involved in on-farm production and were likely to sell more grain early when prices are still high, while majority of the female headed households are involved in post-harvesting processing and prefer to store more of their output for household food self-sufficiency.

The coefficient of household size is negative and significantly influenced smallholder households' rice commercialization levels ($\beta = -0.006, P < 0.012$). This suggests that a unit increase in the size of household is likely to decrease the probability of smallholder rice commercialization. The result showed that the smallholder rice farmers who had large household size had a higher probability of reducing the proportion of rice sold. This implies that the larger the household size, the less it is oriented toward the market. This gives the necessity to withhold more farm produce for home consumption. This result concurs with the findings of Apind *et al.* (2015); and Lawin and Zongo (2016).

The coefficient of farm size is positive and significantly influenced farm households' rice commercialization levels ($\beta = -0.052, P < 0.004$). Farm size indicates the potential to produce surplus for the market and significantly associated with a higher level of agricultural commercialization. Results revealed that an additional hectare of land used for rice production will lead to increase in the probability of smallholder rice commercialization. The finding is in line with the findings of Oluwande *et al.* (2010); and Martey *et al.* (2012) who all revealed that households with larger farm sizes are able to produce marketable surplus and hence participate more in the market.

The coefficient of frequency of extension contact is negative and significantly influenced smallholder household's rice commercialization levels ($\beta = -0.010, P < 0.004$). However, as the frequency of extension contact with extension agents increases, the probability of increase in smallholder rice commercialization level decreases. The plausible reason for this finding could be due to low extension agents to farmer's ratio and the fact that the primary function of the extension agents in Nigeria and especially in the study area is mainly restricted to dissemination of information and training of farmers on adoption of production technologies which may not have anything to do with linking farmers to the markets or encouraging them to participate in output markets, in line with the findings of Abu (2013) and Boniphace *et al.* (2014).



Table 5: Tobit Estimates of Determinants of Commercialization

Variables	Marginal Effect	Standard Error	t-value	P> z
Constant	0.0045481	0.1473287	0.03	0.97
Age	-0.0003888	0.0010847	-0.36	0.720
Sex	0.0390797**	0.0192685	2.03	0.043
Marital status	0.0308246	0.019974	1.54	0.123
Educational level	0.0001112	0.0011527	0.10	0.923
Household size	-0.00058566**	0.0023423	-2.50	0.012
Farming experience	-0.001145	0.0011045	-1.04	0.300
Farm size	0.0529994***	0.0183669	2.89	0.004
Extension contact	-0.0104478***	0.0035912	-2.91	0.004
Membership of farmer group	0.0243732	0.0159457	1.53	0.126
Quantity produced	0.0000473***	6.94e-06	6.81	0.000
Access to credit	-0.0028291	0.151938	-0.19	0.852
Market information	0.0490023***	0.158874	3.08	0.002
Unit price	0.003723**	0.0015415	2.42	0.016
NSRIC participation	0.2230494***	0.0330614	6.75	0.000
Distance to market	0.0008836	0.0008599	1.03	0.304
Irrigation	0.00368066	0.156185	1.52	0.029
Access to tractors	0.0420027**	0.182421	2.30	0.021
Training	0.0118282*	0.0072682	1.73	0.084
Number of observations		231		
F(18,213)		57.64		
Prob>F		0.0000		
Pseudo R ²		0.4278		

Note: *, **, ***significance at the 10%, 5% and 1% probability levels, respectively.

Source: Field survey, 2016

The coefficient of quantity produced is positive and significantly influenced smallholder households' rice commercialization levels ($\beta = 0.00005 P < 0.000$). Quantity of rice produced is associated with higher level of rice sales. Results reveals that an increase in household quantity of rice produced necessitates the producer to market the excess after taking away the portion for household consumption and/or gift to friends/relatives, which result in an increase in the household output commercialization level. This implies that an additional bag (100kg) of rice produced leads to the probability of increase in the level of commercialization. This result is consistent with the findings of Abu (2015) and Kabit *et al.* (2016) who both found out that surplus production serves as an incentive for a household to participate in market.

Unit price had a positive and significant influence on smallholder household's rice commercialization levels ($\beta = 0.0037 P < 0.016$). This agrees with the *a priori* expectation. An increase in the unit price of rice increase the probability of more quantity offered to the market, an indication of increased commercialization. This finding confirms the assertion from economic theory that output price is an incentive for farm households to supply more produce for sale, and is in consonance with the finding of Oluwande *et al.* (2010); and Martey *et al.* (2012) who all discovered that output price serves as an incentive for sellers to supply more produce to the market and influences level of market participation and commercialization.

The coefficient of access to market information is positive and significantly influenced smallholder households' rice commercialization levels ($\beta = 0.49 P < 0.002$). This is in agreement with the *a priori* expectation. This result indicates that the proportion of rice



marketed increases in response to access to market information, an indication of increase in the probability of smallholder rice commercialization. This suggests that access to output market information are expected to enhance skills and knowledge of farmers, guarantees producers flow of insights on market requirements and opportunity sets that enable farmers to plan effectively in line with the study of Abu (2015).

The coefficient of NSRIC project participation was positive and significantly influenced smallholder households' rice commercialization levels ($\beta = 0.223 P < 0.000$). Result revealed that NSRIC project participation will lead to an increase in the probability of smallholder commercialization. This implies that NSRIC project participants benefited from various services they were exposed to, which has tremendously and significantly enhanced their output, level of commercialization and income, which is usually the ultimate aim of all the intervention programmes, and is in line with the findings of Lawin and Zango (2016).

The coefficient of irrigation was positive and significantly related to smallholder households rice commercialization levels ($\beta = 0.024 P < 0.029$). An increase in availability of irrigation, will lead to an increase in the probability of practicing two-cycle production leading to additional marketable surplus and hence an increase in the level of commercialization. This implies that farmers having access to irrigation have opportunities to cultivate rice throughout the year (rain-fed and irrigated farming) and the produce would be over and above home consumption. This finding is supported by Kabit *et al.* (2016).

The coefficient of access to tractors was positive and significantly influenced smallholder households' rice commercialization levels ($\beta = 0.042 P < 0.021$). An increase in access to tractors will lead to increase in the probability of smallholder rice commercialization levels. The Agricultural Equipment Hiring Centre (AEHC) is a demand-driven model through which farmers get easy access to tractors, farm implements and other machineries, and the primary catalyst that aided the expansion of farm lands, timeliness of operations, reduction in drudgery and the ability to control weeds effectively. This implies that access to tractors leads to expansion and increase in the land areas under cultivation, with the attendant increase in the quantity of rice produced, marketable surplus and hence participate more in the market. This finding corroborates those of Boniphase *et al.* (2016).

The coefficient of training was positive and significantly influenced smallholder households' rice commercialization levels ($\beta = 0.011 P < 0.084$). This is in agreement with the *a priori* expectation. Participation in Farmer Business Schools (FBS) and Good Agricultural Practices (GAP) training packages mainly focused on specific crops, improve farmers' business market orientation and farm management skills to guide, educate and promote commercialization through changing the mindset of the smallholder rice farmers from more subsistence production to viewing farming as business. These findings are in tandem with the studies of Ojo (2011) that found that training and special skills acquisition has tremendously and significantly enhanced smallholder farmers' output, market participation and incomes, which are usually the ultimate objectives of intervention programmes.

Costs and Returns of the Rice Enterprise Respondents in Niger State

Result of the cost and returns analysis for rice enterprise is given in Table 6. Generally, it is evident from Table 6 that the imputed labour cost dominated production cost, accounting for 46.30% and 38.85% of the total cost of NSRIC participants and non-participants, respectively. The fixed cost representing depreciation on farm fixed assets was low, accounting averagely for 6.42% and 9.03% of the production cost for participants and non-participants, respectively. This is in line with the findings of Baba (2010) who reported low fixed cost.



Similarly, the costs and returns analysis revealed that smallholder rice farmers in the study area earned positive net farm incomes of ₦123,684.08 and ₦46,872.14 for NSRIC project participants and non-participants, respectively. However, it is evident that, net income earned by the NSRIC participants was higher than that of non-participants. The implication of this positive gross return is that the NSRIC project may have contributed to increased incomes of the smallholder rice farmers in the study area.

Table 6: Estimated Annual Costs and Returns Analysis of the Respondents

Items	NSRIC Cost (₦/ha)	Participant % of Total Cost	NSRIC Cost (₦/ ha)	Participant % of Total Cost
Variable Costs				
Cost of seeds	13,568.38	13.05	20,310.30	24.43
Fertilizer	30,213.68	29.07	18,967.90	22.81
Agrochemicals	4,241.03	4.08	3,601.30	4.33
Labour	48,121.37	46.30	32,303.60	38.85
Transportation	1,130.77	1.09	449.10	0.54
Total Variable Cost	97,275.21	93.58	75,632.20	90.97
Fixed Costs				
Rent on Land	512.82	0.49	542.40	0.65
Depreciation on Farm tools	2,343.70	2.25	2,820.90	3.39
Payment of Interest	3,812.38	3.67	4,147.40	4.99
Total Fixed Costs	6668.91	6.42	7,510.60	9.03
Total Costs	103,944.12	100.00	83,142.80	100.00
Returns				
Gross income	227,628.21		130,014.96	
Gross margin	130,352.99		54,382.74	
Net farm income	123,684.08		46,872.14	
Return on Naira Invested	1.18		0.56	

Source: Field survey, 2016

CONCLUSION AND RECOMMENDATIONS

The study concluded that participation in the Niger State Rice Investment Consortium Project had significant effects on commercialization levels and income of participants in Niger State, Nigeria. To increase further participation in the project, the following recommendations were made:

1. Government at all levels must develop appropriate policies, programmes and strategies to promote the commercialization of smallholder agriculture through vigorous campaigns, sensitization and training of farmers with marketing and negotiation skills.
2. Policy initiatives targeted at productivity enhancing mechanisms such as use of fertilizer, other agro-inputs as well as use of machineries be made available by Ministry of Agriculture and Rural Development to increase production of rice and commercialize their enterprise.
3. Policy thrust aimed at strengthening extension services delivery system are put in place, reducing the wide extension agent to farmer ratio, introducing market-linkage related packages and periodic training and upgrading of the skills of extension agents on most effective way of technology package and delivery.
4. Provision of information to smallholder farmers and supporting farmers to invest in mobile phones and radio sets in order to have access to real-time market information.



5. Organization of farmers into effective groups and associations to facilitate joint mobilization of resources to help one another and also strengthen access to information that will assist in improving the execution of their activities as well as better influence market prices for their products through their collective bargaining power.
6. Provision of small scale farmer managed irrigation schemes for supplementary irrigation to facilitate all year round farming and enhance productivity and commercialization.
7. More agricultural lands be made available to farm households to encourage mechanization, commercialization and economies of scale, and efforts should be made at upgrading roads and other rural infrastructures, e.g., establishment of more points of sale in farming communities as well as deepen collaborate with farming communities as well as deepen collaborate with the rural access and mobility project (RAMPII) to upgrade farm-to-market roads.

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