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ASSESSMENT OF FARMERS' PERCEPTION ON REL... TECHNOLOGIES IN WUSHISHI LOCAL GOVERNME... NIGERIA

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Abstract

This study examined perceived relevance of improved rice technologies by rice ... Government Area of Niger State, Nigeria. The specific objectives were to de... characteristics of the rice farmers; assess level of awareness and perceived relevanceof i... determine factors affecting adoption and constraints encountered by the rice farmers. Data ... rice farmers randomly selected using structured questionnaire complemented with ... Descriptive statistics (frequency counts, percentages and means) and inferential statistics (L... as a 4-point Likert scale were used to analyzed the data collected.Results of the analysis reve... (83.3%) of the rice farmers were males,85.0% were married, while 73.3% were young within t... 21 – 40 years. About 74.2% of the rice farmers were educated, 79.2% had experience in rice fa... 30 years. There washigh level of awareness of Fadama development ($\bar{X}$= 2.39), Sawah techn... improved rice varieties like Faro 57 and 61 ($\bar{X}$= 2.68), machineries such as reap harvester ($\bar{X}$= 2.9... 2.88) as well as agro – chemicals like Gramazone, Weed off and 2.4D ($\bar{X}$= 3.00). Most of th... technologies were perceived to be relevant by the rice farmers. The result of the logit regression a... that adoption of improved rice technologies was significantly influenced by cooperative members ... p<0.01),labour cost and household (p<0.05), age and gender(p<0.10). Major constraints encountere... farmers were inadequate capital and transportation (100.0%), land degradation (77.5%) and shortage ... material (65.0%) ranked 1st, 2nd and 3rd, respectively. It was therefore recommended that extension agen... pay more attention to the socio-economic characteristics of rice farmers that significantlyinfluenced their ... of improved ricetechnologies.

KEY WORDS: Rice, farmers, Perception, constraints, modern technology.

Introduction

Rice is a staple crop which belongs to the family *Gramineae*, genus *Oryza* and species ... *sativa L.* and *glaberrima*. It was brought to West Africa in the early 19th century (Jirgi, 2009). It is a major commodity in the world trade and the second most important cereal. According to West African Rice Development Association (WARDA) (2010), Nigeria is one of the largest rice producers inWest Africa. It is one of the principal foods eaten by almost every household in Nigeria no matter their socio-economic status and the most valued cereal crops in Nigeria especially in the areas where it is being produced (Osanyinlusi *et al.,* 2016).Imolehin and Wada (2012) posited in their study that rice provides means of employment and income ... more than 80% of the inhabitantbecause of ... value chain.

Rice used to be the "white man's" food ... meant only for high class individuals in the society (Akpokodje *et al*., 2003). However, as a result of its contribution to per capita calories of Nigerian's diet which is high, the demand for rice in the country has been increasing at a much faster rate than any other African countries since the mid-1970s (WARDA, 2010). Nigeria has about 4.6 million hectares of land area which meets the needs of the country for rice production, but only 1.7 million hectares is used for cultivation of rice which is about 35% utilization (Imolehin & Wada, 2012).

United States Agency for International Development (USAID) (2010) statistics shows that Nigeria is one of the largest importers of rice in West Africa due to its low local production, but as a result of the increase in import bill of over six hundred and fifty billion naira annually, importation of rice has been banned in order to boost local production.The major constraints to local production of rice in Nigeria are inadequate use of resources, environmental and institutional factors. More so, according to Osanyinlusi *et al.* (2016), low usage of agricultural technologies such as improved seed varieties, agro–chemicals, modern rice milling etc., has led to poor agricultural performance.

Oyekanni *et al.* (2008) posited that farmers' positive perception and adoption of improved technologies could lead to high yield in rice production in the country.Technologies can only be viable when it is being practiced, where farmers do not practice these new technologies, they are in vain (Sall *et al.,* 2007). The use and development of these improved technologies will assist in changing the rate and system of rice production which is one of the goals of agricultural research institutes (Sall *et al.,* 2007).

According to Oladele and Fawale (2007), research institutes have been able to develop these technologies which are being disseminated through Agricultural Development Projects (ADP). The State Agricultural Development Projects are aimed at assisting farmers to adopt improved agricultural production technologies such rice production technologiesto increase productivity. However, there is the need to disseminate these technologies in a way that will be acceptable to the rice farmers which could increase their perception and adoption levels (Oladele and Fawale, 2007).

Agricultural research institutes in Nigeria has faced a huge set back in the area of perception research of farmers with respect to adoption and utilization of new technologies.Thus, this study sought to investigate how rice farmers in the study area perceived the various rice production innovations in terms of their benefits and constraints. Hence, this study is sets out to achieve the following objectiveswhich are to:

i. describe the socio-economic characteristics of the rice farmers in the study area;
ii. ascertain the level of awareness of farmers on theimproved rice technologies;
iii. assess the perceived relevance of the improved rice technologies;
iv. determine the factors affecting the farmer's adoption of improved rice technologies, and
v. examine the constraints associated with the adoption of improved rice technologies in the study area.

Methodology

The study area is Wushishi Local Government Area of Niger State, Nigeria. The State lies between the Latitude 8° 22'N & 11° 30'E and Longitude 3° 33'N & 7° 20'E of the equator. Wushishi LGA was carved out from Mariga Local Government Area with headquarters in Wushishi town. It has an area of 1,879 square kilometers and a population of about 81,783 (NPC 2006). However, the projected population at 2017 using 3.2% growth rate was 115,649. Farming is the dominant occupation and key employer of the people in Niger state, and serves as a source of income and employment to them. It experiences distinct dry and wet seasons with mean annual rainfall of 1000 mm and mean temperature of 36.5°C.

Multi-stage sampling technique was used to select respondents for the study. First stage involved random selection of two communities from Wushishi L.G.A. Second stage involved obtaining the total registered rice farmers in the study area from Niger State Agricultural and Mechanization Development Authority. The third and last stage involved proportionate sampling by 20% from the sample frame to give a total of 120 rice farmers.

Primary data were collected with the aid of structured questionnaire complimented by an interview schedule. Data collected were analyzed using descriptive statistics(frequency counts, percentage) and inferential statistics (Logit regression) as well as attitudinal measuring scale of 3-point Likert type rating scale categorized as Aware = 3, Undecided = 2, Unaware = 1. A mean score of 2.0 was determined by adding 3 + 2 + 1 = 6 and divided by 3. The decision rule was that any mean ($\overline{X}$)

scores ≥ 2.0 indicate awareness, while scores < 2.0 indicated unawareness. Also, a 4-point Likert type rating scale categorized as Very Relevant = 4, Relevant = 3, Indifferent = 2, Not Relevant = 1. A mean score of 2.5 was determined by adding 4 + 3 + 2 + 1 = 10 and divided by 4. The decision rule was that any mean ($\bar{X}$) scores ≥ 2.5 indicated relevant, while scores <2.5 indicated not relevant.

Model Specification

Logit regression model is a particular model which assumes a dichotomous or binary value. The implicit form of the model is given as:

$Y = f(X_1, X_2, X_3, X_4, X_5, X_6, X_7, X_8)$

The general logit regression model in its explicit form is expressed as below:

$Y = \alpha + \beta_1X_1 + \beta_2X_2 + \beta_3X_3 + ... \beta_8X_8 + e$

Where;

Y = Adoption of improved rice technologies (yes = 1, otherwise = 0)

α = Model intercept

$\beta_1 - \beta_8$ = Coefficients of the independent variables

$X_1 - X_8$ = Independent variables

X_1 = Age (in years)

X_2 = Household size (in numbers)

X_3 = Sex of farmers (male = 1, female = 0)

X_4 = Educational level (in years)

X_5 = Years of experience (in years)

X_6 = Extension contact (number of visits)

X_7 = Labour cost (₦)

X_8 = Cooperative membership (member = 1, otherwise = 0)

Results and Discussion

Socio-economic characteristics of the respondents

The result of the socio-economic characteristics of the respondents as presented in Table 1 showed that 73.3%of the respondents were between the ages of 21 and 40 years implying that most of the farmers were of mid-age. Age is an important factor which influences the probability of adoption of new technologies.This finding is in line with the work of Singh *et al.* (2011) who reported that age is a primary latent characteristic in adoption decisions (Singh *et al.*, 2011). More so, Tiamiyu*et al.* (2009) opined that young farmers are more likely to adopt new technologies if there are not constrained by limited resources, while older farmers are less likely to use new technologies if they require extra physical labour.

The majority (83.3%) of the respondents were males, 85.0% were married and 64.2% had household size between 1 – 20 members. This implies that there are more males in rice production in the study area than the females. The large percentage of married respondents shows that more family members are needed for rice production. In Africa settings, large household size is an indicator of better economic statusas it implies that high number of family labour will be available for rice production. Thesefindings are in consonance with Horna*et al.* (2006) who posited that households are often organized around males ashead because the probability of female participation in the technology uptake decision is not significant.

Furthermore, majority (84.2%) of the respondents attained one form of education or the other with most(45.8%) acquired secondary education implying that the respondents were literate and could influence adoption of improved rice technologies. According to Rogers (2003) technology complexity has a negative effect on adoption and could be dealt with only through education. The majority (89.2%) of the respondents had farming experience between 1 and 30 years, implying that they have been into rice farming for a long period of time. This is agreement with the work of Mbah (2006) who reported that rice farmers in Ishiagu-Ivo Local Government area of Ebonyi State, Nigeria had long years of experience in farming (10 to 30 years).

Table 1: Distribution of respondents based on their socio-economic characteristics

Variables	Frequency	Percentage
Age(years)		
< 21	1	0.8
21 – 30	45	37.5
31 – 40	43	35.8
41 – 50	30	25
>50	1	0.8
Total	**120**	100.0
Gender		
Female	20	16.7
Male	100	83.3
Total	120	100
Marital status		
Single	18	15
Married	102	85
Total	**120**	**100.0**
Household size (number)		
1 – 5	8	6.7
6 – 10	12	10
11 – 15	31	25.8
16 – 20	26	21.7
>20	43	35.8
Total	**120**	**100.0**
Educational level		
Non-formal	19	15.8
Primary	35	29.2
Secondary	55	45.8
Tertiary	11	9.2
Total	**120**	**100.0**
Farming experience (years)		
1 – 10	12	10
11 – 20	51	42.5
21 – 30	44	36.7
> 30	13	10.8
Total	**120**	**100**

Source: Field Survey, 2017

However, the institutional variables accessed by the respondents include cooperative societies, extension services and labour usage as presented in Table 2. It showed that the majority (83.3%) of the respondent belongs to cooperative societies which could play a significant role in assisting members assess improved rice production technologies. This is in line with the work of Abebaw and Haile (2013) that investigated the impact of cooperative societies on adoption of agricultural technologies in Ethiopia. They reported that cooperatives play an important role in accelerating the adoption of agricultural technologies by smallholder farmers.More so, the majority (66.7%) of the respondents had access to extension services which could influence their level of awareness positively.

The respondents also indicated that the frequency of extension visits was on monthly basis, while their assessment on the extension service delivery was perceived to be effective. This implies that the respondents in the study area were well monitored by the extension agent throughout the adoption process of new rice production technologies. The extension services are usually carryout through method (83.3%) and result (16.7%) demonstration as indicated by the respondents. Mwanga (2010) in Tanzania reported that farmers could potentially increase their productivity through adoption of agricultural production innovation, practices and new input packages if appropriate extension

services are put in place. Frequency of extension contact has been found out to influence significantly the decision of farmers to adopt improved rice varieties in South-western Nigeria (Saka *et al.*, 2005). More so, Odoemenem and Obinne (2010) reported that farmers who adopted rice production practices in his study area had greater contact with extension agents.

The majority (98.3%) of the respondent source their labourfrom both hired and family labour, while only few (1.7%) used basically family labour in their rice farming operations. This implies thatmore hands are needed during rice production which could influence the adoption of improved rice production technologies. This finding is in agreement with the work of Jamala *et al.* (2011) factors influencing adoption of irrigated rice production in North-east Nigeria and reported that labour availability significantly influenced adoption of rice production technologies.

Table 2: Distribution of respondents based on institutional variables assessed

Variables	Frequency	Percentage
Cooperative membership		
Yes	100	83.3
No	20	16.7
Access to extension services		
Yes	80	66.7
No	40	33.3
Frequency of extension contact		
None	40	33.3
Monthly	80	66.7
New practice demonstration		
Method demonstration	100	83.3
Result demonstration	20	16.7
Extension service assessment		
Very effective	64	53.4
Effective	16	13.3
Not effective	40	33.3
Labor source		
Family	2	1.7
Hired	0	0.0
Both	118	98.3
Total	**120**	**100.0**

Source: Field survey, 2017

Level of awareness of improved rice production technologies

Table 3, shows the level of awareness of the respondents to improved rice technologies in the study area. This was determined using 3–point Likert type rating scale and a mean score of 2.0 was used as the decision rule. The level of awareness for each categories of technologies were as follows: Fadama development ($\bar{X}$= 2.39), Sawah practices ($\bar{X}$= 2.35), Faro 57 ($\bar{X}$= 2.68), Faro 61 ($\bar{X}$= 2.61), Thresher ($\bar{X}$= 2.67), Reaper harvester($\bar{X}$= 2.95), Power tiller ($\bar{X}$= 2.89), Planter ($\bar{X}$= 2.93), Plough ($\bar{X}$= 2.82), Round–up ($\bar{X}$= 2.38), Gramazone($\bar{X}$= 3.00), 2.4D ($\bar{X}$= 3.00) and Weed–off ($\bar{X}$= 3.00) which all had a weighted mean score of ≥ 2.0. This implies that the respondents had high level of awareness of these technologies.Plausible reasons for this high awareness could be traced to the high intensity of extension services provided in the study area. However, technologies on land evaluation were not as popular as machinery and use of agrochemicals. Rice technologies such as NERICA ($\bar{X}$= 1.48), Faro 45 ($\bar{X}$= 1.62), Faro 52 ($\bar{X}$= 1.18), Faro($\bar{X}$= 1.15)had a weighted mean score of< 2 which implies that there was low awareness of the improved rice technologies in the study area.

Table 3: Level of awareness of improved rice production technologies (n = 120)

Technologies	Weighted sum	Weighted mean	Remark
Land Evaluation technology			
Fadama development	287	2.39	High awareness
Sawah practices	282	2.35	High awareness
Improved varieties technology			
NERICA	178	1.48	Low awareness
Faro 45	194	1.62	Low awareness
Faro 52	142	1.18	Low awareness
Faro 57	321	2.68	High awareness
Faro 61	321	2.68	High awareness
Faro 62	138	1.15	Low awareness
Machinery and equipment			
Thresher	320	2.67	High awareness
Reaper harvester	354	2.95	High awareness
Power tiller	347	2.89	High awareness
Planter	352	2.93	High awareness
Plough	338	2.82	High awareness
Use of Agrochemicals			
Round up	286	2.38	High awareness
Grama zone	360	3	High awareness
2.4D	360	3	High awareness
Weed off	360	3	High awareness

Source: Field Survey, 2017
Weighted sum= aggregate response points from the 3–point Likert scale
Weighted mean = weighted sum divided by the total respondents (n)
Mean score ($\bar{X}$) of≥ 2.0 implies High awareness, while mean score of < 2.0 implies Low awareness

Perceived relevance of the improved rice production technologies

Table 4 shows the perceived relevance of the improved rice technologies by the respondents in the study area. This was determined using 4–point Likert type rating scale and a mean score of 2.5 was used as the decision rule. The result revealed that Fadama development ($\bar{X}$= 2.39) and Sawahpractices ($\bar{X}$= 2.93) are perceived to be relevant in terms of land evaluation for rice production.This is in agreement with Agwu and Abah (2009) who posited that *Fadama* as derived from Hausa language is suitable for rice production due to its flood plains and low lying areas underlined by shallow aquifers found along water system. In addition, Fashola *et al.* (2007) also reported that Sawahpractice is an improved land evaluation for rice production that involved levelled rice field surrounded by an inlet and outlet connecting irrigation and drainage canals

In terms of improved rice varieties, Faro 57 ($\bar{X}$= 2.93) and Faro 61 ($\bar{X}$= 3.88) were perceived to be relevant rice production technologies which could be due to inherent characteristics (early maturity, increased yield, disease resistance etc.,) that could be lacking in order varieties. Improved machinery and equipment include thresher ($\bar{X}$= 3.58), reaper harvester ($\bar{X}$= 3.58), power tiller ($\bar{X}$= 3.58), planter ($\bar{X}$= 3.58)and plough ($\bar{X}$= 3.58). They were all perceived to be relevant rice production technologies based on their weighted mean score value of≥ 2.5. This implies that these machines and equipment are very important in rice production. More so, agro-chemicals such as Gramazone ($\bar{X}$= 3.85), 2.4D ($\bar{X}$= 3.85) and Weed-off ($\bar{X}$= 3.58) were perceived to be relevant in rice production, while Round–up ($\bar{X}$= 1.77) had a weighted mean score value of< 2.5, thusperceived not to be relevant in rice production. Farmers' perception on the relevance of improved rice production technologies shows a high degree of variation. This has the tendency of affecting the adoption of these technologies. Also, some of the technologies are not in the current interest and immediate needs of the farmers which might influence their perceptions as at the time of this study.

Table 4: Perceived Relevance of the rice production technologies (n = 120)

Technologies	Weighted sum	Weighted mean	Remark
Land Evaluation technology			
Stakes development	480	4.01	Relevant
Seed practices	351	2.93	Relevant
Improved Varieties technology			
[redacted]	219	1.83	Not Relevant
[redacted]	206	1.72	Not Relevant
[redacted]	219	1.83	Not Relevant
[redacted]	352	2.93	Relevant
[redacted]	466	3.88	Relevant
[redacted]	219	1.83	Not Relevant
Machinery and equipment			
Tractor	429	3.58	Relevant
Reaper harvester	429	3.58	Relevant
Power tiller	429	3.58	Relevant
Planter	429	3.58	Relevant
Plough	429	3.58	Relevant
Use of Agrochemicals			
Round-up	212	1.77	Not Relevant
Gramoxone	462	3.85	Relevant
2,4D	462	3.85	Relevant
Weed off	462	3.85	Relevant

Source: Field Survey, 2017

Note: Mean score ($\bar{X}$) of ≥ 2.5 implies Relevant, while mean score of < 2.5 implies Not relevant

Factors affecting farmers' adoption of improved rice production technologies

Table 5 shows the result of the Logit regression analysis for the factors affecting adoption of improved rice production technologies amongst respondent in the study area with Pseudo R^2 of 0.5684. This implies that about 57% of the variations in adoption of improved rice production technologies were explained by the independent variables included in the model, while chi – squared statistic of 72.59 was statistically significant at 1% level of probability indicating the goodness of fit of the overall model. Out of the eight variables specified in the model, five variables (age, gender, cooperative membership, labour cost and household size) were statistically significant at different levels of probability.

Age of the rice farmers was positive and statistically significant at 10% probability level, implying that increase in age of the rice farmers, increases the probability of adopting the improved rice production technologies in the study area. However, gender was negative and statistically significant at 10% level of probability implying an inverse relationship with adoption of improved rice production technologies. Increasing the number of females in rice production could decrease the probability of adopting the improved rice production technologies as most of them do not have the capacity to adopt improved technologies.

More so, cooperative membership was positive and statistically significant at 1% level of probability implying a direct relationship with adoption of improved rice production technologies. This shows that cooperative membership increases the probability of the respondents adopting improved rice production technologies. Labour cost was negative and statistically significant at 5% level of probability implying an inverse relationship with adoption of improved rice production technologies. Increase cost oflabour associated with improved rice technologies could decrease the probability of adopting such technologies.

Household size of the rice farmers was positive and statistically significant at 5% level of probability implying that increase in household size increases the probability of adopting improved rice technologies. Larger household size enhances expansion of farmland as there will be more hands to assist in rice production activities.

Table 5: Regression estimates of factors affecting adoption of improved technologies

Variables	Coefficient	Z-value
Age	0.1793684	1.78*
Gender	-1.575605	-1.96*
Educational level	-0.001666	-0.02
Year of experience	0.071024	1.38
Extension contact	1.394101	1.54
Cooperative membership	3.595242	4.29***
Labor cost	-0.0002762	-2.30**
Household size	0.5664921	2.15**
Constant	-8.977231	-1.83
Pseudo – R^2	0.5684	
Chi – squared	72.59***	
Log likelihood	-102.8952	

Source: Field Survey, 2017
Note: ***, **, * Significant at 1%, 5%, and 10% respectively.

Constraints associated with adoption of improved rice production technologies

From Table 6, it could be seen that inadequate capital and transportation (100.0%) ranked 1st among the constraints associated with adoption of improved rice technologies in the study area. The inadequacy of capital thus deprived farmers from increasing rice production. Limited capital and access to financial services are probably themajor challenges facing smallholders' rice farmers in adoption of improved rice technologies. This finding is in consonance with the work of Fakayode (2009) that reported that inadequate funds were considered as the greatest challenge limiting rice productionin Kwara State, Nigeria. Transportation has also affected the farmers in moving their products to the market as Ojehomon *et al.* (2009) reported that the most important socio-economic constraints of rice farmers was high transport cost and difficulties in acquiring rice processing equipment. Land degradation (such as erosion, flooding) (77.5%) which are abiotic constraints affects the expected yield of the farmers. Flooding and drought were the major abiotic constraints in rice production across ecologies in the country (Ojehomon *et al.*, 2009). Other constraints faced by the respondents include shortage of planting materials (65.0%), pest and diseases (35.0%), and extension delivery system (32.5%) ranked 3rd, 4th and 5th, respectively.

Table 6: Constraints faced by the respondents

Constraints	Frequency	Percentage	Ranking
Inadequate capital	120	100.0	1st
Pest and diseases	42	35.0	4th
shortage of planting material	78	65.0	3rd
Transportation	120	100.0	1st
Land degradation	93	77.5	2nd
Extension delivery system	39	32.5	5th

Source: Field Survey, 2017

Conclusion

Most of the respondents in the study area were males, married and in their productive stage of life. The level of awareness of improved rice production technologies was high and twelve (12) out of the seventeen (17) improved rice production technologies were perceived relevant. These are Fadama development, Sawah practices, Faro 57, Faro 61, thresher, reaper harvester, power-tiller, planter, plough, Gramazone, 2.4D and Weed-off. Factors such as age, gender, cooperative membership, labour cost and household size significantly affect the adoption of improved rice production technologies in the study area. The major problems faced by the respondents

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Z-value
1.78*
-1.96*
-0.02
1.38
1.54
4.29***
-2.30**
2.15**
-1.83

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From the findings of the study, the following recommendations were made:

i. Extension agents should encourage farmers through field demonstration on the use of farm machinery and equipment, agro-chemicals and land reclamation technologies to further boost rice production.

ii. Extension agents and other relevant stakeholders should ensure adequate awareness creation of improved rice production technologies for greater adoption.

iii. Government and other relevant stakeholders should enhance the socio-economic characteristics of farmers as this tends to have an effect on their adoption rate through provision enabling environment in the study area.

iv. Relevant financial institutions (formal and informal) especially Bank of Agriculture should assist farmers through provision of soft loans to enhance adoption of improved rice technologies and boost rice production generally.

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