Household Farmers Willingness to Invest in Improved Rice Production Technologies in Awgu LGA, Enugu State

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Abstract: This study examined the influence of the socio-economic characteristics of the rice household farmers in Awgu local government area in Enugu state, Nigeria on their willingness to invest in improved rice technologies and also to determine the factors affecting the farmers' willingness to invest. Purposive random sampling was employed for the selection of the local government and random sampling was used for the selection, forty farming households from Aninri, Oji River and from Awgu farming zone, implying a sample of one hundred and twenty households for the study. The simple percentage analysis and one way ANOVA model was employed in the analysis of the data and for the validations of the hypothesis, the result suggestively revealed that about 57(48%)of the respondents are very willing to invest in rice improved technologies and some factors affecting rice farmers willingness to invest are: lack of adequate information, lack of funding, poor storage facilities etc. The ANOVA analysis revealed that education level, age, farming system, farm size, occupation and level of awareness influences the farmers' willingness to invest in improved rice production technologies.

Keywords: Technology, household, willingness, rice, farmers

1   INTRODUCTION

Rice (*Oryza sativa*) a cereal belonging to the Gramineae, a large monocotyledonous family of some 600 genera and around 10,000 species (Agricnews 2003). It is valued as the most important staple food for over half of the world population and ranks third after wheat and maize in production on world basis. More than half of the world's population depends on rice as the major source of calories (Fao 2004). Nigeria has become the highest rice productions country in West Africa and the third largest in Africa, after Egypt and Madagascar. The production reached its peak in 1990 when the country was producing 3.4 million tons of rice from about 1.2 million tons (Imolehinand 2000) before it slightly fluctuated down the slope in 1993. However, the production soared from 1993 to 2006 where its production remains 3.8 million metric tons.

The two major rice varieties grown worldwide today are *Oryza sativa indica* and *Oryza sativa japonica*.

Together with the five wild taxa, O. rufipogon (sensu lato), O. longistaminata Chev. et Roehr., O. barthii A. Chev., O. glumaepatula Steud., and O. meridionalis Ng., the two cultivated rice species, Oryza sativa L. and O. glaberrima Steud., form the Oryza sativa complex. Among these taxa, only *O. rufipogon* produces fertile F1 hybrids with *O. sativa* and therefore these two species are considered to belong to a single biological species. Together with all the circumstantial evidence, this suggests that *O. rufipogon* is the ancestor of *O. sativa*. Similarly, it leaves no doubt that *O. barthii* is the ancestor of African rice *O. glaberrima*.

Rice (*Oryza sativa*) plays a vital role in the food security of over half of the world population (Gutaker *et al.,* 2019). Approximately 782 million tons of paddy rice were produced worldwide in 2018. At the same time, the production of paddy rice causes a variety of environmental impacts. Approximately 782 million tons of paddy rice were produced worldwide in 2018 (FAO 2018).

Rice (*Oryza sativa*) is no doubt the world's most important food crop being the staple food of over 50 percent of the world population; indicatively, India, China and a number of other countries in Africa such as Nigeria (FAO, 2006). It is one of the major cereals in developing nations such as Nigeria, especially in the producing areas, where it provides employment and income for more than 80% of the inhabitants as a result of the activities that take place along the production and distribution chains from cultivation to consumption (Umeh, 2015).

Rice is the most important grain with regard to human nutrition and calorie intake (Usman, 2011). It provides more than one fifth of the calorie consumed worldwide by human species, though relatively lower in protein compare to other cereals, it contains a better balance of amino acids (Oladimeji and Abdulsalam, 2013).

Rice has shaped the culture, diets and economies of thousands of millions of people. For more than half of the humanity "rice is life". Considering its importance position, the United Nation designated year 2004 as the "International Year of rice. Importance of rice can be highlighted as follows; Rice serves as food, it can be used in the production of other food materials such as popped and puffed rice, instant or rice flakes, canned rice and fermented products, rice straw can be used as feed for livestock and also use as a roofing material, Rice husk can be used for paper making and good source of fuel, rice bran oil is useful in the soap industry Etc.

Rice is also very useful in the in the improvement of the economy of a nation. When a nation invests in the production of rice, there will be less demand in the importation of rice which may even create room for export and create more job opportunities to citizens of the country.

In Nigeria, rice consumption has risen tremendously at about 10% per annum due to changing consumer preferences (Akande 2003). However, (Ebuehi and Oyewole 2006) discovered that most Nigerians prefer to consume imported rice brands as compared to local rice varieties. The reason is that most Nigerian rice processors lack adequate technology of rice processing to meet international standards. Rice processing involves several steps: removal of the husks, milling the shelled rice to remove the bran layer, and an additional whitening step to meet market expectations for the appearance of the rice kernels. This process generated several streams of material which include the husks, the bran, and the milled rice kernel (Shramm 2006). Nigeria has the potential to be self-sufficient in rice production, both for food and industrial raw material needs and for export purposes. However, a number of constraints have been identified as limiting factors for rice production. The traditional methods of processing rice paddy involve soaking of the paddy in water for 2 to 3 days to soften the kernel, followed by steaming the soaked paddy for 5–10 minutes and drying it in the sun followed by pounding the dried paddy in a mortar and pestle device to remove the husk or use of simple machines for dehulling/milling; then the grain is cleaned using a winnowing basket. Though the traditional method of processing rice is simple, but tedious, it has a very low outturn and results in breakages of rice kernels and incomplete removal of husks. More so, it has a short storage life as the fat in the bran develops rancidity (Srilakshmi 2003).

Rice production in South Eastern especially in Enugu state Nigeria is mostly by traditional methods with patches of mechanized methods in some areas (Ugochukwu and Ezedinma 2011). Rice is a major contributor to regional trade in Nigeria. Some farmers are willing to grow rice no matter the constraints they are facing (Matanmi *et al.,* 2011). As rice farmers strive for profitable and sustainable production, researchers and decision makers have to address and respond to issues concerning production patterns and processes.

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H0: Educational level, age, farming system, occupation, income, farm size, will not influence farmer's willingness of investing in improved rice production technologies.

2.0 LITERATURE REVIEW

Decreased rain fall coupled with intermittent drought is a common feature in the tropical and sub-tropical savannas (Mohammed *et al.,* 2015). According to Jeong et al. (2010), drought can lead to yield reductions in 25% of upland crop production fields. Drought tolerant varieties developed through plant breeding are more accessible to farmers than costly agronomic practices or irrigation enhancements that might require large investments by farmers (Hu & Xiong, 2014).

Fertilizer as one of the major factors affecting rice production, Ezui *et al.,* (2010) opined that both NPK 15:15:15 and Urea 50 kg bags were sold for up to six thousand Naira. This can lead to a decline in the production of rice (Mohammed *et al.*, 2015). Farmers are

mindful of the significance of fertilizers that is both organic and inorganic in farming activity.

3.0   MATERIALS AND METHOD

This section provides profiles of the selected study areas, the sampling protocol and the data collection process We used both quantitative and qualitative participatory rural appraisal (PRA) methods to capture the data.

3.1   The Study Area

The study was carried out in the Awgu Local Government of Enugu State, which is one of the states in the eastern part of Nigeria. Awgu LGA is located approximately between latitudes 06 00' and 06 19' North of the Equator and Longitudes 07 23 and 07 35' East of the Greenwich meridian. Awgu LGA is bounded in the north by Udi and Nkanu West LGA, in the west by Oji River LGA, Aninri LGA and Ivo LGA of Ebonyi state in the East and share border with Umunneochi LGA of Abia state in the south. (Enugu State Agricultural Development Project (ENADEP) (2009)
The agricultural zones of Awgu local government include Awgu, Aninri and Oji River

3.2   Research Design

The study was carried out using a structural questionnaire. A total of one hundred and twenty questionnaires were distributed to the rice farmers in the selected agricultural zones in Awgu government areas (Awgu, Aninri and Oji River).

3.3   Data Collection

The main source of information for the study was obtained through the use of structured questionnaires, both closed-ended and open-ended questionnaire were used.

In the closed ended, respondents were given the option within to select the right response, while in the open ended respondent were allowed to express their view freely. Data required for the study was collected from primary data. Primary data were collected from the source by means of research questionnaires. Before embarking on actual research, questionnaires was constructed and a pilot study was in Awgu Local Government Area Agricultural Zone (Abubakar *et al,* 2018) to enable the researcher to test the validity and the reliability of the research instruments was to be used in the data collection exercise. Another reason for the pilot test was to enable the researcher to familiarize with what kind of feedback to get from those who were respondents and to make any

necessary adjustments to the research instruments where certain matters were not clear to the respondents.

3.4   Sampling Method

Purposive sampling as described by Ohen and Ajah (2015) was used for selection of local government's areas while simple random sampling was used for selection of farm in selected local government areas and to pick the respondents. The agricultural zones of Awgu local government include Awgu, Aninri and Oji River.

3.5   Data Collection Procedures

In order to ensure even and effective coverage of the study area, simple random sampling was used to pick the respondents. 120 questionnaires were distributed to each of the selected agricultural zones in Awgu local government, one hundred were retrieved and one hundred were correctly filled hence used for the interpretation of the result. The data of interest includes socio-economic characteristics of households in the study area which include gender, age, level of education, income, household size, occupation, religion, marital status; quantity of rice produced; investment in rice production; and willingness to invest.

3.4   Data Analysis

We analyzed the collected data for the study using both descriptive and inferential statistics. Descriptive statistics such as mean, frequency and percentage were utilized and one way ANOVA analysis and Dunnett's test were employed to validate the hypothesis.

4.0 RESULT AND DISCUSSION

Table 1: socio economic questions

s/n	Characteristics	options	frequency	percentage (%)
1.	Age			
		20-30	6	5.0
		31-40	40	33.3
		41-50	34	28.3
		51-60	19	15.8
		61 &above	21	17.5
		total	120	100.0
	Farming system	subsistence	5	4.2
		peasant	49	40.8
		commercial	46	38.3
		undecided	20	16.7
		Total	120	100
3.	Farm size			
		1- 3 plots	17	14.2
		4 - 6 plots	83	69.2
		7 - 9 plots	17	14.2
		undecided	3	2.5
		Total	120	100.0
			120	100.0
4.	Occupation			
		farmer	71	59.2
		civil servant	22	18.3
		artisan	12	10.0
		entrepreneur	9	7.5
		undecided	6	5.0
		Total	120	100.0
5.	Education qualification			
		school cert	43	35.8
		o level	43	35.8
		bsc or equivalent	25	20.8
			6	5.0
		Non of the above	3	2.5
		Total	120	100.0

Source: Field Data, 2023

Majority 40(33.3%) of the household farmers were relatively in their active economic and productive ages of 31-40 years (Table 1). Since age of an agro enterprise stakeholder is important in determining productivity and to a large extent adoption of innovation (Nwaru, 2004). Also, this implies that the rice farmers in the study area are still within their productive age and can still engage efficiently in rice production and can easily adopt and invest in an improved rice technology. Rice farming is a labour intensive occupation and exerts energy for land preparation, nursery, planting, weeding and harvesting. The findings are similar to those of Nwaobiala and Adesope (2015) who found out that the mean age of

upland rice farmers and swamp rice farmers in Ebonyi State were 37.3 years and 39.2 years respectively. This is encouraging as an active age implies increased productivity and enables the farmers engage in other value adding activities like rice processing. The result therefore implies great prospect for willingness of the household farmers to invest improved technology in rice production in the study area. From table 1 above, the result for farming system revealed that more than forty percent 49(40.8%) of the rice farmers in the study area practices more of peasant farming followed by commercial system of farming (38.3%) which possibly means that the household rice farmers in the study do not

only farm for consumption but majorly for commercial purposes in order to earn a living. The result from farm size showed that about 69% of the farmer's farm on only 4-6 plots of land and 14% on 1-3 plots. These results imply that the household farmers in the study area do not have adequate land for commercial system of farming which could contribute to the reason why they resorted to peasant farming since there is no adequate availability of land for rice farming. The results for occupation of the farmers revealed that more than fifty percent 71(59.2%) of the farmers in the study area are majorly farming, and

5% were undecided in their responses, this result plausibly implies that farmers in the study area are focused in farm work and mainly and earn a living through farming. The highest percentage of level of education is 35.8% (o level) and school cert. (35.8%). These results imply that the farmers in the study area are enlightened. Educational enlightenment, and also imply that the rice farmers will be more receptive to information from extension agents and other means on the adoption of best practices for investing in improved rice technology that would harness the quality of rice.

Table 2: Farmers level of awareness of improved rice production technologies in the study area n=120

s/n	variable	options	frequency	percentage (%)	Mean
1.	What is your major source of information about rice production?	radio	55	45.8	
		television	12	10.0	
		extension officer	12	10.0	
		other farmers	40	33.3	
		other sources	1	.8	
		Total	120	100.0	2.3333
2.	Which of the following rice production improved technology are you conversant with?	tube well	4	3.3	
		borehole	13	10.8	
		bird scarer	42	35.0	
		knapsack sprayer	58	48.3	
		can't say	3	2.5	
		Total	120	100.0	3.3583
3.	what improved rice farming input do you adopt often	improved variety	13	10.8	
		herbicide	69	57.5	
		fertilizer	34	28.3	
		all of the above	4	3.3	
		Total	120	100.0	2.2417
4.	What method of field preparation/planting gap do you adopt?	25cmx25cm planting	59	49.2	
		ploughing	37	30.8	
		harrowing	17	14.2	
		seed selection	7	5.8	
		Total	120	100.0	1.7667
5.	Which of the improved harvesting/processing technology do you employ	combined harvester	30	25.0	
		per boiler	39	32.5	
		de stoner	39	32.5	
		packaging equipment	12	10.0	
		Total	120	100.0	2.2750

In table 2, the result revealed that 45.8% of the farmers get their information about improved rice production technologies from the radio, and from their

fellow farmers (33.3%). The results generally imply that the farmers in the study area are informed and aware of improved rice production technologies. However, the

presence of extension officer in the study will go a long way to get the farmers informed about the improved rice technologies, the result showed that it is only 10.0% of farmers that have access to extension officers. From table 2 also, 48.3% of the farmers in the study area opined that they are conversant with knapsack sprayer as an improved rice production technologies, although 2.5% of the farmers couldn't say which technology there are conversant with. Majorly, the farmers in the study area stated that herbicide (57.5%) is improved rice farming input that they adopt followed by the application of fertilizer 28.3%, the least percentage (3.3%) of the farmers opined that they adopt all improved rice farming inputs. This result may be an indication that the household rice farmers in the study area are faced with the challenge of weed control and improvement of the soil fertility in order to enhance the yield of crop. So investing in these rice farming inputs will enhance adequate rice production

output. 49.2% of the respondent in the study area adopt 25x25cm planting method, 14.2% adopt harrowing, 32.5% of the respondent employs per boiler, 32.5% employ de stoner. It is obvious that the respondents/farmers in the study area adopts improved rice production technologies.

The mean scores of all items that measure farmers' level of awareness of improved rice production technologies in the study area ranged from 1.76 to 3.35. This implies that the most important factor that contributes to the farmers' level of awareness of improved technologies is the method of field preparation/planting gap do you adopt. The mean scores (2.39) of all items that measure farmers' level of awareness of improved rice production technologies in the study area fell below the set mid-point (2.50). This finding suggests that level of awareness are indispensable for farmers to adopt improved rice technologies in the study area.

Table 3: Farmers willingness to invest in improved rice technologies

s/n	variable	options	frequency	percentage (%)	mean
1.	How willing are you to invest in improved rice technology?	very willing	57	47.5	
		just willing	38	31.7	
		not willing	6	5.0	
		can't say	5	4.2	
		undecided	14	11.7	
		Total	120	100.0	2.0083
2.	What is your major source of income?	farming only	99	82.5	
		grants	21	17.5	
		Loan	0	0	
		Farming and other business	0	0	
		can't say	0	0	
		Total	120	100.0	1.1750
3.	How much are you willing to invest in improved rice production	less than 50,000	32	26.7	
		50000-100000	45	37.5	
		100000-200000	41	34.2	
		200000 and above	2	1.7	
		Total	120	100.0	2.1083
4.	What duration are you willing to invest in improved technology?	short term investment	31	31.0	
		middle interval investment	34	28.3	
		long term investment	78	65.0	
		all of the above	6	5.0	
		Total	2	1.7	1.8000
5.	Which of the improved rice technology are you willing to invest on	planting	8	6.7	
		weeding	104	86.7	
		harvesting	3	2.5	2.0417
		processing and packaging	5	4.2	
		Total	120	100.0	

Overall, the household rice farmers appeared to be very willing to make investment in improved rice technologies.

technologies. More than forty seven percent (47.5%) of the respondents were very willing to invest in improved

rice technologies. Table 3 shows that in total, about 80% of the rice farmers in the study area reported their willingness to invest in improved rice production, the remaining 5% of the respondents were not willing to invest, 11% were undecided which could be due to lack of adequate information about rice improved technologies or lack of fund for investment because the respondents also reported that the major source of their income is through farming (82.5%), the remaining percentage of the respondents acknowledge the receipt of grants (17.5%) which could be from government, cooperative society or government. This result indicates that the rice farmers in the study area need to be funded adequately in order to invest in improved rice production. Also, in table 3, 37.5% of the farmers are willing to invest ₦50, 000 to ₦ 100,000, this could be due to the fact that majority of the respondents are peasant farmers and since their major source of income is farming, they are only left with small amount for farming after feeding and other expenses. So there is need for government intervention in terms of soft loans and grants. 65.0% of the respondents preferred long term investment; this could be due to the farm ownership system that the farmers practice which is

through inheritance or leasing of land for some years depending on the nature of the leasing agreement, only 6.0% of the respondents are willing to adopt all the different types of investment. Majority of the respondents (86.7%) acknowledged weeding as the improved rice technology that they are most willing to invest, and this agreed with the 57.5% of the respondents affirming that their major improved rice farming input is herbicide in table 2.

The mean scores of all items that measure farmers' level of awareness of improved rice production technologies in the study area ranged from 1.175 to 2.108 with the source of income having the least mean value. This implies that the most important factor that contributes to the farmers' willingness to invest in improved technologies is the option of the major source of income. The mean scores (1.827) of all items that measure farmers' farmers' willingness of improved rice production technologies in the study area fell below the set mid-point (2.50). This finding suggests that level of awareness are indispensable for farmers to adopt improved rice technologies in the study area.

Table 4: Factors that influences farmer's willingness to invest in improved rice production technology

s/n	variable	Options	Frequency	Percentage (%)	Mean
1.	Who provides you access with loan and grants	government	20	16.7	
		cooperative society	46	38.3	
		Individual	27	22.5	
		Family	23	19.2	
		none of the above	4	3.3	
		Total	120	100.0	2.5417
2.	What type of farm ownership do you practice	Inheritance	42	35.0	
		Leasing	36	30.0	
		Rent	29	24.2	
		Buying	5	4.2	
		5.00	7	5.8	
		Total	1	.8	2.2250
3.	Who do you talk/report to in case of a rice disease outbreak?	Neighbor	79	65.8	
		extension officer	10	8.3	
		fellow farmer	27	22.5	
		can't tell	4	3.3	
		Total	120	100.0	1.6333
4.	what rice storage method do you adopt?	mylar bag	8	6.7	
		mason bag	104	86.7	
		Buckets	3	2.5	
		lack of storage facility	5	4.2	
		Total	120	100.0	2.0417

Table 4 summarized the descriptive statistics of the variables concerning the factors that influences the household rice farmers to invest in improved rice technologies. The Provision of grants and loan by cooperative society as one of the factors influencing farmer's willing to invest was expressed by the respondents 46(38.3%). On the factors related to the type of farm ownership, more than thirty-five percent 42(35%) of the sampled rice household farmers got acquire their farmland through inheritance. The percentage of farmland acquisition through buying is less than five percent 5(4.2%). More than sixty-five percent 79(65.8%) of the sampled rice farmers report the outbreak of disease in the rice farm majorly to their neighbors and relatives. The percentage of farmers that reports to the extension officer is less than ten percent (8.3%). In terms of storage facility as a factor influencing the willingness to invest in improved rice technology, majority of the sampled rice household farmers adopts mason bag 104 (86.7%).

The mean scores of all items that measure farmers' willingness to invest in improved rice production technologies in the study area ranged from 1.633 to 2.542 with the report in rice disease outbreak having the least mean value. This implies that the most important factor that contributes to the farmers' willingness to invest in improved technologies is the option of the rice disease outbreak. The mean scores (1.827) of all items that measure farmers' farmers' willingness of improved rice production technologies in the study area fell below the set mid-point (2.50). This finding suggests that the farmers' willingness to invest improved rice production technology are indispensable for farmers to adopt improved rice technologies in the study area.

variables	Levene's statistics	df	f	sig
age	10.522	2	3.324	0.040
Farming system	11.125	2	8.159	<0.001
Farm size	3.034	2	3.159	0.047
Occupation	11.692	2	8.547	<0.001
Awareness	8.311	2	4.506	0.013
Education qualification	16.652	2	4.231	0.017

The mean difference is significant at the 0.05 level.

Hypothesis

There are no significant relationship between the household rice farmers' willingness to invest and the socio economic characteristics
The hypothesis test if the household rice farmers' willingness to invest is related to the socio economic characteristics. The ANOVA result suggests that there is a significant relationship between these variables because from table 5. P value for age is 0.040 and F= 3.324 which is less than the critical F value (3.99). Also all the p- values in the table test positives (< 0.05) at the mean significant level of 0.05.

CONCLUSION

The study has shown the household farmers' willingness to invest in rice improved technology. The study revealed that some of the factors challenging the willingness of the rice farmers to invest in rice improved technologies are; the absence of extension officers in the study area which leave the farmers with insufficient information about some recent improved technologies that should be adopted and invested in. And also unavailability of required funds in rice farming, it is therefore recommended that the services of the extension officers be extended to the study area for sufficient and adequate information about rice improved technologies. Also, the federal and state government through the ministry of agriculture should encourage rice farmers with soft loan, grants and mechanized farming tools.

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