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SOCIO-ECONOMIC DETERMINANTS OF IMPROVED RICE TECHNOLOGIES' ADOPTION AMONG SMALL SCALE FARMERS IN KOGI STATE, NIGERIA

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Abstract. *This study examined the socio-economic determinants of the adoption of improved rice technologies by small scale farmers in Kogi State, Nigeria. It specifically investigated the influence of socio-economic characteristics on the adoption of improved rice technologies, adoption level of farmers and constraints against adoption of rice technologies. Multistage random sampling was used to pick 120 registered rice farmers with the Kogi State Agricultural Development Project (ADP). Frequencies, percentages, mean, mode, mean scores and ordered probit regression were used to analyze the data. From the result, all the farmers adopted the use of agrochemicals (100%) and the farmers were categorized into low, medium and high adopters, with 60% of the farmers being high adopters. The result also showed that lack of infrastructural facilities was a major constraint experienced by farmers in the study area having a mean score of 3.7. However, the ordered probit revealed that membership of cooperative (1.029277 at 1% significance), source of fund (0.0100499 at 1% significance)) and source of labour (0.2746477, at 10% significance) determined the adoption of rice technologies while marginal effect on farm size, household size, contact with extension agents favoured the adoption of all the eight most important rice technologies which could be used as a measure towards pleasant disposition to commercial rice farming. The study recommends that private rice industries should utilize this positive disposition for rice farmers towards rice technology adoption by establishing rice processing industries in the study area and making the farmers' rice out growers to feed the industries.*

Key words: *rice, improved technologies, adoption; socio-economic determinants*

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INTRODUCTION

Small scale farmers have consistently remained the major producers of rice in Nigeria producing over 80% of the total output (Ohajianya and Onyenweaku, 2002) yet they are discriminated against in the scheme of agricultural policies and programs with the presumption that they are less technically efficient than large farmers (Enwerem and Ohajianya, 2013).

The demand for domestic rice in Nigeria has not been met as a result of continued fluctuation in rice production which is an indication of limited capacity of Nigerian economy. This can also be as a result of the inability of the rice farmers to obtain maximum output from the resources committed to enterprise (Kolawole, 2010). An average yield of rice in Nigeria is 1.8 tons per hectare compared to 3.0 tons per hectare from countries like Cote D'iviore and Senegal (West African Rice Development Association (WARDA), 2001). The production level of rice in Nigeria therefore, reflects low level of production among rice farmers.

Some of the reasons for the deficit in rice production are connected with attendant dangers of flood, inadequate water supply at the end of dry season, shortage of agrochemicals, usage of unimproved seeds, crude mode of production, and high cost of labour among others (Atala and Voh, 1994). Studies have shown that rice production in Nigeria is primarily done by small scale producers with average farm size of 1.259ha (Okoruwa and Ogundele, 2006), who are constrained by some factors that do not promote effective and efficient rice production.

This unsatisfactory development calls for a comprehensive research to further identify the factors influencing rice production among small scale farmers in Nigeria. Goni *et al.* (2007) opined that "the low agricultural productivity in Nigeria is revealed by the actual yields of major crops such as rice compared with potential yields". In a related manner, Biyi (2005), reported that, Nigeria has the potential to increase her domestic share of the rice market in a medium to long term investment strategy that can develop into self-sufficient industry locally. This implies that there is the tendency to increase output of rice in Nigeria with the available land if productive resources and technologies are introduced to the farmers by agent of change and if they are adopted and used efficiently by Small Scale Farmers in Kogi State.

The increase in the production of rice has not been enough to meet the consumption demand of the ever increasing population in Nigeria. Despite the importance of Nigerian rice production within the West African context, a comprehensive and up to date picture of rice production and processing in particular is lacking (Akpokodje *et al.,* 2001). In spite of its contribution to the food requirements of the Nigerian population, rice production in the country is put at about 3.2 million tones (Babafada, 2003). This has been shown to be far below the national requirement as over $600 million worth of rice is annually being imported into the country (Adeoye, 2003).

Several factors have been associated with adoption behaviour. These are the independent factors like personal, institution, environmental and socio – economic factors (Matata *et al.,* 2001). Adesina and Baidu-Forson (1995) asserted in their study that a probit regression on socio-economic determinants revealed that age was negatively related with probability of participating in rice development projects, though Asante *et al.* (2011) recorded a positive relationship.

According to Adetiloye (2012), most peasants are uneducated and ageing, the introduction of sustainable credit into agriculture will attract the youth and the educated, but in Kogi State, the population of the youths in the rural area has been greatly vitiated by rural-urban migration, as most youth want to obtain white collar jobs and are not interested in farming. Lawal and Shittu (2006) posited that lack of access to credit causes setbacks to the productivity of farmers as a result of the fact that, these farmers do not have resources to procure improved seedlings, chemicals and hired labour, as well as transport and market their produce which would have improved their productivity.

The State Agricultural Development Project (ADP) is an intervention initiated by the World Bank to assist farmers in adopting improved agricultural production technologies as a means of achieving high productivity among the farmers. Kogi State is endowed with vast arable land and human resources for rice production. However, it seems that rice farmers in Kogi State have not been able to explore all these favourable variables to farmers to adopt and achieve desirable increase in yield. This could be due to some problems such as the inability of the farmers to adopt improved seed varieties, credits and use of agrochemicals, could also be as a result of the fact that most rice producers in the State are the aged farmers who are somewhat less inclined to adopt new practices as asserted by (Bryon *et al*., 2005). In order to improve on the production of rice in this area, one may want to know the following:

i. What are the socio-economic characteristics of small scale rice farmers in the study area?
ii. What are the socio-economic characteristics that determine the adoption of improved rice technologies among small scale rice farmers in the study area?
iii. What is the level of adoption of improved rice technologies by farmers in the area?
iv. What are the factors that militate against the adoption of improved technologies?

Objectives of the study

The main objective of the study is to analyze the socio-economic factors determining the production of rice among small scale farmers in Kogi State, Nigeria.

The specific objectives are to:

i. Describe the socio-economic characteristics of small scale farmers growing rice
ii. find out the influence of socioeconomic characteristics of small scale farmers on the adoption of improved rice technologies
iii. Find out the level of adoption of improved technologies.
iv. Find out the constraints against the adoption of improved rice technologies.

1. RESEARCH METHODOLOGY

1.1. The study area

The study was carried out in Kogi State, Nigeria. The State lies on Latitude 71' 49^{o} North and Longitude 61' 45^{o} East with a geographical feature depicting young sedimentary rocks and alluvium along the riverbeds, which promotes agricultural activities and has an average maximum temperature of 33.2^{o}C and average minimum of 22.8^{o}C. It shares

common boundaries with Niger, Kwara, Nassarawa and The Federal Capital Territory to the north. To the east, the state is bounded by Benue State, to the South by Enugu and Anambra States, and to the West by Ondo, Ekiti and Edo States. Ethnically, Igala, Okun, Egbira, Nupe and Bassa form the main ethnic groups. Kogi State occupies 29,833 square kilometers and has a population of 3,314,043 out of which 1,672,903 are male and 1,641,140 female (NPC, 2007). The State has two distinct weathers, the dry season, which lasts from November to March and rainy season that lasts from April to October. Annual rainfall ranges from 1016mm to 1524mm retrieved from Kogi State website, 17th May, 2015.

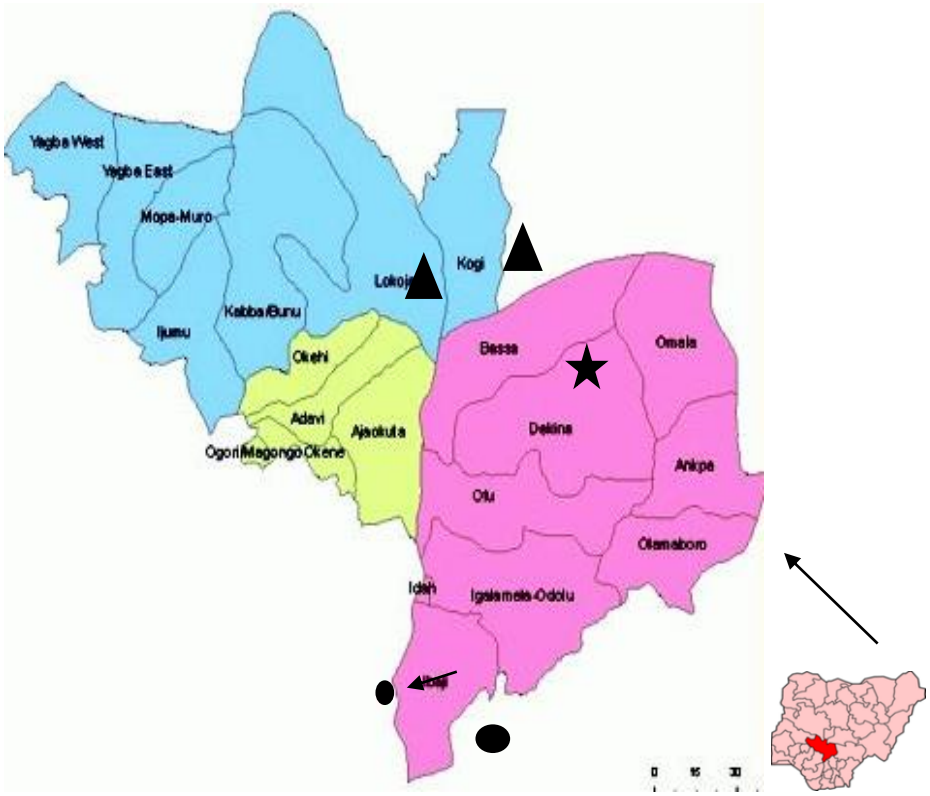

Fig. 1 Map of Kogi State, Nigeria

Key

ADP Zone B – Bassa
ADP Zone C – Koto-karfe and Lokoja
ADP Zone D- Ibaji and Idah

1.2. Sampling procedure

The sampling frame for this study consists of farmers growing rice under various cropping systems in selected zones of Kogi State. Kogi State has four agricultural zones (A, B, C, and D), but B, C and D were purposively selected based on their involvement in rice production. A multistage sampling technique was used to select a total of 120 farmers (respondents) from the three zones. Two blocks were selected from each zones, making 6 blocks in whole. A cell was also selected from each block to make 6 cells. Finally, random sampling technique was used to select 20 contact farmers from registered rice farmers from each cell making a total of 120 contact farmers. Each cell contained between 25 and 35 registered farmers. The sampled farmers were representative of the registered rice farmers.

1.3. Method of data collection

The data for this study were from primary source, since they were collected from respondents using structured questionnaire, personal interview and informal discussion. Structured questionnaire was used for literate farmers and interview schedules for the illiterate ones. The data collected were subjected to statistical analysis using descriptive and inferential analysis.

1.4. Method of data analysis

Data collected were analyzed based on the stated objectives.

Objective I: The socio-economic characteristics of respondents were analyzed using descriptive statistics such as frequency, percentage, mean and mode

Objective II: The socio-economic characteristics of rice farmers that determine the adoption of improved rice technology were analyzed using the ordered probit regression model. The implicit form of the model is given thus:

$$Y^* = x^1\beta + e_1$$

Where y* is the exact but unobserved dependent variable
X is the vector of independent variables and
B is the vector of regression coefficients which is estimated.

$$Y = (X_1 + X_2 + X_3 + X_4 \ldots\ldots\ldots X_n) + e$$

Where: Y = Adoption level of improved rice technologies
X_1 = Age of farmers in years (numbers)
X_2 = Level of education (years spent in school)
X_3 = Marital status (Married=1, others = 0)
X_4 = Sex (dummy variable; 1 = male, 0 = female)
X_5 = Household size in numbers
X_6 = Farmers experience in years
X_7 = Farm size in hectare (ha)
X_8 = Membership of Farmers' Association (dummy variable;
1 = members, 0 = Non-members)
X_9= source of labour
X_{10}= Contact with extension agents (Yes=1, No=0)
e = Error term

Objective III: The adoption levels of the various innovations, practices, systems and technologies were placed on a binary or dichotomous variable where the farmers were asked to indicate if they have adopted a set of listed technologies or not. Their response categories are as follows: Yes-1 and No-0 and were further analyzed using descriptive statistics. The farmers were further grouped under three categories (High, Medium and Low adopters) using frequencies and percentages.

Objective IV: Constraints militating against adoption of improved rice technology. A list of constraints were presented to the rice farmers to select the extent to which the constraints affects them. A 4-point Likert type scale of very severe (VS), moderately severe (MS), less severe (LS) and not severe (NS) with values of 4, 3, 2 and 1 were used. The sum total of 4, 3, 2 &1=10 when divided by 4 gave an average of 2.5. Any mean score below 2.5 would be considered not severe or less severe and above 2.5 would be considered either as very severe or moderately severe.

2. RESULTS AND DISCUSSION

2.1. Socio-economic characteristics of small scale rice farmers in the study area

The result of the socio-economic characteristics of small scale farmers in the study area analyzed using frequency and percentage is shown in table below. They were Age, Sex, Marital status, household size, size of land, source of labour, source of fund, contact with extension agents, cooperative membership, farming experience and educational level.

Table 1 Distribution of the various socioeconomic characteristics of the respondents

Variable	Frequency	Percentage (%)	Mean/Mode
Age(Years)			
20-29	13	10.8	42.25
30-39	25	20.8	
40-49	65	54.2	
50-59	10	8.3	
60 and above	7	5.8	
Total	120	100	
Sex			
Male	75	62.5	75
Female	45	37.5	
Total	120	100	
Marital Status			
Single	10	8.3	36
Married	36	80.0	
Widowed	11	9.2	
Separated	3	2.5	
Total	120	100	
Educational Qualification			
No Formal Education	33	27.5	52
Primary Education	20	16.7	
Secondary Education	52	43.3	
Tertiary Education	15	12.5	
Total	120	100	

Farming Experience(Years)			
1-5	15	18.3	14.0
6-10	30	25.0	
11-15	13	10.8	
16-20	35	29.2	
21 and above	26	21.7	
Total	120	100	
Household Size			
1-5 persons	17	14.2	10.6
6-10 persons	80	66.7	
11-15 persons	19	15.8	
15-20 persons	2	1.7	
21-25 persons	2	1.7	
Total	120	100	
Size of Farmland (Ha)			
1-5	73	60.8	5.375
6-10	37	30.8	
11-15	10	8.3	
16-20	0	0	
21-25	0	0	
Total	120	100	
Cooperative Membership			
Yes	67	55.8	67
No	53	44.2	
Total	120	100	
Source of Fund			
Personal Savings	74	61.7	74
Family	16	13.3	
Cooperative Loans	30	25	
Total	120	100	
Source of Labour			
Family	38	31.7	49
Hired	33	27.5	
Both	49	40.8	
Total	120	100	
Contact with Extension Agents			
1-3 times	102	85	2.45
4-6 times	18	15	
7-10 times	0	0	
11-15 times	0	0	
Total	120	100	

Source: Field Survey, 2015

Table 1 shows that 5.8% of the respondents were older than 60, 8.3% were between the ages of 50-59, 54.2% were between the ages of 40-49, 20.8% were between the ages of 30-39 and 10.8% were between the ages of 20-29. This implies that the dominant age of the respondents was between the economically productive ages of 40-49, which is in agreement with Okoruwa and Ogundele (2006) that the average age of rice farmers was estimated to be between 42 and 45 years.

There was an indication that majority of the respondents were males with 62.5% and women with 37.5% as presented in Table 1. This implies that the majority of the rice farmers in the study area were males. This result tallies with ILO (2007). However, the percentage of women involvement was significantly high, this is in harmony with Ibrahim and Klock, (2002) that contribution of women farmers in agricultural production is highly recognized, but in practice, they are less represented in most agricultural oriented development plans. Eighty percent (80%) of the rice farmers were married. This is an indication that some of them may have support from their family members in carrying out the production of rice. Others were 8.3% single, 9.2% widowed and 2.5% were separated.

Educational qualification showed that majority of the rice farmers constituting 72.5% had various forms of education ranging from primary to tertiary education. This will help to broaden the farmers' knowledge and makes adoption of improved technologies easy. Which is in accord with Okoruwa and Ogundele (2006) that the average year of schooling for the traditional rice farmers ranges between 7 -12 years, but contrary to Mbah (2006) who reported that most of the rice farmers with 69% being either illiterates or semi-illiterates and 27.5% of the rice farmers had no formal education.

The Table further indicates that 66.7% had a family size ranging from 6-10 persons, with the implication that most of the rice farmers had large family size, and may need little additional labour outside their family to complement farming activities and operations which the family size cannot supply. This result supports the findings of Mbah (2006), who said that greater number of rice farmers have large family size of about 10-25 members.

The Table 1 also brought out the fact that 60.8% of the rice farmers had the size of farmland ranging from 1-5 hectares, with most of them having between 1-1.3 hectares and also small scaled, which is similar to the report of Amaza and Maurice (2005) that most of the rice farmers in Nigeria are of small to medium scale categories with an average of 1.2 hectares. Also, the table shows that 55.8% of the respondents were members of cooperative societies, while 44.2% were non-members of any cooperative society at all. The locality, distance, level of interactiveness could have made some of the rice farmers not to be members of cooperative. The fairly high percentage of cooperative membership could be due to benefit such as loans, inputs, sharing of ideas and full support from their opinion leaders who are well-educated, which complements the findings of Idiong *et al.* (2007) who affirmed that membership of cooperative affords the farmers opportunities of sharing information on modern rice practices.

Table 1 shows that 61.67% of the respondents used their personal savings as their major source of fund, 13.33% got support from their families and 25% from cooperative loan. Contact with extension agents on Table 1 indicates that 85% of the respondents had contact with extension agents within the range of 1-3 times in a year and 15% had contact with extension agents between the range of 4-6 times, which indicates that few of the farmers had opportunity of getting adequate interaction for basic information on improved technologies. This result is in agreement with Umunna (2008), who in his study reported that, 88.1% of the farmers that he investigated ranked extension agents as the highest source of agricultural information.

2.2. Socio-economic determinants of the adoption of improved rice technologies

The Table 2 below shows the socio-economic determinants on the adoption of the most important eight (8) improved rice technologies by the respondents. The technologies

are: Use of improved varieties, agrochemicals, fertilizer, proper spacing, improved nursery, timely transplanting, improved processing and improved storage methods.

Table 2 Regression result of the influence of Socio-economic characteristics on the adoption of improved rice technologies

Variables	Coefficients	Standard Error	P>|z|
X_1 Age	-0.1593593	0.1916627	0.406
X_2 Sex	0.2837989	0.2507697	0.258
X_3 Marital status	0.0040531	0.2379737	0.986
X_4 Educational level	-0.1435379	0.2661899	0.590
X_5 Farming Experience	-0.1206955	0.1101299	0.273
X_6 Household size	0.0291158	0.1933426	0.880
X_7 Member of Cooperative	1.029277	0.3253801	0.002**
X_8 Size of farmland	0.2448807	0.2440001	0.316
X_9 Source of Fund	0.0100499	0.0757207	0.894
X_{10}Source of labour	0.2746477	0.1626295	0.091*
X_{11} Contact with extension agents	0.069027	0.3180996	0.828

Source: Field Survey, 2015

Number of Obs	=	120
LR chi^2 (13)	=	53.86
Prob > chi^2	=	0.000
Pseudo R^2	=	0.1243

NB: figures in parentheses are z-values* and ** denote 10% and 1% significance respectively.

From the result of the Ordered Probit Regression on Table 2, the coefficient of determination (LR) of 53.86 and adjusted (Pr) 0.000 which implies that 100% of the changes experienced in the total adoption level of the farmers were explained by the variables in the model and the Pr ratio of 53.86 was significant at 1%. It could be observed in the table that age, educational level and farming experience were negatively related, which implies that a year increase in age, educational level and/or farming experience could lead to a probable decrease in the adoption of all the selected most important eight(8) improved rice technologies, which is in agreement with Adesina and Baidu-Forson (1995), that age was negatively related with probability of participation in Rice Development Projects, but contrary to the findings of Asante *et al.* (2011) and Gbetibouo (2009) that a positive relationship exists between age and adoption of improved technologies. Education had negative contribution to the adoption of rice technologies. This is in accord with Martey et al, (2012) who asserted that the negative effect of education on adoption level suggests the strong competing effect of diverting skills of household heads to other off-farm employment opportunities. More so, the educated farmers may be willing to select out of the eight most important rice technologies. However, Tambo and Abdoulaye (2011) reported that education enhances access to information processing for technology uptake and higher farm productivity.

Other variables such as sex, marital status, household size, membership of cooperative, size of farmland, source of fund and contact with extension agents, all had positive contributions to the adoption of the eight selected improved technologies, which implies that an increase in these variables will lead to an increase in the adoption level of all the rice technologies and as such determine sustainable adoption of rice technologies. In contrast with Asante *et al*. (2011) and Gbetibouo (2009) who asserted that older farmers are more

experienced which allows them to assess the attributes of an improved technology relative to younger household heads, this study holds that even with the longer years of farming experience of older farmers, younger farmers could be more innovative in terms of technology adoption and are more likely to take risk than older household heads.

Findings on marital status in this research, disagreed with Martey *et al*. (2013). According to them, marital status was negatively associated with lower probability of participation in adoption of improved technologies. Married household heads were less likely to participate in adoption process, which could be due to other off-farm responsibilities that they are also committed to. However, in this study, marital status formed a positive determinant of adopting rice technologies.

Cooperative membership and source of information were not only positive but significant at 1%, while source of labour was significant at 10%. This further indicates that membership of cooperative, source of fund and labour source and availability would strongly determine the successful adoption of rice technologies for sustainable rice production in Kogi State, Nigeria.

2.3. Marginal effect of socio-economic characteristics on adoption of improved rice technologies

The Table 3 below shows the marginal effects of socio-economic determinants on adoption of improved rice technologies at different levels ranging from Adoption of between 1-8 numbers of technologies adopted.

Table 3a Marginal effects of socio-economic characteristics from 1-8 rice technologies adopted

	Adoption levels (ADL)							
Variables	ADL=1	ADL=2	ADL=3	ADL=4	ADL=5	ADL=6	ADL=7	ADL=8
Age	0.0009277	0.0018096	0.0146719	0.0176624	0.0254763	-0.005494	-0.01541	-0.01541
Sex	-0.001868	-0.003529	-0.027460	-0.031841	-0.043574	0.0125942	0.0276827	0.0276827
Marital status	0.0000214	0.0000417	0.0003382	0.0004071	0.0005873	-0.000127	-0.000355	-0.000355
Educational level	0.0007964	0.0015802	0.0013148	0.0162595	0.0244971	-0.003647	-0.014148	-0.014148
Farming experience	0.0007096	0.001384	0.0112221	0.0135094	0.0194861	-0.004202	-0.011787	-0.011787
Household size	-0.000183	-0.000356	-0.002890	-0.003479	-0.005018	0.0010821	0.0030352	0.0030352
Cooperative membership	-0.009817	-0.016161	-0.108715	-0.113395	-0.142555	0.048741	0.0946369	0.0946369
Source of labour	-0.001599	-0.003120	-0.025299	-0.030455	-0.043929	0.0021903	0.0265712	0.0265712
Size of farmland	-0.001468	-0.002863	-0.023214	-0.027946	-0.040309	0.0086925	0.0243819	0.0243819
Contact with extension agents	-0.000369	-0.000721	-0.005850	-0.007042	-0.010157	0.0021903	0.0061438	0.0061438

Source: Field Survey, 2015

The marginal effect of ordered probit table shows the socio-economic determinants of the adoption level of improved rice technologies at different stages ranging from adoption of only one (1) technology all the way to adoption of eight (8) technologies.

As shown in the Table 3a above, it could be observed that age would positively determine the adoption of 1-5 technologies, which indicates that a year increase in age would lead to an increase in adoption of 1-5 technologies, but increase in the age of the rice farmers would turn negative when the number of rice technologies is increased to between 6-8. This implies that as the farmers advance in age, they lose the capacity of adopting more than 5 rice technologies. The maximum of adopting five out of the eight most important rice technologies was witnessed when marital status, education, farming experience were to determine number of rice technologies to be adopted, meaning that education and marital status (in the case of more married people as the mode) has a limiting effect to the number of rice technologies that could be adopted, in summary, the socio-economic factors that favour the adoption of only one to five rice technologies out of all the eight most important technologies are likely to be small scale rice producers that may not want to embrace large scale farming.

This could be interpreted to mean that the identified socio-economic variables that favour the use of all the eight rice technologies were socio-economic variables that were likely to determine the commercialization of rice production in the study area. In summary, many socio-economic variables that favour commercialization of rice production were found in the study area.

2.4. Adoption level of improved rice technologies in the study area

Table 3b below shows the distribution of farmers according to the rice technology adopted in the study area. Improved rice technologies considered were: use of improved varieties, use of agrochemicals, zero tillage, fertilizer application, proper spacing, improved nursery, timely transplanting, line planting, urea deep placement, planting depth, improved processing, improved storage methods, tube well and boreholes.

Table 3b Distribution of Respondents according to the rice technology adopted

Improved technologies	Frequency	Percentage (%)
Use of improved varieties	93	77.5
Use of agrochemicals	120	100**
Zero tillage	9	7.5*
Fertilizer application	106	88.3
Proper spacing	117	97.5**
Improved nursery	57	47.5
Timely transplanting	57	47.5
Line planting	112	93.3**
Urea deep placement	13	10.8*
Planting depth	108	90
Improved processing	87	72.5
Improved storage methods	67	55.8
Tube well	7	5.8*
Boreholes	54	45

Source: Field Survey, 2015

** =high adoption *=low adoption.

As indicated in table 3b above, technologies such as use of improved varieties (77.5%), use of agrochemicals (100%), fertilizer application (88.3%), proper spacing (97.5%), line planting (93.3%), planting depth (90%) and improved processing (72.5%) were widely accepted by the farmers in the study area because they have high adoption level. Improved storage methods was a little above average with 55.8%, while, zero tillage (7.5%), improved nursery and timely transplanting (47.5%), urea deep placement (10.8%), tube well (5.8%) and boreholes (45%) had low adoption rates, which implies that they were not widely accepted by the better percentage of the rice farmers in the study area. As such irrigation rice farming through the use of tube well could be less adopted by farmers in the study area.

The low adoption of tube well is similar to the findings of Olaolu *et al.* (2011) on the impact of national fadama development project II on rice farmers' profitability in Kogi State and contrary to the findings of Umeh and Chukwu (2013) where tube well and zero tillage were accepted.

2.5. Categorization of farmers into various groups of adopters

In Table 3c below, eight technologies were purposively selected to classify the farmers into various groups of adopters; Low adopters (1-3 technologies), medium adopters (4-5 technologies) and high adopters (6-8technologies) according to the number of technologies adopted. These technologies were selected because of the level of similarity the improved technologies had with existing farming practices. The technologies were: use of improved varieties, use of agrochemicals, fertilizer application, proper spacing, improved nursery, timely transplanting, improved processing and improved storage methods.

Table 3c Distribution of farmers by level of adoption of improved rice technologies

No of technologies adopted	Frequency	Percentage	Adoption level
1	1	0.83	Low adopters
2	2	1.67	Low adopters
3	11	9.17	Low adopters
4	11	9.17	Medium adopters
5	23	19.17	Medium adopters
6	29	24.17	High adopters
7	15	12.50	High adopters
8	28	23.33	High adopters
Total	120	100.00	

Source: Field survey, 2015

Out of the eight technologies, any farmer who adopted 1/3 × 8, which culminate to 2.66 approximately 3 technologies can be regarded as a low adopter, while farmers with 2/3× 8, which is equal to 3-5.3 technologies approximately were classified as medium adopters and 6-8 as high adopters. The Table above shows that 11.67% of the respondents were low adopters, 28.33% of the respondents was medium adopters and 60% were high adopters. This implies that rice technologies were adopted in the study area.

2.6. Constraints Militating against the Adoption of Improved Rice Technologies

Table 4 Respondents according to their constraints in the study area

Various Constraints	VS	MS	LS	NS	Total	TVS	TMS	TLS	TNS	Total	Mean Score	Remark
Lack of tractor hire service	45	48	24	3	120	180	144	48	3	375	3.1	Moderately Severe
Illiteracy	43	25	37	15	120	172	75	74	15	336	2.8	Moderately Severe
Lack of awareness of improved technologies	20	21	47	32	120	80	63	94	32	269	2.2	Less Severe
Fluctuation in climatic conditions	70	45	4	1	120	280	135	8	1	424	3.5	Very Severe
Lack of Infrastructural facilities	95	18	0	7	120	380	54	0	7	441	3.7	Very Severe
Inaccessibility to cooperative organization	17	21	33	49	120	68	63	66	49	246	2.1	Less Severe
Lack of extension services	22	34	57	7	120	88	102	114	7	311	2.6	Moderately Severe

Source: Field Survey, 2015

As indicated in Table 4 above, problems such as fluctuation of climatic conditions with mean score of 3.5, lack of infrastructural facilities having a mean score 3.7 were perceived to be very severe by the farmers in the study area. Problems such as illiteracy with mean score 2.8, lack of tractor hiring service with mean score 3.1 and lack of extension services (mean score 2.6) were perceived to be moderately severe, while lack of awareness of improved technologies and inaccessibility to cooperative organization with mean score of 2.2 and 2.1 respectively were perceived to be less severe problems. These findings are in agreement with Guerin and Guerin (1994), that there are several constraints to the adoption of improved technologies and innovation by farmers: these include the extent to which the rice farmer finds the new technology to be complex and difficult to comprehend.

CONCLUSION

Findings from this study have revealed that rice farmers in Kogi State adopted improved rice technologies in various degrees. They will be willing to adopt between 6 to 8 selected most important technologies. This implies that adopting all eight most important rice technologies is a step towards commercialization of rice production. However, constraints such as availability of tractors and infrastructural facilities may not make the dream of rice commercialization realizable among the small scale rice farmers in the study area.

Recommendations

i. Farmers should receive more training and knowledge about improved rice technologies through steady flow of information by the extension agents.
ii. Rice processing industries should be established by private organizations to encourage commercial farming to support adoption of more improved rice technologies.
iii. The high indication of adoption of the rice technologies should be used to an advantage by private rice industries who can utilize these farmers as out growers to feed their rice industries.
iv. Enabling environment should be provided through public private partnership to provide policies fashioned to help provide adequate infrastructural facilities in the study area.
v. Inputs and credit facilities should be made readily available to the farmers by their various cooperative societies in the study area.

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SOCIJALNO-EKONOMSKE DETERMINANTE USVAJANJA UNAPREĐENIH TEHNOLOGIJA PROIZVODNJE PIRINČA OD STRANE MALIH PROIZVOĐAČA U DRŽAVI KOGI U NIGERIJI

Ova studija je ispitivala socijalno-ekonomske determinante usvajanja unapređenih tehnologija proizvodnje pirinča od strane malih proizvođača u Državi Kogi u Nigeriji. Posebno je istražen uticaj socio-ekonomskih karakteristika na usvajanje unapređenih tehnologija proizvodnje pirinča, nivo usvajanja od strane poljoprivrednika i ograničenja protiv usvajanja ovih tehnologija. Metodom slučajnog uzorka u više faza izabrano je 120 registrovanih proizvođača pirinča u okviru Projekta poljoprivrednog razvoja Države Kogi. Frekvencije, procenti, srednje vrednosti, modus, srednje ocene i uređena probit regresija su korišćeni za analizu podataka. Rezultati navode da su svi poljoprivrednici prešli na upotrebu agrohemikalija (100%), kao i da su poljoprivrednici kategorisani prema stepenu usvajanja (nizak, srednji i visok stepen usvajanja), pri čemu je 60% poljoprivrednika zabeležilo visok stepen usvajanja. Rezultati su takođe pokazali da je nedostatak infrastrukturnih objekata shvaćen kao velika prepreka od strane poljoprivrednika u proučavanom području, sa srednjom ocenom od 3,7. Međutim, uređena probit regresija je otkrila da su članstvo u zadruzi (1,029277 na 1% značaja), izvor finansija (0,0100499 na 1% značaja)) i izvor radne snage (0,2746477, na 10% značaja) imali uticaj na usvajanje tehnologija proizvodnje pirinča, dok je marginalni efekat na veličinu poseda, veličinu domaćinstva, kontakt sa savetodavnim agentima povoljno uticao na usvajanje svih osam najvažnijih tehnologija proizvodnje pirinča koje se mogu koristiti kao mera naklonjenosti komercijalnoj proizvodnji pirinča. Studija preporučuje da privatne industrije pirinča treba da iskoriste ovaj pozitivan stav proizvođača pirinča ka usvajanju tehnologije proizvodnje pirinča tako što će otvarati pogone za obradu pirinča u posmatranom području i pretvoriti male proizvođače pirinča u glavne snabdevače industrija.

Ključne reči: *pirinač, unapređene tehnologije, usvajanje, socijalno-ekonomske determinante*