



## **AWARENESS AND ADOPTION OF RICE PRODUCTION TECHNOLOGIES IN JIGAWA STATE, NIGERIA**

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### **ABSTRACT**

The study broadly aims at providing information on the awareness and adoption of rice production technologies in Jigawa State, Nigeria. Data were generated from a sample size of 203 respondents and analysed using descriptive statistics. The result showed that the average age of household head was 42 years, average farm size of 3 hectares and farming experience of 12 years. The results revealed that respondents were aware (64 %) and adopted (18 %) rice production technologies. It was concluded that extension workers were a major sources of information for rice production. Therefore, it was recommended that the extension workers should update their knowledge on current production technologies and authentic rice farmers should be granted loan at a very low interest and without or minimal collateral.

**Keywords:** Agriculture, Adoption, Awareness, Diffusion, Innovation, Rice.

### **INTRODUCTION**

Rice production in Nigeria in spite of its progress over time is not anything to write home about in meeting the domestic needs not to talk of export. The country's plan on rice over years had been fickle and unstable between tariff import and imports restrictions (Isaac and Abdulrazak, 2014). However, in 2013, the Nigerian government announced that, they will place sanction on the importation of rice with effect from 2015. The minister of agriculture and rural development said "we want deject those who import rice as traders. We want those who are going to go in and have commercial farmers, produce rice, buy domestic paddy rice and mill it for us" the government is looking at the tariff policy to discourage importers of rice, while encouraging those going into local production, processing and milling of rice (Udo, 2014).

Rice (*Oryza sativa L.*) is one of the most necessary agricultural food for more than half of the world's population (Daramola *et al.*, 2008). Amos (2014) states that the total area under rice cultivation is globally estimated to be 150 million ha, with annual production averaging 500 million metric tons (MT). Its production accounts for 29% of the total output of crops worldwide, with Africa accounting for about 10 to 13% Evans *et al.* (2018). Rice is the fifth most essential cereal in relations to land and fourth in production in sub-Sahara Africa (SSA). Its production is mostly by smallholders' farmers, with an average farm size of 1 to 2 ha. Rice is consumed through all income groups and 2019 rice consumption is projected to increase by 4 % to 6.7 million tons from the 6.4 million tons recorded in 2018 (Global Agricultural Information Network [GAIN], 2018). The Nigeria's increasing rice consumption is mostly driven by population growth, increasing urbanization as well as a substitution of the traditional



coarse grains. Production has still not kept pace with intake. Nigeria eats more rice than it produces and imports is increases over the years.

In Jigawa State rice is a major cereal crop grown during the dry and rainy seasons. The other cereal crops include millet, sorghum and maize. There has been a significant improvement in the yield of rice supported under cluster programme. The rice yield in 2016 and 2017 was 3.5 and 4.5 MT/ha respectively, the rice area cultivated was 50,000 and 100,000 ha in 2016 and 2017 and the rice production was 175000 and 450000 metric tons in 2016 and 2017 (Jigawa State Ministry of Agriculture and Water Resources [JSMOA], 2017).

Most farmers still depend on outdated production systems which are of low output/yield (Daudu *et al.*, 2014). The demand for rice is on the increase in the recent times, hence a major content in the strategic food security planning policies for several countries. Consumption of rice is growing quicker than any other commodity in Africa particularly metropolitan areas (Seck *et al.*, 2012).

Diffusion is defined as the stage in which the innovation extends for use by people in a given community. "Interaction" connotes a sense of acceptance and perhaps transparency within the user environment (Ekong, 2010). There are a number of factors interacting to influence the diffusion of a new agricultural technology (innovation). The four major factors are the innovation itself, method of dissemination (how information about the innovation is communicated), time, and the nature of the social system into which the innovation is being introduced (Rogers, 1982). Adoption refers to "the stage in which a technology is selected for use by an individual or an organization" (Rajesh and Rajhans 2014).

According to Awotide *et al.* (2012a) and Awotide *et al.* (2012b), rural farmers in most cases find it difficult to obtain improved rice production inputs that is suitable to their local condition. As the new farming technologies/practices are announced in a community, not all people adopt them. At the same time, some farmers, no matter what will enhance their farming based their farming practices entirely upon traditional agriculture (Ani *et al.*, 2008). Mbanaso (2010) opines that technologies released by research institutes are not likely to be accepted by farmers if they are not well-suited with the farmers' conditions. These conditions are accessibility to the technologies either in the form of availability of resources to purchase the needed inputs or in the form of the relevance and appropriateness of the technologies to their needs, capabilities and environmental conditions.

Ibrahim (2014) has shown that farmers have not adequately adopted improved rice production technologies instead they still depend largely on the local production technologies which give low yield. The achievement of any innovation rest on its diffusion among the potential users, which ultimately is measured by the level of adoption of that innovation (Iheanacho, 2006; and Ogunwale *et al.*, 2006). It is assumed that notable improvements can occur in Nigerian agriculture, if the available innovations were accepted and adopted by the farmers. For this reason, this study was conducted to measure the awareness and adoption level of rice production technologies by the farmers.

In view of this, the research provided answers to the following questions: what are the socio-economic and institutional characteristics of rice farmers; and what is the awareness and adoption of rice production technologies? The objectives of the study was to describe the socio-economic and institutional characteristics of rice farmers and measure the awareness and adoption of rice production technologies by the respondents in the study area.



## **MATERIALS AND METHODS**

### **The Study Area**

The study was conducted in Jigawa State, Nigeria. The State is situated in the North-western part of the country between latitudes 11.00°N to 13.00°N and longitudes 8.00°E to 10.15°E. The State has a total land area of approximately 22,410 square kilometers with 27 Local Government Areas (LGAs) (National Population Commission [NPC], 2006). The State has a projected population of 6,346,156 people in 2018 and the population growth of the state is expected at 3.2 % with about 48 % of the population falling under the age of fifteen. From the estimation about 2.9 million are measured to be productive adults and the majority (80%) of the population is found in the rural areas and is made up of typically Hausa, Fulani and Manga.

According to Jigawa State Diary (2015), the topography is characterized by high land areas which is almost 750 meters above the sea level. Soil tends to be fertile ranging from sandy-loamy with many compartments of *fadama* and alluvial plains suitable for the cultivation of rice, sugar-cane, millet, vegetables and sorghum. There are usually two seasons in the state viz the rainy season lasting from June through October and dry season spanning from November and May. The mean temperature ranges from 35 °C in October to about 50 °C in May, while mean annual rainfall varies from 700 mm to over 1000 mm and can last up to 200 days in some lowland parts of the state. The months of November to March are particularly cold due to dry harmattan wind. Jigawa State is predominantly an Agrarian state with over 80 % of the population involved in Agriculture. The major rain fed crops grown in the State includes rice, millet, sorghum, cowpea, and groundnut, cocoyam, and soya beans. Dry crops include sugarcane, hot pepper, okra, tomatoes, onions and spinach. The major livestock kept in the state includes, small ruminants (sheep and goat), poultry and cattle.

### **Sampling Procedure and Sample Size**

A multi-stage sampling procedure was used to select the sample size. First stage, 30 % of 23 rice producing LGAs were purposively selected based on high concentration of rice production activities. This gives 7 LGAs out of 23 LGAs in the State. The LGAs selected are Birnin-Kudu and Jahun in zone 1, Ringim in zone 2, Auyo and Kafin-Hausa in zone 3, Kazaure and Yankwashi in zone 4. Second stage was a stratified sampling procedure of 10 % of rice producing villages out of 106 based on homogenous nature of the population and time factor. Due to the time factor, 15 % of 1350 were randomly selected to give a total sample size of 203 respondents.

### **Method of Data Collection and Data Analysis**

Primary data for this study were collected through administration of structured questionnaire. Data were analyzed using descriptive statistics. The descriptive statistics include; frequency (f), percentage (%), mean and likert scale. Likert Scale was used to measure awareness and adoption level of rice production technologies, the respondents were asked to indicate the extent of their awareness and adoption on each indicator using a 5 – point Likert type continuum scale of Highly Aware (HA), Aware (A), Undecided (UN), Remotely (RA) and Unaware (UA) for level of awareness and Awareness (A), Interest (I), Evaluation (E), Trial (T) and Adoption (Ad) for level of adoption with assigning a weight of 5, 4, 3, 2 and 1 for positive statement HA, respectively, and vice versa for negative statements. For each indicator a weighted mean was obtained as follows:

$$WM = [(FHA * 5) + (FA * 4) + (FUN * 3) + (FRA * 2) + (FUA * 1)]$$

where;

WM = Weighted Mean

F = Frequency



Value 5, 4, 3, 2 and 1 = Attached weights

HA, A, UN, RA and UA = Perception of Highly Aware, Aware, Undecided, Remotely Aware and Unaware.

Adopting Bagheri *et al.* (2008), Bagheri (2010) and Yusuf (2016) perception analysis, the mean for all indicators were then categorized as: mean of 1.00 – 1.49 = Strongly Disagree, 1.50 – 2.49 = Disagree, 2.50 – 3.49 = Undecided, 3.50 – 4.49 = Agree and 4.50 – 5.00 = Strongly Agree.

## RESULTS AND DISCUSSION

### Socio-economic Characteristics of the Respondents

Table 1 shows the summary of socio-economic factors of respondents. The mean age of household heads was 41 years with a minimum and maximum of 20 and 70 years respectively. This finding is line with that of Abdulmumini *et al.* (2019) stated that the age population of the respondents in the study area was energetic necessary in order to reduce their level of inadequacy and this young age surely effect the adoption of the technologies. This also propose that married respondents with additional member of households could boost adoption of technologies. Furthermore, the mean household size was 10 people with a mean of 11 years and 3 hectares (ha) of farming experience and farm size, respectively. The result also showed that majority (82%) of the respondents have farm size ranging from <1ha with an average of 3ha. This showed that there was a positive relationship between farm size and adoption of technologies. Jayne *et al.* (2014) opined that the higher the farm size of the household, the higher the expected level of food production.

**Table 1:** Socio-economic Factors of the Respondents

| Variables                  | Mean | Minimum | Maximum |
|----------------------------|------|---------|---------|
| Age (Years)                | 41   | 20      | 70      |
| Household size (Numbers)   | 10   | 2       | 21      |
| Farming experience (Years) | 11   | 1       | 16      |
| Farm size (hectare)        | 3    | 1       | 7       |

Source Field survey, 2018

Sources of information refers to the channels through which information on rice production get to the farmers. This Figure 1 on the pie chart shows that majority of the rice farmers sourced information from extension worker (82%) and ranked first, followed by friends and relatives (11%) ranked second, media (4%) ranked third and combined (3%) ranked fourth. The finding implies that the respondents in study area rely more on extension workers as a major source of sourcing information (Figure 1) on improved rice production technologies. This finding differs with Shegun and Adun (2002) and Jirgi (2009) who reported that the greatest key source of information was radio with 43% followed by neighbors (29%) and extension agents (28%). According to Jirgi *et al.* (2009) among rice farmers in Niger State, Nigeria 56% of the farmers received information through the radio, 28% through extension agents, 10% through television and pamphlet 6%. Fadiji *et al.* (2005) reported that the major sources of extension information among farmers in rural Nigeria were extension agents, radio and other farmers.

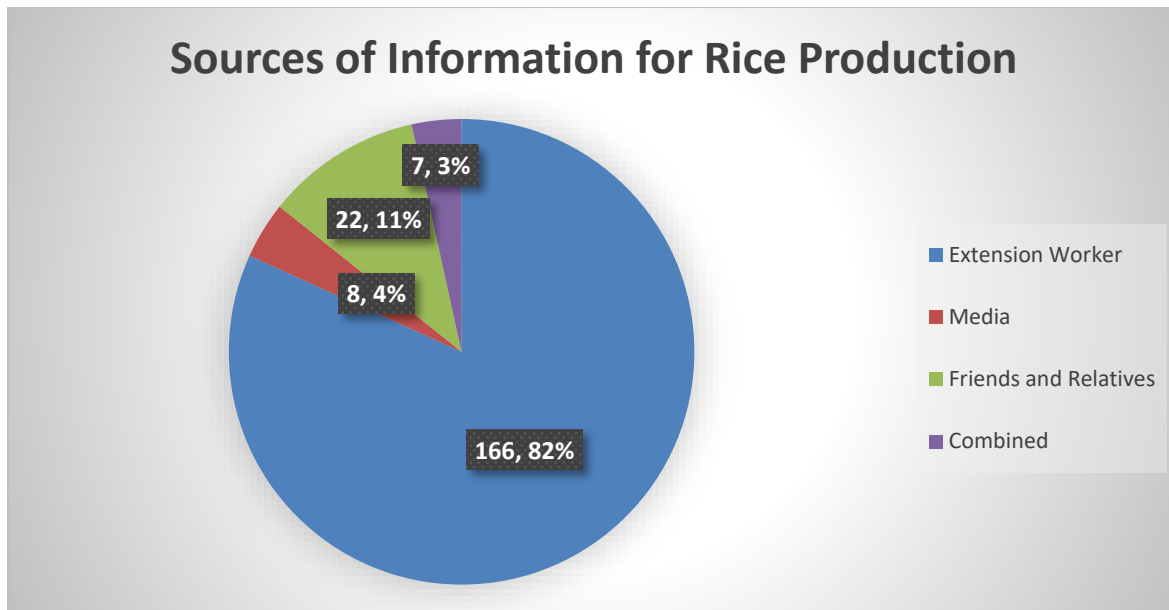


Figure 1: Source of sourcing information for rice production in the study area  
Source Field survey, 2018

### Awareness of Rice Production Technologies

Awareness of rice production technologies follows over a long period of time. Awareness of rice production technologies among farmers does not start at the same period. Therefore, to measure awareness of rice production technologies, likert type scale was also used and the result revealed that rice farmers had different stage of awareness about rice production technologies. This was taken with rating scale ranging from highly aware to unaware.

The results of Table 2 reveals that respondents who were on the aware stage constitute the mean of (mean = 3.89), for recommended land preparation, (mean = 4.03) for use of recommended improved variety, (mean = 3.83) for timely planting, (mean = 3.58) for plant spacing of 25×20 cm, (mean = 3.65) for recommended method of fertilizer application, (mean = 4.02) and for proper weeding and (mean = 3.62) for early harvesting. Respondents who were on undecided level of awareness constitute the mean of (mean = 3.15), for planting at recommended seed rate, (mean = 3.46), for recommended fertilizer application, (mean = 2.88), for diseases control and (mean = 3.23) for pests control. The results clearly show that 64 % of rice production technologies was aware by the respondents in the study area.

Fashola *et al.* (2006), reports that awareness could lead to adoption but does not necessarily results in adoption. This is because adoption of agricultural innovations depends on credibility of the source of information, knowledge, and level of awareness, farmer's attitude and group influence which may also affect adoption behavior.

This finding corroborate with Umeh and Chukwu (2015) which revealed that use of improved rice varieties, use of agro-chemical, zero tillage, use of fertilizers, proper spacing, 91.67 %, 87.50 %, 85.42 %, 83.33 % and 77.08 %, respectively, were known by the respondents.





**Table 2: Respondents according to Awareness of Rice Production Technologies (n = 203)**

| Production technologies                       | HA  | A   | U   | RA | UA | WS  | MS  |
|-----------------------------------------------|-----|-----|-----|----|----|-----|-----|
| Recommended land preparation                  | 330 | 338 | 51  | 10 | 20 | 791 | 3.9 |
| Use of recommended improved variety           | 470 | 264 | 48  | 20 | 17 | 819 | 4.0 |
| Planting at recommended seed rate             | 125 | 288 | 141 | 54 | 32 | 640 | 3.2 |
| Timely Planting                               | 395 | 284 | 42  | 34 | 22 | 777 | 3.8 |
| Plant spacing of 25×20 cm                     | 330 | 260 | 78  | 24 | 34 | 726 | 3.6 |
| Recommended fertilizer application            | 245 | 308 | 90  | 26 | 34 | 703 | 3.4 |
| Recommended methods of fertilizer application | 205 | 428 | 51  | 38 | 19 | 741 | 3.7 |
| Proper weeding                                | 325 | 436 | 24  | 22 | 10 | 817 | 4.0 |
| Diseases control                              | 170 | 188 | 105 | 70 | 52 | 585 | 2.9 |
| Pests' control                                | 190 | 304 | 75  | 48 | 40 | 657 | 3.2 |
| Early Harvesting                              | 325 | 316 | 39  | 16 | 38 | 734 | 3.6 |

Note: HA = Highly Aware, A = Aware, U = Undecided, RA = Remotely Aware, UA = Unaware, WS = Weighted Score and MS = Mean Score

### Adoption of Rice Production Technologies by the Respondents

Adoption refers to the acceptance and continuous use of the recommended lowland rice production technologies by the farmer. In order to measure the adoption of rice production technologies, likert type scale was used and the result revealed that farmers had different stages of adoption about adoption of rice production technologies. This was captured with rating scale ranging from awareness stage to adoption stage.

Respondents who were on stage of adoption constitute the mean of 4.67 and 4.50 (Table 3) for use of recommended improved variety and timely planting, respectively. This shows that the respondents' decision to adopt or reject rice production technologies depends on the complex nature of the technology.

Proper weeding (mean = 4.34) and early harvesting (mean = 4.14) were on the trial stage of adoption. This implies that respondents had passed awareness, interest and evaluation stage of adoption which could probably lead to adoption stage.

Planting at recommended seed rate (mean = 2.53), plant spacing of 25×20 cm (mean = 2.66), diseases control (mean = 2.58) and pests control (mean = 2.59) were at evaluation stage of adoption. This implies that rice production technologies that require technicality in adopting them will likely stop in evaluation stage of adoption. The results also show that recommended land preparation (mean = 2.10), recommended fertilizer application (mean = 2.41) and recommended method of fertilizer application (mean = 2.29) were at interest stage of adoption. This implies that 18 % of rice production technologies were on adoption stage of adoption in the study area.

According to Odoemenem and Obinne (2010), the improved cereal crop production innovations available to small scale farmers in Benue State include improved cereal varieties, fertilizer, pesticides and herbicides. The assessment of the adoption of these innovations indicated that improved crop variety was adopted by 32.43% of the farmers in the study area followed by fertilizer with 27.03% and pesticides with 24.32%. Herbicide recorded the least rate of adoption with 16.22%.

This agree with Mustapha *et al.* (2012) who stated that the majority of the respondents adopted rice production technologies with respect to high yielding varieties (77.5%), early maturing varieties (69.37%), use of herbicides (93.75%) and broadcasting method (55%). Singha and Baruah (2011) stated that farmers were unfavorable to adoption of recommendations of those relatively complex practices in nature such as seed treatment, application of manure and fertilizers, and plant protection measures under different farming



systems. However, there are chances for improving the difficulty of certain practices through the deployment of suitable extension methods.

**Table 3:** Respondents according to Adoption of Rice Production Technologies (n = 203)

| <b>Production technologies</b>                | <b>A</b> | <b>I</b> | <b>E</b> | <b>T</b> | <b>Ad</b> | <b>WS</b> | <b>MS</b> |
|-----------------------------------------------|----------|----------|----------|----------|-----------|-----------|-----------|
| Recommended land preparation                  | 82       | 160      | 9        | 60       | 115       | 426       | 2.10      |
| Use of recommended improved variety           | 5        | 10       | 21       | 72       | 840       | 948       | 4.67      |
| Planting at recommended seed rate             | 80       | 64       | 72       | 148      | 150       | 514       | 2.53      |
| Timely Planting                               | 10       | 14       | 15       | 20       | 845       | 904       | 4.50      |
| Plant spacing of 25×20 cm                     | 78       | 86       | 51       | 104      | 190       | 509       | 2.66      |
| Recommended fertilizer application            | 84       | 78       | 57       | 116      | 155       | 490       | 2.41      |
| Recommended Methods of fertilizer application | 90       | 94       | 42       | 84       | 155       | 465       | 2.29      |
| Proper weeding                                | 10       | 40       | 42       | 44       | 745       | 881       | 4.34      |
| Diseases control                              | 94       | 38       | 39       | 128      | 225       | 524       | 2.58      |
| Pests' control                                | 75       | 76       | 54       | 160      | 160       | 525       | 2.59      |
| Early Harvesting                              | 10       | 30       | 15       | 20       | 765       | 840       | 4.14      |

Note: A = Awareness I = Interest E = Evaluation T = Trial Ad = Adoption WS = Weight Score and MS = Mean Score

## CONCLUSION AND RECOMMENDATIONS

The study revealed that majority of the rice production technologies was aware by the respondents in the study area. Use of recommended improved variety and planting at recommended seed rate was the rice production technologies adopted by the adopters. Based on the findings of the study, the following recommendations were made:

1. Since respondent in the study area depended highly on extension workers in sourcing information for rice production, so, extension workers should update their knowledge on current production technologies, and
2. Middle aged farmers were found to have actively participated in the adoption of rice production technologies in Jigawa State. They should be encouraged by the State and Local Government by making agriculture an attractive occupation through grants and loans at very low interest or without interest.

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