RESEARCH ARTICLE

Effect of IFAD-VCDP on Input-Output Commercialization of Rice Farmers in Niger State of Nigeria

M. Sanusi Sadiq[1*] iD • I. P. Singh[2] iD • Muhammad Makarfi Ahmad[3] iD

[1]Federal University Dutse, Faculty of Agriculture, Department of Agricultural Economics & Extension, Dutse/Nigeria
[2]Swami Keshwanand Rajasthan Agricultural University, College of Agriculture, Department of Agricultural Economics, Bikaner/India
[3]Bayero University Kano, Faculty of Agriculture, Department of Agricultural Economics & Extension, Kano/Nigeria

ARTICLE INFO

ABSTRACT

The present research empirically determined the effect of IFAD programme on output and input commercialization among rice farmers in Niger State of Nigeria using field survey data elicited from 111 participants and 185 non-participants (90 and 95 non-participants from exposed and control groups respectively) drawn *via* multi-stage sampling design. The collected data were analyzed using Heckman's model. The empirical finding showed that the programme has no effect on output commercialization due to the poor market outlet as a result of no provision of established off-takers. However, the input support aspect of the programme mandate exerts an effect on the input commercialization among the farmers in the studied area. Furthermore, the poor incentive for extension agents, non-productive large household dominated by weaker people and one-way income traffic affected output commercialization among the rice farmers in the study area. Therefore, based on these, the programme should link the farmers with off-takers so as to sustain the viability of the programme even after its life span. In addition, to tackle poor extension contact, the farmers should effectively and efficiently use their social capital to introduce farmer to farmer extension approach by using private extension service as the technical support unit.

Introduction

Between 2002 and 2014, Africa has experienced a relatively strong economic growth with an average recorded economy growth of 5.3 percent, far above the global average between 2001 and 2010, and even higher than the growth rate of 3.8% recorded by developing East Asia and the Pacific (AfDB, OECD and UNDP, 2014). This return to economic growth since 2000s along with burgeoning urbanization and buoyant global commodity markets, now provide unprecedented market opportunities for Africa to develop a competitive and dynamic agricultural sector. The rising demand for food both in quantity and quality required rapid commercialization of African agriculture and articulated investments in processing, logistics, market infrastructure and retail networks (Byerlee and Haggblade, 2013).

Pingali and Rosegrant (1995) as reported by Ouedraogo (2019), viewed the promotion of commercialization in agriculture as inherent to the development process if the sector has to play an active role in economic growth and poverty reduction in developing countries. Therefore, the prospect of using agriculture as the most viable means by the smallholder farmers to escape from vicious cycle of poverty,

---

*Corresponding author
E-mail address: sadiqsanusi30@gmail.com

still to a large extent depends on their ability to improve not only on input-output intensification but also efficient market integration for their products. In fact, market-oriented small-scale farming represents the most effective way to strengthen the linkages between technology, productivity and poverty reduction (De Janvry and Sadoulet, 2009) given that the smallholder farmers account for the bulk of the staple food supply. Also, previous researches *viz.* Mellor and Malik (2017) and Papaioannou and De Haas (2017) stressed that agricultural commercialization can affect the overall rural economy by inducing higher expenditure on the part of commercial farmers on labour, as well as higher demand for products and services from the rural non-farm sector.

A pre-condition for successful participation in the market is the ability to meet market demand whose prerequisite is generation of marketable surplus (Rola-Rebzen and Hardaker, 2006). However, smallholder farmers' ability to meet market demand has been constrained by market failures including but not limited to high transaction costs that continue to serve as a barrier to market integration thereby making those involved to receive non-commensurate remuneration (Jayne *et al.*, 2006; Barrett, 2007).

Salau *et al.* (2018) opined that for accelerated agricultural productivity growth in Nigeria, increase use of fertilizer is very necessary. At the same time, promoting commercialization of smallholder agriculture can foster increased use of fertilizer because farmers that are market-oriented are likely to make extra cash income that can be invested in procurement of agro-inputs. However, the extent to which agricultural commercialization promotes input intensification in Nigeria is not clear.

The Value Chain Development Programme (VCDP) is consistent with the Federal Government of Nigeria Agricultural Transformation Agenda (ATA) to unearth laudable potential in the agricultural sector through a commodity value chain approach. The IFAD programme is production oriented with the main objective of having direct impact on the production levels of target groups, which will lead to increase in the net income of the farmers (IFAD, 2015). It target two of the priority commodities identified in the ATA *viz.* cassava and rice, in order to take advantage of existing market opportunities and address the constraints along the value chain (FMARD, 2016).

Despite effort by the numerous past and existing programmes flouted by both government and non-governmental agencies to address poverty in the country, especially that of the rural economy, poverty rate is still alarming among the pillar that is the backbone of the nation food security. However, the failures of these previous interventions cannot be dissociated from inherent weakness in the strategy of increasing productivity of the small-scale farmers, without taking cognizance of the role market has on the resource poor who are the major pivot of food security in the country. In addition, these programmes did not generate sustainable income for the smallholder farmers which necessitate shift from one intervention programme to another. In view of this background, this research was conceptualized

to tentatively verify the productivity of the income generated by the farmers under the scope of the programme *viz.* ability to generate savings, guarantee sustainable livelihood and the sustainability of the programme after its exit. This is so because the programme is aimed towards a paradigm shift of the smallholder farmers from low livelihood status to a sustainable one. If empirical evidence showed positive effect of the programme on the livelihood of the farmers, then value-added agriculture will be a formidable means of poverty alleviation or otherwise it will be a myth. It is inview of the foregoing that the research question on the effect of IFAD-VCD programme on doubling farmers' income *viz.* input-output commercialization among rice farmers in Niger State of Nigeria was determined. Thus, the study ought to determine the effect of IFAD-VCD on doubling farmers' income *viz.* input-output commercialization among rice farmers in Niger State of Nigeria.

Hypothesis

H_{01}: The programme has no effect on farmers' input commercialization.

H_{02}: The programme has no effect on farmers' output commercialization

H_{A1}: The programme has effect on farmers' input commercialization.

H_{A2}: The programme has effect on farmers' output commercialization

Materials and Methods

The study was conducted in Niger state of Nigeria situated on latitudes 8°20'N and 11°30'N of the equator and longitudes 3°30'E and 7°20'E of the Greenwich Meridian time. The vegetation of the state is northern guinea savannah with sparse of southern guinea savannah. Agriculture is the major occupation in the study area and complemented with civil service jobs, artisanal, craftwork, *Ayurveda* medicines and petty trade. The present study relied on cross sectional data obtained from 296 rice farmers drawn *viz.* multi-stage sampling technique using sampling frame obtained from IFAD-VCDP, NAMDA and through reconnaissance survey. In the state only five (5) Local Government Areas were chosen as the pilot phase for the programme with Agricultural Zone A (Bida) and C (Kontagora) having two LGAs each namely Bida and Katcha; and, Wushishi and Kontagora respectively, while Zone B has one participating LGA *viz.*Shiroro. In the first stage, from Agricultural Zone A, one LGA *viz.* Katcha LGA was randomly selected; from Zone B the only participating LGA *viz.* Shiroro LGA was automatically selected; while from Zone C, Wushishi LGA was purposively selected based on its comparative advantage as rice is produce throughout the year owing to the presence of Tungan Kawo irrigation dam. The sample size used for the study was composed of three groups of respondents *viz.* treatment group (IFAD participating farmers), exposed/spill-over group (non-IFAD participating farmers but living within the radius of 50km of IFAD site as adopted by Irshad *et al.*, 2016) and the control group (neither IFAD participants nor living within the radius of 50km). In the same vein, the exposed group emanates from the selected IFAD participating LGAs

while one LGA from each of the Agricultural zones *viz.* Lapai (Zone A), Gurara (Zone B) and Mariga (Zone C) were selected as control units.

In the second stage, two villages were randomly selected from each of the chosen participating LGAs, exposed sites and the control LGAs. Thereafter, two active co-operative associations from each of the selected participating, exposed and control villages were randomly selected. It is worth to note that Microsoft excel inbuilt random sampling mechanism was used for the random selections of the villages and the co-operative associations. In the last stage, using the sampling frame obtained from IFAD/VCD office in Niger State and reconnaissance survey (Table 1), Cochran's formula was used to determine the representative sample size. Thus, a total of 296 active rice farmers form the sample size for the study. However, only 295 questionnaires were found valid for analysis. Structured questionnaire complemented with interview schedule was used to elicit information from the

respondents during the 2018 production season and descriptive statistics and Heckman's model were used to analyze the collected data. The Cochran's formula used is shown below:

$$n_a = \frac{n_r}{1+\frac{(n_r-1)}{N}} \tag{1}$$

$$n_r = \frac{(1.96)^2 pq}{e^2} \tag{2}$$

Where:

n_a = adjusted sample size for finite population

n_r = sample size for infinite population

N = population size

p = proportion of population having a particular characteristic

q = 1 – p

e^2 = error gap (0.07)

Thus, p = 0.40 and q = 1 – 0.40 = 0.60

Table 1. Sampling frame of participating and non-participating farmers

Groups	LGAs	Villages	Co-operative Associations	SF	SS
TREATMENT	**Katcha**	**Baddegi**	ManagiBadeggi Farmers CMPS	24	10
			AminciEbantiTwaki CMPS Ltd	25	10
		Edostu	Edotsu Co-Operative Credit & Marketing CMPS	25	10
			EdotsuJinjinWugakunYema CMPS	25	10
	Shiroro	**Baha**	Baha Abmajezhin Cooperative Multi-Purpose Society Ltd	15	7
			AbwanuboNajeyi Development Association	18	8
		Paigado	PaigadoAchajebwa Development Farmers Soc.	25	10
			PaigadoFarmers Cooperative Society Ltd	25	10
	Wushishi	**Bankogi**	BankogiAlheri Farmers Coop. Multipurpose Soc Ltd	22	9
			BankogiGwariNasara CMPS	16	7
		Kanko	Kanko Arewa Farmers	25	10
			Kanko UnguwarNdakogi Cooperative Multipurpose Society Ltd	25	10
SUB-TOTAL				270	111
SPILL-OVER/EXPOSED	**Katcha**	**Kangi Toga**	Kangi Toga Farmers Cooperative	20	9
			Kangi Toga Youth farmers cooperative society ltd	15	8
		SheshiDama	Sheshi-DamaFarmers Cooperative	18	8
			Shinkafamana Multipurpose farmers cooperative Sheshi-Dama	15	8
	Shiroro	**FarinDoki**	Ayenaje multipurpose Development Association Farin-Doki	20	9
			FarindokiYouth Farmers Cooperative Society ltd	15	8
		Zhikuchi	GenukoFarmers Cooperative society Ltd	10	6
			Zhikuchi Rice Farmers Cooperative Society Ltd	12	7
	Wushishi	**Gwarijiko**	GwarijikoFarmers Cooperative	16	8
			Kyadyafu Cooperative Society Gwariji	10	6
		Fugangi	FugankpanFarmers Cooperative Society	13	7
			Fugan Youth Farmers Cooperative Society	10	6
SUB-TOTAL				174	90
CONTROL	**Lapai**	**Gbage**	Gbage Youth Farmer Cooperative Society	15	8
			Gbage rice farmer Cooperative Society Ltd	20	9
		Puzhi	PuzhiShinkafamana Farmers C.S. Ltd I	12	7
			PuzhiShinkafamana Farmers C.S. Ltd II	18	8
	Gurara	**Tufa**	Yanga Multipurpose Cooperative Association	19	9
			Abawa Rice Farmers Association	10	6
		Lambata	Lambata Rice Farmers Cooperative Multipurpose Society Ltd	15	8
			Boku/SarkiGbadagu Development Association.	14	8
	Mariga	**Kahigo**	KahigoFadama User Cooperative Society	17	8
			Young Farmers Cooperative Multi-Purpose Society Limited	20	9
		Bobi	Respect Cooperative Association Cooperative Society	13	7
			BobiHimma Irrigation Cooperative Society	20	9
SUB-TOTAL				193	95
Grand Total				637	296

Source: IFAD-VCDP farmer database and Niger State Agricultural Mechanization Development Authority (NAMDA), 2018.
SF and SS means sampling frame and sample size respectively.

Model Specification

The Heckman's model is composed of decision model and the outcome model with the former having the dependent factor been dichotomous while the latter has it's predict variable been continuous. The two-step Heckman selection model was adopted because of its ability to correct sample selection bias.

The decision stage or first stage: This is a probit model and it is given below:

$$FUI_i = f(X_1, X_2, X_3 \ldots \ldots \ldots \ldots \ldots .. X_n) \qquad (3)$$

$$FUI_{it} = \beta_0 + \beta X_{it} + \varepsilon_i \qquad (4)$$

Where:

FUI_{it} = [Total inorganic fertilizer (kg) used by ith farm]/[Total farm size (ha)]

FUI_{it} = Fertilizer utilization index (high = 1, otherwise = 0)

X_{it} = Vector of explanatory variables:

X_1 = Unit price of fertilizer (₦); X_2 = Yield (kg); X_3 = Marital status (married =1, otherwise = 0) X_4 = Education (years); X_5 = Sickness of household member (number); X_6 = Extension visit (number); X_7 = Access to credit (yes = 1, otherwise = 0); X_8 = Seed variety (improved = 1, local =0); X_9= Gender (male =1, otherwise = 0); X_{10}= Age (year); X_{11} = Household size (number); X_{12} = Annual income (₦); X_{13} = Farm size (hectare); X_{14} = Farming Experience (year); X_{15} = Non-farm income (yes =1, otherwise = 0); X_{16} = language spoken (number); X_{17} = Security threat (yes = 1, no = 0); X_{18} = IFAD Participation (yes = 1, no = 0); β_0 = Intercept; β_{1-n} = Vector of parameters to be estimated; and, ε_i = Stochastic term.

The outcome stage or second stage: The dependent factor of the model is a continuous variable and it is shown below:

$$Y_i^* = \alpha + X\beta + \varepsilon_i \qquad (5)$$

$$Y_i^* = \alpha + X_1\beta_1 + X_2\beta_2 + X_3\beta_3 + X_4\beta_4 + X_5\beta_5 + \cdots . + X_n\beta_n + \gamma IMR + \varepsilon_i \qquad (6)$$

Where:

Y_i^* = latent observation (HCI) for i^{th} household; HCI_i = Household commercial index for i^{th} household; X_1 = Unit price of output (₦); X_2 = Yield (kg); X_3 = Marital status (married =1, otherwise = 0); X_4 = Education (years); X_5 = Sickness of household member (number); X_6 = Extension visit (number); X_7 = Access to credit (yes = 1, otherwise = 0); X_8 = Seed variety (improved = 1, local =0); X_9= Gender (male =1, otherwise = 0); X_{10}= Age (year); X_{11} = Household size (number); X_{12} = Annual income (₦); X_{13} = Farm size (hectare); X_{14} = Farming Experience (year); X_{15} = Non-farm income (yes =1, otherwise = 0); X_{16} = language spoken (number); X_{17} = Security threat (yes = 1, no = 0); X_{18} = IFAD Participation (yes = 1, no = 0); IMR= The Inverse Mill's ratio; β_0 = Intercept; β_{1-n} = Vector of parameters to be estimated; γ= Lambda; and, ε_i = Stochastic term.

The Inverse Mill's Ratio (IMR) is the ratio of the probability density function over the cumulative distribution function of a distribution. It is a proxy variable for the probability of a farmer involving in output commercialization and is added to the outcome equation as an additional independent variable. In addition, the IMR measures the sample selection effect.

The most common approach used in measuring the degree of commercialization at the household level has been the proportion of sales from the total value of agricultural production (Von Braun, 1994). This is actually the revealed marketing decision of a household, particularly for commodities that are potentially used for sale and home consumption (Randolph, 1992). The HCI is conceptualized in this study as a ratio of the gross value of marketed rice output to the gross value of produced rice per household per cropping season and it is given as:

$$HCI_i = \left[\frac{Gross\ value\ of\ marketed\ sugarcane\ output}{Gross\ value\ of\ produced\ sugarcane} \right] \times 100 \qquad (7)$$

Results and Discussion

Socio-economic Characteristics of the Respondents

The cursory review of the socio-economic correlates showed that on the average both the participants and non-participants have post-primary education, but the year of post-primary education of the participating group was found to be marginally higher (Table 2). On the average, most of the participating farmers had moderate access to credit facilities while access to credit was poor among the non-participating farmers. Also, it was observed that the treatment group had more access to extension services and credit supply than their counterparts outside the treatment group. However, both the participants and non-participants were within their productive age i.e. youthful age which is a veritable asset for agricultural productivity, growth and development. Thus, it can be suggested that the rice food security in the studied area is not under threat as able-bodied men have key into the enterprise of rice production with vigor and passion. In addition, both of the groups had adequate years of experience in the production of rice which enabled them to be efficient in rationalization of their productive resources. Both groups have a large household size which makes them have access to cheap labour, thus a cost-cut in the cost of labour incurred in the production process. It was observed that there was high adoption of improved rice varieties while it was among the non-participants. Besides, the treatment group faced little security *viz.* communal conflicts, land tenurial problems and farmers/herders clashes as compared to that counterparts who didn't participate in the programme. Both groups are not much cosmopolitan as on the average most of the farmers can hardly speak and understand more than two languages, thus affecting their global integration into the larger society beyond the sphere of their farming communities. This pose as a challenge particularly to the treatment group as diffusion of technologies will be hindered.

Averagely, rice cultivation is done on small-scale basis across the group, thus indicating that rice is produced in subsistence quantity. This small farm size of the participating farmers would hinder commercialization inspite of the technical and financial support given to the treatment groups, thus affecting capital accumulation and inturn the economic growth. Furthermore, on the average, the quantity of the rice productivity of the treatment group was higher than that of

the non-treatment group by 34.86%. Therefore, it can be suggested that the programme support viz. technical and financial made the treatment group to have head advantage in respect of access to adequate tradable inputs and yield than the non-treatment group. It was observed that both the treatment and non-treatment groups had high commercialization index, an indication of high marketed surplus. This is expected as smallholder farmers are known to engage in distress or force sale all aimed at meeting their immediate credit requirement. Also, the annual income of the participating farmers is higher than of the non-participant by approximately 21.4%.

Table 2. Socio-economic profile of the respondents

Items	Treatment	Control	Spill-over	Pooled (non-treatment)
CI	0.764569	0.776476	0.713865	0.746355
Yield	3622.864	2223.16	2519.718	2359.974
Marital status	0.945455	0.677083	0.988764	0.827027
Educational level	9.054545	8.395833	8.808989	8.594595
Sickness	2.236364	2.75	2.842697	2.794595
Extension visit	7.872727	3.197917	4.516854	3.832432
Access to credit	0.445455	0.260417	0.337079	0.297297
Seed variety	0.963636	0.520833	0.168539	0.351351
Gender	0.972727	0.916667	0.966292	0.940541
Age	40.58182	40.67708	40.79775	40.73514
Household size	7.909091	7.791667	9.617978	8.67027
Farm size	1.33	1.295313	1.196629	1.247838
Farming experience	19.87273	19.89583	20	19.94595
Annual income (₦)	5.6883e+005	5.2366e+005	3.6473e+005	4.4721e+005
Non-farm income	0.718182	0.708333	0.719101	0.713514
Language spoken	2.463636	2.479167	2.382022	2.432432
Security threat	0.045455	0.302083	0.078652	0.194595

Source: Field survey, 2018.

Effect of IFAD on Marketed Surplus and Fertilizer Utilization

The significance of the Mill's Lambda/ Inverse Mill's ratio coefficient at 10% degree of freedom indicates the presence of selection bias in the data set and that the estimated parameters in the outcome equation are different from zero i.e. they exert significant influence on the response variable of the outcome equation. In addition, the significance of the Wald Chi[2] at less than 10% degree of freedom implies that the Heckman's model is the best fit for the specified equation. The test between the stimulus exonerates them from the problem of multicollinearity as indicated by the variance inflation factors (VIF) of the stimulus which were less than the VIF benchmark value of 10.0. The result of the outcome model showed the predictor variables *viz.* yield, extension visit, household size, income, farm size and non-farm income to exert significant influences on output commercialization decision of the farmers while in the case of the decision model, control variables *viz.* unit price of fertilizer, yield and participation in IFAD programme had influence on fertilizer utilization intensity (FUI) decision among the farmers in the studied area as indicated by the significance of their respective estimated coefficients at less than 10% degree of freedom (Table 3).

The positive significant effect of yield on both marketable surplus and FUI decisions among the farmers implies that farmers who recorded high yield have higher probability to increase their marketed surplus and the quantity of the synthetic fertilizer used in rice production in the studied area. However, it is expected that increase in marketed surplus should be guided by price which though is not significant but exhibit an inverse relationship which is contrary to the theory/law of supply. This is an indication that market intelligence enabled the farmers to deferred their sales due to glut which dampen prices during the boom period based on past experience till when the price become remunerative, thus delineating the farmers from the risk of convergent web cycle. Therefore, the marginal effect of a 1kg increase in rice yield would increase marketed surplus (MS) and FUI among the rice farmers by 2.39E-5kg and 2.799E-4kg respectively. The extension visit was found to exert a negative significant effect but a positive non-significant effect on farmers' MS and FUI decisions respectively, in rice production.

The positive significant effect of the unit price of inorganic fertilizer revealed the non-conformity of price to the law of demand due to poor soil quality which makes fertilizer a necessity, thus forcing the rice farmers to increase fertilizer utilization intensity in the studied area. Therefore, instead of a unit increase in the price of fertilizer to deter farmers from demand for fertilizer, the reverse is the case as fertilizer has become a necessity due to poor soil quality. Thus, the marginal implication of a unit increase in the price of fertilizer will increase the probability of a farmer to increase his/her

fertilizer utilization intensity by 0.007 kg in rice production in the studied area.

The negative influence of the extension visit(s) on farmers' decision on marketed surplus showed how lack of knowledge on market information and intelligence on the side of the change agents due to one-sided dimension of extension service mandate (production-led extension) in the studied area *viz.* dissemination of innovative farm practices only affects output commercialization among rice farmers and their business going concern due to low turnover. Therefore, the marginal implication of an additional unit of extension visit will decrease rice output commercialization among the farmers by 0.0036kg. However, the positive non-significant of the extension services on FUI is an indication of the inadequacy of the extension agents/ personnel to bring about the desirable change (adoption of improved rice practices) that will warrant an increase of FUI among the farmers in the studied area.

The negative significant effect of the household size estimated coefficient on MS decision among the farmers implies that large household would force a farmer to retain more for household consumption than the rice quantity that will be released to the non-farming population given the fact that rice is no longer a luxury food to millions of Nigerians but has become the cereal that constitutes a major source of calories for the rural and urban poor with demand growing at an annual rate of 5 percent (Oikeh *et. al* no date). Also, the negative non-significance of household size estimated coefficient on FUI depicts the drain effect of vulnerable composed household on farm capital investment due to excessive food expenditure on many mouths to cater for, thus affecting the purchasing power of farmer with respect to fertilizer utilization.

Table 3. Effect of IFAD on marketed surplus and fertilizer utilization

Variables	Decision model			Outcome model			VIF
	Coefficient	SE	t-value	Coefficient	SE	t-value	
Constant	−1.11901	0.88192	1.269^{NS}	0.77843	0.08921	8.726***	-
Unit price of fert (₦)	0.00715	0.00309	2.316**	-	-	-	1.137
Unit price of output (₦)	-	-	-	−6.121E-6	4.475E-6	1.368^{NS}	1.147
Yield	0.00028	0.00017	1.683*	2.393E-5	1.164E-5	2.056**	2.440
Marital status	−0.07813	0.29549	0.264^{NS}	−0.01181	0.02135	0.553^{NS}	1.521
Educational level	−0.01212	0.02027	0.597^{NS}	0.00058	0.00129	0.445^{NS}	1.296
Sickness	0.01996	0.07432	0.268^{NS}	0.00016	0.00464	0.035^{NS}	1.846
Extension visit	0.00571	0.03502	0.163^{NS}	−0.00364	0.00219	1.659*	2.044
Access to credit	0.33507	0.22918	1.462^{NS}	−0.00764	0.01389	0.550^{NS}	1.283
Seed variety	−0.20195	0.21740	0.928^{NS}	0.00399	0.01631	0.245^{NS}	1.734
Gender	0.29103	0.43634	0.667^{NS}	−0.01689	0.03219	0.525^{NS}	1.253
Age	0.00043	0.01647	0.025^{NS}	0.00031	0.00102	0.303^{NS}	2.241
Household size	−0.01379	0.03925	0.351^{NS}	−0.00685	0.00231	2.961***	2.088
Annual income (₦)	4.329E-7	4.056E-7	1.067^{NS}	5.927E-8	1.932E-8	3.067***	1.361
Farm size	0.12631	0.22817	0.553^{NS}	0.03832	0.01393	2.751***	1.594
Farming experience	−0.01020	0.01687	0.604^{NS}	−0.00034	0.00113	0.302^{NS}	2.361
Non-farm income	−0.08185	0.20966	0.390^{NS}	−0.04263	0.01296	3.290***	1.081
Language spoken	−0.02786	0.15022	0.185^{NS}	−0.01020	0.00991	1.029^{NS}	1.251
Security threat	−0.21067	0.27685	0.761^{NS}	−0.01124	0.02253	0.499^{NS}	1.467
Participation	0.66462	0.32015	2.076**	0.02612	0.02376	1.099^{NS}	2.800
IMR (γ)	-	-	-	0.09002	0.05396	1.668*	-
Wald Chi^2	47.24***						

Source: Field survey, 2018.
*** ** * & NS means significant at 1%, 5%, 10% and non-significant respectively.
The values in ( ) and [] are standard error and probability values, respectively.

The positive significant effect of income on MS showed how enlarged income which guarantees continuous future expenditure enjoyment will encourage farmers to increase their marketed surplus over marketable surplus in the studied area. Thus, the marginal implication of a unit increase in a farmer's income will increase his/her output commercialization by 5.927E-8kg. However, the positive non-significant of the income on FUI may be attributed to the reliance of the resource-poor farmers who are mostly smallholders on social capital to source for fertilizer and also the pecuniary advantage of bulk discount in fertilizer purchase in the studied area.

The positive significant effect of farm size on MS indicates how economies of size for farmers with large operational holdings increase their output commercialization due to high rice output. The high tendency of output commercialization among this category of farmers is their ability to substitute or defer the sales of rice product for other crops until when the price is remunerative. However, the insignificant but positive sign of the farm size coefficient on FUI depicts the likelihood effect of economies of scale on fertilizer utilization among the farmers with large operational holdings. Therefore, the marginal implication of a unit increase in the operational holding devoted to rice production will increase the probability of output commercialization among rice farmers by 0.038kg in

the study area. The negative significant effect of non-farm income on MS indicates that farmers with non-farm income i.e. mono-income retain more of their rice output than what they offered to the non-farming population all in an effort to meet up with their farm family food requirement. Earlier submission under household size revealed that rice in Nigeria is no longer a luxury food to millions of Nigerians given its importance with respect to calorie constituent. However, the non-farm income exert non-influence on FUI as most of the rice farmers in the study area did not diverse their income base. Therefore, the marginal implication of a farmer with no non-farm income will lead to a decrease in his/her MS by 0.043kg as compared to their counterparts with non-farm income who are liable to have their MS to increase by 0.043kg. The non-significant of the participation on output commercialization may be attributed to poor output market linkage as the programme mandate concentrate more on production and value addition with little or no effort in making provision of off-takers to enhance farmers marketed surplus. However, if adequate provision is made by linking the participating farmers with off-takers, they stand a better chance with respect to output commercialization than their counterparts who did not participate in the programme as indicated by the positive sign of the estimated coefficient. On the other hand, the significance of the participation coefficient on FUI clearly show the effect of input support *viz.* provision of synthetic fertilizer and technical support on application aid in enhancing fertilizer utilization among the participating farmers in the study area. Therefore, the marginal implication of a farmer participating in the programme will lead to an increase in FUI by 0.665kg.

Since participation in the programme has effect on input commercialization and it is contrary to that of output commercialization, therefore the H_{01} is rejected in favour of the H_{A1} hypothesis while the H_{02} was accepted in place of the H_{A2}

Conclusion

Based on these findings, it can be inferred that the programme has no effect on farmers' output commercialization owing to little or no adequate linkage of the farmers to the off-takers as obtained in the programme like Fadama IIIAF[+] in the state, thus affecting output commercialization. However, input support by the programme which is among the pre-requisite mandate exerts its effect on fertilizer utilization. Though, idiosyncratic factors *viz* poor incentive for extension agents, large household dominated by weaker people and one-way income traffic were found to affect output commercialization among the rice farmers in the study area. Therefore, the study recommended the need for IFAD to link the farmers to the off-takers in order to enable the farmers to sustain the going concern of their business as a reliable and adequate market are the major means that can guarantee the viability of the enterprise. In addition, the mandate of the programme *viz.* value addition should be harnessed so that farmers can diversify their income, thus doubling farmers' income.

Since all the rice farmers belong to co-operative organization, the organization should explore its educational potential by enlightening the farmers on the need to keep a sustainable household size for a better standard of living. Also, the co-operative institutions should adopt a farmer to farmer extension approach so as to tackle the duty dereliction by the extension agents. More so, they should use their pooled capital to acquire qualitative skills on rice innovative practices from private extension services available in the study area *viz.* Agricultural Graduate Association of Nigeria (AGAN) which the social organization can disseminate among its member more effectively and efficiently.

References

AfDB, OECD & UNDP. (2014). African Economic Outlook 2014: Global Value Chains and Africa's Industrialization, OECD Publishing, Paris, http://dx.doi.org/10.1787/aeo-2014-en.

Barrett, C. (2007). Smallholder market participation: Concepts and evidence from Eastern and Southern Africa. Food Policy, 33(4): 299–317.

Byerlee, D. & Haggblade, S. (2013). African food systems to 2030: Toward inclusive business models. Stanford Symposium Series on Global Food Policy and Food Security in the 21st Century, Centre on Food Security and the Environment. Pp 36

De Janvry, A. & Sadoulet, E. (2009). Agricultural growth and poverty reduction: Additional evidence. The World Bank Research Observer, 25(1): 1–20.

Federal Ministry of Agriculture and Rural Development (FMARD). (2016). Value Chain Development Programme Baseline Survey Report, Abuja. Pp. 40

International Fund for Agricultural Development (IFAD). (2015). IFAD's Internal Guidelines: economic and financial analysis of rural investment projects, Rome. Pp. 47

Irshad, M. Q., Ali, T., Shahbaz, B. & Maqsood, M. (2016). Impact assessment of the IPM-FFS program on agronomic practices adopted by cotton growers in Punjab Pakistan. Journal of Agricultural Research, 54(2): 321-330

Jayne, T. S., Zulu, B. & Nijhoff, J. J. (2006). Stabilizing food markets in eastern and southern Africa. Food Policy, 31: 328-341.

Mellor, J. W. & Malik, S. J. (2017). The impact of growth in small commercial farm productivity on rural poverty reduction. World Development, 91: 1–10.

Oikeh, S. O., Nwilene, F. E., Agunbiade, T. A., Oladimeji, O., Ajayi, O., Semon, M., Tsunematsu, H. & Samejima, H. (No date). Growing upland rice: A production handbook-Africa Rice Center *(WARDA)*. Accessed from www.warda.org on 17/2/2019

Ouedraogo, S. A. (2019). Smallholders' agricultural commercialization, food crop yield and poverty reduction: Evidence from rural Burkina Faso. African Journal of Agricultural and Resource Economics, 14(1): 28-41

Papaioannou, K.J. & De Haas, M. (2017). Weather shocks and agricultural commercialization in colonial tropical Africa: Did cash crops alleviate social distress? World Development, 94(June): 346–65.

Pingali, P. L. & Rosegrant, M. W. (1995). Agricultural commercialization and diversification: Processes and policies. Food Policy, 20(3): 171–85.

Randolph, T. F. (1992). The impact of agricultural commercialization on child nutrition. A case study of smallholder household in Malawi. Being Ph.D Dissertation submitted to Cornell University, Ithaca, New York, USA.

Rola-Rubzen, M. F. & Hardaker, J. B. (2006). Improving market access for smallholders: challenges and opportunities. Paper presented at the 50th Annual Conference of the Australian Agricultural and Resource Economics Society, 8th-10th February, 2006, Sydney.

Salau, S., Omotesho, O. & Muhammad-Lawal, A. (2018). Agricultural commercialization, fertilizer use and non-farm employment: What options for smallholder farmers in Nigeria?10th International Conference of Agricultural Economists held on July, 28th – August 2nd, 2018 in Vancouver.

Von Braun, J. (1995). Agricultural commercialization: Impacts on income and nutrition and implication for policy. Food Policy, 20(3): 187-202