Logistic Model Analysis of Adoption of NERICA among Smallholder Farmers in Enugu State, Nigeria

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Abstract: **Adoption of New rice for Africa (NERICA) variety by small holder farmers in Enugu State, Nigeria was studied using one hundred and twenty respondents. Structured questionnaire was employed to collect data for the study. Percentage responses, Logistic regression analysis and Net farm income were used to address the objectives of the study. The result of the determinant factors to the adoption of the technology was educational level, farming experience, membership of cooperatives, and household size. The gross margin of the rice was N392,070, the net farm income was N393, 220, while return on investment was N2.3. The result of constraints to NERICA adoption were poor extension contact, poor access to credit, unavailability and high cost of farm inputs and poor access to lands. Based on the results , the need to enhance farmers' access to credit, educational programmes, land, fertilizer and labour saving device.**

Keywords: **Logistic Model, Analysis Adoption, NERICA, Smallholder, Farmers.**

I. INTRODUCTION

Rice as reported by Food Agriculture Organization (FAO) (2019) is the fourth largest crop produced in the world after sorghum, millet and maize in terms of production and areas cultivated. The global rice production estimates for 2018 cropping season country by country according to United Nations Food and Agricultural Organization Statistics (FAOSTAT), revealed that China was on the top position with estimated output of 206.5 million metric tonnes, followed by India with 157.2 million metric tonnes, while Indonesia was left in distant third position with 70.8 million metric tonnes (Udemezue, 2019). Nigeria is currently according to Rice Farmers' Association of Nigeria (RIFAN), (2018) and Ume, Ezeano, Edeh and Udefi (2018) the largest rice producing country in Africa with annual production increase from 3.2 million metric tons in 2015 to 4 million metric tons in 2017. Apart from being the highest producer of rice in Africa continent, Nigeria is one of the highest consumer of rice nation in World This consumption habit could be linked to rapid urbanization, population growing taste, quick to cook and change in consumer habits (Ume and Nwaobiala, 2012). The domestic rice production in Nigeria, however has been inadequate, thus creating supply deficits which had several years met through imports by country successive government (Osagie, 2016)**.** For instance in the year 2017 according to Central Bank of Nigeria (CBN), (2019) only about 56% of the 6.3 million metric tonnes of rice consumed in Nigeria annually is locally produced, while the supply deficit of about 2.6 million metric tonnes was augmented through imports. The inability of Nigeria to meet up with the food demands of her growing population despite her potentials could be related to low productivity in the farmers' farms (Ayodele, Fagade and Lower, (2016). However, one of the remarkable ways of increasing agricultural productivity by successive government in the country and other international donors was through development and dissemination of improved seed inputs (CBN, 2019). The important of use of improved seeds in attainment of agricultural productivity as reported by Spielman, Kelemwork, and Alemu, (2011) and Alene, Poonyth, and Hassan, (2012.). a vital, cheapest and one of the most economical and efficient inputs use in improving, crop production and productivity and determines the crop production status and the response of other inputs used in crop production

Nevertheless among the technologies introduced to rice farmer in Nigeria and other Africa countries according to Africa Rice Center (2008) is New Rice for Africa (NERICA). NERICA varieties are inter-specific hybrids between local Africa rice (oryza glaberimma) and the Asian rice (oryza sativa) with unique characteristics of shorter duration (maturing between 30 and 50 days earlier than traditional varieties), higher yield, contain amino acid, tolerant to major stresses, higher protein and good taste compared with the traditional rice varieties (Diagne, 2011; Dontsop Nguezet, Diagne, Okoruwa, and Ojehomon. 2011.). Furthermore, NERICA possess early vigor during vegetative growth phase and this is potentially a useful trait for weed competitiveness, resistant to African pest and diseases such as devastating blast rice stem borer and termites (Diran, 2015). Some of the NERICA ccultivars line and common name are WAB 450-I-B-P38-HB (NERICA 1), WAB 450-I-B-P91-HB (NERICA 4), WAB 450-11-1-1-P41-HB (NERICA 10) and WAB 450-16-2-BL2-DV1 (NERICA 11) (Africa Rice Center 2008; Dontsop Nguezet, 2011.)

However, the rice technology was disseminated by the extension services of Enugu State Agricultural Development Programme (ADP) and Ministry of Agriculture in the Local Government Area to the rice farmers in the study area with limited extension follow up such as technical advice on line planting, use of fertilizer, pesticides, timely weeding, timely planting and minimum tillage. The moribund state of the nation's extension system, occasioned chiefly by World Bank withdrawal of the sponsorship could be the reasons for poor extending of the technical assistants, hence hindering the technology adoption. The factors influencing farmers' decision to adopt the technical assistants (line planting, use of fertilizer, pesticides, timely weeding, timely planting, minimum tillage) are very limited in the study area to the best knowledge of the researcher. Specifically, the objectives of the are to (i) describe the farmers' socioeconomic characteristics, (ii) ascertain the determinant factors to adoption of the technology (iii) estimate the profitability of NERICA rice and (iv)assess the constraints to NERICA adoption by farmers in the study area.

II. MATERIALS AND METHODS

Study Area

Enugu State is the study area and it is one of the states in South East, Nigeria. It is located between latitudes 6°30' N and 7°10'N of Equator and longitudes 6°35'E and 7°30'E of Greenwich Meridian. Enugu State has eighteen Local Government Areas with an estimated population of about 4, 1671 million people (NPC, 2006). The state has a land area of 16,727 square km^2, three Agricultural zones(Enugu West, Enugu South and Enugu East), rainfall of about 1800mm to 2500mm per annum, temperature range of 29^{0C} to 35^{0C} and relative humidity of 68%. The state is agrarian and other non-agricultural activities engaged by the people include barbing, hair dressing salon, vulcanize and petty trading.

Sampling procedure and sampling size

A multi-stage random sampling procedure and purposive sampling were employed to select Agricultural zones, communities', villages and respondents. First, two out of three agricultural zones of the state (Enugu North and Enugu South) were purposively selected based intensity of NERICA production. Second, two Local Government Areas (LGAs) were purposively selected from each of the zones based on intensity of NERICA production The selected LGAs were Uzo uwani and Nsukka from Enugu North, while Udi and Awgu from Enugu East. Third, five communities from each of the four selected Local Government Areas were randomly selected. This gave a total of twenty communities. Fourh, six farmers were randomly selected from the lists provided by the extension agents covering the areas from the each of the twenty selected communities. This brought to a total of one hundred and twenty farmers for detailed studies.

Method of Data Collection

Structured questionnaires and informal or oral interview was used to capture primary data from the respondents. The secondary data was obtained through reviewing of related literatures, text books, conference papers, seminars, Journals, published and unpublished thesis, workshop, internets and government publication.

Method of Data Analysis

Objectives I and iii were addressed using percentage responses, objective ii and iv were addressed using Logistic model and Net farm income analysis model respectively.

Model Specification

Logits Model

Logit model has characteristics features of having parameter guesstimate which are asymptotically reliable, well-organized and simplicity in computation, thus making it theoretically favoured in adoption literature than conventional linear regression models, The binary logistic regression is a type of regression where the dependent variable is converted into a dichotomous binary variable coded 0 and 1. The farmers who adopted NERICA technologies were allotted the value of 1, while non-adopters; 0. The logit model is based on the cumulative logistic distribution function and could be specified as:

$$P_i = \frac{1}{1+e^{-z}} \quad (1)$$

P_i is the odd of adopting NERICA technology while 1-P_i is the possibility of not adopting. In the logistic function 1- P_i can be stated as:

$$1 - P_i = 1 - \frac{1}{1+e^{-z}} = \frac{1}{1+e^{z}} \quad .(2)$$

The ratio of equation (1) and (3) gives the odd ratio:

$$\frac{P_i}{1-P_i} = \frac{1+e^{-z}}{1-e^{z}} \quad (3)$$

$$\frac{P_i}{1-P_i} = e^{z} \quad (4)$$

Equation (4) is the ratio in favours of adoption of NERICA technologies to the odds of not adopting. Taking the natural log of both sides of the equation (4);

$$z = In \frac{P_i}{1-P_i} \quad (5)$$

Thus, the function may perhaps be stated as:

$$In \frac{P_i}{1-P_i} = \beta_o + \beta_i X_i + \mu \quad (6)$$

Where: X_i indicates the factors limiting the adoption of NERICA, β_i signifies the vector of parameter to be predicted using the maximum likelihood method, and μ represents error term which is usually normally distributed with zero mean variance. The empirical condition of the logit model for the adoption of NERICA is:

$$\text{Log } (P_i/1\text{-}P_i) = \beta_0 + \beta_1 \ln M_1 + \beta_2 \ln M_2 + \beta_3 \ln M_3 + \beta_4 \ln M_4 + \beta_5 \ln M_5 \ldots\ldots\ldots\ldots + \beta_n \ln M_n + V_1 - U_1 \quad (7)$$

Where P_i connotes 1 if the farmer adopts NERICA technologies, P_i symbolizes 0 otherwise, β_0 signifies intercept, β_{is} shows the coefficients to be forecasted, and e stands for error term. The equation can be implicitly expressed as ;

$$Y = \beta_0 + \beta_1 \ln M_1 + \beta_2 \ln M_2 + \beta_3 \ln M_3 + \beta_4 \ln M_4 + \beta_5 \ln M_5 + \beta 6 \ln M_6 \ldots\ldots\ldots\ldots + \beta_n \ln M_n + V_1 - U_1 \quad (8)$$

Where

Y = (Percentage of given adopted technologies), β_1 = Unknown coefficient value of factors;

M_1 = Farmers age (yrs), M_2 = Educational Level (yrs), M_3 = Access to Extension Service (Access; 1otherwise; 0)

M_4 = Household size (number of person), M_5 = farm size (hectare), $M_{6\,=}$ Farming experience (yrs), M_7 = Credit access (dummy), X_8 = Membership of organization (Member; 1, otherwise; 0), e= Error term

Gross Margin Analysis Model

Gross margin analysis is the difference between the total revenue (TR) and the total cost (TVC)

$$GM = \underset{n}{TR} - \underset{m}{TVC} \quad (9)$$

$$ie, GM = \sum_{i-1} P_1 - Q1 \sum_{j-1} + ri\ x\ xi \quad (10)$$

The Net farm income can be calculated by gross margin less fixed input. The net farm income can be expresses as thus:

$$NFI = \sum_{n-1}^{n} P_1 Q_1 - [(\sum = +i\ x\ 1) + K] \quad (11)$$

Where

GM = Gross margin (₦)

NFI = Net farm income (₦), PI = Market (unit) price of output (₦), Q = Quantity of input (kg), RT = Unit, X1 = Quantity of the variable input (kg), K = Animal fixed cost (Depreciation) (₦)

i – 123 ---------- I, J = 123 ----------j

III. RESULTS AND DISCUSSION

Socio - Economic Characteristics of the Respondents

The farmers' socio-economic characteristics analyzed were age of the farmer, level of education, years of farming experience, farm size and access to credit.

Table 1; Distribution of Respondents According to Age

Age	Frequency	Percentage
19 - 25	9	8
26 - 30	33	27
31 - 40	36	30
41 - 50	42	35
Total	120	100

Source: Field Survey; 2019

The age bracket of 41 and above constituted the majority (35%) of the rice farmers as shown in Table 3. Furthermore, 8% , 27% and 38% of the respondents fell within age bracket of 19 – 25, 26 – 30 and 31 – 40 respectively. This could imply that aged people are more involved in rice production than young and energetic youths who rather prefer white collar job than farming (Ume, et al; 2018). The aged people are very conservative and may not like to adopt new technologies for fear of unknown, they added.

Table 2: Distribution of Respondents According level of Education

Level of Education	Frequency	Percentage
No formal Education	38	32
Primary education	45	38
Secondary education	21	17
Tertiary education	16	13
Total	120	100

Source: Field Survey; 2019

From Table 2, 32% of the respondents had no formal education, while 68% had formal education. Ogada, Mwabuand Muchai, (2014) opined that education and training are important factors that enhance farmers' ability to evaluate, understand and accept new innovation. Educated farmers are also expected to be more receptive to improved farming techniques than farmer that had no formal education, they reported.

Table 3: Distribution of Respondents According to farming Experience.

Years	Frequency	Percentage
1 – 5	23	19
6 – 10	32	26
11 – 15	35	30
21 and above	30	25
Total	120	100

Source: Field Survey; 2019.

Table 3 reveals that 45% of the farmers had farming experience below of 11 years , whereas 55% had above 11

years farming experience. This finding concurred to Ume *et al* (2012), who opined that the more experience farmer is, the more ability he or she has to overcome obstacles involved in farming in order to boast their efficiencies and in setting realistic production goals through technology adoption.

Table 4 Distribution of Respondent According to farm size.

Farm size	Frequency	Percentage
0.5 ha	26	21
0.6 – 1.0ha	32	27
1.1 – 1.5ha	30	25
1.6 – 2.0ha	23	19
Above 2.0ha	9	8
Total	120	100

Source: Field Survey, 2019

The Table 4 discloses that 27% of the respondents cultivated between 0.6 – 1.0ha, 25% cultivated above 1.5 ha , while 19% cultivated about 1.6 – 2.0 ha of land. Also, 21% cultivated 0.5 ha and 8% cultivated above 2.0ha of land. The implication is that most of the respondents were small scaled in their farm. This predicament could adversely affect their adoption decision, as they have limited land to experiment the new technology. Onyeneke, (2017) made similar observations. He reported that most arable farmers in most developing countries cultivate less than 2 hectares of land, hence making farm modernization very difficult, if not impossible.

Table; 5.Distribution of Respondents According to membership of co-operatives

Membership	Frequency	Percentage
Yes	36	30
No	84	70
Total	120	100

Source Field Survey, 2019

The Table above states that 70% of the farmers were not member of any organization while 30% were members. Cooperative as reported by Onyeneke, (2017) enables members to have access to information on improved innovations, materials inputs of the technology (fertilizer and chemicals), credit (for payment of labour, capacity building and training) in order to improve their decision to technology adoption. Several studies (Ogada, et al; 2014, Ojo and Ogunyemi, 2014, Ume, et al; 2018) made similar findings. They opined that cooperative ensures cross fertilization of information about given technology, leading ease of innovation adoption .

Table 6: Distribution of Respondents According to Extension contact

Extension contact	Frequency	Percentage
No contact	40	33
Contact	80	67
Total	120	100

Source; Field Survey, 2019

The above Table showcases that 67% of the sampled farmers had contact with extension agent, while only 33% had no contact. Extension services as opined by Saliu, Ibrahim and Eniojukan, (2016) in agricultural development through dissemination of innovation to farmers, provision of technical assistance and sources of improved inputs in order improve farmers' technology adoption.

Table 7: Distribution of Respondent According to Household size

Size of household	Frequency	Percentage
2-3	12	10
4-5	66	55
6-7	31	26
8-9	11	9
Total	120	100

Source: Field Survey, 2019

In Table 7, 81% of the respondents had household size below 8 persons, whilst 9 % had above 8 persons. Household components comprises of husband, wives, children, grandchildren and extended family, of which according to Ojo and Ogunyemi, (2014)ensures labour availability to the household head, especially during the peak of farming season when labour is scarce and expensive. Onyeneke, (2017) and Ume, et al; (2016) observed that the above assertion could be logical, only if the household members are of labour age.

Table 8: Distribution of Respondent According to Access to Credit

Access to Credit	Frequency	Percentage
Yes	40	33
No	80	67
Total	120	100

Source; Field Survey; 2019

Table 8 indicates that 33% of the farmers had access to credit either from formal or informal sectors, while 67% had not. ExDixon, Nalley, Kosina, Rovere, Hellin, and Aquino, (2015). reported that credit is important for agricultural development (through procurement of improved planting materials and procurement of labour), income generation and household welfare. This finding collaborated with Ojo and Ogunyemi, (2014) who asserted that paucity of fund for adoption of the technology is a persistent problem in the adoption process.

Determinant factor to Farmers' adoption of NERICA Rice Varieties

The estimates of the factors affecting adaption rates NERICA rice varieties production technologies using Tobit model was summarized and presented in Table 9

Table 9: Logistic Regression result of NERICA Rice adoption.

Variables	Coefficient	Standard error	t-cal
constant	5.582584	0.4882745	11.43***
age(years)	0.1220665	0.0778549	1.57**
educational level(years)	-0.0679009	0.0751594	-0.90
extension contact(dummy)	0.2950766	0.1645775	1.79*
household size(number)	0.1475403	0.1034666	3.43***
farm size(hectare)	0.0151728	0.0593988	0.26
farming experience(years)	0.251179	0.066919	0.75
access to credit(dummy)	-0.265133	0.1648926	-1.61**
member of organization	0.0491406	0.1598433	0.31
Log likelihood =			-137.27756
Pseudo R2 =			0.0801
LR chi2(8) =			23.90***
sigma	0 .7684062	0.0574911	
***, ** and * shows significant at 1%, 5% and 10% levels respectively.			

Source; Field Survey; 2019

The age of the farmer had positive relationship with technology adoption and significant of 5% probability level. Old age is often associated with long years of farming experience and could positivity influence adoption decision process of the farmer (Owombo and Idumah, (2015). This finding agrees with Nwaru, (2004) who reported similar findings among farmers in Abia State, Nigeria. However, the opinion of Saliu, et al, (2016) was in disagreement to the above assertion. He was of the view that old people are often risk averse and less receptive to technology adoption. Also, in line with apriori expectation, the co-efficient of household size was positive and statistically significant at 1% risk level. This implied that as house hold size increases, adoption of NERICA rice varieties production technologies also improved. This may be because, family size is an important socio economic characteristic that tends to determine how much family labour will be put into use in the farm and also to respond to innovative change. Owombo and Idumah, (2015) had a negative relationship between larger household size and technology adoption. They opined that increased in household size especially towards dependent populations, could encourage consumption oriented economy with meagre savings to procure material inputs and other resources needed to enhance technology adoption.

Furthermore, the coefficient of extension contact had direct relationship with technology adoption at 99% confidence interval. Ume and Nwaobiala (2012) finding concurred with the above statement. They reported that extension aids in facilitating technology adoption by farmers through disseminating information on the mode of application or usage of the technologies as well as source of technological inputs. Therefore, frequent extension contact could likely to minimize doubts among farmers and ensure timely procurement of inputs. This would most probably encourage sustained usage of the improved technologies (Emodi and Dimelu, 2014). The aforementioned finding was in contrary to Grabowski and Kabwe, (2016), who posited that wide ratio extension agents and the farmers and negative attitude of extension agent to their duties could be cited for the reasons to the negative sign of the coefficient.

Finally, the coefficient of credit had inverse relationship to the dependent variable and significant at 95% confidence level. The negative sign for the coefficient of credit agreed with the evidence from ExDixon, et al; (2015) could be an indication of poor access to credit facilities by the farmers. Nevertheless, the work of Ume, et al (2016) was in divergent Theypined that it is expected that with high volume of credit, more of the technologies involving extra costs could be readily adopted. Agricultural credit has the potential to enhance efficient resource allocation, permits application of technology, reduces postharvest wastes and stabilizes farm input prices, farm income and enhance efficient marketing of agricultural products (Enya and Alimba, 2007).

Costs and Return of NERICA Rice production

Table 10: Cost and Returns in NERICA Rice production/hectare

Items	Unit	Quantity	Cost/unit N	Total cost	Total Revenue
Revenue	Kg	5600	100		560000
Physical Inputs					
Planting materials	Kg	150	250	37, 500	
Fertilizer labour cost	Kg	200	10,000	40,000	
Clearing	Manday	36 hrs	1500	6000	
Land preparation	Ha	72	2,500	2000	
Planting	Manday	24 hrs	700	1400	
Weeding	Manaday	96 hrs	1000	8000	
Fertilizer application		18 hrs	600	12000	
Harvesting	Manaday	96hrs	1,200	9,600	

Total = 306 *134500*

ank lending rate 24% = 32280 (24/100 x 134500)

Total variable cost (TVC) = 166780 (Total cost + BLR)

Gross marginal (GM) = 392070 (TR - TVC)

Total fixed cost = Depreciation on (Hoe, cutlass, rake) = 1150

Total cost = 167930 (TVC + Depreciation)

Net farm income = 393220(TR - TC)

Return on investment = 2.53 (NFI / TC)

Source Field Survey Data 2019

N/B kg = Kilogram, MD = Manday.

N= Naira(Nigeria currency), which has exchange rate of 1$ for N386 as at July 30, 2020

The cost element in NERICA production was NERICA seeds, fertilizer and labour and tools. Land was not valued because most lands are either inherited or communally owned in which no rent is paid. The common tools used by the farmers are hoe, cutlass and rake; and their depreciation value encountered were N200, N600 and N350 respectively.

Cost of Inputs; An average 150kg of rice seeds were used in the production of a hectare of the rice. Therefore expenditure on NERICA seeds per planting was N37500. About 4 bags (200kg) of NPK (3 bags of fertilizer and 1 bag of Urea) costing N 40,000 at N 10,000 each was applied per hectares. Therefore, the total cost of physical inputs was N 77500.

Labour cost; A total of 306 men hours' equivalent was used to produce one hectares of rice. Weeding had the highest man hour of 96, followed by harvesting 96, while land preparation and clearing is 72 and 36, while planting and fertilizer application were the least 24 and 18 man hours respectively. Wage rate varied with the nature of farm operation. Clearing attracted 1500 per man day, land preparation; 2500 planting; 700 and harvesting; 1200. The total cost of labour was N57, 000 which was about 33.9% of total cost of production.

*Cost and Returns***;** A total of 7000kg was harvested per hectare and this yielded a market value of N560,000. Taking away the total cost from the total revenue generated, therefore the gross margin for NERICA production was N392,070; the return per investment was N2.3 which means that in every N1 invested in paddy production, N2.3 could be realized. Ume, et al; (2016) finding on return per investment, N2.34 was similar

Table 11 Constraints to Adoption of NERICA with ranking

Problems	Freq.	Percentage	Ranking
High cost and scarcity of farm input	99	82.5	1st
Poor access to credit	98	81.7	2nd
High cost of labour	97	80.8	3rd
Climate Change	96	80	4th
Poor access in extension services	94	78.9	5th
Poor access to land	74	67.4	6th
Low soil of fertility	57	47.5	8th
Pests and Diseases	34	28.3	9TH

*multiple

source Survey Data, 2019

Table 11 indicates that high cost and scarcity of farm input problem was encountered by the farmers as represented by 82.5% of the total respondents and ranked first. FAO, (2014) was of the view that low access to farm inputs by farmers could hinder their technology adoptability Therefore, the need to subsidize improve farm inputs as they are usually scarce and expensive at farm level in sub- Saharan Africa, otherwise the adoption decision of farmers, particularly poor resource ones will be undesirably affected. Furthermore, poor access to credit (81.7%) was one of the problems that hindered adoption of technology by the rice farmers in the study area.

Grabowski, *et al*, (2016) attested the importance of credit in technology adoption through aiding in procurement of indispensible farm inputs and in payment of hired labour used in application of the technology.

In addition, 80.8% of the respondents encountered high cost of labour as hindrance to technology adoption, especially for those innovations that is labour intensive. High cost of labour as asserted by Ume, et al. (2017) could be as a result of able bodied youth drifting from the rural to the urban areas in search of white collar job and the few who may not be opportune to be attracted by urban drift, resorted to charge high prices in order to meet up with the welfare of the urban counterpart.

More so, climate change was complained by 80% of the respondents. Rice production in Nigeria and many other sub-Saharan Africa largely depends on climatic variability, as most of rice is produced in rain-fed environment. For instance, rice production and yield obvious fluctuate, which increases during the favorable monsoon seasons, but drop sharply during unfavorable years (Ume, et al; 2017).Moreover, poor access to extension service was encountered by 78.9% of the total respondents. The major problem of extension in the sub-Saharan Africa as revealed by FAO, (2014) and Saliu, et al, (2016) is that year after year extension worker who are hardly afforded in-service training and are loosely linked to research but continue to disseminate the same messages continually to same audience. This condition has subsequently arisen where the disseminated messages to the majority of the extension audience have become technically redundant and outdated (FAO, 2018, Ume, et al, 2016).

Also, 67.4% of the respondents reported that poor access to land constituted a hindrance to technology adoption in the study area. In Nigeria and many developing countries, agriculture operates in marginal and small landholdings where land endowments are scattered in different plots or parcels. This is because of the ever increasing population has put pressure on land to be fragmented, averaging 3.3 parcels per household (Gauchan et al, 2012). Since the size of parcels is small, commercializing and adopting new agricultural technologies have been a difficult task and almost impossible. These developments increasingly dwarf the technology adoptability of the farmers. As well, 47.5% of the respondents identified low soil fertility as a major constraint to the

adoption technology in the study area. This scenario is as a result of soil erosion and other poor soil management factors which could make farmers' efforts misery rewarded (Okoronkwo, 2009).

IV. CONCLUSION AND RECOMMENDATIONS

Based on the results, the following conclusions were deduced:

(i) Most of the respondents were aged, large household size, member of organizations and educated.
(ii) The determinant factors to adoption of NERICA rice technology were age of the farmer, household size, education level, farming experience, membership of cooperative, extension contact and access to credit.
(iii) NERICA rice varieties was profitable in the study area with gross margin of N392070 and Net farm income of N393.220
(iv) The major constraints to the rice productions were poor extension contact, poor access to credit, unavailability and high cost of farm inputs and poor access to land

Based on the results obtained from the study, the following recommendations were proffered in order to enhance the adoption of NERICA by farmers in the study area.

1. Policy that will inspire the formation of co-operative societies should be encouraged. This is due to the importance of co-operatives in capacity building, acquisition of credit and procurement of production input at low cost in order to boost farmers' yields..
2. There is need to enhance the educational status of the farmers through engaging them in educational programmes such as adult education, workshop and seminars. This will broaden the knowledge of farmers, thereby increasing their rate of adoption of technology for high productivity to be obtained.
3. The positive influence of fertilizer on yield of crops had been noted. In this direction, increased subsidy policy by government should be encouraged in order to not only ensuring the availability of this input but its affordability by resourced poor farmers at farm level.
4. Labour saving devices such as hand driven plough should be developed and disseminate to genuine farmers at a subsidized price, in order to lower high cost of labour prevalent in the area.
5. There is need to ensure the availability and affordability of NERICA seed to the farmers in order to avert their possible resorting to use of the local varieties. These local varieties has genetically broken down and prone to pest and diseases; thus affecting their yields by the farmers.
6. Extension agents must be well motivated with incentives by the government agencies concerned and Non- Governmental Organization (NGO) in order to keep them alive to their duties
7. Government through concerned agencies should enforce credit facilities access to farmers from commercial and micro finance banks at zero collaterals and low interest rates.

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