



### Research Article

## Effects of Niger State Rice Investment Consortium on Income of Smallholder Rice Farmers in Niger State, Nigeria

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### Abstract

The Niger State Rice Investment Consortium (NSRIC) project, Niger State Agricultural Policy, promotes the transformation of the predominantly subsistence Agricultural production system to a modernized and Commercial-oriented system. Total sample size of 234 (made up of 117 participants and 117 non-participants), drawn from twelve (12) localities in three (3) Local Government Areas (LGAs), were selected through multi-stage sampling technique. Data were collected using well-structured questionnaire. Data were analyzed using Descriptive Statistics, Ordinary Least Square Model and Henry Garrett Technique. The results showed that the respondents were in their productive age with mean age of 39 and 44 years for participants and non-participants respectively. It was observed that 80.34% and 81.22% of the participants and non-participants respectively were married. The mean farm sizes were 2.0ha and 1.84ha for participants and non-participants respectively. The regression estimates for income among the respondents showed that the coefficient of farm size, frequency of extension contact and capital were significant at 1 percent probability level and positive for the participants, non-participants, pooled data and pooled data with dummy. The result of Henry Garrett Ranking Technique revealed that poor access road was ranked first most pressing farmers' constraint with a Garrett mean score of 52.27 and 53.09, and lack of government policy on commercialization was ranked the tenth farmers' constraint.

**Keywords:** Consortium, Commercialization, Smallholder, Rice, Income

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### Introduction

Agriculture plays a significant role in livelihoods, employment, income, growth, food security, poverty alleviation, socio-economic development in developing countries (World Bank, 2008; Pingali, 2010; International Fund for Agricultural Development - IFAD, 2011; International Food Policy Research Institute - 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, despite Nigeria's potential in respect to stallholder commercialization, is largely untapped and the current status of agriculture in the country is a source of major concern (Awotide and Akerele, 2010). The Nigerian agricultural sector is dominated by resource poor smallholder farmers, 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.

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. For example, the focus of the Agricultural Transformation Agenda (ATA) waste create a favourable policy and regulatory framework that will lead to enhanced quality compliance with local, regional and international standards; facilitate measures that will promote private sector investment into the sector and create room for strengthened public private partnership (Ajani and Igbokwe, 2014).

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 was then stipulated as a plan 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 (NV3:2020, 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 commercialization (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. 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 bridging the widening nutritional gap

and persistent food insecurity in Nigeria, the government developed policies to commercialize agriculture with the over-arching 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. Consistent with these policies thrusts and in the urge for transforming the subsistence-oriented production system, the Commercial Agriculture Development Programme (CADP) encourage 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; 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 is on this premise that this study seeks to assess the effect of Niger State Rice Investment Consortium (NSRIC) project on commercialization levels of smallholder rice farmers in the study area. This study was to determine the effect of NSRIC project on income of the smallholder rice farmers in the study area and also to identify commercialization constraints facing the farmers in the study area.



### Materials and Methods

The study was conducted in Niger State, Nigeria; specifically in three sample Local Government Areas (LGAs), including Gbako, Lavun and Wushishi LGAs. The State lies on latitude 8°20'N and Longitude 3°30' and 7°40'E (Niger State Bureau of Statistics, NSBS; 2014).

The state has a total land area of about 86,000km<sup>2</sup>, representing 9.3 percent of the total land area of the country Niger State Vision 3:2020 Report (2008). An estimated 80% of the state land area (86,000km<sup>2</sup>) is suitable for agriculture (arable) and the range of crop species that can be produced is wide Niger State Vision 3:2020 Report (2008). 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 (NV3:2020, 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 by 2015.

Niger State experiences distinct dry and wet seasons with annual rainfall varying from 1,100mm in the Northern parts to 1,600mm in the Southern parts. The vegetation of the state is mainly Southern Guinea Savanna. The average minimum temperature is 26°C while the average maximum temperature is 36°C. The mean humidity ranges between 60% (January to February) and 80% (June to September).

The majority of the population in the state (about 85%) are smallholder farmers, while others constituting (15%) are involved in vocations such as white-collar jobs, business, craft and arts Niger State Vision 3:2020 Report (2008). Agriculture is one of the major occupations, as over 90 percent of the rural populace are involved in farming (Bala, 2004). 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; NSV3:2020, 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; NSV3:2020, 2008).

A multi-stage sampling procedure was for the study. The first stage involved purposive selection of three (3) LGAs based on the participation in NSRIC project. The LGAs include Gbako, Lavun and Wushishi. The second stage involved selection of two villages each from the three (3) LGAs selected. The third stage involved 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.

Finally, 10% of the smallholder rice farmers were randomly selected from each of the villages comprising 117 respondents for NSRIC project participants and 117 for non-participants. Table 1 shows the sampling technique (Household sampling frame and size).

Both primary and secondary data were employed for this study. Primary data were collected with the aid of well-structured questionnaire. Information elicited for include, household socio-economic profiles of the NSRIC project participating and non-participating smallholder rice farmers and commercialization constraints facing the 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).

Descriptive statistics such as frequency distribution tables, cross tabulations, averages/means, percentages were employed to summarize the data on socio-economic variables of smallholder rice farmers in the study area. 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.

## Results and Discussion

### *Socio-economic characteristics of respondents*

Table 2 present the socio-economic characteristics of the Niger State Rice Investment Consortium Project participating and non-participating smallholder rice farmers in the study area. The study showed that most of the respondents were male with 81.20 and 94.02 percent 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 men. The results showed that majority of the respondents were within the age brackets of 31 – 50 years with 57.27 percent and 52.13 percent 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. The sampled smallholder rice farmers that participated in NSRIC project were about 7 years younger than the non-participants. The results further indicated 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.

The results of the distribution of respondents according to marital status are presented in Table 2. Majority (80.77%) of the respondents were found to be married, and this represents 80.34% and 81.22% of participants and non-participants in the area respectively. The high percentage of married respondents could be attributed to the active age bracket range of the majority of the respondents. 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. Table 2 also presents the educational level of respondents. The results 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 percent for participants and non-participants had tertiary education. Smallholder rice farmers that participate in NSRIC project are more educated than non-participant households. The farmers' level of education is very important in agricultural productivity and market participation as it enhances farmers' access to information and proper use of inputs, leading to higher marketable surplus and hence increased commercialization. This is consistent with the findings of Oparinde and Daramola (2014).

The result showed that majority of respondents (82.05% and 46.16% participants and non-participants respectively) had years of experience ranging between 1-20 years (Table 2). The mean years of farming experience was 16 and 23 years for participants and non-participants respectively. The observed higher years of experience for non-participants than the participants 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. The result is consistent with the findings of Nwachukwu *et al.* (2014).

Membership of organization by respondents was another socio-economic characteristics studied in the research. From Table 2, it showed 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 percentage of participants (85.47%) were members of farmers' association while majority (59.83%) of non-participants were not members of any farmers' association. The participation in farmers association may have some 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. Oparinde and Daramola (2014) also reported similar findings to the present study in their studies.

The result revealed that majority of the respondents (47.86% and 38.46%) of participants and non-participants respectively had household size of 6 – 10 persons, while 30.23% and 52.13 percent of participants and non-participants had a household size above 11 persons (Table 2). The mean household size was 9 and 11 for participants and non-participants respectively. Eboh (1995) reported also that large household size is a characteristic feature of the rural areas. The area of farmland under cultivation by the respondents is shown in Table 2. Result indicated that 89.74% and 96.58% of participants and non-participants respectively had farm size less than or equal to two (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. Martey *et al.* (2012) 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.

#### ***Effect of Niger state rice investment consortium project on income of rice farmers***

The summary of the estimated regression analysis for income of participants, non-participants, pooled sampled without dummy and pooled sampled with dummy are presented in Table 3, 4, 5, and 6 respectively. Table 3 presents the

summary of the estimated regression model for the participants. The linear regression model was selected as the lead equation for having the highest number of significant explanatory variables and an F-value that was statistically significant at 1%. The R<sup>2</sup> value of 0.4512 was observed indicating that 45% of the variation in the income was accounted for by the explanatory variables included in the model. The coefficients of farm size, fertilizer and capital were all significant at 1% probability level. This implies that an increase in the levels of these inputs will lead to an increase in incomes of the farmers. This is in line with the findings of Tsado *et al.* (2014) and Oparinde and Daramola (2014).

Table 4 presents the summary of the estimated regression model for income of the non-participants. The linear model was selected as the lead equation for having the highest number of significant explanatory variables and an F-value that was statistically significant at 1%. The R<sup>2</sup> value of 0.5922 was observed, indicating that 59% of the variation in the income was accounted for by the explanatory variables included in the model. The coefficient of farm size, agrochemicals, capital and were significant at 1%, 5%, 1% and 10% respectively. This implies that an increase in the levels of these inputs will lead to an increase in incomes of the farmer. Similar findings were documented by Nwaru *et al.* (2011) and Tsado *et al.* (2014). The coefficient of seed was however negative and significant at 10%.

The summary of the estimated regression model for the pooled without dummy is presented in Table 5. The double log model was selected as the lead equation for having the highest number of significant explanatory variables and an F-value that was statistically significant at 1%. The R<sup>2</sup> value of 0.6206 indicates that 62% of the variation in the income was accounted for by the explanatory variables included in the model. The coefficient of farm size, fertilizer, extension contact and capital were positive and significant at 1%, 1%, 10% and 1% probability level. This implies that an increase in these inputs would lead to an increase in the income of respondents. The coefficients of seed and labour were however negative and significant at 1% and 10% probability level respectively.



Table 6 presents the summary of the estimated regression model for the pooled with dummy. The Double log model was selected as the lead equation for having the highest number of significant explanatory variables and an F-value that was statically significant at 1%. The  $R^2$  value of 0.8311 indicates that 83% of the variation in the level of income was accounted for by the explanatory variables included in the model. The coefficient of farm size and capital were significant at 1% probability level. Similarly, the dummy variable representing the NSRIC project participation status was significant at 1% and positively related to income of the smallholder rice farmers. This implies that an increase in these inputs would lead to an increase in the income of respondents. The coefficient of seed was however negative and significant at 10%.

#### *Constraints to smallholder household commercialization*

Ten major constraints to smallholder household commercialization were identified in this study and their ranking according to Henry Garrette technique is presented in Table 7.

The results revealed that poor access roads to marketing centers was ranked as the first most pressing constraint with a Garrette mean score 52.27 and 53.09 for NSRIC project participants and non-participants respectively. The deplorable condition of rural roads was identified as one of the state's critical developmental challenges especially in view of accessibility of these roads to farms and markets.

Inadequate market infrastructure was ranked second most pressing constraint with a Garrette mean score 51.95 and 52.33 for participants and non-participants respectively. Inadequate market infrastructure reflects the poor state of our rural markets in respect of makeshift arrangements and the physical structures constructed with thatch, and is consistent with the findings of Varathan *et al* (2012) and Mohanasundaram (2015).

Distance to market was ranked third most pressing constraint with a Garrette mean score of 51.49 by participants (Table 7), however, this constraint was ranked fifth with a Garrette mean score of 49.74 by non-participants smallholder rice farmers in the study area. The consequence of this

constraint is that the farmers who happen to reach these bigger markets have to pay high transportation costs escalating overall marketing costs.

Ndanitsa (2005) had earlier reported higher transportation cost consequent of the increase in the pumping price of petroleum products due to the deregulation of the downstream sector, to be a serious constraint to farmers cultivating farmlands in *Fadama* areas of the state.

**Unfavourable market prices:** Table 7 revealed that unfavourable market prices was ranked fourth constraint with a Garrette mean score of 50.38 by participants, ranked eighth with a Garrette mean score of 48.58 by non-participants smallholder rice farmers in the study area. This implies that unfavourable market prices reflects low prices of rice faced by the smallholder households in the study area, which finds explanation in the economic theory of demand and supply. This is in line with the studies of Mohanasundaram (2015), who found out that during harvest season, there are gluts of rice as well as other crops, which forces prices downwards from the lucrative levels they were during the dry season with the attendant consequence of reduced incomes. Meanwhile, Ndanitsa *et al* (2017) recommended marketing credit to farmers to enable them process and store their products and not going into force sells, to avoid gluts in the market.

**Buyers dictating prices:** Table 7 revealed that buyers dictating prices was ranked fifth constraint with a Garrette mean score of 50.26 by participant whereas this constraint was ranked seventh with Garrette mean score of 48.73 by non-participant smallholder rice farmers in the study area. This implies that middlemen and other buyers impose prices on sellers which especially happens in farm gate sale where the buyer travels into the farming community in line with the findings of Varathan *et al*. (2012).

**Fluctuation in prices:** Fluctuation in prices was ranked sixth constraint with a Garrette mean score of 49.95 by participants, however, this constraint was ranked fourth with a Garrette mean score of 49.75 by non-participants smallholder rice farmers (Table 7) in the study area. Fluctuation in prices is described as the instability and volatility of prices

especially during the harvesting and processing periods as a result of the complex interaction of market forces. The implication of this constraint is its potential to impact negatively the incomes of market participants and discourage farmers from participating, and is in line with the findings of Mohanasundaram (2015) and Ndanitsa *et al* (2017).

**Inadequate storage facilities:** Table 7 revealed lack of storage facilities, ranked seventh constraint with a Garrett mean score of 49.48 by participants, whereas this constraint was ranked sixth with a Garrett mean score of 49.50 by non-participants smallholder rice farmers in the study area. The study revealed that the smallholder rice farmers have inadequate storage facilities to keep their bumper harvest and produce in wait for higher prices (take advantage of future higher prices). This implies persistent poor prices during harvesting period and selling the output at cheaper prices consistent with the findings of Varathan *et al.* (2012) and Kimara (2013).

**Lack of government policy on commercialization:** Table 7 revealed lack of government policies on commercialization, was ranked the constraint with a Garrett mean score of 47.26 by participants, whereas this constraint was ranked third with a Garrett mean score of 52.23 by non-participants smallholder rice farmers in the study area. The study further revealed that government through its policy does not assist the farmers to sell their output especially through price control mechanisms. The implication is that smallholder households tend to lose confidence in some government policies, consistent with the findings of Varathan *et al.* (2012) and Kimara (2013).

**Inadequate access to means of transportation:** Table 7 further revealed access to means of transport was ranked ninth constraint with a Garrett mean score of 47.15 by participants, whereas this constraint was ranked tenth with a Garrett mean score of 47.34 by non-participants. The study further confirmed that farm communities far away from main roads coupled with the poor nature of roads reinforce this constraint, with the attendant implication of households without any option being forced to sell

at farm-gate where they are exposed to low prices thereby reducing their market participation and income consistent with the findings of Mohanasundaram (2015).

**Inadequate market information:** Table 7 further revealed lack of market information was ranked tenth constraint with a Garrett mean score of 46.82 by participants, whereas this constraint was ranked second with a Garrett mean score (52.33) by non-participants. Market information is important to enable the smallholder farmers to make proper decisions about prices for their produce. Farmers explained that they do not receive market information from agriculture extension officers. This implies that middlemen tend to dominate and maximize profit because farmers are always ignorant about current prices, consistent with the findings of Varathan *et al.* (2012) and Mohanasundaram (2015).

### Conclusion and Recommendation

This study assessed the effect of Niger State Rice Investment Consortium Project on income levels of smallholder rice farmers in Niger State, Nigeria. The study revealed that the household specific farm income are greater among NSRIC project participating smallholder rice farmers than non-participating smallholder rice farmers in the study area. The study further revealed that gender, household size, farm size, extension contact, quantity produced, project participation, access to market information, unit price and training can transform the predominantly subsistence agricultural production system to a market-oriented and commercialized system. Therefore, it can be concluded that participation in the Niger State Rice Investment Consortium Project has a significant effect on income of participants in Niger State, Nigeria.

To increase further participation in the project, the following recommendations were made; 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; 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; policy thrust aimed at strengthening extension services delivery system be 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; 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; 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; provision of small scale farmer managed irrigation schemes for supplementary irrigation to facilitate all year round farming and enhance productivity and commercialization; 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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**Table 1: Household Sampling Frame and Size**

Category	LGAs	Villages	Sample Frame	Sample Size @10%
Participants	Gbako	Edozhigi	200	20
		Gbadafu	190	19
		Gbara	220	22
	Lavun	Sheshibikun	202	20
		Wushishi	160	16
		TunganKawo	190	19
Non-Participants	Gbako	Sheshiko	202	20
		WuyaSuman	190	19
		Latiko	202	20
	Lavun	Sossa	220	22
		Rogota	170	17
		Kasakogi	190	19
Total		12	2,336	234

Source: NSRIC and VLS, 2016

**Table 2: Socio-economic Characteristics of Respondent**

Variables	NSRIC participant		NSRIC Non-participant		Pooled	
	Frequency	Percentage	Frequency	Percentage	Frequency	Percentage
<b>Age</b>						
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	38.42		44.10		42	
<b>Gender</b>						
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
<b>Marital Status</b>						
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
<b>Educational Level</b>						
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

<b>Years of Experience</b>						
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	
<b>Membership of Farmer Organization</b>						
Yes						
No	100	85.47	47	40.17	147	62.82
Total	17	14.53	70	59.83	87	37.18
	117	100.00	117	100.00	234	100.00
<b>Extension Contact</b>						
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
<b>Household Size</b>						
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	
<b>Farm Size</b>						
0.1 – 1.0	11	9.40	13	11.11	24	10.26
1.1 – 2.0	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 3: Regression estimates for Participant Functional Forms**

Variables	Linear	Double-log	Exponential	Semi-log
Constant	8435.50 (0.18)	13.22495(10.03)***	11.7454 (79.90)***	377747.30 (0.88)
Farm size	179256.8 (4.62)***	1.0838 (4.47)***	0.5617974 (4.51)***	333741.6 (4.24)***
Labour	-242.43 (-0.30)	-0.0047479 (-0.03)	-0.0018275(-0.07)	29501.92 (0.55)
Fertilizer	204.015 (3.10)***	0.0626648 (0.32)	0.000611 (1.02)	11608.01 (0.18)
Seed	-78.9796 (-0.19)	-0.013467 (-0.12)	-0.004116(-0.31)	1922.698 (0.05)
Agrochemicals	-2516.41 (-0.53)	-0.0620138 (-0.60)	-0.0154194(-1.02)	-5391.49(-0.16)
Capital	9.88876 (4.46)***	0.1731459 (1.77)*	0.0000277 (1.27)	53146.1 (1.67)*
Extension contact	-0.53652 (-0.99)	-0.0009491 (-0.22)	-2.01E-06(-1.15)	401.4187 (0.28)
R <sup>2</sup>	0.4512	0.3984	0.4028	0.3971
Adjusted R <sup>2</sup>	0.416	0.3598	0.3645	0.3584
F-ratio	12.80	10.31	10.50	10.26

Source: Data Analysis, 2016

Note: \*, \*\*, and \*\*\* implies statistical significance at the 10%, 5% and 1% probability level respectively. Figures in parentheses are the respective t-ratios.

**Table 4: Regression Estimates for non-participants Functional Forms**

Variables	Linear	Double-log	Exponential	Semi-log
Constant	-6531.24 (0.36)	12.89526 (10.47)***	10.19893 (35.03)***	180642.2 (2.05)**
Farm size	51346.11 (11.32)***	1.114114 (10.70)***	0.7126 (9.85)***	71080.97 (9.55)
Labour	187.5668 (0.87)	0.2392398 (1.06)	0.0003 (0.09)	32323.06 (2.00)**
Fertilizer	-24.7027 (-0.56)	-0.0886027 (-0.69)	-0.000389 (-0.55)	-6528.7 (-0.71)
Seed	-29.5345 (-1.71)*	-0.2104776 (-1.70)*	-0.0016466 (-1.91)*	-12198.9 (-1.37)
Agrochemicals	3641.0 (2.08)**	0.0741697 (0.47)	0.0176135 (0.63)	18205.61 (1.63)
Capital	4.148 (3.09)***	0.2274516 (2.18)**	0.0000294 (1.38)	24351.40 (3.27)***
Extension contact	0.41308 (1.68)*	0.0088843 (1.61)	4.09E-06 (1.05)	781.0058 (1.42)
R <sup>2</sup>	0.5922	0.5328	0.5008	0.5032
Adjusted R <sup>2</sup>	0.5070	0.5028	0.4687	0.4712
F-ratio	22.6	17.76	15.62	15.77

Source: Data Analysis, 2016

Note: \*, \*\*, and \*\*\* implies statistical significance at the 10%, 5% and 1% probability level respectively. Figures in parentheses are the respective t-ratios.

**Table 5: Regression Estimates for Pooled without dummy Functional Forms**

Variables	Linear	Double-log	Exponential	Semi-log
Constant	44783.3 (1.20)	15.04701 (13.21)***	11.36088 (56.59)***	161898.6 (0.71)
Farm size	79766.5 (5.05)***	1.260948 (9.88)***	0.711152 (8.63)***	137592.5 (5.38)***
Labour	-1655.6 (-3.05)***	-0.3593127(-1.87)*	-0.0102023(-3.49)***	-61644.5 (-1.60)
Fertilizer	772.59 (7.28)***	0.5778393 (4.52)***	0.0028715 (5.02)***	154424.9 (6.02)***
Seed	-749.938 (-4.76)***	-0.8005996 (-7.87)***	-0.0064503 (-7.59)***	-98851.42 (-4.85)***
Agrochemicals	5986.6 (1.58)	0.0676713 (0.52)	0.005761 (0.28)	40738.3888 (1.56)
Capital	7.099055 (1.74)*	0.2321966 (3.25)***	0.0000413 (1.88)*	28200.77 (1.36)
Extension contact	0.2453219 (0.51)	0.0106026 (1.80)*	1.61E-06 (0.62)	2172 (1.84)*
R <sup>2</sup>	0.5796	0.6206	0.6107	0.5228
Adjusted R <sup>2</sup>	0.5666	0.6089	0.5986	0.5080
F-ratio	44.52	52.81	50.64	35.37

Source: Data Analysis, 2016

Note: \*, \*\*, and \*\*\* implies statistical significance at the 10%, 5% and 1% probability level respectively. Figures in parentheses are the respective t-ratios.

**Table 6: Regression estimates for pooled with dummy Functional Forms**

Variables	Linear	Double-log	Exponential	Semi-log
Constant	-116204.50 (-3.80)***	13.873 (18.14)***	10.38867 (7035)***	-47041.06 (-0.27)
Farm size	74911.40 (6.29)***	1.1104 (12.93)***	0.681832 (11.87)***	11.798.2 (5.73)***
Labour	-49.17 (-0.12)	0.1369 (1.40)	-0.0005 (-0.0005)	26671.11 (0.90)
Fertilizer	286.98 (3.26)***	-0.0281 (-0.30)	-0.00006 (-0.14)	46571 (2.23)**
Seed	34.04 (0.26)	-0.1516 (-1.94)*	-0.001715 (-2.64)***	16654 (0.94)
Agrochemicals	4035.30 (1.42)	0.0114 (0.13)	-0.006022 (-0.44)	30724.08 (0.94)
Capital	5.07 (1.65)	0.2039 (3.95)***	0.00002 (1.96)*	23164.77 (1.49)
Extension contact	-0.07 (-0.20)	0.0032 (0.82)	-3.00E-07(-0.17)	859.55 (0.97)
NSRIC	211987.50 (13.18)***	0.2748 (16.74)***	1.2802 (16.49)***	48910 (13.24)***
Participation				
R <sup>2</sup>	0.7627	0.8311	0.8237	0.7318
Adjusted R <sup>2</sup>	0.7543	0.8251	0.8174	0.7222
F-ratio	90.40	138.36	131.40	76.72

Source: Data Analysis, 2016

Note: \*, \*\*, and \*\*\* implies statistical significance at the 10%, 5% and 1% probability level respectively. Figures in parentheses are the respective t-ratios.



Table 7: Commercialization constraints faced by respondents

Constraint	Participants			Non-participants			Pooled		
	Total score	Mean score	Rank	Total score	Mean score	Rank	Total score	Mean score	Rank
Poor access roads to marketing centres	6116	52.27	I	6211	53.09	I	11822	50.52	II
Unfavourable market price	5894	50.38	IV	5821	49.75	IV	12003	51.29	I
Inadequate storage facilities	5789	49.48	VII	5792	49.50	VI	10696	45.71	VIII
Distance to market centres	6024	51.49	III	5820	49.74	V	11704	50.02	IV
Fluctuation in prices	5884	49.95	VI	5684	48.58	VIII	11607	49.60	V
Buyers dictating prices	5880	50.26	V	5701	48.73	VII	11585	49.51	VI
Inadequate market information	5478	46.82	X	5581	47.70	IX	10087	43.11	X
Lack of government policy on commercialization	5529	47.26	VIII	6111	52.23	III	11806	50.45	III
Inadequate market infrastructure	6078	51.95	II	6123	52.33	II	11551	49.36	VII
Inadequate access to means of transport	5517	47.15	IX	5539	47.34	X	10595	45.28	IX

Source: Field survey, 2016

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