MULTINOMIAL LOGIT ANALYSIS OF DETERMINANTS OF CHOICE OF CREDIT SOURCE AMONG WOMEN ARABLE CROP FARMERS IN IMO STATE, NIGERIA

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ABSTRACT

This study analyzed the determinants of choice of credit source among women arable crop farmers in Imo State, Nigeria. Data were collected with structured and validated questionnaire from 277 proportionately and randomly selected women arable crop farmers. Data were analyzed using descriptive statistics (means, standard deviation, frequency distribution and percentages) and econometric tool of Multinomial Logit model. Results showed that the mean age, level of education, farm size, extension contact farming experience, duration of residence in the village, interest rates from formal and informal credit sources and annual farm income for the farmers were 40 years, 9.4 years, 1.15 Ha, 0.57 visit, 15.3 years, 39 years, 23%, 6% and N309.618 respectively. The probability of choosing formal credit source or informal credit source increased with increase in level of education, extension contact, farm size, annual farm income farming experience, duration of residence to the village and possession of collateral, but decreased with longer distances from farmer's home to the source of credit and charging high interest rate in the study area. Extension agents should create more awareness to the women farmers on other available sources of credit apart from the informal credit sources they are used to, and also educate them on how to easily procure credit from those sources.

Keywords: Multinomial logit, Determinants, Credit source, Women farmers, Imo State

INTRODUCTION

Agriculture in Nigeria is practiced majorly in the rural areas, and the agricultural sector is one of the vital sectors in Nigerian economy, and accounts for about one-third of the Gross Domestic Product (GDP) and employs about two-third of the labour force directly and indirectly (Ajayi & Olalekan, 2018). Women constitute the larger proportion of rural dwellers in Nigeria (National Population Commission (NPC), 2007; Ajayi & Olalekan, 2018) noted that more than two-third of all farm activities are carried out by the women, and their economic activities at the grass root level revolve around agriculture and other informal sectors (World Bank, 2017).

Many of the agricultural activities require reasonable capital which most women farmers cannot provide alone because of the seasonality of agriculture, low level of literacy and scientific knowledge. Also, most of the women farmers are usually poor, working under drudgery, hazardous and unhygienic conditions, with very little access to resources especially credit (Okon, Orebiyi., Ohajianya., Ibekwe., Ugwu & Okwara, 2016). The ever increasing importance of credit in agriculture in Nigeria can never be over emphasized. Credit is one of the principal components of all the activities under agriculture. Access to credit potentially ensure increase output and enhances food security, serving as a major driving component for increased agricultural production (Ijioma & Osondu, 2015)

In Nigeria, there are two main sources of agricultural credit: formal and informal sources. The informal sources include friends, relatives, money lenders and indigenous thrifts and savings organizations. The formal sources include the conventional banks, specialized banks, government parastatals and registered corporations (Oyedele & Akintola, 2012; Thomas & Michael, 2017).

The problem however, is that women farmers in Imo state make choice of their credit sources and this decision is potentially determined by various factors. However, information as regards what informed women farmers' choice of a particular credit source is still lacking. Aside, information on the determinants of choice of credit source is also not available. Yet, such information is necessary not only for the purpose of improvement in credit access and supply but also for strategic planning of credit sector in Nigeria. Most previous studies (Duniya & Adinah, 2015; Ike, 2009; Okunade, 2007; Oyedele & Akintola, 2012; Omonona *et.al*, 2008; Ololade & Olagunju, 2013; Bammeke, 2016; Sanusi & Adeseji, 2010; Ajayi & Olalekan, 2018; Ijioma & Osondu, 2015; Okon et al., 2016) examined various aspects of credit, including accessibility, availability, constraints, demand, supply and utilization, but none of these studies employed multinomial logit model to investigate the determinants of choice of credit source among women farmers in Imo State, thereby leaving a research gap, which this study intends to fill.

METHODOLOGY

The study was conducted in Imo State of Nigeria. It is located between latitude 4^0 4^1 and 8^0 5^1 North and longitude 6^0 4^1 and 8^0 05^1 East. There, are three major agricultural zones in the state namely; Owerri; Orlu and Okigwe. The state is subdivided into 27 Local Government Areas (LGAs). The state has a population of 4.6 million with women constituting about 2.7 million (NPC, 2017). The dominant economic activity is agricultural production. Women feature prominently in several facets and activities of farming.

Agriculture is rain-fed and the soil replenishment is achieved through bush fallow. The major crops cultivated include cassava, yam, maize, cocoyam, plantain, banana, oil palm, melon, and vegetables. The animals reared include pigs, poultry, sheep, goats, rabbits, snails and apiculture. Agriculture in the state is practiced by both men and women. The women farmers lack essential production inputs such as capital, and hence they resort to borrowing from formal and informal credit sources. The women farmers borrow from formal sources, some borrow from informal sources, while some borrow from both formal and informal credit sources.

Multi-stage sampling technique was adopted in selecting sample. In the first stage, four Local Government Areas (LGAs) were purposively selected from each agricultural zone to get 12 LGAs in the second stage, two communities were purposively selected from each chosen LGA to get 24 communities. The purposive selection was based on the record of highest number of contact women arable crop farmers that utilized formal and informal credit in their production activities as provided by the extension agents. In the third stage, the lists of contact women arable crop farmers that borrowed from formal sources, informal sources, and both formal and informal credit sources totaling 69, 165 and 257 respectively were compiled with the assistance of extension agents. From this sampling frame, 39, 93 and 145 women arable crop farmers that borrowed from formal credit sources, informal credit sources, and both formal and informal credit sources respectively were proportionately and randomly selected to obtain the sample size of 277 women arable crop farmers for the study.

Data were collected using structured and validated questionnaire. Data collected were analyzed using descriptive statistics (mean, standard deviation, frequency distribution and percentages), and econometric tool of multinomial logit model.

The multinomial logistic regression model was chosen for analyzing the data set because it provides a reliable and effective way to determine the factors that influence choice of a particular credit source which is the response variable and the estimate of odds ratio of certain factors on the choice of a particular credit source. The odds ratio is the primary measure of effect size in logistic regression and it is defined as the odds of being a case for one group divided by the odds of being a case for another group. In order to estimate the factors that influence choice of credit source, this study model the options simultaneously using the multinomial logit model.
For each choice of credit formal ($y_i=1$), informal ($y_i=2$), one regression would be run to predict the probability of y_i (the dependent variable for any observation i) being in that category as opposed to being in the reference or baseline category of both formal and informal ($y_i=0$).as follows:

$$= X_i\beta_n + e_n \ldots\ldots\ldots y_i \ldots\ldots\ldots \quad (1)$$

The model stated more explicitly is as follows:

$$V_{ci} = \beta_0 + \beta_1 x_1 + \beta_2 x_2 + \beta_3 x_3 + \ldots e_i \quad \ldots\ldots\ldots (2)$$

Where Vc_i denotes the measurable utility derived from any of the two alternatives formal or informal credit, X_i denotes the attributes that predispose a farmer to choosing either credit source, β_n are the parameters estimated and e_i are the error terms. The probability of a farmer choosing a formal or informal credit source
i.e. Pr (y_i) is given below:

$$Pr(y_i) = \frac{\exp\beta_0 + \beta_{11}x_1 + \beta_{21}x_2 \ldots + \beta_{k1}x_k}{\sum \exp(\beta_{0n} + \beta_{1n}x_1 + \beta_{2n}x_2 + \ldots + \beta_{kn}x_k)} \quad \ldots\ldots\ldots\ldots\ldots\ldots (3)$$

With $y_i = 0$ as the reference category, $Pr(y_i = 0)$ $\ldots\ldots\ldots\ldots$ (4)

$$= \frac{1}{1 + \sum_{j=1}^{J} \exp(X_i \beta_j)}$$

A positive sign of a coefficient in the results would imply that the independent variable increases the probability of the farmer choosing that source of credit while a negative sign of a coefficient would imply a decreasing effect. The log likelihood function for the multinomial logit, which gives the relative probability of choosing either formal or informal credit to the probability of the reference group can be written as:

$$\ln \frac{Py_i}{Py_0} = \beta_i X_i \quad \ldots\ldots\ldots\ldots\ldots\ldots\ldots\ldots (5)$$

Where $P\,y_i$= probability of choice of formal credit or informal credit; Py_0=probability of being in the reference group.

Other statistical tool used was the marginal effects of changes in the farmer's attributes on the probability of a woman arable crop farmer choosing either formal or informal sources, and their as well as respective elasticities are also presented. Marginal effects are calculated after estimating the probabilistic regression as follows:

Marginal effect of $x\ (Mfx) = \frac{df}{dx}$ ……(6)

Where Mfx is the partial derivative, with respect to x, of the prediction function f.

Potential determinants of women arable crop farmers' choice of a particular credit source that were fitted into the multinomial logit model are as follows;

Le = Level of Education (years spent in school)
AG = Age (years)
HS = Household size (Number of persons)
DC = Distance to credit source (km)
EX = Extension contact (Number of visits per annum)
DR = Duration of residence in the village (years)
IR = Interest rate (%)
CO = Collateral (Dummy variable, possession of tangible collateral = 1, if otherwise = 0)
FM = Farmers' cooperative membership (Dummy variable, member = 1, non-member = 0)
AI = Annual farm income (₦)
FZ = Farm size (Ha)
FE = Farming experience (years)

RESULTS AND DISCUSSION

Average Socio-Economic and Farm Characteristics of women arable crop farmers

The average socio-economic and farm characteristics of the women arable crop farmers is presented in Table 1.

Table 1: Average Characteristics of women arable crop farmers in Imo State, Nigeria

Variable	Min	Max	Mean	Standard Deviation
Level of education (years)	0	15	9.4	3.7
Age (years)	29	73	40.2	16.3
Household size (number of persons)	4	13	9	3
Distance to formal credit source (km)	1.2	8.3	5.4	2.7
Extension contact (Number of visits)	0	2	0.57	0.26
Annual farm income (₦)	87103	493006	309618	127105
Farm size (Ha)	0.75	3.12	1.15	0.39
Duration of Residence in the Village (years)	20	51	39	6.2
Farming experience (years)	6	23	15.3	6.2
Distance to informal credit source (km)	0.25	1.38	0.84	0.25
Amount of credit from formal source	103716	322519	216,309	85113
Amount of credit from informal sources(₦)	6296	720103	29,462	8337
Amount of credit from both formal and informal sources (₦)	89438	287104	175,492	58374
Interest Rate from formal credit sources (%)	22	30	23	2
Interest Rate from informal credit sources(%)	5	9	6	3

Source: Summarized from Survey Data, 2019

Results show that mean level of education, age, household size, extension contact, farm size, farming experience, duration of residence in the village, interest rate from formal credit source and interest rate from informal credit source were 9.4 years, 40.2 years, 9 persons, 0.57 visits, 1.15 Ha, 15.3 years, 39 years, 23% and 6% respectively, indicating that the women farmers are literate, within their active stage of life, have large
household sizes, had poor extension visits, are small scale farmers, have acquired much farming experience, and resided in the village for a long time.
The mean distance to formal and informal credit sources were 5.4km and 0.84 km respectively, suggesting that the formal credit sources were too far from their houses, while the informal credit sources were very close to their houses, and this affects their credit transaction costs. The mean amount of credit from formal sources, informal sources, and both formal and informal sources were ₦216309, ₦29462, and ₦175492 respectively, which implies that credit from informal sources was the lowest in the study area. The mean interest rate paid by the farmers on formal and informal credit sources were 23% and 6% respectively, which implied that higher interest was paid on formal credit sources in the study area. The finding on education is consistent with the works of Adebayo and Adeola (2008) who found the mean level of education of farmers as 9.2yeas in their work on choice of access to credit source. The high level of farming experience acquired by the farmers supports the finding of Udoh (2005) and Mpuga (2004) who reported mean farming experience of 14.9years and 15.2years respectively in their separate studies. The result on farm size agrees with those of Akudugu et.al (2009) on women farmers' access to credit who reported the mean farm size of 1.08 hectares. The finding on interest rate is consistent with those of Tang et.al (2010) who found the mean interest rate of 24% on formal credit and 8% on informal credit

Determinants of Choice of Credit Source among Women arable Crop Farmers
The results of the multinomial logit analysis on the determinants of choice of credit source among women arable crop farmers in Imo State are shown in Table 2. The effect coefficients were estimated with respect to the women that borrowed from both formal and informal credit sources (group 3), as the reference category.
Table 2 shows that, the likelihood ratio was -119.426, while the chi – square value was 74.014 and they are significant at 1% level of probability.

This test confirms that all the slop coefficients are significantly different from zero. The Pseudo R^2 value of 0.6314 also confirmed that all the slope coefficients are not equal to zero, which implies that the explanatory variables are collectively significant in explaining the choice of credit source among women arable crop farmers in the study area. According to previous studies, Ojo *et al* (2013) obtained Pseudo R^2 value of 0. 3789, Ijioma and Osondu (2015) obtained Pseudo R^2 values of between 0.3318 and 0.3491 while Hill (1980), Ajayi and Olalekan (2018) and Akimade (2014) reported Pseudo R^2 values of 0.2516, 0.3782 and 0.4181 respectively as representing a relatively good fit for a multinomial logit model.

Table 2: Results of the estimated multinomial logit model for determinants of choice of credit source among women arable crop farmers in Imo State, Nigeria

Variable	Formal credit Source	Informal credit source	Both formal and informal credit sources
	(category 1)	(category 2)	(Reference category)
Constant	10.344	12.018	14.056
	(3.079)	(3.151)**	(1.063)
Level of education	0.075	0.067	0.074

	(2.642)**	(3.081)**	(1.612)
Age	0.038	0.051	0.016
	(1.336)	(1.914)	(1.431)
Household size	0.028	0.042	0.046
	(1.602)	(1.743)	(1.521)
Distance to			
credit source	-0.008	-0.028	-0.007
	(-2.513)*	(-2.441)*	(-1.042)
Extension contact	0.007	0.045	0.065
	(2.382)*	(2.427)*	(1.425)
Duration of Residence			
In the village	0.005	0.029	0.042
	(2.392)*	(3.014)**	(1.738)
Interest Rate	0.026	0.081	0.049
	(-3.071)**	(-3.965)**	(-2.3014)*
Collateral	0.009	0.043	0.087
	(3.303)**	(3.018)**	(2.453)*
Farmers Cooperative			
membership	0.003	0.018	0.033
	(3.419)**	(2.943)**	(2.516)*
Annual farm Income	0.042	0.058	0.083
	(3.302)**	(2.904)**	(1.122)
Farm size	0.004	0.016	0.041
	(2.542)*	(2.538)*	(1.033)
Farming Experience	0.009	0.045	0.088
	(3.042)**	(2.935)**	(1.982)*
Sample size (n)	39	93	145

Number of observations = 277
Figures in parentheses are t–ratios
Log likelihood = - 119.426**
Chi–square = 74.014**
Pseudo R^2 = 0.6314
* = significant at 5% level
** = significant at 1% level
Source: Summarized from computer printout of survey Data Analysis, 2019.

The results of the estimated equations were discussed in terms of the significance and signs of the parameters. Therefore evidence from the model as contained in Table 2 shows that the set of significant explanatory variables varies across the categories in terms of the levels of significance and signs of variables. However, level of education, extension contact, farm size, annual farm income, farming experience, duration of residence in the village, collateral and
farmers' cooperative membership have positive coefficients and statistically significant,
Hence, the Pseudo R^2 value of 0.6314 in this study is indicative of good fit and the correctness of the estimated model.
while distance to credit source and interest rate had negative coefficient and significantly associated with the classification of the two categories relative to the reference category. The positive signs implies that the probability of choosing formal credit or informal credit source tends

to increase with the level of education, extension contact, farm size, farming experience, duration of residence in the village, possession of desired collateral and cooperative membership of the women farmers. The negative sign indicates that the probability of choosing formal credit or informal credit source tends to decrease with longer distance from the farmers home to the credit source and charging of high interest rates by credit sources in the study area.

Duration of residency in the village, possession of desired collateral, charging of low interest and cooperative membership were determinants of women farmers choice of informal credit sources. This study confirms that as the farmer stayed longer in the village, she was more likely to access informal credit which is factual because it was observed that farmers that borrowed from informal sources had the highest duration of residence in the villages of 39 years. This proved that their familiarity with the village communities was probably a condition for their using this source of credit as confirmed by Distance to credit sources, however, had a significant but negative effect on choice of credit sources. This finding infers that long distance to source of credit would increase transaction costs and would more likely cause default in loan repayment if care is not taken due to additional the additional expenses and that the shorter the distance to credit source the more the farmer's likelihood choosing the credit sources which provide larger loans (Ajayi and Olalekan, 2018) Results from this study showed that choice of credit sources was enhanced by higher annual farm income from arable crop farming which was considered as assurance that the farmer would be able to repay the loan on time. Experience in cultivation of arable crops was also shown as being advantageous to choosing credit source and obtaining credit facilities as a guarantee that the crop enterprise would most likely succeed.

Marginal effects and the Quasi Elasticities estimated

Table 3 contains the values of the estimated marginal effects and the quasi – elasticities calculated for the significant variables.

Table 3: Marginal effects and the Quasi Elasticities estimated

Variable	Formal credit Source (category 1)	Informal credit source (category 2)	Both formal and informal credit sources (Reference category)
Duration of Residence in the village	0.0017	0.0031	0.0028
	(1.4831)	(2.3392)	(1.0091)
Level of education	0.0032	0.0046	0.0033
	(1.5213)	(1.4691)	(1.0311)
Extension contact	0.0006	0.0008	0.0003
	(0.6229)	(0.5713)	(0.4126)
Farm size	0.0096	0.0078	0.0634
	(1.0944)	(2.6013)	(1.7118)
Farming Experience	0.0045	0.0062	0.0026
	(3.4112)	(3.9128)	(1.6613)
Distance to credit source	-0.0036	-0.0081	-0.0033
	(-2.6013)	(-2.9012)	(-1.5013)
Collateral	0.0021	0.0037	0.0018
	(2.5316)	(3.1026)	(1.0926)
Interest Rate	-0.0006	-.0.0015	-0.0004
	(-1.4092)	(-2.5116)	(-1.0093)
Farmers' Cooperative			

membership	0.0013	0.0062	0.0009
	(1.0391)	(2.4122)	(1.0083)
Annual farm	0.0038	0.0059	0.0523
income	(1.2165)	(2.0827)	(1.0255)

Note: The first figures are marginal effects while figures in parentheses are partial elasticities

Source: Summarized from computer printout of Data Analysis, 2019

Apart from the partial elasticities of duration of residence in the village, level of education, farm size, farming experience, collateral, farmers' cooperative membership and annual farm income for formal credit source, informal credit source and reference category respectively that were elastic, all other variables across the categories as classified were inelastic.

For the variables that are elastic, one percent change in these explanatory variables leads to a more than proportionate change in the probability of other classified categories relative to the reference category. For the variables that were inelastic, the probability of classifying the women farmers into any particular category is not greatly affected by marginal changes in these variables as a one percent change in the variables lead to a less than proportionate change in the probability of classification.

CONCLUSION

This study investigated the determinants of choice of credit source among women arable crop farmers in Imo State, Nigeria. The women farmers were smallholder operators and at their active stage of life. Results of the multinomial logit analysis showed that the probability of choosing formal credit source or informal credit source increased with the increase in level of education, extension contact, farm size, farming experience, duration of residence in the village, possession of desired collateral, cooperative membership and annual farm income but decreases with longer distances from farmer's home to the source of credit and charging of high interest.

RECOMMENDATIONS

1. There is need for extension agents to create more awareness to the women farmers on other sources of credit and educate them on easy ways to access the credit so as to obtain reasonable amount of credit to finance their farm business.

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DOES LOSS OF FARM WORK-DAYS AFFECT FARMERS' REVENUE IN RIVERS STATE, NIGERIA?

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ABSTRACT
Farmers' wellbeing is considered important especially in Nigeria, because most of the farm activities are not mechanized. Thus, the study investigated the effect of loss of farm work days on cassava and maize farmers' income in Ikwerre Local Government Area of Rivers State.Primary data were obtained using structured questionnaire and scheduled interviews. Descriptive statistical tools and multiple regression models were the analytical tools used. Result showed that majority 47.5 % of the farmers were absent from farm work between 4-6 days per production season due to ill health and obtained a mean income of ₦ 58, 437.50.The regression result showed that a 1% increase in the cost of medical treatment increased farmers' income by 8.5% while a 1% increase in loss of work days due to ill health reduced farmers' income by 0.5%.Sexof the farmers was negatively signed and statistically significant at 5% level. Inadequate funds for medical treatment, high cost of health care services were among major challenges faced by the farmers in the area. Medication treatment aimed at reducing farm work day loss due to ill health should be made available to farmers at affordable prices. This would help them improve their wellbeing and farm productivity.

Keywords: Loss, farm, work-days, revenue

INTRODUCTION
Agriculture underpins the health of rural households. It provides income that makes households resilient to health shocks; it provides food to meet their nutrient and energy needs; and it provides medicinal plants for treating ailments (Asenso-Okyere., Chiang., Thangata & Andam, 2011). It was further stressed that the success of agricultural livelihoods depends on the health of the workforce, and agricultural production systems can have impacts on workers' health, nutrition, and well-being of farmers. Agriculture everywhere in the world involves physical activities and being presence in the farm to perform one task or the other is important for greater productivity which is an important goal of any business. It has been reported that developing countries need good health and productive agriculture to fight against poverty because lowered productivity by agricultural workers due to poor health affects their income.

Ulimwengu, (2009), viewed health as a capital good which can either improve or reduce households' productivity. He further reported that health status could influence productivity or the production and use of agricultural goods could result to health consequences (Ulimwengu, 2009). However, reduced aggregate productivity of farmers was associated with poor health (Cole and Neumayer, 2006). Healthcare expenses may consume resources that otherwise might be used to purchase improved seed, fertilizer, equipment, or other inputs. Also, households with sick family members are less able to adopt labour-intensive techniques (Agulanna, Ikpi, Okoruwa and Akinyosoye , 2013). The report of Asenso-Okyere., et al. (2011) explained that ill health impacts farm households in three broad ways: absenteeism from work due to morbidity (and eventual death); family time diverted to caring for the sick and loss of savings and assets in dealing with disease and its consequences. According to them, this scenario results to the long-term impacts of ill health include loss of farming knowledge, reduction of land under cultivation, planting of less

labor-intensive crops, reduction of variety of crops planted, and reduction of livestock. The ultimate impact of ill health is a decline in household income and possible food insecurity.

According to Hawkes and Ruel (2006), in agricultural communities, poor health reduces income and productivity, further decreasing people's ability to address poor health and inhibiting economic development. A number of reasons have been given why farmers spend less hours and days doing farm work in Nigeria. One of which is the farmers' health mainly due to common diseases and infections within the community and locations.

Good health and productive agriculture as well as farmer's income are important in the economy of any nation especially in the fight against poverty. The process of agricultural production and the income it generates can contribute to both good and poor health among the producers as well as the entire society. Being an agricultural producer is a determinant of health relative to income and labour (Corinna and Ruel, 2006). Good health increases the GDP per capita of any nation, by increasing both labour productivity and the relative size of the labour force (Ruger, Jamison and Bloom, 2001). Good health as related to labour output or better production organization can enhance farmers or households income and economic growth. Therefore, health influences total factor productivity and growth directly through household income and wealth, and indirectly through various forms of capital and technology adoption (Munongo & Chitungo, 2013).

Onuche, Opaluwa and Edoka (2014), reported that the most prominent disease conditions affecting farm families were malaria fever, typhoid fever and diarrhea and these led to an average of 8.2 days reduction in time available for farm work in a farming season. Asenso-Okyere et. al., (2010) argued that, the long-term impacts of malaria include loss of farming knowledge, reduction of land under cultivation, planting of less labor-intensive crops, reduction of variety of crops planted, and reduction of livestock. The ultimate impact of malaria according to their report is a decline in farmers' income and food insecurity that is, a severe deterioration in farmers' livelihood. Malaria affects people's abilities, needs and desires to consume different amounts and types of food, which in turn affects demand from agricultural systems and the types of products. Even if a health condition is not present, the risk of malaria may create or reduce demand for outputs with specific qualities (Srinivasan, Irz and Shankar, 2006). The effect of ill health on agriculture could be felt in two key factors; labour quality or quantity reduction and availability of disposable income. During the period of malaria attack for instance, farmer's financial resources could be diverted to pay for medical treatment and eventually such cost would have been used to purchase agricultural inputs such as land, fertilizer, farm implements amongst others (Slater & Wiggins, 2005).Cole and Neumayer (2006), reported that farmers in mixed cropping systems were the vast majority who suffered from intense muscular fatigue, heat exhaustion, and skin disorders, forcing them to take days off from attending to crops.

Cassava is an important crop in Africa, often produced together with maize by smallholder farmers (IITA, 2016). It is also intercropped with vegetables, yam, sweet potato, melon, maize, rice, groundnut, or other legumes. Cassava and maize-based systems are found in several farms in Nigeria including farms in Rivers State. Cassava is a major staple and commonly consumed in different forms in Nigeria. However, maize is also commonly consumed cereal in Nigeria and in most parts of the world. It is mainly intercropped with cassava in eastern and southern Nigeria. In Nigeria, most of the farm tasks are not yet mechanized, hence farm activities are carried out manually to ensure better crop yield. Also, to note is the untimely execution of farm tasks with its negative impacts on yield. This is so because agriculture as practiced in African is mostly rain-fed and requires timely production activities. If weeding for instance is not done at the right time, it could result to crop failure because weeds compete with cultivated crops for available plant

nutrients in the soil. Poor soil nutrient would reduce farm yield and eventually reduce income level of the farmers. Evaluating the effects of ill health on farm income is important in understanding better strategies and policy issues aimed at improving farm productivity and income. It is therefore, imperative to assess the effect of farm working loss days due to ill-health on farm income in IkwerreLocal Government Area of Rivers State, Nigeria. Specifically, socio-economic characteristics of cassava and maize farmers were described; number of days cassava and maize farmers absent from farm activities due to ill health in the study area was determined;effects of loss of work days on cassava and maize farmers income in the study area were estimated and challenges encountered by cassava and maize farmers were examined.

METHODOLOGY

The study was carried out in Ikwerre Local Government Area, which is one of the 23 Local Government Areas of Rivers State. It has an area of 1380Km^2 a total population of 188,930 people (National Population Commission, 2006) and a projected population of 265,400 persons. The Local Government Area is positioned between longitude 4.3833^{0}N and 7.350^{0}E and latitude 4.42^{0}N and 7.21^{0}E in the Niger Delta region of Nigeria.The major occupation of the people is fishing, farming of crops such as cassava, maize, yam, cocoyam, melon, oil palm among others.

A two-stage sampling technique was bused in the selection of the respondents. In the first stage, 10 communities (Igwuruta, Omagwa, Isiokpo, Elele, Omerelu, Omademe, Aluu, Omuanwa, Apani, Ozuaha) were randomly selected from the 12 communities in the Local Government Area. In the second stage, 8 cassava and maize farmers were selected from each community through the snow balling technique due which gave 80 respondents in all.

Primary and secondary data were used in the study. Secondary data used were collected from published article, reviewed literature and other published data. Primary data were collected using questionnaire. The questionnaire was structured into different sections to provide information needed to achieve the objectives of the study. Scheduled interview was also used to obtain relevant information from the sampled farmers.

Data were analyzed using descriptive statistical tools such as mean, frequency count and percentageas well as Ordinary Least Square (OLS) multiple regression model. The lead equation was chosen based on statistical and econometric criteria such as the R-Square and number of significant variables.

The model is expressed as:

Implicit form $Y= f(Xs)$ 1

$Y= f(X_1,X_2,X_3,X_4,X_5,X_6,X_7,X_8,X_9+e$ 2

Explicit form

$\mathbf{Y=} \beta_0+ \beta_1X_1+ \beta_2X_2 + \beta_3X_3+ \beta_4X_4 + \beta_5X_5 +\beta_6X_6 +\beta_7X_7+ \beta_8X_8 + \beta_9X_9+e$ 3

Y= Income (₦)

X_1=Age of farmers (in years)

X_2= Distance to health care center in km

X_3=Education (years)

X_4= Farm size (ha)

X_5= Healthcare center availability (Yes=1,No=0)

X_6= Amount of money spent on malaria treatment (Naira)

X_7= Number of days absent from farm activities due to malaria ill health during a production cycle

X_8= Travel time to the healthcare center (in minutes)

X_9= Sex (male=1 or female=0)

Where;

β_0=Intercept
$\beta_1, \beta_2, \beta_3$..... β_n= estimated coefficients
e=error term

Functional Forms

Linear: $Y = \beta_0 + \beta_1X_1 + \beta_2X_2 + \beta_3X_3 + \beta_4X_4 + \beta_5X_5 + \beta_6X_6 + \beta_7X_7 + \beta_8X_8 + \beta_9X_9 + e$

Semi-Log: $Y = \beta_0 + \beta_1 \log X_1 + \beta_2 \log X_2 + \beta_3 \log X_3 + \beta_4 \log X_4 + \beta_5 \log X_5 + \beta_6 \log X_6 + \beta_7 \log X_7 + \beta_8 \log X_8 + \beta_9 \log X_9 + e$

Double log: $\log Y = \beta_0 + \beta_1 \log X_1 + \beta_2 \log X_2 + \beta_3 \log X_3 + \beta_4 \log X_4 + \beta_5 \log X_5 + \beta_6 \log X_6 + \beta_7 \log X_7 + \beta_8 \log X_8 + \beta_9 \log X_9 + e$

Exponential: $\log Y = \beta_0 + \beta_1X_1 + \beta_2X_2 + \beta_3X_3 + \beta_4X_4 + \beta_5X_5 + \beta_6X_6 + \beta_7X_7 + \beta_8X_8 + \beta_9X + e$

RESULTS AND DISCUSSION

The selected socio-economic characteristics of cassava and maize farmers Local Government Area of Rivers State are presented in Table 1.

Table 1: Socioeconomic characteristics of the respondents of cassava and maize farmers in Ikwerre LGA

Variables	Frequency (No = 80)	Percent
Gender		
Male	36	45
Female	44	55
Age in years		
20-39	18	22.5
40 -59	57	71.3
60 & above	5	6.3
Educational Qualification		
Non formal education	3	3.8
Primary	18	22.5
Secondary	58	72.5
Tertiary	1	1.3
Major Occupation		
Farming	41	51.3
Trading	35	42.8
Civil service	2	2.5
Others	2	2.5
Farming experience in years		
2-14	17	21.3
15 – 27	46	57.9
28 – 40	15	19
41 – 53	2	2.6
Cropping system		
Cassava sole	13	16.3
Maize sole	20	25
Cassava/ maize	47	58.8
Farm size in hectare		
Below 0.050	30	34.1
0.051– 1.00	46	52.3
1.01 & above	12	13.6
Mean	0.42	
Total	88	100

Source: Field survey, 2019

Result in Table 1 showed that 55% of cassava and maize farmers in the study area were females while 45% were males. It is observed that farming in Ikwerre community is predominantly left in the hands of the female folks. This is because the males are involved in other businesses that generate higher income. Majority (71%) were within the age range of 40-59 years. This is an indication that the respondents were within the very active productive age group. This agrees with the findings of Ajani and Ashagidigbi (2008) which stated that the average age of farmers were between 41 and 43 years respectively.

In terms of educational attainment, 72.5% of the farmers completed secondary school education. This indicated that most of the farmers were well educated and could easily adopt new innovations to boost cassava and maize productivity. Slightly more than half (51.3%) of the respondents indicated farming as their sole occupation. This could be as a result of the farmers' interest in farming or unavailability of white-collar jobs in the area. Some of the them 48.8% were engaged in non-farm activities which enabled them to earn additional income for the up keep of their household.

Average annual income of cassava and maize farmers was ₦59,650. It was observed that (57%) of the respondents had farming experience of 15 to 27 years. This finding is in agreement with the report of Ajani and Ashagidigbi, (2008) which suggested that farmers had wealth of farming experience which helped them to enhance their farm productivity. This could be attributed to their commitments and interest in farming. Furthermore, 58.8% of them were cultivated cassava intercropped with maize type of crop. This could be due to limited access to land and inputs such as fertilizer and for high productivity and to overcome the risk of crop failure.

Number of work days lost due to ill health in a production cycle

The number of work days lost due to ill health in a production cycle is presented in Table 2

Table 2: Number of work days lost due to ill health in a production cycle

Number of days	Frequency	Percent
1 – 3 days	30	37.5
4- 6	38	47.5
7 – 9	12	15
Mean work lost days	5	

Source: Field survey, 2019

The number of farm work days lost due to ill health is presented in Table 2 which showed that 47.5 % of the farmers were absent from farm work between 4 – 6 days due to ill health. The result further showed that 37.5% of them were absent between 1 – 3 days off from farm work due to medical treatment of ill health during production season. This agrees with Onuche, Opaluwa and Edoka (2014), who observed that ill health impact negatively on agricultural production by reducing the number of days available for farm work. This is an indication that farmers lost quite a number of days from doing farm work due to ill health. The reduction in the number of days farmers spent working in the farm may have reduced productivity thereby contributed to decrease in farmers' income.

Source of medical treatment of cassava and maize farmers

The source of medical treatment of cassava and maize farmers is presented in Table 3.

Table 3: Source of medical treatment of cassava and maize farmers

Source of treatment	Frequency	Percentage
Self-medication	7	8.8
Visit to health care center	6	7.5
Medicine/chemist shop	17	21.3

Medicine vendor	0	0
Traditional medicine	6	7.5
Pharmacy	32	40
Private clinic	3	3.8
General hospital	9	11.3
Total	80	100

Source: Primary Healthcare Centre in Ikwerre LGA / field Survey, 2019.

Table 3 showed that 40% of cassava and maize farmers in the study area visited pharmacy shops for their treatment, and 21.3% of them used medicine/chemist shop respectively. This could be due to the fact that that healthcare centers, private clinics, general and teaching hospitals required involved spending of much time before getting treatment. Also, the price of drugs in other sources could be the reason respondents use pharmacy and medicine/chemist shop.

Range revenue of the farmers in a production season

The Range Revenue of the farmers in a production season is presented in Table 4

Result in Table 4 showed that majority 90% of the farmers earned less than ₦100,000.00 from cassava/ maize farms in the study area during the production year with a mean income of ₦58,437.50.

Table :4 Range of revenue of the farmers in a production season

Amount in Naira (₦)	Frequency	Percent
Less 100,000.00	72	90
100,000 – 200,000	5	6.25
201,000 - 300,000	2	2.5
301,000 – 400,000	1	1.25
Mean Revenue = ₦ 58, 437.50		

Source: Field survey, 2019

This is not surprise because most farms in the area are subsistence in nature, so farmers cultivated an average farm plot size of 0.42 hectare with majority 52.2% of them cultivated 0.051 – 1.00 hectares.

Result of regression analysis of the determinants of maize and cassava farmers' income

The result of regression analysis of the determinants of maize and cassava farmers' income is presented in Table 5.

Table 5: Result of regression analysis of the determinants of maize and cassava farmers' income

Variables	Linear function	Semi log	Double log	Exponential
Constant	2.8715.23	10.68610***	80015.35	10.26998***
	(0.745836)	(13.34457)	(1.237466)	(20.37385)
Age	-6309.878	0.141943	-11520.65	0.085116
	(-0.720902)	(0.681381)	(0.684902)	(0.742742)
Distance to health care center	1274.786	-0.062451	-2750.574	0.015006
	(0.246105)	(-0.456451)	(-0.248975)	(0.221265)
Education	-8545.161	0.007093	-7531.329	-0.048115
	(-1.148551)	(0.032021)	(-0.421043)	(-0.493952)
Farm size	69789.41***	0.553590***	42975.16***	0.854042
	(9.701988)	(6.985514)	(6.715871)	(9.068240)

Health care center availability	8567.271 (0.971698)	0.075102 (0.397782)	4111.616 (0.269701)	0.130107 (1.127101)
Medical cost	0.755869** (2.247072)	0.061445 (0.723939)	2169.631 (0.316576)	8.501-06** (1.930380)
Number of days loss due to treatment	-2727.432 (-1.404024)	-0.156412 (-1.457244)	-5857.205 (-0.675813)	-0.050257** (-1.976004)
Sex	701.4995 (0.094523)	-0.182027 (-1.130482)	6101.182 (0.469264)	-0.164740* (-1.95426)
R^2	0.544833	0.379721	0.336631	0.524327
Adjusted R^2	0.504818	0.325191	0.278312	0.482510
P-value(F)	13.61580	6.963524	5.772311	12.53849

Source: Data analysis2019**.** ***, ** and * indicates statistical significance at 1%, 5% and 10% level respectively. Figures in bracket are T- values

Four functional forms of a linear, semi-log, double log, and exponential log were used in the analysis. Exponential function was chosen as the lead equation because it showed the best fit of the four tested functions based the best fits in terms of coefficient of determination (R^2), the statistical significance of the regression and expected signs of the regression coefficient. The overall regression model was significant at 1% level. The value of the coefficient of multiple determinations R^2, which measures the overall goodness of fit of the entire regression was 0.52. This implied that 52% of the total variation in income of cassava and maize farmers was accounted by the various independent variables used the model. Therefore, the variables included in the model were significant determinants of maize and cassava farmers' income. The F ratio was 12.54 and significant at a 1% level, implying that the combined effects of the entire included variables in the model were significant.

Thus, the model is fitted as; $Y= 10.26998 + 0.085116_{Age} + 0.0150066_{Dist}-0.048115_{Edu} + 0.854042_{Farmsize} + 0.130107_{Av.Hc} + 8.501\text{-}06_{Medcost}-0.050257\ _{DaysLost}- -0.164740_{Sex}$

The result showed that cost of medical treatment waspositiveand statistically significant at 5% level. This implies that a 1 % increase in the cost of medical treatment increased farmers' income by 8.5%. This could be true because, increasing spending on medical treatment could mean accessing better healthcare services in terms of quality and delivery. Accessing better care services for ill health treatment would result to better health wellbeing. Improved well being of farmers would likely enhance work done which will increase farm income. This result agrees with the findings of Kioko., Mwabu and Kimuyu(2013), who observed that amount of money spent on treatment showed great influence on income in Kenya. Number of work day's loss due to ill health was negative and significant at 5%. This implies that a 1 percent increase in the number of days lost by farmers due to ill health will reduce farmers' income by 0.5%. This could also mean that when a farmer is absent from farm work due to ill health, there could be reduction in crop yield mainly due to delayed farm work execution or inability to work in the farm. This supports the finding of Onuche, Opaluwa and Edoka (2014), which found that health shocks impacted negatively on agricultural production by reducing the number of days available for farm work.

Furthermore, the study found that sex of the farmers was negatively signed and statistically significant at 5% level. This means increasing the number of female famers in cassava and maize production will reduce farm income. This is true because, farm works requires physical strength for better performance, when more female are more engaged than their male counter parts in farm

business, the output will be reduced because there certain farm tasks women which are difficult for female farm workers to perform due to their feminine nature.

Problems encountered by cassava and maize farmers

The problems encountered by cassava and maize farmers is presented in Table 4.

Table 4:Problems encountered by cassava and maize farmers.

Problems	Strongly disagree	Disagree	Strongly agree	Agree	Mean	Remark
Inadequate basic healthcare facilities	3	3	61	13	3.0500	Accepted
Lack of funds for treatment	2	3	66	9	3.0250	Accepted
High cost of healthcare services	1	7	62	10	3.0125	Accepted
High cost of malaria drugs	2	2	69	7	3.0125	Accepted
Poor healthcare facilities	4	1	66	9	3.0000	Accepted
Long distance of healthcare center from home	14	22	37	7	2.4625	Not accepted
Healthcare center unavailability	18	23	34	5	2.3250	Not accepted
High cost of preventive materials	14	49	8	9	2.1500	Not accepted
Religious beliefs	24	47	7	2	1.8375	Not accepted

Source: Data survey from field survey, 2019.

The result in Table 5 showed that inadequate of basic health care facility ranked first as the most serious constraints with a mean value of 3.0500. This is followed by inadequate of funds for treatment, high cost of health care services, high cost of malaria drugs, poor health care facility, long distance from home to health care centers, unavailability of health care centers, high cost of preventive materials and religious beliefs. This confirms the findings of Kughur*et. al.* (2015) who listed some of the variables as constraints/ problems encountered by cassava farmers in Nigeria. It was observed that lack of basic health care facility ranked first as the most important constraints with a mean value of 3.0500. This was followed by lack of funds for treatment, high cost of health care services, high cost of malaria drugs and poor health care facilities.

CONCLUSION

The study concludes that an average farmer was absent from farm work for 5 days due to ill health during a farm production period and earned an average revenue of ₦58, 437.50. Cost of medical treatment showed positive influence on farmers' income while number of work days lost due to ill health and sex of the farmers negatively influenced farm income. Major constraints/problems faced by farmers in treating include inadequate basic healthcare facilities, inadequate funds for treatment and high cost of health care services.

RECOMMENDATIONS

It is recommended that,

1. Basic health facilities and infrastructure should be put in place to enable farmers have access to quality healthcare services.
2. There should be interventions by government and relevant stakeholders in form of mobilizing resources, formulating and implementing policies and programmes that will regulate cost of medical treatment.
3. Medication aimed that reducing work day loss should be made available to farmers at affordable prices in order to improve their wellbeing and farm productivity.

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Appendix 1

UNIVERSITY OF PORT HARCOURT

OFFICE OF RESEARCH MANAGEMENT AND DEVELOPMENT

EAST- WEST ROAD
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RESEARCH ETHICS COMMITTEE

UPH/CEREMAD/REC/MM79/020 Date: 24th August, 2021

Dr. Mercy Ebere Ndunueze-Ogaraka and Mpi Loveth
Department of Agricultural Economics and Extension
Faculty of Agriculture
University of Port Harcourt

Dear Ndunueze-Ogaraka and Mpi,

RE: APPLICATION FOR ETHICAL APPROVAL

Your application for ethical approval of research proposal entitled: **Effects of ill-health on cassava-maize farm based income in Ikwerre Local Government Area, Rivers State, Nigeria** refers.

The Research Ethics Committee at its 79th meeting held on Tuesday, 24th August, 2021, considered your application for ethical approval, and after due deliberation, **approved your proposal**.

Let me on behalf of the committee congratulate and wish you a fruitful research experience.

Thank you.

RESEARCH ETHICS COMMITTEE

Mrs. E.N. Enyi
Secretary

FACTORS INFLUENCING LIVINGSTONE POTATO (RIZGA) PRODUCTION IN LERE LOCAL GOVERNMENT AREA OF KADUNA STATE

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ABSTRACT
The study examined factors influencing Livingstone potato production in Lere Local Government Area (LGA) of Kaduna state. The specific objectives of the study were to described socioeconomic characteristics of the Livingstone potato farmers; ascertain the uses of Livingstone potato and identify factors influencing the production of Livingstone potato in the study area. The population for the study consists of Livingstone potato farmers selected from 8 villages in the LGA. Questionnaire was used for data collection. Descriptive statistics and multiple regression analysis were used to analyze data collected. Results revealed that 62.3% of the farmers allocated less than 1hectare of land for Livingstone potato production. The regression result showed that education, rizga farming experience, household size, amount of credit obtained, cost of seed and cost of agrochemicals were the significant factors that influenced the quantity of Livingstone potato produced. Findings from the study also revealed that the farmers consume Livingstone potato tuber and leave as food and used it in herbal preparation for treatment of malaria, typhoid and ulcer. Based on the findings of this study, farmers were encouraged to increase their farm size to enjoy economy of scale. Furthermore, the zonal extension agents in the study area should train these farmers on improved production practices that will increase Livingstone potato yield per hectare.
Keywords: Lere LGA, production, tuber and leaves of Livingstone potato

INTRODUCTION
Root and tuber crops are important food crops for direct human consumption in Africa. They are second in importance to cereals as global sources of carbohydrates (Anoma & Thamilini, 2016). Safwan, and Mohammed, (2016**)** asserts that root and tuber crops play a major part in daily diet, accounting for over 50% of the total staple in Sub-Saharan Africa. Similarly, Nanbol and Namo, (2019) opine that root and tuber crops play vital roles in the food basket of the world and constitute the single most important occupational group in Nigeria. These crops are raw material for manufactured products for both rural and urban consumption in addition to providing income sources for resource poor farming households. They are grown in varied agro-ecologies and production systems ranging from highland densely populated regions to lowland drier areas prone to droughts or floods. Roots and tuber crops includes cassava, yam, cocoyam, sweat and irish potato often referred to as major root and tuber crops while crops such as Livingstone Potato (*Plectranthus esculentus*), Turmeric (*Curcuma longa* Linn), and Hausa potato (*Solenostemon rotundifolius* Poir) are referred to as minor root and tuber crops (Akinpelu,, Olojede., Dung., Dalyop, Okoye, & Asumugha,., 2010).

Livingstone potato (*Plectranthus esculentus*) is a dicotyledonous plant and belongs to the Lamiaceace family (Mwanja, Goler, & Gugu, 2015). The crop is believed to have originally been selected from wild plants. It was first cultivated in the upper Niger valley of the Hausa land in Nigeria (Mwanja *et al.,* 2015). The plant organ is rich in carbohydrate and commonly used as a dietary staple, livestock feed, raw material for industrial products (Dansi, 2011). Apart from the tuberous roots, the leaves of some varieties can be cooked as vegetables. Kujeke., Mazarura., Ngadze, Gasura., Rugare, Matikiti, & Masekesa, (2019), states that the vegetable has been

utilized for food, economic and medicinal benefits. Xaba & Croeser (2011) states that Livingstone potato is regarded as highly nutritious, with essential amino acids, calcium, iron, vitamin A, trace elements and minerals. Members of this family also possess oils, which are mostly present in the leaves (Kujeke *et al*., 2019). The oil are valuable in cosmetic, flavouring, fragrance, perfumery, pesticide, and pharmaceutical industries (Ozkan, 2008).

Livingstone potato is a members of the family Lamiaceae. According to Raja (2012), the plant family is an important medicinal plant. Eleazu., Eleazu., Ironkwe & Iroaganachi (2014); Eleazu *et al.* (2014a) report the potential of Livingstone potato in the management of diabetes. Safwan and Mohammed (2016), is of the opinion that the medicinal properties of this minor and underutilized root and tuber can play an important role in the lives of rural people who produce and consume them, particularly those in the remote parts of the developing countries with limited access to health facilities. Minor root and tuber crop such as Livingstone potatoes play crucial roles in household food and dietary security. A large proportion of the output from the cultivation of minor root and tuber crops are done around homesteads, along farm boundaries and in marginal lands with little attention and tending (Safwan and Mohammed, 2016). In spite of these potentials, Livingstone potato production is on the decline (Kujeke., Masekesa, Icishahayo, Ngadze, & Mazarura., 2015). It is almost a lost crop.

Food production and demand gap is a major issue in Nigeria despite efforts made by the Federal Government of Nigeria (FGN) to attain sustainable development goal of zero hunger. According to Aina *et al.* (2019), Nigerian population is among the fastest growing populations in the world but food production increases at a rate lower than the population growth rate. To address this challenge the FGN introduced Root and Tuber Expansion Programme (RTEP). RTEP was embarked upon on realization of the important role of this class of agricultural produce but research focuses were more on the major root and tuber crops at the neglect of the minor root and tubers such as Livingstone potato. Furthermore, the plant has almost lost its cultivation as a result of neglect from local farmers who prefer major root and tuber crops. Yet, Livingstone Potato (*Plectranthus esculentus*) could be an important staple food crops if promoted and expanded. Hence the contribution of this crop in bridging the country's food production deficit should not be underestimated. It is therefore imperative to examine factors influencing Livingstone potato production in Lere LGA of Kaduna state. The specific objectives of the study were to described socioeconomic characteristics of the Livingstone potato farmers; ascertain the uses of Livingstone potato and identify factors influencing the production of Livingstone potato in the study area.

METHODOLOGY

The study was conducted in Lere Local Government Area (LGA) of Kaduna state. Lere LGA is located on latitude $10^0 0$'N and $10^0 40$'N and longitude $8^0 20$'E and $8^0 50$'E of the prime meridian (GIS Laboratory, Department of Geography and Environmental Management, ABU). It shares boundary with Kano state in the northern part, it is bounded by Bauchi and Plateau states in the eastern part. The climate and soil condition of the study areas favour the production of maize, yam, millet, beans, tomatoes, onion, sugar-cane, rice, groundnut, cucumber, cabbage and Livingstone potato (Figure 1).

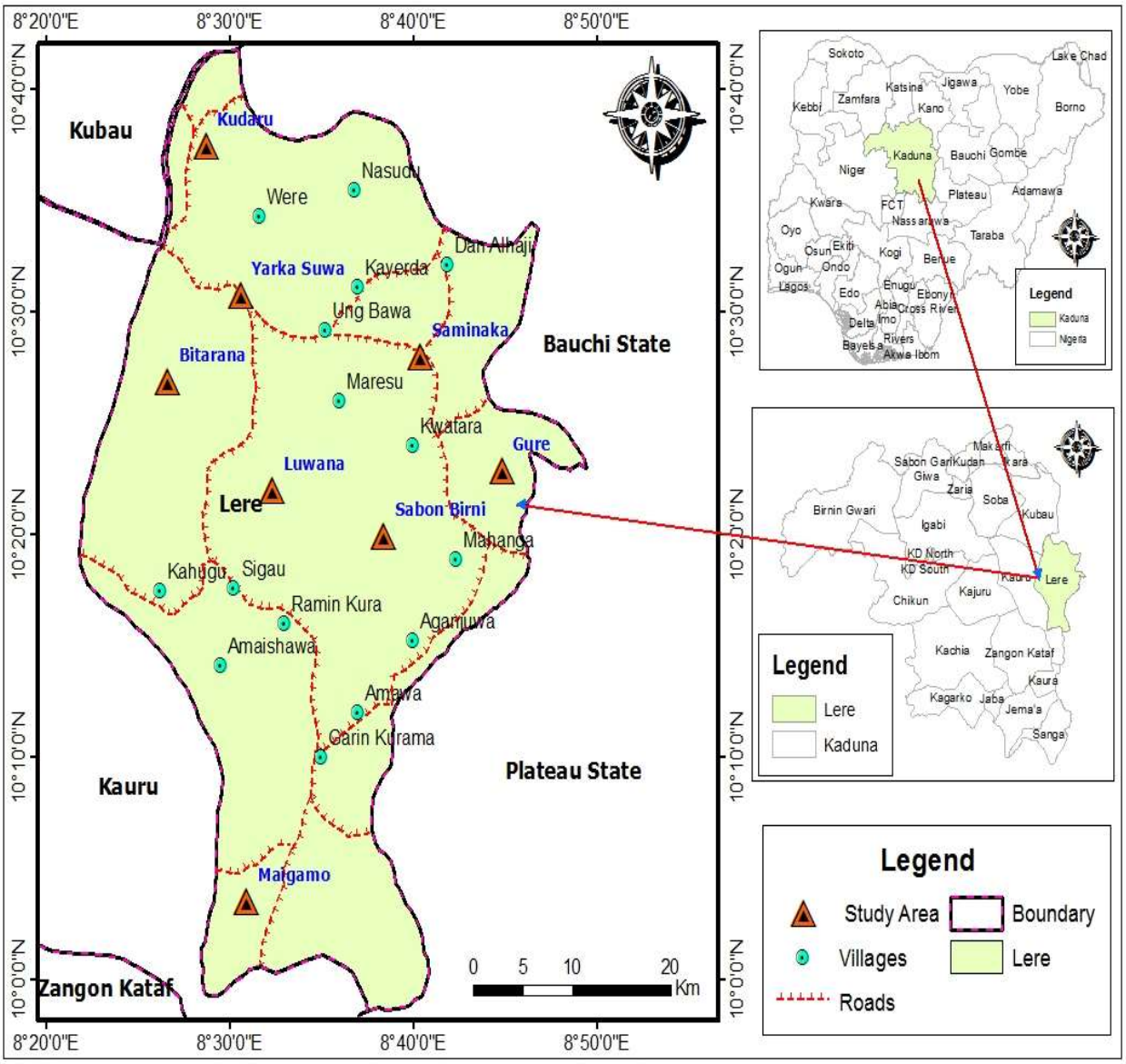

Figure: 1 Map of Lere LGA Showing the Study Area.
Source: GIS Laboratory, Department of Geography and Environmental Management, Ahmadu Bello University (ABU), Zaria.

The population for the study consists of Livingstone potato farmers in Lere LGA, Kaduna state. Specifically, the study was conducted in 8 villages based on the list of Livingstone potato farmers obtained from extension agents of Lere Agricultural Development Program (ADP) zone, Kaduna state. A total of 106 Livingstone potato farmers was used for the study (Table 1).

Tables 1: Distribution of Livingstone potatoes farmer in the study area

S/N	Villages	Number of Livingstone potatoes farmers
i.	Kudaru	11
ii.	Yarka Suwa	5
iii.	Saminaka	9
iv.	Bitrana	6
v.	Luwana	9
vi.	Sabon Birmi	8

vii.	Gure	44
viii.	Maigamo	14
	Total	**106**

Source: Field survey, 2021

Primary data were collected using questionnaire and analyzed with the use of descriptive statistics (frequency count, percentages) and multiple regression analysis. The implicit multiple regression model is express as follows:

$Y = a + b_1x_1 + b_2x_2 + b_3x_3 + b_4x_4 + b_5x_5 + b_6x_6 + b_7x_7 + b_8x_8 + b_9x_9 + b_{10}x_{10} + b_{11}x_{11} + e$

Where: Y (dependent variable) =Quantity of Livingstone potato (bag of 100kg)

X_{1-11}= (independent variables) = selected socioeconomics characteristics and production variables

X_1=Education (dummy variable- No formal education=0, primary=1, senior secondary certificate of education (SSCE)=2, Adult education=3 and tertiary education=4; X_2=Rizga farming experience (years); X_3=Cost of agrochemicals (fertilizer, herbicide, pesticide) (₦); X_4=Cost of seed (₦); X_5=Amount of credit (₦); X_6=Land ownership methods (dummy variable-rent, borrowed, purchased, gift and inherited arbitrarily assigned 1, 2, 3, 4 and 5 respectively; X_7= Extension services received (No visit=0, a score for each of the extension services received. Minimum of 0 and maximum of 3); X_8=Household size (number) X_9=Membership of farmers' cooperative (Year); X_{10}=Rizga farm size (hectare), and X_{11}=Hired labour (amount in ₦).

RESULTS AND DISCUSSION

Socioeconomic characteristics

Selected socioeconomic characteristics were considered in Table 2.

Table 2: Distribution of Livingstone potato farmers by socioeconomic characteristics

Socioeconomic variables	Frequency	Percentage	Mean
Sex			
Male	79	74.5	
Female	27	25.5	
Marital status			
Married	81	76.4	
Single	8	7.6	
Widow/widower	17	16.0	
Age (years)			
20-39	39	36.8	
40-60	67	63.2	42.8
Household size			
1-10	23	21.7	
11 and above	83	78.3	11.0
Rizga farming experience			
1-10	45	41.5	
11 and above	61	58.5	10.5
Education			
No formal education	36	34.0	
Primary	25	23.6	
SSCE	29	27.3	
Adult education	10	9.4	
Tertiary	6	5.7	
Extension services received			
No visit	69	65.1	

Method of planting	22	20.8
Fertilizer application	7	6.6
Storage method	8	7.5
Membership of cooperative		
Yes	57	53.8
No	49	46.2

Source: Field survey, 2021

Result in Table 2 show that production of Livingstone potato in the study area is dominated by male (74.5%) that are married (76.4%), with a mean age of 42.8 years. This implies that the young and economically active ones dominate Livingstone potato production in the study area. A mean of 11 was obtained for household size, implying a large household size for production. This may be an advantage because of the availability of work force but it may also be an indication of economic burden of dependency ratio. Finding is supported is by Bezawit (2011) that Family labor plays significant role in potato production. Findings also indicates that the farmers has significant years of experience in rizga farming with a mean of 10.5 years, which is expected to impact positively on production. Educationally, 34% of the farmers has no formal education and only 5.7% has tertiary education. About 23.6%, 27.4% and 9.4% of the Livingstone potato farmers has primary, SSCE and adult education respectively. This shows that majority of the Livingstone potato farmer's possesses low level of basic education that could help to understand improved farming methods. This result corroborates the finding of Akinpelu *et al*. (2009) who found low (7-12 years) level of education among Livingstone potato farmers. Agricultural extension services play a great role in enhancing agricultural production. About 65.1% of the rizga farmers did not have access to extension service while the remaining 34.9% has access to extension services. Extension services received on Livingstone potato has to do with method of planting (20.8%), fertilizer application (6.6) and storage (7.5%). Result also show that 53.8% of the farmers belong to cooperative society. Engagement in cooperative society provides exposure to useful information and actual learning experiences that could increase production. This result negates the finding of Akinpelu *et al*. (2009) who found that majority (78.60%) of the Livingstone potato farmers did not belong to any cooperative society.

Livingstone potato farmers based on land and credit

Distribution of Livingston potato farmers based on land and credit is presented in Table 3.

Table 3: Distribution of Livingstone potato farmers based on land and credit

Production variables		**Frequency**	**Percentage**	**Mean**
Farm size (hectare)	0.2-0.5	51	48.1	
	0.6-0.9	15	14.2	0.65
	1 and above	40	37.7	
	Total	**106**	**100**	
Land ownership method	Rent	9	8.5	
	Borrowed	19	17.9	
	Purchased	11	10.4	
	Gift	4	3.8	
	Inherit	63	59.4	
	Total	**106**	**100**	
Credit	Yes	94	88.7	
	No credit	12	11.3	
	Total	**106**	**100**	
Amount of credit obtained	4,000-12,5000	44	46.8	
	12,501-25,000	31	33.0	21,748

	25,501-37,500	10	10.6
	37,501-50,000	9	9.6
	Total	**94**	**100**

Source: field survey, 2021

More (62.3%) of the farmers allocates less than 1 hectare (ha) of land to Livingstone potato production and a mean farm size of 0.65ha was obtained (Table 3). The implication of small farm size allocated to production means low productivity which leads to low income. Result is in agreement with Akinpelu, *et al.,* (2009) that farmers allocate few portions of their land to the production of Livingstone potato. Similarly, Olojede *et al.,* (2013) reports that Livingstone potato are produced in smallholdings of less than 0.1 ha. Land used for cultivation of Livingstone potato shows that majority of these farmers has permanent land ownership method. About 10.4%, 3.8% and 59.4% acquired the land by purchased, gift and inheritance. Cumulatively 73.6% of the farmers has security of land for production (Table 3). About 88.7% of the Livingstone potato farmers in the study area obtained credit while 11.3% did not. The mean credit obtained by the beneficiaries was ₦21,748 (Table 3). This suggests that most of the farmers obtain inadequate credit for production.

Production variables and quantity of Livingstone potato produced

Table 4: Distribution based on production costs and output (n=106)

Production variables		Frequency	Percentage	Mean
Cost of agrochemicals	10,100 -20,000	60	57.0	
	20,100 -30,000	10	9.4	28,000
	30,100 -40,000	12	11.0	
	>40,000	24	22.6	
Cost of labour	8,100-10,000	35	33.0	
	10,100 -12,000	4	3.8	17,500
	12,100 – 14,000	5	4.7	
	>14,000	62	58.5	
Cost of seed	4,000 – 5,000	74	69.8	
	5,100 – 6,000	11	10.4	6,000
	>6,000	21	19.8	
Quantity of Livingstone produced (100Kg bag)	< 10	48	45.3	
	10	41	38.7	9.125
	20	14	13.2	
	30	3	2.8	

Source: field survey, 2021

The mean amount of money spent by the Livingstone potato farmers on agrochemicals, hired labour and seed was ₦28,000, ₦17,500 and ₦6,000 respectively for a mean output of 9.12 bags of 100kg (less than 1 ton)/ha (Table 4). This is a wide production gap compared to 2-6t/ha (https://handwiki.org>wiki> biology; and tuber yield of 5.8 t/ha, 9.8 t/ha and 18.3 t/ha under three treatments of no fertilizer/manure, organic manure and NPK 17:17:17 (Emmanuel *et al.,* 2016).

Uses of Livingstone potato

Distribution according to Uses of Livingstone potato is presented in Table 5.

Table 5: Distribution based on uses of Livingstone potatoes by the farmers (n=106)

Uses		Frequency	Percentage
Frequency of tuber consumption per week	Once	6	5.7
	Twice	46	43.4
	Thrice and above	54	50.9
Consumption of leaves as a vegetable	No	70	66.0

	Yes	36		34.0
Herbal use of Livingstone potato	Yes	37		34.9
for treatment of ailments	No	69		65.1
Malaria	29		27.4	
Typhoid	3		2.8	
Use against snake bite	3		2.8	
Ulcer	2		1.9	

Source: field survey, 2021

Findings in Table 5 shows that 50.9% of the Livingstone potato farmers consume Livingstone potato tuber thrice or more per week. Another 43.4% of them consume the tuber twice in a week while 5.7% consume the tuber once in a week. About 34% of the Livingstone potato farmers consume the leave as vegetables. Consumption of the tuber thrice or more per week by half of the farmers and the use of the leaves by some of them as vegetable is a pointer to the potentials of the Livingstone potato as a staple crop in the study area and in the country at large. Another 34.9% of the Livingstone potato farmers uses the crop in herbal preparation for the treatment of ailments. Claims of using Livingstone potato for herbal preparation to cure malaria was indicated by 27.4% of the farmers. Claim that Livingstone potato herbal preparation cure typhoid and use against snake bite was indicated by 2.8% each and claim for ulcer cure by 1.9% of the farmers. Although there are evidences supporting the use of Livingstone in the treatment of ailments (Lukhoba *et al.,* 2006; Eleazu *et al.,* 2014; 2014a; Obasi *et al.,* 2019), the claims that Livingstone potato is use in herbal preparation for treatment of malaria, typhoid, ulcer and snake bite necessitate further research to scientifically authenticate these claims because the use of this crop or it leaves wrongly for treatment of wrong ailment could pose great danger to human health.

Factors influencing Livingstone potato production

Distribution according to Factors influencing Livingstone potato production is presented in Table 5.

Table 6: Factors influencing quantity of Livingstone potato produced

	Variables	Coefficients	SE	T-value	Significance
	(Constant)	2.595	2.501	1.037	.308
Socioeconomics	Education	.434	.109	3.993	.000*
	Rizga farming experience	10.104	2.369	4.266	.000*
	Household size	.592	.950	4.266	.000*
	Extension visits	-.637	1.454	-.438	.665
	Cooperative membership	2.02E-6	.000	.011	.991
	Rizga farm size	.038	.039	.967	.342
Production	Amount of credit	-.140	.036	-3.904	.001**
	Cost of seed	-.3.216	1.554	-2.069	.048**
	Agrochemicals	-2.691	1.324	1.988	.057***
	Land ownership	.093	.474	.196	.846
	Cost of hired labour	.002	.001	1.681	.104

F cal.= 6.508 R=.848 R^2=.719 SE= standard error *P<0.001 **P<0.005 ***P<0.010

Source, Field survey, 2021

Findings reveals that three of the socioeconomic variables education (.434), rizga farming experience (10.104) and household size (.592) has positive and significant influence on quantity of Livingstone potato produced at 1% level of probability. The positive influence therefore means that quantity of Livingstone potato produced would increase as the farmers acquire more education and experience couple with readily available labour from their households. Better educated farmers

would know how to access information, improved knowledge and tools that would boost their production. The act of carrying out a practice over time leads to more efficiency in planning, organizing and directing farm enterprise. This explains the positive influence of rizga farming experience on quantity of Livingstone potato produced. Result is consistent with the findings of Ukoha *et al.,* (2010). On the other hand three of the production input variables; amount of credit received (-.140), cost of seed (-.3.216) and cost of agrochemicals (-2.691) has negative influence on quantity of Livingstone potato produced and significant at 1%, 5% and 10% level of probability respectively. This suggests that as cost of input increases, the number of farmers that will plant Livingstone potato will decrease. This is expected because increase in cost of production is a disincentive particularly where there are alternative crops that can be produced at minimal cost for more return to inputs. Contrary to expectation, credit was negative. This might be due to diversion of credit obtained into other uses. Finding on credit negates the findings of Ukoha *et al.,* (2010). Result of the analysis also shows that the coefficient of multiple determinations (R^2) was 0.719. This implies that 71.9% of the variations in the production of Livingstone potato were explained by the variables included in the model.

CONCLUSION

The findings of the study revealed that majority of the farmers allocates less than 1ha of land for Livingstone potato production. Education, experience, household size, amount of credit received, cost of seed and cost of agrochemicals were significant variables that influenced the quantity of Livingstone potato produced. Consumption of Livingstone potato tuber and leaves as food was indicated, hence this crop could be an important staple crop for farmers in the study area. The use of Livingstone potato in herbal preparation was reported.

RECOMMENDATIONS

Based on the findings of the study, the following recommendations were suggested:

1. Further research is needed to authenticate the use of Livingstone potato for malaria, typhoid, ulcer treatment and its use against snake bite.
2. The zonal extension agents in the study area should train these farmers on improved production practices that will increase Livingstone potato yield per hectare.
3. Furthermore, farmers are encourage to increase farm land allocated to cultivation of Livingstone potato to enjoy economy of scale.
4. Cooperative should be strengthen so that the farmers can pool their money together for bulk purchase of inputs needed for production. Furthermore, through cooperative membership they can have access to seed and agrochemical companies that will give inputs at subsidized rate.

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DETERMINANTS OF FARMLAND VALUE IN ABA AGRICULTURAL ZONE, ABIA STATE, NIGERIA

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ABSTRACT
This study ascertained the determinants of farmland value in Aba Agricultural Zone, Abia State. Multi-stage sampling procedure was used to select 144 farmers for the study. Data were elicited with the use of structured and open-ended questionnaire. Data were analyzed using descriptive statistics, partial factor productivity, hedonic price index and Ordinary Least Square regression model. The result of the value of farmland showed a mean value of ₦666, 564.42 for 1.96 hectare on the average. The result of the hedonic regression model showed that land size, distance to the urban centre, distance to the market, presence of government institutions, proximity to tarred road, topography, value of crop and location of farmland significantly influenced the value of farm land in the study area. However, the farmers' perceived decision to alternative use of arable farmland were for construction and building (3.95), sale to foreign investors (3.89), as well as outright sale to private investors(3.68), leasing the farmland for other non-agricultural purposes apart from building (3.23) and using of the farmland for livestock production (2.52). The study however recommended that stakeholders in land management should make laws that will prevent the rate at which agricultural lands are converted to other uses which should also be reserved for agricultural purposes.

Keywords: Determinants, Farmland, Value, Aba Agriculture Zone

INTRODUCTION
The use of land for residential, industrial and commercial, civic and cultural centers tends to dominate agricultural lands in the bid for space in the urban place (Francis et al, 2013). Urban expansion inevitably takes up agricultural land with concomitant increase in land values and land markets. There are parcels of vacant with speculators anticipating higher gains. Such lands are kept for non-agricultural uses as farming on it will not be cost effective (Satterthwaite et al*.,* 2010). For example, in conception, Chilean city of about 500,000 inhabitants, 1,734 hectares of wetland and 1,417 hectares of agricultural land and forests were transformed into residential areas over a period (25 years) 1975 to 2000 (Pauchardet al*.,* 2006). The only option left for farmers is a shift from farming on their small land holdings to other relevant productive economic activities that commands higher opportunity cost. In most urban and peri-urban cities, prime agricultural land is converted to residential or industrial uses with escalated poverty and food insecurity issues. Furthermore, many have maintained that it is rational to value land based on its opportunity cost hence any land use activity with higher returns should command higher value. A number of factors affect commercial property values (land inclusive) in Nigeria. These include institutional and economic factors, location, complementary uses, competition amongst and between uses, design,

degree of obsolescence, accessibility, road network, relationship between landlord and tenant, and negative externalities (Omogun, 2006).

Most productive agricultural land is located in immediate proximity to urban areas. Thus, as urban areas continue their natural expansion, these prime agricultural lands situated directly in the path of encroaching development are taken up (Jess, 2006). This is the case of farmlands in Aba agricultural zone, Abia State. Urban sprawl in the zone following the increased industrialization and socio-economic activities within and/or close to the area attracts population explosion. The growing population density, urbanization and poverty are leading to widespread changes in land use and land cover, thus agricultural lands are shrinking massively. This is reflected in the form of settlements and satellite towns build up in the urban peripheries which were previously agricultural land. The trend of farm land deprivation with concomitant reduction in farm output and productivity despite the increasing land value is the focus of this study. This is a clear depiction of the situation in Aba agricultural zone and its trajectory areas. Therefore, this study intends to analyze farm land values and productivity so as to ascertain the value of land that will increase farm productivity and income in Aba Agricultural zone.

According to Neergardet al., (2009), urban areas in low- and middle-income nations without any land-use plan would expand haphazardly. In such cases, dispossession of farmland for other uses is imperative. Urban sprawl inevitably covers some agricultural land while changes in farmland values and land markets around cities often result in land being left vacant as speculators are targeting high values on land. Ehirimet al., (2013) noted that high farmland value obviously leads to cost ineffective food production. Although Aba agricultural zone is gradually attaining an urban status with most arable lands converted to other use, a concomitant shrinking of arable farmland will certainly affect food production. There may be no further increase in farm sizes of small holder farmers as the value of farm land continues to appreciate when opportunity cost becomes higher (David et al*.,* 2013).

However, the effect of increased land value on farm output has not been ascertained especially in the study area, the declining small holder farm output in the area is a major concern to its urbanization. No small land holding can accommodate any meaningful land improvement and the government policies that targeted increased output and food self-sufficiency may collapse if value of farmland continues to increase due to increasing urbanization. Food security expectation of the area is threatened by the shrinkage in farm land orchestrated by high opportunity cost. Such situation may leave the farmers in Aba Zone with strong doubt about closing food security gap and expanding farm income.It is in the above perspective that this study aimed mainly to ascertain the determinants of farmland value in Aba Agricultural Zone, Abia state, Nigeria. Specifically, the study objectives are to: examine the values of various sizes of farmland used for arable crop production in the study area, determine the factors that influence the value of farmland in the study area, and ascertain the perceived alternative use of their farmland instead of agricultural purpose in the study area.

METHODOLOGY

The study was conducted in Aba agricultural zone of Abia state, Nigeria.Aba Agricultural Zone made up of seven Local Government Areas namely Osisioma, Aba North, Aba South, Obingwa, Ukwa East, Ukwa West and Ugwunagbo. The zone is located between latitudes 5^0 and 39^0N and Longitudes 2^0 and 0^0 E, has a total land mass of 810,160ha and with a population of 1,167,698

persons (National Population Commission, 2006). The choice of Aba was as a result of its high rate of urbanization. The pre-dominant soil of the area is sandy loam while the natural vegetation is the tropical rain forest, characterized by two distinct seasons; the dry season and the wet season.

Multi stage sampling technique was used in selecting 144 farmers from a total of 1450 registered crop farmers for the study. Aba Agricultural Zone is made up of seven Local Government Areas namely Osisioma, Aba North, Aba South, Obingwa, Ukwa East, Ukwa West and Ugwunagbo. In the first stage, a purposive selection of four (4) Local Governments Areas (LGAs) out of the 7 LGAs in the zone was done for the study. The LGAs selected were Aba North, Obingwa, Osisioma and Aba South LGAs. The selection of these 4 LGAs was due to the observed rapid urbanization among them. The urban development though has left some areas as peri-urban areas due to the low speed of urbanization. There are both farming activities and other non-farming activities going on in the LGAs selected from the areas for the study. The second stage is a random selection of 12 communities from a list of 43 communities across the already selected LGAs in the zone. There are an unequal number of communities across the selected LGAs, hence a proportionate sampling was done to select the 12 communities used for the study. Aba North and South have 10 and eight communities respectively while Obingwa and Osisioma has 13 and 12 autonomous communities respectively. Three communities were randomly selected from Osisoma, and Aba North LGAs each while four and two communities respectively were randomly selected from Obingwa and Aba South LGAs making a total of 12 communities used for the study.

The third and the final stage, involved the random selection of 144 farmers from the list of farming households obtained from the Aba zonal office of the Abia State Agricultural Development Programme (ADP) for this study. Due to the unequal number of farmers across these communities, proportionate selection of only 30% of the farmers sampled from each community in the list was done. 40 and 37 of them were drawn from Obingwa and Osisioma LGA's while 35 and 32 of them were drawn from Aba South and Aba North respectively and used for the study. The 144 farmers were sampled from a sample frame of 1450 farm households.

Secondary information were obtained from the State Agricultural Development Programme. Data that were obtained was the list of farmers in the Agricultural Zone and primary data were collected using a set of structured and open-ended questionnaire. Random sampling technique was used to select 144 respondents sampled.

Model Specification

Analysis of the partial productivity of arable farmland was determined using the partial factor productivity analysis. This is expressed as:

Land productivity (₦/Ha) = $\frac{Value\ of\ output\ (mix\ crop)(₦)}{Area\ of\ land\ cultivated\ (ha)}$(Ehirim *et al*., 2013) ……. 1

Farmland value was determined using the hedonic price model. The hedonic price model assumes that land prices contain information in relation to the value that a farmer puts on the land. The characteristics of land determine the value of such land. Hence, the variations in prices are attributed to different characteristics, with different productive values. There are few empirical evidences on hedonic price models of agricultural land in Nigeria but the studies of Dresche et al.,

(2001) and Kostov (2009) factored some features in hedonic pricing model and it is implicitly specified thus:

$$In\ P_L = \beta_0 + \sum_{j=1}^{m} \beta j\ Xj + E \quad \ldots\ldots\ldots\ldots\ldots \quad 2$$

where,

P is the per hectare price of farmland, $\beta_0$is the intercept, Xj represents the vector of both location characteristics farm and nonfarm characteristics that influence the value of farm land, and $\beta_j$is the coefficient on Xj. Each explanatory variable in themodel has an exponential impact on farmland price such that a k change in a variable, Xj, would have a 100(exp(kβj)-1) percent impact on land price.

The X_j, are the following variables: X_1=land size in hectare; X_2=distance to the nearest urban centre in kilometers; X_3=distance to the nearest farm processing plants (kilometers); X_4 = distance to the nearest market in kilometers; X_5=proximity to tarred road (kilometers); X_6=availability of public transport (1=available, 0= otherwise);X_7=presence of government institutions (1=present, 0= otherwise); X_8=topography (proxied by combination of erosion + flood = 2; presence of either erosion or flooding (yes =1 and none of the above = 0); and X_9=net farm income (₦),

The explicit form is specified as follows:

$$P_L = \beta_0 + \beta_1 X_1 + \beta_2 X_2 + \beta_3 X_3 + \beta_4 X_4 + \beta_5 X_5 + \beta_6 X_6 + \beta_7 X_7 + \beta_8 X_8 + \beta_9 X_9 + e \quad \ldots\ldots \quad 3$$

The level of perceived alternative use of the farm land by farmers was measured from a 5-point Likerttype scale of strongly agreed (5), agreed (4), undecided (3), disagreed (2) and strongly disagreed (1) across a list of some alternative use of their farm land to arable crop production in the area. The perceived use of farm land for alternative purpose was collapsed into agreed or disagreed using the mid value of (5 + 4 + 3 + 2 + 1)/ 5 = 3.0 as bench mark (mean score)

RESULTS AND DISCUSSION

Farmland cross sizes and productivity

Distribution of farmers according to farm sizes and productivity is presented in Table 1.

Table 1:Farmland across farm sizes and productivity in Aba Agricultural Zone

Farm Size (Ha)	Frequency	Relative Frequency (%)	Mean Farm size (Ha)	Annual Land Productivity (₦/Ha)	Estimated Value (₦)
0.01 – 1.50	81	56.3	0.45	159,877.90	897,987.78

1.51 – 3.00	29	20.1	1.37	144,656.65	601,120.99
3.01 – 4.50	16	11.1	3.42	197,556.89	446,770.01
4.51 – 6.00	12	8.3	4.44	177,562.12	334.605.88
6.01- 7.50	6	4.2	6.28	219,336.54	299,785.09
Total	144	100.0			
Mean			1.96	172,994.89	666,564.42

Source: Field Survey 2017

The result in Table 1 is the relative distribution of farmers based on value of land estimated from hedonic price analysis and land productivity of relative farm sizes in the area. Majority (56.3%) of the farmers had relatively low farm size of between 0.01 to 1.50 hectares in the area. Few (4.2%) farmers have farm sizes of 6.01-7.50 hectares. Such large areas of farmlands are usually found in the remote areas of the Aba zone and are mainly used for arable production or forestry management. Again, it can be seen from the result that (20.1%) and (11.1%) of the farmers have arable farm land of above 1.00 hectares and below 4.50 hectares respectively. It could be deduced from the result that fewer farmers had large farm lands for arable agriculture while majority of them cultivated small size farm holdings in the area. The mean farm size cultivated in the area is 1.96 hectares. Umunnakwe (2011) and Ogbonna *et al*., (2007) suggested that smallholder farmers who are majorly in rural areas may cultivate on small farm holdings of less than 2.5 hectares but may enjoy more advantage of environmental friendly farming giving the increased accumulation of organic matter in the soil that enhances soil quality for agricultural production.

The result further revealed that mean annual land productivity and land value per hectare in the area was₦172, 994.89 and ₦666, 564.42 respectively. Though the land value is high compared to the capital base of most smallholder farmers in the area, the productivity and the returns from such lands may suggest a favourable farming activity in the area. Land is becoming a scarce resource due to immense agricultural and demographic pressures. However, Effiong (2011) noted that land use pattern of a region is an outcome of natural and socio–economic factors as well as their utilization by man in time and space. The result further suggested relatively small farm size of 0.45 hectares on the average with average annual productivity of ₦159, 877.90/ha, though it has the highest mean value of ₦897, 987.78/ha. The foregoing analysis suggests that farmlands with close proximity to city centers have relatively higher values given their high opportunity cost of land in the area. Cunningham &Siago (2005)noted that rapidly increasing human populations and expanding agricultural activities have brought about extensive land use changes throughout the world. This extensive use of land as alternative to agriculture may be the reason for relatively high opportunity cost of land for farming.

Again, relatively larger farmlands have relatively higher mean annual farm productivity of ₦219, 336.54/ha, but with relatively lower land value of ₦299,785.09/ha than others in the area. The hedonic pricing analysis suggested that their higher farm productivity may not be because oftheir remote location from the city center or market but may be attributed to the farmland in those areas are most suitable for agricultural production. This is consistent with Ehirimet al., (2013) who that observed that lands with superior quality are most suitable for arable crop production in Imo State. According to them, such lands may have higher marginal productivity. Large farmlands for

agricultural production are mostly generated from high deforestation practices in South-Eastern Nigeria between 1972 and 2001 (Bisong, 2007). This practice is common with public than communal lands. However, agricultural land use characteristics, such as farm types and the nature of croplands/fallows, correlated strongly and significantly with deforestation rates (Idoko, Bisong, Bisong&Okon, 2008).

Hedonic regression factors influencing farmland value

Hedonic regression estimates of the factors that influence the value of farmland is presented in Table 2 below.

Table 2:Hedonic regression estimate of the factors that influence the value of farmland

Explanatory Variables	Linear+	Semi-log	Double-log	Exponential
Constant	227.12 (2.60)**	0.9324 (2.51)**	0.8749 (3.83)***	303.41 (2.69)**
Land Size	-233.10 (2.51)**	-82.234 (1.88)*	-0.0654 (2.63)**	-45.910 (1.52)
Distance to urban	-312.11 (-3.52)***	-0.5258 (-1.49)	-53.678 (-2.61)**	-33.509 (-2.52)**
Distance from farm processing plants	-0.0764 (-1.41)	-0.9453 (-1.11)	-0.9907 (-0.99)	-0.7536 (-1.95)*
Distance to the market	-2.0761 (-1.96)*	-1.0755 (-0.33)	-7.4367 (-1.51)	-0.3729 (-1.22)
Availability of public transport	0.0555 (0.66)	0.0032 (0.71)	0.4531 (1.09)	0.8576 (0.81)
Presence of government institutions	1234.4 (2.66)**	2317.3 (1.69)*	465.41 (1.93)*	543.22 (2.11)*
Proximity to tarred road	-0.0932 (-2.52)**	-0.7354 (-1.99)*	-0.8867 (-1.18)	-0.0412 (-0.86)
Topography	2.1636 (2.61)*	6.3547 (1.89)*	41.546 (1.41)	2.119 (2.23)*
Net farm income	0.05542 (1.82)*	35241 (1.12)	43.675 (1.01)	0.4512 (0.19)
Location of farm land	0.6439 (4.55)***	0.0046 (1.10)	0.0939 (0.49)	0.1296 (1.06)
R^2	0.8813	0.6128	0.6892	0.6044
F-Value	74.0939**	13.7143**	42.8075**	29.7734**
Sample size (n)	144	144	144	144

Source: Field Survey, 2017; Figures in parentheses are t-ratios, * significant at 10%, ** significant at 5%, *** significant at 1%

Table 2 showed the factors that influenced the value of farmland in the study area and were determined by estimating four functional forms of the hedonic regression model out of the four functional forms estimated, linear was chosen as the lead equation based on the highest co-efficient of multiple determination (R^2) value, conformity to *a priori* expectation and number of significant explanatory variables. The results showed that the linear equation gave the highest value of coefficient of multiple determination (R^2), highest number of significant explanatory variables and hence the best fit given an F-value of 74.09. The F-value is higher than the tabulated value of 4.29 at 0.01 critical level, hence making the linear functional form the best fit.The coefficient of R^2 was 0.8813, which implies that about 88% of the variations in value of farmland were accounted for by the joint action of the independent variables included in thehedonic regression model.

The coefficient of land size was negative and significant at 5% level. This means that land size is inversely related to value of farm land. The implication is that the larger the size of farm land the lower the unit value by 233.10 units. This is in line with *a priori* expectation. Most areas with larger farm sizes are located in the remote areas far from the city center. Farmers even convert some forest for arable crop production to increase their area of land under cultivation (Effiong, 2011). These virgin lands under cultivation attract lower value in the area.

The coefficient of distance to the urban centre was negative and significant at 1% level. This implies that the higher the distance to the urban centre, the lower the selling price of farm land and vice versa. Land prices are usually higher in the urban areas than the rural areas, so any land closer to the urban centre tends to command higher price than the ones farther from the urban centre.

The coefficient of distance to the market was negative and significant at 10% level of significance. This is in line with the *a priori* expectation that the closer the land is situated to the market the higher the commanding value of the farm land. Farm lands that are closer to the market reduces the cost of transportation of produce to the market thereby increasing the profit margin of the farmer; so people tend to place more value on the land. This consistent with David (2000) that observed that distance to the market is an important characteristic to farmland value.

The coefficient of the presence of government institution was positive and significant at 5% level. This implies that the presence of government institution will increase the value of farm land in the area than the areas where there are no government institutions. Government institutions attract development and investing in both agriculture and non-agricultural sectors.

The coefficient of proximity to the tarred road was negative and significant at 5% level. This implies that the closer the farmland is to the tarred road the higher the commanding value of that farm land. This is in line with the with Andrew *et al.,* (2002), who noted that land that have close proximity to tarred road command high value because of its accessibility.

The coefficient of topography was positive and significant at 10% level. This implies that farm lands that are flat command higher value than undulating farm land. This is expected because farms that are situated in undulated land tend not to do well, as a result nutrient are easily eroded thus reducing the yield of the crops on the land. This is consistent with David (2000) who observed that average elevation of the farmland appears to exert a negative and highly significant effect on farmland prices.

The coefficient of net farm income was positive and significant at 10% level. This implies that farm land with higher yield and return per hectare commands higher price than otherwise. This is in line with Drescher *et al.,* (2001), who noted that farmland that offers a higher expected return from agricultural production has a higher price.

The coefficient of location of farm land was positive and significant at 1% level. Farm land located in the urban centre commands higher value than farm land in the rural areas, this is because agricultural produce usually commands higher value in the urban areas than the rural areas because of population and the ease of making money in the urban centres. Drescher *et al.,* (2001) attributed factors influencing farmland prices as location, agricultural factors, and non-agricultural factors. Location reflects the proximity of the farmland tometropolitan areas vice versa. Agricultural factors include characteristics related to the productivity of a specific farmland parcel as well as attributes of the agricultural economy. Non-agricultural factors consist of economic characteristics of the region related to potential demand to convert farmland to a non-agricultural use.

Distribution of farmers based on perceived decision of alternative use of arable farmland

Distribution of farmers based on perceived decision of alternative use of arable farmland is presented in Table 3.

The result in Table 3 showed the farmers perceived alternative use of farmlands instead of arable farming in the area. The mean scores for alternative use of arable farm lands ranges from the least score of 1.58 to the highest mean score of 3.95. Farmers agreed to give out their arable farm land mostly to construct building if they had the resources to do so instead of using it for arable farming. Construction of building on the farmland instead of arable crop farming with a mean score of 3.95 is the most perceived alternative choice decision of arable crop farmers in the area. It could be seen from the result that 46.5% of such farmers strongly agreed in giving out a portion of such lands for building of houses if there is an opportunity for that rather than using the land for arable farming. This perceived choice decision of farmers is close to offering the land for sale to foreign and private investors with a mean value of 3.89 and 3.68 respectively. More than 50% and 46.5% of the farmers gave out their arable farm lands to foreign and private investors rather than cropping on them. This makes the opportunity cost of arable farm land increasingly high since the value of perceived alternative use of such land is very high. The reason for this increasing opportunity cost of land could be the rapid urbanization of the agricultural zone. The rapid encroachment of peri-urban settlement, need for lands for industrial building and estate may be the reasons for high opportunity cost of land in Aba Agricultural zone.

This finding contradicts that of Ehirim*et al*., (2013) who observed that suitable arable lands in Imo state have high opportunity cost due to the increasing value marginal productivity for cassava production. Farmlands for arable crop production must show a superior quality if food security is to be achieved. The study also showed that farmers agreed that they can use their farm land for livestock production (with a mean score of 2.52), majority of these farmers are undecided whether that could be an alternative economic activity for them. Although farmlands can be used for other agricultural purposes, arable crop production is the commonest economic activity of most small-holder farmer since farm lands can be easily accessed either on communal or rental basis. Again, the finding collaborated the finding of Effiong (2011) that lands within urban areas have high value hence, agricultural productivity in such areas can be compromised following both environmental pollution and high opportunity cost from alternative uses.

Table 3:Distribution of farmers based on perceived decision of alternative use of arable farmland in Aba Agricultural Zone

S/N	Alternative Farmland Uses	Perceived Decision by Farmers						
		Strongly Agreed (5)	Agreed (4)	Undecided (3)	Disagreed (2)	Strongly Disagreed (1)	Mean X	Remark
i.	Use of the farmland for building or other construction	67 (46.5)	37 (25.6)	16 (11.1)	14 (9.7)	10 (6.9)	3.95	Agreed
ii.	Sale of the farmland to foreign investors	72 (50.0)	35 (24.3)	12 (8.3)	9 (6/3)	6 (4.2)	3.89	Agreed
iii.	Outright sale of the farmland to private investors	67 (46.5)	32 (22.2)	12 (8.3)	8 (5.6)	15 (10.4)	3.68	Agreed
iv.	Leasing the farming land for other non-agricultural purposes apart from building.	55 (38.2)	13 (9.0)	34 (23.6)	12 (8.3)	12 (8.3)	3.23	Agreed
v.	Use of the farmland for livestock production.	19 (13.2)	16 (11.1)	19 (13.2)	53 (36.8)	42 (29.1)	2.52	Agreed
vi.	Use of the farm land for aquaculture or fish farming activities.	15 (10.4)	27 (18.8)	15 (10.4)	58 (40.2)	50 (34.7)	2.34	Disagreed
vii.	Use of the farmland for forestry activities.	8 (5.6)	7 (4.9)	22 (15.3)	55 (38.2)	40 (27.7)	2.07	Disagreed
viii.	Keeping the farmland fallow.	8 (5.6)	12 (8.3)	19 (13.2)	46 (31.9)	38 (26.4)	1.91	Disagreed
ix.	Allowing the land for other religious or divine purposes.	7 (4.9)	2 (1.4)	19 (13.2)	47 (32.6)	50 (34.7)	1.69	Disagreed
x.	Giving the land to government for infrastructural purposes.	8 (5.6)	7 (4.9)	8 (5.6)	41 (28.4)	54 (37.5)	1.58	Disagreed

Source: Field Survey Data

The need for food security should make farmland available and at an affordable cost but with rapid urban encroachment in the area this could be very difficult with concomitant disadvantage

to food production in the area. Among other perceived alternative uses of lands such as aquaculture, forestry management and fallow were each disagreed by the farmers with a mean value of 2.34, 2.07 and 1.91 respectively. The least alternative use of farm land by the farmers was to give their land to government (1.69) and use for divine or other religious activities (1.58) in the area.

CONCLUSION

The study concluded that the value of land in Aba Agricultural Zone is high and this affects the size of land holding of farmers in the zone. Also, factors that affect the value of farmland in the study area were land size, distance to the urban centre, distance to the market, presence of government institutions, proximity to tarred road, topography, value of crop and location of farm land; hence farmland that offers a higher expected return from agricultural production has a higher price.

RECOMMENDATIONS

In view of the findings, the study however recommends the following

i. The value of land in the study area was high. Therefore, stakeholders in land management should make laws that will prevent the rate at which agricultural lands are converted to other uses.
ii. Policy makers should make laws that will designate some areas within the zone as green areas. These areas will only be reserved for agricultural purposes.

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FACTORS AFFECTING ARABLE CROP FARMERS' WILLINGNESS TO PAY FOR CLIMATE INFORMATION SERVICES IN ETCHE LOCAL GOVERNMENT AREA, RIVERS STATE, NIGERIA

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ABSTRACT
The study on Factors affecting arable crop farmers' willingness to pay for climate information services was conducted in Etche Local Government Area, Rivers state, Nigeria. The specific objectives of the study are to describe the socio-economic characteristics of the arable crop farmers in the study area; ascertain the sources, utilization and willingness to pay for climate information services, determine factors affecting arable crop farmers' willingness to pay for climate information services in the study area, and identify the constraints encountered by the arable crop farmers' willingness to pay for climate information services in the study area. Primary data were collected with the instrument of questionnaire and interview schedule from ninety (90) arable crop farmers using multistage sampling procedures. Data were analyzed using descriptive statistics and logit regression analysis. The study found out that 57.8% were females, average ages was 51.9 years, about 85.6% were married with mean household size of six (6) persons. The logit regression analysis revealed that level of education and age were significant at 1%, while income, farming experience, gender and mass media were significant at 5% and positively affecting farmers' willingness to pay for climate information services. The major constraints are lack of fund for payment of climate information services, lack of government support, and high cost of payment for climate information services among others. Government organizations and NGOs agencies should take up the challenge and opportunity to provide climate information.
Keywords: Willingness, Climate Information, Services, Arable crop farmers

INTRODUCTION
In West Africa, the rainfall regime is characterized by a strong spatial and temporal variability. The inter-annual rainfall variability differs between the north and the south of the region with a decrease of the mean annual rainfall from south to north and a shift in the seasonal cycle from a two-season regime in the south to a single rainy season in the north (United Nations Environment Program [UNEP], 2013). The annual rainfall variability in terms of percentage ranges from 10-20% in the coastal areas to over 40% in the northern Sahel. The variability of West Africa climate is also marked by recurrent droughts balanced out by a few number of heavy rainfall years – above the average rainfall years (Wilson, 2013).

Adjusting with variables of climate variability and risks, local communities have relied on indigenous weather forecasting methods to plan agricultural activities. The traditional seasonal climate forecast is mainly a mere understanding of the knowledge that people of a particular geographical area use to predict the weather and the climate. It is embedded in the art, history and culture of the people concerned and transmitted from one generation to another. It is often based

on generations of experience and includes both biophysical and mystical indicators (Zongo, Diarra, Barbier, Zorom, Yacouba & Dogot, 2016).

The impacts of climate change are already constraining the achievement of productive and secure livelihoods among the most vulnerable people in the region (Ouédraogo, Zougmoré, Barry, Somé & Baki, 2015). However, climate change uncertainties can be understood, managed and used to inform decision-making in agriculture. The ability to understand, monitor and predict climatic variability provides an opportunity for farmers to put historical experiences into perspective and to evaluate alternative management strategies for informed decision-making. This may help them to take advantage of good years and minimize the losses during poor years. Climate information reduces uncertainty and can help farmers make better use of inputs and technologies. Moreover, climate information has the potential to improve the resilience of agriculture to climatic shocks. It can be used to help manage current climate risks and build resilience to future climate. For example, farmers can use information on the onset of the next rainy season to make decisions about which crops to plant and when to plant them (Akpodiogaga-a & Odjugo, 2010). In agriculture, climate and weather data are combined with non-meteorological data, such as agricultural information to produce agro-met-advisories.

Climatic fluctuations are putting Nigeria's agricultural system under serious threats and stress. This implies that rural sustenance and food security in Nigeria is under serious threat as crop production takes significant aspect of agricultural activities in Nigeria (Ayinde, Muchie, & Olatunji, 2011). Extreme events such as droughts, floods and forest fires have become more frequent which result in tragic crop failure, increased hunger, malnutrition, pests and diseases and reduced agricultural productivity (Akpodiogaga & Odjugo, 2010). Food crisis, most especially rice output arising from lower yields is suspected to be exacerbated by climate change and related events (Nnaji, 2001). The provision of climate information services (CIS) is one of the main ways in which farmers can deal with climate change and variability in order to improve decision-making in agriculture. According to Antwi-Agyei et al. (2012), the capacity of farmers can be built through the use of Climate information as a tool for climate smart agriculture. "Based on the utility maximization theory, a smallholder farmer considers how to attain the highest level of utility from the payment and utilisation of climate information" (Adzawla et al., 2019).

Climate services can be understood as activities that deal with generating and providing climate information to a wide range of users in order to support climate resilient development. "Climate information refers to both short-term weather forecasts, through seasonal forecasts to longer-term climate change information on decadal timescales" (Nkiaka et al., 2019; Singh et al., 2018). To be useful to smallholder farmers. The need for improved access to farmers' climate information and productivity growth is widely documented (Naab et. 2019). However, it is not clear how the access and utilization of climate information farmer's willingness to pay for climate information services have also received lots of analysis from authors in developing countries (Sulaiman, Hall & Suresh, 2005) in recent years, little analysis has occurred in Nigeria. Specific studies on farmer's willingness to pay for climate information services in the Etche Local Government Area, Rivers State, Nigeria is few, leaving gap in knowledge. The possible challenges farmers anticipate to accessing climate information services have not been identified and ranked yet in the literature of farmer's willingness to pay for climate information services in Etche Local Government Area,

Rivers state. This study therefore seeks to address these gaps empirically with the following specific objectives: describe the socio-economic characteristics of the arable crop farmers in the study area; ascertain the farmers' awareness, utilization and willingness to pay for climate information services; identify the types and sources of climate information services required by the arable crop farmers in the study area; determine factors affecting arable crop farmers' willingness to pay for climate information services in the study area and., and to identify the barriers in willingness of arable crop farmers to pay for climate information services in the study area.

METHODOLOGY

The study was carried out in Etche Local Government Area (LGAs) Rivers State, Nigeria. Etche LGAs is one of the 23 Local Government Area Rivers State, Nigeria. Etche LGA is located on the eastern part of Rivers State. It is located between latitude 4º59′27′′N and 4.990833ºN and between longitude 7º03′16′′E and 7.005444ºE. It has an area of 805 square kilometers and an estimated population of 249,939 people, the average annual temperature is 26.4ºC, relative humidity is high in the state throughout the year and decreases slightly in the dry season total annual rainfall decreases from about 4,700mm on the coast to about 1,700mm in extreme north of the LGA (National Population Commission NPC, 2012). Etche Local Government Area is made up of about twenty-three (23) major communities. The major occupation in Etche LGAs is farming. The climate of the region is a rain forest type, characterized by the alternation of two seasons, short dry season period and a long raining season.

Multistage sampling technique was used to select arable crop farmers from whom data were generated for this study. The first stage of sampling involved a random selection of three major communities. The second stage was a random selection of five villages in each community making 15 villages. The third stage involved a random selection of six arable crop farmers from each selected village using the list of farmers obtained from Agricultural Development Programme (ADP) extension agent in the study area, making a total number of 90 arable farmers for the study. Primary data were obtained through the use questionnaire and interview schedule with personal observation administered to the selected arable crop farmers in the study area, while secondary source of information were obtained from textbooks, internet, and published journals among others. Data were analyzed using descriptive statistics such as frequencies, percentages and mean; Contingent Valuation Method and Logit regression model.

Logit Regression model is expressed as:

Y = willingness to pay for CIS

yi={1if the ith farmer has access/is willing to pay for CIS, 0; otherwise (Ouedraogo et al., 2018)

$$Ln = y_i/(1-y_i) = Bo + B_1X_1 + B_2X_2 + B_3X_3 + B_4X_4 + B_5X_5 + B_6X_6 + B_7X_7 + B_8X_8 + e$$

Where;

y_i = probability that an arable crop farmer willing to pay for climate information service

$1-y_i$ = probability that an arable crop farmer is not will to pay for climate information service

Bo = intercept

B (1,2,3,…8) = estimated coefficients

X (1,2,3,…8) = set of independent variables, where;

X_1 = household size (number)
X_2 = educational level (years)
X_3 = age (years)
X_4 = income of farmers measured in naira
X_5 = farming experience (years)
X_6 = marital status (single = 0, married=1)
X_7 = gender (male = 1, female = 2)
X_8 = access to extension services (1 = yes, no = 0)
X_9 = exposure to mass medium (1 = yes, no = 0)
e = error term

RESULTS AND DISCUSSION

Socioeconomic characteristics of the arable crop farmers

The socioeconomic characteristics of the arable crop farmers are presented in Table 1 below:

Results shown in Table 1 reveal the socio-economic characteristics of arable crop farmers in the study area. The result shows that about 57.8% of the arable crop farmers were females while about 42.2% were males. This implies that female were more involved in arable crop farming in the study area than male. About 47.7% of the arable crop farmers are within the age bracket of 51 years and above, with mean of 51.9 years. This indicates that the arable crop farmers were above the middle and active ages of production, hence energetic enough to explore for CIS. This result agrees with Mabe, Nketiah and Darko (2014) and Ouédraogo *et al.,* (2015), Older farmers show more willingness to pay for climate information services (Muema et al., 2018). Majority (85.6%) of the farmers were married. This could be due to the fact that married people have several financial obligations to meet their family needs. Hence, they derive their livelihood in arable crop farming.

About 40% of the arable crop farmers spent 13 years above to attain the level of education, about 30% of the farmers spent between 7-12 years in formal education, with mean of 10.92 years.

Table 1: Socioeconomic characteristics of the arable crop farmers in the study area

Variables	Frequency	Percentage
Gender		
Male	38	42.2
Female	52	57.8
Age		
30 and below	5	5.6
31 – 40	9	10.0
41 – 50	33	36.7
51 and above	43	47.7
Mean	51.9	
Marital status		
Single	13	14.4
Married	77	85.6
Educational level (years)		
0 (no formal education)	5	5.6
1 – 6	22	24.4
7 – 12	27	30.0
13 and above	36	40.0
Mean	10.92	
Major occupation		
Farming	47	52.2
Trading	19	21.1
Artisan	9	10.0
Civil servant	15	16.7
Farming experience (years)		
5 and below	6	6.7
6 – 10	7	7.8
11 – 15	15	16.7
16 – 20	12	13.3
21 and above	50	55.5
Mean	28.21	
Household size (numbers)		
1 – 3	31	34.4
4 – 6	43	47.8
7 – 9	11	12.2
9 and above	5	5.6
Mean	6	
Source of labour		
Family	65	72.2
Hired	15	16.7
Both	10	11.1
Farmers' income (₦)		
20,000 and below	4	4.4
21,000 – 40,000	39	43.3
41,000 – 60,000	36	40.0
61,000 and above	11	12.2
Mean	45,153.84	
Access to credit		
Yes	39	43.3
No	51	56.7
Mass media		
Yes	35	38.9
No	55	61.1
Visited by extension agent		
Yes	13	14.4
No	77	85.6
Total	90	100

Source: Field survey, 2020.

With tertiary education being the high level of education attained by the arable crop farmers, which is quite appropriate because a good level of education should be attained in other for the arable crop farmers to be able to understand and operate in the farm using climate information services to achieve precision agriculture. This result agrees with Debaeke, Pellerin and Scopel (2017), and Amegnaglo, Anaman, Mensah-Bonsu, Onumah and Gero (2017) who in their study observed that farmers that are willing to pay for climate information and services tended to be well educated. About 52.2% of the farmers were involved in farming as their major occupation. This implies that they are mostly farmers.

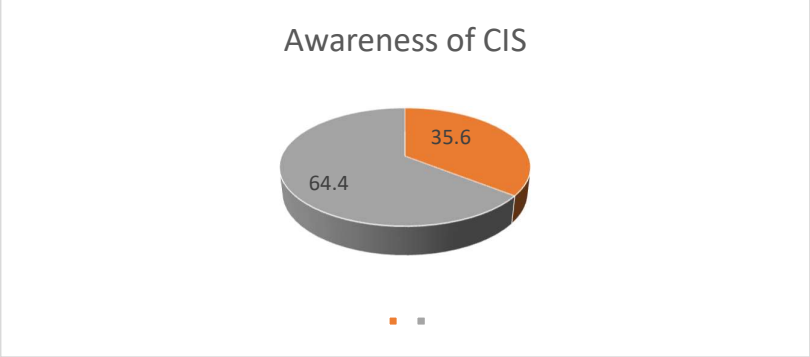
About 55.5% of the arable crop farmers have farming experience of 21 years and above, with mean of 28.21 years. This implies that the farmers were well experienced and would be able to utilize climate information effectively. This finding is in line with Zongo *et al.,* (2016) who observed that farmers that are willing to pay for all climate information services tended to be more experience farmers in agricultural enterprise.

On their household size, about 47.8% had a household size of 4-6 persons, 34.4% had household size between 1-3 persons, with household of six (6) persons. This indicates that the arable crop farmers' household size was at average. Hence, the family members could be a source of labour on the farm for the arable crop farmers in the study area, were majority (72.2%) utilize family member for labour, followed by hired labour of 16.7% and some farmers that use both sources accounted for 11.1%.

About 43.3% of the farmers earned monthly income ranges between ₦21,000.00 – ₦40,000.00, 40% earned between ₦41,000.00 – ₦60,000.00, with mean monthly income of ₦45,153.84. About 56.7% of arable crop farmers have no access to credit facilities. Majority (85.6%) of the farmers have no access to extension service agents in the study area. Exposure to mass media showed that arable crop farmers 38.9% were exposed to mass media stations for information on climate services, while 61.1% had no exposure to mass media on climate information and services. This implies that most of the arable crop farmers were not exposed to mass media in the study which could be due to poor availability of power supply and network.

Awareness of climate information services

The awareness of climate information services is presented in Figure 1.

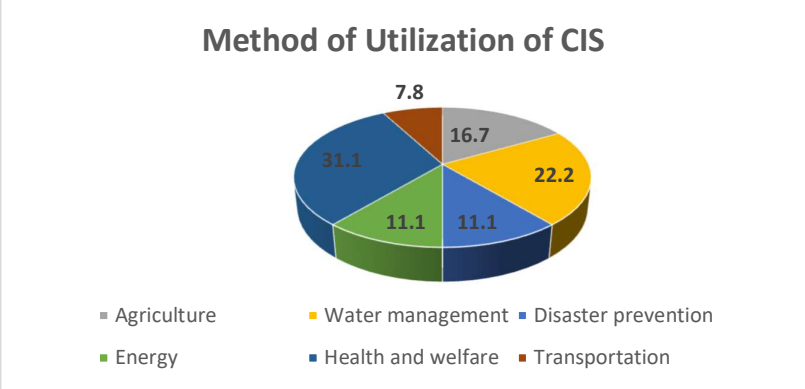


Source: Field survey, 2020; Figure 1: Awareness of climate information services (CIS) by the arable crop farmers in the study area

Figure 1 shows that 64.4% accounted for the arable crop farmers who were not aware of climate information service, while 35.6% were aware of climate information service in the study area.

This result is at variance of Ibrahim, Mensah, Alhassan, Adzawla and Adjei-Mensah (2019) who reported that majority of smallholder farmers in Savelugu Municipality Ghana were aware of climate information service.

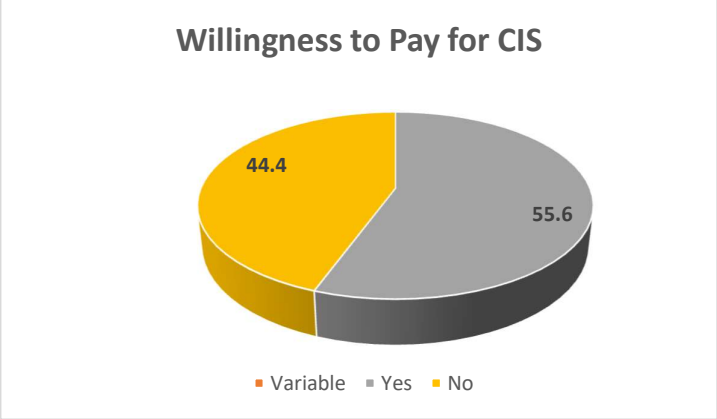
Method of Utilization of Climate Information Services
The method of utilization of Climate Information Services is presented in Figure 2.



Field survey, 2020; Figure 2: Method of Utilization of Climate Information Services (CIS) by the arable crop farmers in the study area

Figure 2 shows the method of utilization of climate information services in which health and welfare accounted for 31.1%, 22.2% for water management and 16.7% for agricultural activities.

Willingness to pay of climate information services
The willingness to pay of climate information services is presented in Figure 3.



Source: Field survey, 2020; Figure 3: Willingness to pay of climate information services (CIS) by the arable crop farmers in the study area

In figure 3, about 55.6% of the arable crop farmers were willing to pay for climate information services, while 44.4% were not willing to pay for climate information services. The reason most farmers are willing to pay for climate information services could be due to the fact that most of the farmers are educated and know the value of Climate technologies, while the main reasons for which some farmers were not willing to pay for climate information services were lack of money,

also the proved evidence on the profitability of the use of climate information services on their farming enterprise. This result agrees with Ibrahim et al., (2019) who recorded that 73.67% were willing to pay climate forecasts information among smallholder farmers' in Savelugu Municipality Ghana. This contradicts the findings of Antwi-Agyei (2021) who reported that smallholder farmers were not willing to pay for the cost of receiving climate information.

Types, sources of climate information services

Types, sources of climate information services is presented in Table 2.

Table 2: Types, sources of climate information services (CIS) by the arable crop farmers in the study area.

Types and source of CIS and products		
Variables	**Frequency**	**Percentage**
Types and source of CIS and products		
Daily weather forecasts	5	5.6
Weekly weather forecasts	4	4.4
Agro-met forecasts	2	2.2
Dekadal climate bulletin	5	5.6
Seasonal climate forecast through television	10	11.1
Seasonal climate forecast through radio	20	22.2
Climate change projections through phone	12	13.3
Climate change vulnerability assessment maps	5	5.6
Advisories/Alerts (extreme events)	5	5.6
Early warnings (outbreaks of pests and diseases)	4	4.4
Frost occurrence forecast	5	5.6
Rainfall onset and cessation dates	5	5.6
Climate atlases	4	4.4
Statistics	4	4.4
Total	90	100

Source: Field survey, 2020

Table 2 shows the types, sources of climate information services (CIS) in the study area.
Sources of climate information services in Table 2 above indicates that seasonal climate forecast through radio were 22.2%, climate change projections through phone 13.3%, and seasonal climate forecast through television accounted 11.1%. This could be due to the presence of a radio channel or station network in Etche LGAs. This provides a major source of information on climate issues to the farmers of the Etche LGAs which could even be transmitted in their local language. With the recent upsurge of mobile phones, one would expect that farmers would prefer to receive seasonal climate forecasts through the mobile phones as well. This result agrees with Ibrahim *et al.,* (2019) who recorded farmers preferred to receive seasonal climate forecasts through radio, mobile phones and television accounted for 49.67%, 26.33% and 24% respectively among smallholder farmers in Savelugu Municipality Ghana. The type of climate information accessed by farmers influences the delivery of efficient climate information (Vincent et al. 2020).

Logit Regression analysis

The Logit Regression analysis on determinants of the factors affecting farmers' willingness to pay for climate information services is presented in Table 3.

Table 3: Logit Regression analysis on determinants of the factors affecting farmers' willingness to pay for climate information services

Variables	Coefficients	Std. Error	T-ratios
Constants (Bo)	1.969195	3.735982	0.5270
Level of education (X_1)	1.05855	0.0491552	21.535***
Age (X_2)	0.9645749	0.0365185	26.4133***
Income (naira) (X_3)	1.000004	0.1100135	9.089**
Farming experience (yr) (X_4)	1.013606	0.1273485	7.959**
Marital status (X_5)	1.922894	1.284571	1.469
Gender (X_6)	1.016299	0.4694423	2.1649**
Access to Extension Services (X_7)	1.044815	0.7611341	1.3727
Mass Media (X_8)	0.538596	0.2543222	2.1177**

Logistic Regression chi-square = 6.79; *** and ** significant at 1% and 5% respectively
Number of observations = 90.
Source: Field survey, 2020

The results of the logit regression analysis on determinants of the factors affecting farmers' willingness to pay for climate information services in the study area are presented in Table 3 above. Two (2) variables were significant at 1% level and they are level of education and age, while four (4) variables were significant at 5% level and they are income, farming experience, gender and mass media. Marital status and access to extension services are insignificant but has positive coefficients. A Likelihood chi-square of 6.79 was obtained which is significant at 1% indicating that the model had good fit to the data.

Level of education is significant at 1%. This implies that as the farmer's level of education increases, the higher the likelihood of willingness to pay for climate information services as the farmers are well educated and knowledgeable of climate services rendered. This observation agrees with Zongo *et al.*, (2016), who in their study showed that education of farmers positively influences the demand for climate information services among farmers' in Burkina Faso. A positive and significant level of education implies that the more educated a farmer is, the more the likelihood of paying for climate information services. The age of the arable crop farmers is significant at 1%. This infers that as the crop farmers get older in age, the more likelihood of paying for climate services. This result is similar to that of Mabe *et al.,* (2014) among farmers in Savelugu-Nanton municipality of the Northern region. Thus, this will increase the likelihood of willingness to pay for climate information services. Income and farming experience of the arable crop farmers is significant at 5%. This shows that a unit upturns in income and farming experience of the arable crop farmer increases the likelihood of espousing climate information services, experienced crop farmers have more comprehension about varying events on climate changes and are willing to pay for climate information services.

Gender of the arable crop farmers is significant at 5%, this means that the sex of the arable crop farmer influences their interest in climate information services, also a positive and significant value of exposure to mass media at 5% implies that the exposure of arable crop farmers to

information on climate services, increases the likelihood of willingness to pay for the services of climate technologies. the greater ease with which men can access climate information using radios and mobile phones compared to women-headed households. This is in line findings of Partey et al (2020) who reported that men respond more to climate information service due to their better access to communication devices and control over financial resources. Bringing to light of information to the arable crop farmers, affords the farmers the opportunity of getting the proper blend of statistics and facts of technological advances which influences the farmers' adoption behavior (Maguza-Tembo, Mangison, Edris, & Kenamu, 2017). This means that the willingness to pay for climate information services depend on many factors including physical environment of farmers and their socio-economic characteristics. It also depends on the benefits the farmer will derive from the information.

The results of the study is in concordance with Mabe *et al.,* (2014) and Zongo *et al.,* (2016)**,** who in their findings among farmers in Savelugu-Nanton municipality of the Northern region and in Savelugu-Nanton municipality of the Northern region respectively shows that factors such as education, age, income, farming experience, gender, and exposure to mass media significantly influenced farmers' willingness to pay for climate information services. Generally, farmers' socio-economic characteristics as age, education level, sex, income level, household size, farm size affect their willingness to pay for climate information services (Ahmed et al. 2015; Quedraogo et al. 2018).

Constraints in willingness to pay for CIS the arable crop farmers

Constraints in willingness to pay for CIS the arable crop farmers is presented in Table 4.

Table 4: Constraints encountered by the arable crop farmers willingness to pay for climate information services in the study area

Variable	Frequency	Percentage
Lack of fund for payment of climate information services	87	96.7
Lack of government support	87	96.7
High cost of payment for climate information services	87	96.7
Ineffectiveness of existing cooperative societies in my area	87	96.7
Nonexistence of cooperative societies in my area	87	96.7
Scarcity to climate information services	84	93.3
Far distance of climate information service centers	84	93.3
Poor access to weather forecast information	82	91.1
High cost of transportation	78	86.7
Poor knowledge of using climate information services	60	66.7
Lack of extension contact	49	54.4

Source: Field survey, 2019.

Table 4 shows the constraints encountered by the arable crop farmers' willingness to pay for climate information services in the study area. Lack of fund for payment of climate information services, lack of government support, high cost of payment for climate information services, ineffectiveness of existing cooperative societies in my area and nonexistence of cooperative societies in my area were recorded highest 96.7% respectively. This finding is in line with Makaudze (2005) and Amegnaglo *et al.,* (2017) who in their study observed that these challenges makes it very difficult for the farmers to be either educated/informed about climate information services, or to be able to purchase the service for their farming activities. Scarcity to climate information services and far

distance of climate information service centers were 93.3% respectively. Poor access to weather forecast information was 91.1%, high cost of transportation was 86.7%, poor knowledge of using climate information services was 66.7%, and lack of extension contact was 54.4%. This implies that extension agent that could keep the farmers abreast and training on climate information services was inadequate.

CONCLUSION The arable crop farmers in the study were well educated to have adequate knowledge on climate information service and have sufficient farming experience, with large household size and the farmers were willing to pay for climate information services. Also, majority were willing to pay for climate information services in the study area. Logit regression analysis on determinants of the factors affecting farmers' willingness to pay for climate information services shows that level of education and age were significant at 1%, while income, farming experience, gender and mass media were significant at 5%. Constraints encountered by the arable crop farmers on willingness to pay for climate information services includes lack of fund for payment of climate information services, lack of government support, high cost of payment for climate information services, ineffectiveness of existing cooperative societies in my area and nonexistence of cooperative societies among others.

RECOMMENDATIONS

The following recommendations were made:

i. There is need for government organizations and NGOs agencies to take up the challenge and opportunity to provide climate information, especially seasonal rainfall forecast, temperature, flood, draught to the farmers. Especially, those farmers indicated willingness to pay for such service.

ii. Extension agents and community leaders should expose and educate arable crop farmers well on the importance of climate information services on arable crop production, which will encourage them to pay willingly for the services.

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ROLES OF NON-GOVERNMENTAL ORGANIZATIONS TOWARDS SUSTAINABLE AGRICULTURAL DEVELOPMENT IN RIVERS STATE, NIGERIA

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ABSTRACT
The study was carried out in Rivers state, Nigeria. The study focused on the roles of Non-Governmental Organizations in achieving sustainable agricultural development in the study area. Specifically, the study was designed to: describe the socio-economic characteristics of the respondents in the study area, determine the roles of Non-Governmental Organizations in promoting agricultural productivity, examine the roles of Non-Governmental Organizations in promoting markets for agricultural produce and examine the roles of Non-Governmental Organizations in promoting sustainable agriculture. A sample size of 465 respondents was selected for the study using multi-stage sampling technique. Structured questionnaire was used to collect data for the study. Data obtained from the study were analyzed using descriptive and inferential statistics such as frequency, percentage and mean score, t-test respectively. T- test was used to determine the difference between variables. Findings from the study showed a mean age of 39.76 years; and that majority (81.30%) were married; more (58.90%) of the respondents had secondary education; with mean household size of 4.60. The respondents were within monthly mean income range of N15,000. From the demographic characteristics of staff of Non-Governmental Organizations, mean age was 45.5 years. (81.3.%) were married, with tertiary education. Majority (40%) of staff of Non-Governmental Organizations were CEO/founder. Roles played by Non-Governmental Organizations towards the achievement of Sustainable Agricultural Development included: provision of post-harvest storage facilities (M=2.51), financial empowerment (M=3.45), Research, Monitoring and evaluation (M=2.52), Training on sustainable agriculture (M=2.5). The study recommends that NGOs should strengthen communication amongst rural dwellers to ensure all-inclusive project implementation.
Keywords: Non-governmental organizations, Sustainable Agriculture, Rural development, socio-economic characteristics

INTRODUCTION
As the world struggle with the challenges of feeding the rapidly rising population, especially in the developing world, concern is growing about the commitment to meet agreed targets to end hunger among vulnerable groups and regions. This concern is amplified in developing countries in the Middle East and Africa, where population shift is aggravated by conflict, insurgency, and climate change. It has become critical for the challenges of food, nutrition security and malnutrition to be addressed (United Nations Development Programme, UNDP, 2018). If done right, agriculture, forestry and fisheries can provide nutritious food for all and generate decent incomes, while supporting people-centred rural development and protecting the environment. Agriculture uses almost one-half of the labor force in developing countries. Indeed, a high share of rural communities and especially the rural poor are directly or indirectly dependent on agriculture through farming, food processing, fishing, forestry, and trade (Food and Agriculture Organization, 2016a).
According to United Nations Development Programme (UNDP, 2018), sustaining world population amidst hunger reduction should be done through promoting sustainable agriculture

with modern technologies and fair distribution systems. Innovations in agriculture are meant to ensure increase in food production and subsequent decrease food loss and food waste. It is important to think of agricultural transformation pathways compatible with a more systemic thinking, where food systems contribute to food security through for example, food production for own consumption, incentives for greater food availability, higher incomes and lower prices, gender-specific time allocation, as well as changes in consumer behavior (FAO, 2015). Hence, achieving Sustainable agriculture requires the link between agricultural interventions, dietary change, and nutrition, which involves several complex factors, for example, food production, diet diversification, biofortification, food safety, gender empowerment, value chains, policy support) (Consortium of International Agricultural Research Centers (CGIAR), 2014).

Fundamentally, the Nigerian agricultural sector has remained largely subsistence and this has restricted growth opportunities with large volume of her food production perishing at the point of origin in the rural areas (World bank, 2014). One of the contributing factors to the problem is poor farming inputs which results in poor production output. If Nigeria is to advance in agriculture and be a major influence on the global stage, it must be prepared to nurture and maintain a good input-output system, evident in food availability.

In Nigeria, the Federal Government is under great pressure to relieve food insecurity and poverty while increasing the production of raw materials for agro-based industries through domestic production, particularly since Nigeria is projected to become the third most populous country in the world by 2050 (Van, Van-Bussel, Wolf, Grassini, Van-Wart, Guilpart, Claessens & De Groot, 2016) it obvious that effective and enormous efforts are required for the actualization of national food security in Nigeria and Africa at large.

Specific objectives of the study were to: describe the socio-economic characteristics of the respondents in the study area; determine the roles of NGOs in promoting agricultural productivity; examine the roles of NGOs in promoting markets for agricultural produce, and examine the roles of NGOs in promoting sustainable agriculture.

Research Hypotheses

Ho: there is no significant difference between NGOs and farmers perception in the roles performed by NGOs in the study area.

METHODOLOGY

The study was carried out in Rivers State, one of the states that make up the Niger Delta region in the South — South geopolitical zone of Nigeria. The state lies approximately between latitude 4°30'N and 5°45'N and longitude 6°30'E and 7°30'L and covers an area of about 11,077 square kilometers approximately 4,277m2 (Orubo, 2005). The land area by local government is shown in table 3.1. Rivers State is bounded in the east by Akwa Ibom State, on the west by Bayelsa state, to the North by Imo and Abia States and to the south by the Atlantic Ocean as shown in fig 3. The geographical area of the state is amphibious in nature, comprising both riverine and upland areas all netted in a web of Rivers and tributaries, some of which include Orashi, Bonny, Sombrieri, New Calahar, Santa Barbra and St. Bartholemeo. The population density in the Niger Delta region is 182 persons per square kilometer. However, Rivers state has high population density figure of about 307 person/km2. It is also pertinent to note that the population distribution in the state is uneven owing to a number of reasons hinged mostly on the terrain of the area amongst other considerations. According to National Bureau of Statistics (2012) the population of the state as at 2006 census is put at 5,198,716 while the projected population as at 2011 is 11,910,816.

The target population comprises of the entire registered farmers in Rivers which is 18,110 (ADP, 2021) and all registered NGOs in Rivers state which is 406 (Rivers state Ministry of Social Welfare and Rehabilitation, 2021) making a total population size of 18,516.

Multi-stage sampling technique was employed in the selection of the samples for the study from 9 Local Government Areas of Rivers State. Ikwerre, Okrika, Etche, Eleme, Oyigbo, Khana, Abua Odual, Degema, Ahoada west, were selected for the study. The NGOs were purposively selected because not all NGOs are into welfare and agricultural development.

Data were collected for this study mainly from primary source. The primary data was obtained from structured questionnaire administered to the respondents.

Data obtained were analyzed using descriptive and inferential statistics such as frequency, percentage. A four-point Likert-type scale with options Strongly Agreed; Agreed; Disagreed and Strongly Disagreed were used. Values ranging from 4 to 1 were assigned to the options. These values were added to get 10 which was further divided by four to give 2.50 which served as the decision rule. Variables greater or equals to 2.50 were considered roles performed and accepted while variables less than 2.50 were regarded as roles not performed. This was used to determine the roles performed by NGOs in promoting sustainable Agriculture in the study area. T-test was used to test the only stated hypothesis. there is no significant difference in perception between NGOs and farmers in the roles performed by NGOs in the study area.

RESULTS AND DISCUSSION

Socioeconomic characteristics of Farmers

Distribution according to socioeconomic characteristics of rural farmers is presented in Table 1.

Table 1 Social Economic Characteristics of Rural farmers in Rivers State

Age(years)	**Frequency**	**Percentage (%)**	**Mean**
21-30	76	17.1	
31-40	141	31.7	
41-50	181	40.7	39.76Yrs
51-60	38	8.5	
61-70	5	1.1	
Above 71	4	0.9	
Marital Status			
Single	39	8.8	
Married	362	81.3	
Separated/Divorced	6	1.3	
Widow	38	8.5	
Educational Qualification			
No Formal	40	9	
Primary	72	16.2	
Secondary	262	58.9	
Tertiary	71	16	
Household Size			
1-3	125	28.1	
4-6	276	62	5 Persons

7-9	20	4.5	
above 10	24	5.4	
Total	445	100	
Monthly Income (₦)			
5,000-20,000	114	25.6	
21,000-36,000	133	29.9	
37,000-52,000	36	8.1	₦15,000
53,000-68,000	48	10.8	
69,000-84,000	56	12.6	
85,000 Above	58	13	
Type of Farming			
Crop Farming	362	81.3	
Livestock Keeping	52	11.7	
Fish Farming	31	7	
Total	445	100	

Source: Field survey, 2021

From the results, the age distribution shows that 40.7% were between the ages of 41-50 years, 31-40 years accounted for 31.7%, 21-30 years were 17.1%, 51-60 years were 8.5%, 61-70 years were 1.1%, 71 years and above were 0.9%. The mean age of the farmers was 39.76 years. This implies a vibrant and energetic. According to the study of Tauer (2017), farmers efficiency age is at its peak at mid-age and diminishes afterwards.

The table also shows that a good number (81.3.%) were married, 8.8% were single, 8.5% were widowed, while 1.3% were divorced/separated. This implies respondents with families and responsibilities that will appreciate considerable amount of support from interventionists like NGOs.

Virtually all the farmers had some form of education with more (58.9%) of the farmers having secondary education, 16.2% had primary education, 16% had tertiary education, while 9% had no formal education. This shows that the respondents were literate and can easily access information and be more willing to participate in developmental interventions of NGOs. This is in line with Danquah & Amankwah-Amoah, (2017) who found education to be a necessary influencer for accepting or rejecting change.

Result on household size showed that more (62%) had a household of 4-6, 28.1% had 1-3, 5.5% had household size of 10 and above, while those with household size of 7-9 were only 4.5%. The mean household size was 4.6 persons which shows a fairly large to a married population which implies more labour for respondents that can enhance agricultural production and ultimately food security.

Monthly gross income was almost evenly distributed among the farmers. The table showed that 29.9% were within monthly income range of ₦21,000-36,000, 25.6% had monthly income of N5,000-20,000, 13% had monthly income of ₦N80,000 and above. This implies respondents with low income to cater for large families which will be willing to embrace any form of change and support from NGOs

Furthermore, farmers in the study area were involved in different forms of farming. However, majority (81.3%) of them were engaged in crop farming, 11.7% livestock keeping, while 7% were into fish farming.

Demographic Characteristics of NGOs in Rivers State

Table 2 Demographic Characteristics of NGOs in Rivers State

Age	**Frequency**	**Percent**	**Mean**
21-30	0	0	
31-40	2	10	
41-50	15	75	45.5 Yrs
51-60	3	15	
61-70	0	0	
Above 71	0	0	
Total	20	100	
Marital Status			
Single	2	10	
Married	15	75	
Separated/Divorced	0	0	
Widow	3	15	
Total	20	100	
Educational Qualification			
No Formal	0	0	
Primary	0	0	
Secondary	0	0	
Tertiary	20	100	
Position in Organisation	Frequency	Percent	
CEO/Founder	8	40	
Secretary	3	15	
Project Manger	5	25	
Operations manager	1	5	
Others	3	15	
Total	20	100	

Source: Field survey, 2021

From the demographic characteristics of staff of NGOs in Table 2, the age distribution shows that 75% were between ages 41-50, 51-60 years were 15% and 31-40 years were 10%. The mean age of NGO staff was 45.5 years. The table also shows that a good number (81.3.%) were married, 8.8% were single, 8.5% were widowed, while 1.3% were divorced/separated. This shows that understands societal responsibilities and importance of food security to the family. All NGO staff (100%) had tertiary education. This implies a well-educated people that have the requisite knowledge to run NGOs successfully and deliver desirable results. Results also shows that majority (40%) of staff of NGO were CEO/founder, 25% project manager, 15% secretary, 5% operations manager and the rest (15%) other designations.

Roles of NGOs in promoting agricultural productivity

Table 3 Shows the mean values of roles of NGOs in promoting agricultural productivity in the study area. Provision of Land (M=1.42), Provision of credit (M=2.19), Development of small-scale farmers (M=2.10), Research, Monitoring and evaluation (M=2.52), Provision of farm inputs (M=2.21), Construction of irrigation canals (M=1.48), Training on improved farming technology (M=2.38), Women empowerment (2.5), Provision of farming machineries (1.72). Only Research, monitoring and evaluation and women empowerment were accepted by farmers as the roles being carried out by NGOs in promoting agricultural productivity in the study area. However, roles accepted by staff of NGOs to be performed by the NGOs were: Provision of land (M=2.75), Provision of credit (M=3.10), development of small-scale farmers (M=3.30), Research, monitoring and evaluation (M=3.05), provision of farm inputs (M=3.05), Training on improved farming technology (M=2.50) and women empowerment (3.55). This showed women in the study area are empowered and they can provide for their families and even explore other means of income to foster food security in their homes. (This is in line with Banyen, Bagah and Kotin, 2015) who reported that women are key players in agricultural development.

Table 3 Roles of NGOs in promoting agricultural productivity

Farmers' Response n=445	Total mean	Mean Score	Remark	NGO's staff Response n=20 Total mean	Mean score	Remark
Provision of Land	632	1.42	Reject	55	2.75	Accept
Provision of credit	974	2.19	Reject	62	3.10	Accept
Development of small-scale farmers	934	2.10	Reject	66	3.30	Accept
Research, Monitoring and evaluation	1120	2.52	Accept	61	3.05	Accept
Provision of farm inputs	984	2.21	Reject	61	3.05	Accept
Construction of irrigation canals	660	1.48	Reject	42	2.10	Reject
Training on improved farming technology	1059	2.38	Reject	50	2.50	Accept
Women empowerment	1114	2.50	Accept	71	3.55	Accept
Provision of farming machineries	766	1.72	Reject	40	2.00	Reject

Source: Field survey, (2021). Cut off: 2.50; Reject-M<2.50, Accept-M≥2.50

Roles of NGOs in promoting markets for agricultural produce

Roles of NGOs in promoting markets for agricultural produce is presented in Table 4.

Table 4: Roles of NGOs in promoting markets for agricultural produce

Farmers'Response n=445	Total mean	Mean Score	Remark	NGOs 'Response n=20	Total mean	Mean Score	Remark

				SA		
Provision of market information	894	2.01	Reject	58	2.90	Accept
Farmer's linkage to available market or clients	695	1.56	Reject	48	2.40	Reject
Market Development	861	1.93	Reject	50	2.50	Accept
Value addition to produce	862	1.94	Reject	55	2.75	Accept
Direct marketing of farmer's produce	505	1.13	Reject	36	1.8	Reject

Source: Field Survey, (2021). Cut off: 2.50; Reject-M<2.50, Accept-M≥2.50

Table 4 Shows the mean values of roles of NGOs in promoting markets for agricultural produce in rural areas of Rivers State. Provision of market (M=2.01), information Farmer's linkage to available market or clients (M=1.56), Market Development (M=1.93), Value addition to produce (M=1.94) Direct marketing of farmer's produce (M=1.13). However, according to NGOs' responses, provision of market information (M=2.90), market development (M=2.50), value addition to produce (M=2.75) were accepted as roles of NGOs in promoting markets for rural people. This result showed that there is a disconnect between the NGOs and rural dwellers in the implementation of SDG-2 projects as that all stakeholders were also not on the same page

Roles of NGOs in promoting sustainable agriculture

Roles of NGOs in promoting sustainable agriculture is presented in Table 5.

Table 5 Roles of NGOs in promoting sustainable agriculture

Roles n=445	Total mean	Mean Score	Remark	NGO staff's Response n=20 SA	Total mean	Mean Score	Remark
Environmental sensitization	804	1.81	Reject		54	2.70	Accept
Planting of trees (Afforestation)	625	1.40	Reject		48	2.40	Reject
Construction of drainage to cub erosion	824	1.85	Reject		43	2.15	Reject
Training on sustainable agriculture	1112	2.50	Accept		56	2.80	Accept
Pest management	1135	2.55	Accept		59	2.95	Accept
Provision of organic farming inputs such as manure in place of fertilizers	850	1.91	Reject		66	3.30	Accept
Provision of Dryers to replace use of charcoal and wood fire	864	1.94	Reject		51	2.55	Accept
Environmental litigation support	718	1.61	Reject		50	2.50	Accept

Source: Field Survey, (2021). Cut off: 2.50; Reject-M<2.50, Accept-M≥2.50

Table 5 Shows the mean values of roles of NGOs in promoting sustainable agriculture in the study area. Environmental sensitization (M=1.81) Planting of trees (Afforestation) (M=1.40), Construction of drainage to cub erosion (M=1.85) Training on sustainable agriculture (M=2.50),

Pest management (M=2.55), Provision of organic farming inputs such as manure in place of fertilizers (M=1.91), Provision of Dryers to replace use of charcoal and wood fire (M=1.94), Environmental litigation support (M=1.61). From the results, Training on sustainable agriculture and pest management were accepted as roles carried out by NGOs in promoting agricultural productivity. However, responses from the NGOs showed Environmental sensitization (M=2.70), training on sustainable agriculture (M=2.8), pest management (M=2.95), provision of organic farming input (M=3.30), provision of dryers (M=2.55), environmental litigation support (M=2.5) accepted as roles carried out by NGOs in promoting sustainable agriculture in the study area.

HO: There is no significant difference between NGOs and farmers perception in the roles performed by NGOs in the study area.

Table 6 showed a significant difference between the perception of the roles of NGOs between the two group of respondents with F (0.435), t (3.374), Farmers mean (1.924), NGOs mean (2.460) mean difference (0536) and p (0.001) <0.005. Looking at both means and the mean difference, one can confidently say there is significant difference in the perception of farmers and NGOs in SDG-2 roles performed. Whereas the NGOs feel they are performing towards food security in the rural areas, the farmers feel otherwise.

Table 6 T-test showing difference between NGOs and farmers perception in the roles performed

Farmers and NGOs		n	Mean	Standard Deviation	Mean Diff	F	t	Sig.
Roles performed by NGOs	Farmers	445	1.924	0.20842	0.5364	0.435	3.374	0.001
	NGOs	20	2.4604	0.36568				

Source: Field survey, (2021) $p \geq 0.05$

CONCLUSION

The study has shown that NGOs are carrying out various roles towards the achievement of sustainable agricultural development in the study area. The NGOs have performed one or two roles within the dimensions of food security. Provision of post-harvest storage facilities, research, monitoring and evaluation, women empowerment, provision of farming inputs, provision of clean drinking water, were some of the roles of NGOs in the study area. However, if the NGOs can harness its resources properly by driving critical improvements in areas of better community engagement, investment in high yielding and income agricultural produce, involvement in post-harvest agricultural processes and agricultural extension services, as well maintaining consistency in its policies, would not only bring about increased staple food production but also its equitable distribution to the generality of the Rivers state citizenry.

RECOMMENDATIONS

The study recommends that:

1. NGOs should strengthen communication amongst rural dwellers to ensure all-inclusive project implementation.

2. Policies that will lead to improve the socio-economic characteristics of farmers prioritize as improved socioeconomic characteristic lead to increased access to food security.

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LEADING POST-COVID-19 RECOVERY FROM THE FRONT: ON THE SHOULDER OF AGRICULTURE AND FOOD POLICY

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ABSTRACT
One of the things that coronavirus pandemic has done is to expose the cracks in Nigeria agriculture and food policy. There is need for a corrective policy that mainstream agriculture and its value chain into Nigeria policy discourse. This is because agriculture is a single sector investment with multi-sector returns. This view has been variously highlighted in empirical studies. Post-COVID-19, any industrial policy without agricultural policy strategy and synergy with system thinking is an invitation to more challenges. What the researchers have proposed in this paper is the adoption of system thinking and how our policy must be data driven to assist the nation with evidence-based policy for better outcome. This view is based on value of data in forming opinion and guiding decision. Interestingly, the Nigeria's peculiarities and circumstances makes evidence-based research very vital. This paper highlights the need for Nigeria food policy to give value to smallholder farmers because they are Africa's food lifelines. The sustainability of food systems must recognize this role for better food outcome, but importantly, Nigeria agricultural and food policy must be *agripreneurial* education focused; strictly interpreted at school and vigorously implemented to deliver affordable, safe, and healthy food outcome.
Keywords: Post COVID-19, food, food policy, agriculture sector, Nigeria

INTRODUCTION
At the turn of 2020, expectation and economic indicators across many nations showed an improvement in economies of many nations (Agbugba& Isukul, 2020). Unfortunately, no environmental analysis had foreseen a momentous change that will lockdown economies and slow down anticipated growth. A peck into the global economy and the challenges that lies ahead as result of the COVID-19 pandemic indicates that the global economy has entered into recession, with far greater impact than the global financial crisis of 2008. Accordingly, the International Monetary Fund (IMF), has estimated negative growth for many economies; -6.1 percent for advanced economies, while emerging and developing economies will have -1.0 percent and -2.2 percent respectively if you exclude China; in addition to reduction in global income per capita of over 170 countries. According to United Nations Economic Commission for Africa (UNECA), a total lockdown of Africa economies will result to $65 billion lose, exposing her economies to several social consequences. Prior to the pandemic outbreak, there is incidence of droughts and locusts in Africa such that the continent is highly reliant on food sourced externally. The pandemic has only worsened the cases such that it will most likely create severe food crisis and chronic hunger if there are no proactive interventions and policies to address it.

According to Fregene & Toda (2020) the convergence of locust outbreak, droughts, excessive flood, and more than $49 billion rising importation costs of food in 2019 will set the stage for food crisis following the pandemic outbreak. The situation is exacerbated by export restrictions like rice export restrictions from rice producing countries in Asia like India, Cambodia, Pakistan, and Vietnam; port and border closures; loss of jobs/income leading to more pressures on food

security through increase in hunger; and lockdowns that has kept farm labourers at home at a critical farming season thereby affecting food production and internal supply chains. In particular, the trade restrictions were major contributors to doubling of global food prices in 2007 and as reported by David Beasley of UN World Food Programme, the pandemic will most likely increase the number of people endangered by imminent global food insecurity to 265 million. Therefore, the fragility of current food system is a concern. The fragile nature of global economies makes a total lockdown and trade restriction very difficult given the fray nature of the food systems.

On the other hand, the shocks of price decline in oil and other commodities across the world and the attendant consequence of rise in US dollars against developing and emerging markets highlights the severity of this pandemic impact on such nations, whose economies depend on these commodities. Already, emerging and developing economies like Nigeria that depends largely on oil are having hard times opening conversations on the need to diversify the economy. The heavy reliance on oil revenue has grossly affected earnings and triggered shocks in other key sectors and fiscal activities of government. For instance, British Petroleum (BP) in Nigeria recently posted a massive quarterly loss of about $4.4 billion which is a sharp contrast to $2.6 billion profit posted in the same quarter in 2019. This has negative consequences on capacity of government to discharge its responsibilities. The challenge of developing economies is already exacerbated by rising debt profile, hunger and high poverty incidences.

In many of these economies, such as Nigeria, about 40% of the budget is used to service national debt, leaving little budget space for investment in critical infrastructures. This makes it difficult to finance health care and other critical sectors and adhering to mitigation measures to flatten the curve. Regrettably, in these economies, mitigation approaches such as social distancing, partial and total lockdown, curfew, and other measures to combat spread of Coronavirus have not worked due to economic structures, worsening poverty and lack and/or inadequacy of palliatives to minimize impact on the people. For instance, the lockdown effects have led to increase in neighborhood crime rates; worsening food crisis, price hike and pressure on food security; loss of jobs and income. According to Libby (2020) for sub-Saharan countries, this puts them at risk following their roughly 40% rice consumption reliance on imports. Currently, there appears a spike in COVID-19 cases after the initial one-month lockdown pointing to difficulty in estimating how close the end will be. Interestingly, there are several stories out of this pandemic; from inadequacies, to relationship between motives and poverty, and yet other stories in principle which mirrors impact of public policy, leadership and commitments in addressing critical social and economic gain in circumstances like this pandemic.

With regards to policy, this pandemic has revealed the several cracks in Nigeria policy at a number of levels, particularly food and agricultural policy. The policies are far cries from Nigeria's interventionist programmes of 1960s that propelled Nigeria to global spotlight as top producer of rubber, palm oil and groundnut as well as second global producer of cocoa. According to Douillet & Grandval (2010) agricultural policies especially at the time of oil discovery that led to intensive exploration, lacked direction and focus thereby leading the nation from being one of top producers to one of heavy reliance on foodstuff importation. For instance, in 2016 Nigeria earned only about $171 million dollars from agricultural exports. This is in sharp contrast to Ghana's exports of cashew alone which according to estimates from Ghana Export Promotion Authority garnered about $981 million. When Nigeria's policy drives are factored into the pale agricultural development, it becomes a shadow even in the face of policy drives that have helped emerging economies like India and Pakistan become top exporters of agricultural commodities.

A look at the sectoral contributions to Nigeria GDP paints a worrisome picture of underperformance in one of the key sectors with multi-sectoral returns and in which it has a comparative advantage and by implication, which shoulders the welfare of over 65 percent of Nigerians; major inputs for other sectors and sustainable economic growth and development of the country – *Agriculture*. Table 1 revealed that against popular expectations, the country's economic growth was triggered by the service sector, which contributed two times more than agriculture; painting a worrisome picture of underperformance in other key sectors. In addition, agricultural sector received meagre 4.5% of the national budget in 2008 which is very low compared to 10% set in 2003 Maputo commitments (Douillet & Grandval, 2010). The investments and policy integrations and implementations in agriculture are its leading cause to the drop of agricultural contributions in Nigeria.

Table 1: Sectoral Contributions to GDP before and after GDP Rebasing

Sector	Before Rebasing	After Rebasing
Agriculture	35	22
Service	29	52
Telecommunication (specific Industry)	0.9	8.7
Manufacturing	1.9	6.8
Oil and Gas	32.4	14.4

Source: National Bureau of Statistics, 2012 and 2014

The lockdown revealed, among other things a spike in point of sale (POS) transaction in excess of 1 trillion Naira. We think this is very encouraging especially government drive to ensure financial inclusion and cashless economy. An analysis of the pandemic show that major emphasis has been concentrated on healthcare system and food system. Majority of efforts have been on improving these two key areas based on the understanding that economic health of a nation hinged on the health of the people. Whereas majority of global population are not interest on governance and economics, they are generally more interested on food mainly for survival. How to overcome hunger in most cases defines their struggle each day and hope embedded with stories that are passed through generation. This again explains why in many developing economies it has been extremely difficult to police lockdown as majority of the populace depends on daily struggle to feed their households.

Part to Recovery - Policy Priority

The pandemic has made the task of achieving Sustainable Development Goals (SDGs) very daunting and exposed the greater need to change policy priority and strategy to be more responsive in order to deliver better outcomes. Nigeria like many nations need to think of policy stimulus post COVID-19 era that will set the economy on the part of growth (Onyeka & Ekuruche, 2020). Policy strategy must of necessity be anchored on the country's area of comparative advantage. This is because no nation developed without investment and management of its factor endowment. Therefore, Nigeria requires an industrial, agricultural and food policy anchored on aggressive management and utilization of available human and natural resources. There is need for a comprehensive and coordinated policy response to mitigate food crisis and other developmental challenges in the midst of chaos.

The discouraging pace of development in most African countries when compared with advanced and emerging economies like Asia reflects the potency of investing and harnessing Nation's factor endowment. African countries have a real opportunity to capitalize on food production and value addition to promote economic transformation. The example of Rwanda in capitalizing

on its vast natural resources to improve its economy is encouraging. For instance, she has currently adopted collaborative mechanization in farming to mitigate the consequences of COVID-19. The major emphasis is localizing agricultural policies, creating sustainable programmes consistent with the environment, and following up with intensive monitoring and effective implementation (Andama *et al.,* 2020).

Therefore, African countries can capitalize on its vast arable land and other resources to opportunistically position her economy. For instance, Nigeria can boast of large expanse of arable lands and growing teeming youthful population to create opportunities in agriculture, technology and manufacturing. United Nations (2020) argues that the pace of development of China and India (which have lifted millions from poverty) are examples of what it means to utilize resources for sustained industrialization in any economy. However, effective resource utilization anchored on vibrant industrial policies is the answer to Nigeria nay Africa's drive for industrialization.

Industrial and Agricultural Policy

Several studies have shown there exists a strong relationship between industrialization and economic development (Isukul *et al.,* 2020). However, this requires strong commitment to working policy. Public policy is therefore a necessary "devil" to promote rapid economic growth and development (Agbugba & Isukul, 2020). This understanding is responsible for the significant economic and development policies developed in Nigeria. Table 2 summarized these policies, objectives and failures.

Table 2: Agricultural Programmes and policies in Nigeria

SN	Agricultural Programmes	Objective	Causes of Failure
1.	Regional Agricultural Programmes (RAP) of 1960 – 1966 covering: Western Region: Cocoa and Coffee Mid-West Region: Rubber Eastern Region: Palm oil Northern Region: Groundnut and Cotton	1. Food sufficiency, 2. Export earnings and 3. job creation	1.Less priority given to food crops. 2.Ethnicity and political interference 3.Mirrored policies of colonial rulers on export cash crops
2.	National Accelerated Food Production Programmes (NAFPP) of 1972	1. Farmer education on food crop production 2. Job creation 3. Irrigation on a large scale 4. Export earnings	1. Lack of farmers' participation 2.Swift stoppage of federal government fund due to another agricultural policy that was formulated – Operation feed the nation 3. Non-inclusion of farmers that could not form a co-operative to benefit from the programme.

3.	River Basin Development Authorities (RBDAs) of 1977	1. Improve farmer output and productivity 2. Irrigation activities to bring more lands for cultivation purposes 3. Construction of rural roads to link farmers to markets	1. Intense political interference 2. Mismanagement and waste of funds through streamlining of functions and sizes RBDAs
4.	Agricultural Development Projects (ADP) of 1975 and expanded nationwide in 1984	1. Improve and Increase agricultural production to reduce rural poverty. 2. Raise small-scale farmers' income 3. More emphasis on modern technology and high input technology	1.Associated complexities with technology transfer 2.Poor involvement of input agencies 3. Poor supply of funds 4. Poor funding of the policy
5.	Operation Feed the Nation (OPN) of 1976	1. Encourage local food production 2. Cost reduction of bread basket and reduction in demand of certain food items	1. Lack of available markets 2. Threats of livestock diseases 3.Large presence of inexperienced labour which was mostly hired. 4. Indiscriminate use of lands for farming activities
6.	Green Revolution Programme (GRP) of 1980	1. Encourage self-sufficiency in food production 2. Introduce modern technologies and inputs like seed varieties and fertilizers. 3. Ensure provision of credit facilities 4. Improve marketing of agricultural products and favourable pricing policy 5. Encourage farmers' production of food crops, cash crops and livestock.	1. Delay in execution 2.Lack of monitoring and evaluation leading to loss of funds spent on such purpose.
7.	Back to Land (BL) of 1983-1985	Encourage agricultural production/productivity in order to combat food insecurity in Nigeria	Policy incoherence arising from lack of input technology and data inadequacy
8.	Structural Adjustment Programme of 1986	1. Provide strategies for agricultural production 2. Provide policies for support services like agricultural extensions.	1. More impact on distribution farm income than agricultural growth and productivity 2. Corruption induced factors and fund mismanagement hindered the progress
9.	National Fadama Development Project (NFDP) I, II and III of 1993 – 2004	1.Reduction of rural poverty and widespread hunger 2. Raise income of rural farmers 3. Increase food security 4.Contribute to achievement of millennium development goals (MDGs)	Design and implementation short comings
10.	National Agricultural Land Development	1. Provide strategic support for land development for farming	1.Lack of release of fund for agricultural programme

	Authority (NALDA) of 1992	2. Encourage food security though through self-reliance and sufficiency. 3. Promote profitable employment for rural dwellers	2. Poor input sourcing and purchase 3. Weak acquisition and repairs of machinery. 4. Poor publicity of programme 5. Poor training of programme staff
11.	National Special Programme on Food Security (NSPFS) of 2002 – 2006	1. Encourage productivity 2. Improve farmer income 3. Provide farmer education on farm management 4. Strengthen research and training of extension services. 5. Promote simple technologies for self sufficiency	1. Poor extension-agent contact 2. Poor knowledge of credit use 3. High cost of farm inputs 4. Existence of difficulties integrating technology to existing production system 5. Lack of modern storage facilities
12.	Root and Tuber Extension Programme (RTEP) of 2000	1. Achieve food security 2. Address welfare of farmers 3. Increase food production 4. Reduce rural poverty and remove lift farmers from poverty trap	1.Challenges with market for products 2.Poor accountability and planning 3.Targeted only small-scale farmers
13.	Seven Point Agenda (SPA) of 2007 – 2010	1.Strengthen agribusiness through such things like changes in land tenure, price support mechanism 2.Improve rural access to infrastructures 3.Strengthen farmer support groups 4. Resuscitation of RBDAs 5. Massive food production	1.Poor integration of poor farmers into the programme 2.Challenges of monitoring and evaluation 3.Poor input and access to markets
14.	Agricultural Transformation Agenda (ATA) I of 2011	1.Policy reformation to eliminate corruptions associated with seeds and fertilizers. 2.Enhance functionality of marketing institutions 3. Provide value addition to food crops produced locally 4. Foster rural economic growth 5. Set up processing zones for staple crops in order to encourage private sector involvement in high production areas.	1.Riddled with corruption and embezzlement of funds 2.Persistence of herdsmen and farmers' conflict 3.Hindered by high rate of Islamic insurgency 4. Poor planning, monitoring and evaluation 5. Poor transparency
15.	Agricultural Transformation Agenda (ATA) II of 2015 – 2016	1.Strengthening of agricultural export markets for products like cocoa, and pal oil. 2.Promote agricultural development by providing better enabling environment through improvement of existing	1.Poor attention given to the programme following emphasis on fighting corruption in the country 2.Existed more in theory with less practical approaches

		infrastructure and making clearer policies 3.Provision of better farm inputs and tools 4. Provide training for farmers in order to encourage productivity	
16.	Anchor Borrowers Programme (ABP) of 2016	1.Uplift several farmers from poverty trap 2. Create more job opportunities for the teeming population	Lacks keen interest in the agro-sector

Source: Adapted from Yusuf (2018) on Assessment of Agricultural Programmes and Food Insecurity in Nigeria

Unfortunately, the economic and social developmental goal hidden in these policies were not achieved because of elitist hijack, poor formulation and implementation and deviations from key areas in which Nigeria have comparative advantages, as well as incessant perturbations in the institutional frameworks (Gatawa, 2017). Several studies have revealed policy gaps and obvious bias on majority of industrial policies in Nigeria (Yusuf, 2018). A well-planned industrial policy enables nations to focus on areas they have comparative advantage and develop the value chain along that line (Babu e*t al.,* 2020). This includes tweaking the models based on identified causes of failures and correcting the policies.

From the point of development theory, there is a general consensus that corrective industrial policies must focus optimally on those areas in which nations have comparative advantages. There are lessons from these experiences: first, is investment in key resources such as human resources through training and development. Secondly, evidence shows that these nations also have developed home-grown solutions to most of their challenges and in most cases export solutions to other nations. The need to respond to and perhaps duplicate and adapt the successful stories behind these policies justifies the consideration of Nigeria's agricultural sector and how comprehensive food policy can deliver a better outcome post COVID era (Sova, 2020). This pandemic lends credence to the value of food, agriculture and policy as resilience agents during crisis. Fortunately, our population dynamics, youthful demographic and resources supports various statistics about Sub-Saharan Africa and Nigeria especially in bridging food security gap and capacity of Africans to provide solutions to many of its challenges and other nations. It is debatable if any other sector can trigger the desired level of growth in real welfare term than agriculture (Liverpool-Tasie *et al.,* 2020).

Agriculture remains a very good platform to reverse gaps in food production as well as provide raw materials for industrial growth. It provides food for the growing population, employment for over 65 per cent of the population and raw materials and foreign exchange earnings for the development of the manufacturing sector (Agbugba & Binaebi, 2018). With this development, it is debatable if the country will be able to ameliorate the challenges of food security faced by Nigerians considering the gap in food requirement growth rate of 3.5% and 3.18% population growth in Nigeria (Sennuga, 2019). However, the less obvious factors, which are attitudinal and mindset reflects the obvious lack of understanding because of absence of information leading to preference for engagements in other businesses thereby affecting rational choice. There is information asymmetry in agriculture in a large magnitude. The precise evaluation of the situation centers on bounded rationality rather than absolute rationality (Petracca, 2021).

The success stories of ATA within a period of four years demonstrate the value of policy that is market oriented. ATA was designed to stimulate agricultural value chain and entrepreneurship. It is an indisputable fact that the benefits of entrepreneurship in general are enormous, hence its discourse and application have continued to generate increasing interest among governments and institutions. This is more prominent in developing countries given its level of economic development and abundant opportunities of economic resources. For instance, rural development is more than ever before linked to entrepreneurship. Institutions and individuals promoting rural development now see it as a strategic weapon that could accelerate the local economy and development process (Ezeibe *et al.,* 2013). The quantum of benefits entrepreneurship thinking and activation will have on areas in which a nation has huge comparative advantage can better be imagined. Thus, the new paradigm in entrepreneurship - *agripreneurship*. Agripreneurship is the idea of entrepreneurship in agriculture. A shift of agriculture from mainly subsistence orientation to full commercialization process makes agriculture attractive and profitable.

Agripreneurship offers nations enormous potentials in terms of export competitiveness, value chain, commercialization and market expansion. These benefits have continued to wax interest for agripreneurship education, orientation and skill among nations. The success of India as a foremost nation to invest in agripreneurship management is still a positive stimulus. This paradigm is important because it gives us an idea of what to do to engineer enterprising spirit and skills – managerial, technical and innovativeness among youths to take advantages of opportunities that abound in agriculture and agribusiness. Therefore, Nigeria recovery efforts must be geared towards addressing a comprehensive food policy plan that consider local peculiarities, while considering global opportunities that comes with a global view.

Recovery Plan – Changing Nigeria Food Policy

As the pandemic lasts and realities of its impact confront nations, the obvious question is what post COVID 19 will be for economies around the world? The experience of Nigeria with recession in 2016/2017 is scary to consider another recession in quick succession. There are lots of plans and many African countries have established economic committees to stimulate ailing economy with policy stimulus. In line with recovery steps, reports like Fregene and Toda (2020) called for food reserve adequacy maintenance, removing protectionist policies, and promoting value chains that links domestic and international markets.

From available evidence gleaned from COVID-19 pandemic, food has become an epicenter of global discussion and will continue to be of major interest post COVID 19 period (Egwue *et al.,* 2020). Food has become a weapon to recover many economies especially for countries like Nigeria with comparative advantage in agriculture. From the foregoing, food is essentially important in discussions about health of individual and of a nation. Every chance in this pandemic opens opportunity to rethink the food policy across the value chain in order to close the seeming cracks in the food policy of Nigeria and opportunities for Nigeria.

Although Nigeria have had a long list of food and agricultural policies, most of these policies have consistently been championed without major input from major stakeholders. To have a comprehensive agricultural and food policy requires a combined decision and input of both government and private sector including smallholder farmers. This will capture all areas of interest, challenges, opportunities and strength. This means changing a different narrative by carrying out environmental scanning on major decisions that affect food such as labour, finance, land, people, trade, nutrition, distribution, competition/competitiveness of food aid, food waste and safety. All the areas enumerated have direct and indirect effect on different actors in the food

system. None is mutually exclusive. It is important that Nigeria food policy must identify our unique peculiarities and work around it. An instance is the informal structure of Nigeria markets and opportunities it creates to mitigate several structural and economic challenges confronting the nations. This reflects in the buying behavior of our citizens hence more than 70 per cent of Nigerians population patronize and obtain their food from informal market. One of the banes of policy copying from other countries policy is inability to address peculiarities given that within these peculiarities lies Nigeria's strengths and weakness.

Many have asked why food policy is important now. The understanding and general consensus is that food policy is critical to and essential in delivering affordable, safe and nutritious food system which we so scarily desire. More importantly, regulations guide human action and absence of policy could lead to breakdown in structure leading to confused state. Food policy governs man's activities and concerns all of us because it affects what we eat, how we get them and by who. Policy documents highlights the beauty of information, which is a fundamental aspect of nature (Cesar, 2015) and removes perceived complexities which could lead to confusions. Therefore, a good food policy should establish structures, shape interactions, and enhance order in the food system. Unfortunately, most African countries are too narrow to handle perspectives and gaps that hinders delivering affordable, safe and nutritious food to citizens.

Nigeria food policy has been very narrow and does not reflect the national realities and market development and peculiarities. Evidence has shown that Nigeria food policy and other polices are not data driven, as such cannot be reliable upon to address national objective. This makes it uncomprehensive to deliver better outcome. A 21st century food policy must be woven around data because it is relevant in driving policy formulation and implementation. Again, there is also lack of integration\collaboration and sync with critical stakeholders and elements making such private institution. Most of these policies have come from government institution with the little input from those whose activities are important drivers of such policy such as smallholder farmers. A comprehensive food policy must interconnect and arise from challenges discovered from the environment. This is because they mostly encountered these challenges. Therefore, they are key blocks in decisions affecting their operation and how it is managed.

In this paper, the researchers have identified two key elements that must drive food policy post-COVID era. Nigeria food policy must be driven by research-based evidence and carefully interpreted at school by both private sector actors and academics (Gakpo, 2020).

Research and Nigeria Agricultural Policy Process

The role of agricultural research in poverty reduction, and accelerating economic growth is not in doubt. This role depends on the effectiveness of agricultural policies to address rapidly demand-driven research. A look at the varied history of agricultural policies and programmes in Nigeria from 1960 till date will raise the question: are these policies coherent with their objectives and evidence-based? Evidences show gaps raven with policy inconsistencies. Most of these policies are duplications of past poor policies packaged to underscore performance by successive government and institutions without commitment to its deliverables. According to Hawkes (2017), the biggest coherence gap is between policies on paper and delivery of those policies. These gaps according to Fashua (2017) are due to poor analysis and research process adopted. Studies on policy have established strong link to research as the cog in the gearbox of policy process.

COVID-19 pandemic has exposed several cracks in Nigeria agricultural policy and to reverse the trend, Nigeria needs to invest in agricultural research, and other innovative technologies as a

means of obtaining reliable data that will guide policy instrument and decision (Echwalu, 2020). We can leverage on research to bridge gaps in policy to address these challenges to improve evidence-based policy-making that will improve food system and help Nigeria overcome its developmental challenges. There is also need to promote research-based policy in Nigeria, not just drafts copied from other countries. Data collection on several agricultural activities like farm inputs and technologies – their providers and accessibilities; financial needs, contributions and its access; access to markets; *agripreneurs'* activities and capacity; agricultural products intermediaries' activities and value chains; and food reserves or banks will provide great assistance in identifying weak spots, areas of surpluses and deficits thereby leading to formulation and implementation of workable intervention programmes. Without research-based policies, bridging these gaps become herculean task thereby producing a recurring decimal of failings in policy formulation and implementation in Nigeria (Andama *et al.,* 2020).

Moreover, some of the critical areas that agricultural research showed focus include according to Agbugba & Obi (2013) value chain, marketing infrastructures, agricultural market access, and agricultural marketing policies. Reliable research will ensure sustainable food system that delivers better outcome for all Nigeria. The place of reliable research cannot be over emphasized especially in the place of food supply maintenance. 2019 edition of State of Food Security and Nutrition in World Report clearly emphasized the place of research following the assertion that creation, access to reliable up-to-date data and its use by every involved stakeholder is one of the most vital cogs in global food supply chain. More importantly, research will bridge the seeming gap in communication, support, strengthen and engage between critical stakeholders. The government's role in this aspect is very important because they need to support research-based policies, encourage data collection and sharing of the data. This will give a definition and clear direction to the formulation of workable policies that will revamp the agricultural sector and its contribution to the export revenue and GDP of the country.

***Agripreneurship* Education**

Nigeria has huge advantage in terms of over 60 percent of arable uncultivated land, youthful population which provides potential demand and pool of skills; and our consuming population which is estimated to equal combination of many countries in Europe by 2030. This makes Nigerian market very attractive. COVID-19 has given us another opportunity to plan around these advantages to achieve Agenda 2030 and contribute to feeding the growing population of the world that is estimated to be 9 billion by 2050 (Coleman, 2020). We have less than 10 years to plan, develop competencies and take advantages of enormous economic opportunities. Repugnant as it maybe, these dreams may follow the trends of past estimates without commitments and actions in terms of planning, implementation and evaluation on one hand and information sharing and communication on the other. Limitations in terms of planning and information sharing make behavioral theories of rational choice to move toward ideals of bounded rationality. The flood gate to absolute rational thinking and time limitation of 10 years makes the consideration of shared information and action through *agripreneurship* education important as the instrumentality of transmitting managerial, technical and innovative skills in managerial the food system (Onyeaka *et al.,* 2021).

The benefits of *agripreneurship* education have been canvassed by several authors like (Babu *et al.*, 2020). The core benefit of education is its ability to bring about behavioral change by providing a platform for shared information and experience. The transfer of information is akin to flow of electricity current that supplies power to an object. Education helps to minimize

information asymmetry and is believed to be the shortest route to achieving the SDGs. From the point of rural development perspective, agripreneurship education will help realize these goals even faster, because agriculture is inclusive. Based on the foregoing, the authors have identified three important educational values that empowered agripreneurship skills – innovation, cooperation and responsibility and which school curriculum must address.

Current policies to engage Nigeria agriculture for effective delivery must be addressed from the point of entrepreneurship as a support basis for industrialization, hence the Nigeria National Industrial Revolution Plan (NIRP) which was described as the flagship industrialization programme with the aim of fast tracking job creation, and accelerating inclusive economic growth must be *agripreneurial* education focused; strictly interpreted at school while vigorous implementation must be coaxed to follow agricultural transformation agenda, sustainability and global best practices. This will help the country to develop as well as transform its value chain to support production. The proponents of *agripreneurship* education thinking hinged their emphasis on the effectiveness of application of theory and management to harness the gains of science and technology for sustainable agricultural practice, social and economic development; job-led economic growth through networks and/or cluster of businesses around food supply chain network.

Co-operatively, there are two principal actors involved in evolving a sustainable agro-industrial development in Nigeria – the government and the private sector, while the consumers are also important in creating effective demand on one hand and public institutions like universities on the other. The role of government is obvious and dominant, and it is important in creating an enabling environment suitable for the evolution of a virile agro-industrial sector. The role of the private sector is simply to take advantage of the existing system of incentives and to engage in agro-industrial ventures and agribusinesses in an innovative way. Although Universities are part of government institutions especially public Universities and their roles are specific. By default, educational institution transfers information. However, changes in the environments makes their task even more demanding, because they represent the microscopic picture of the entire society. Today, educational institutions face more demanding task of application and skill impartation. The growing emphasis on entrepreneurship is not lost on educational institutions.

The aim of the first two values is to change perception by remolding the cognitive limitation of the mind to abreast change and be responsible. The ideals of responsibility over the years have raised certain key fundamental questions. How best can land be made available to youths? How best can finance be made available and what kind of finance do youths need for agribusiness? How best can there be skills impartation to the youths to engage in agribusiness? How best agribusiness be made to be more attractive to the teeming youthful population? This is where concerns in African nations like non-inclusion of informal food traders in traditional safety nets (like pensions) enjoyed by their counterparts in formal sector can be addressed. Generally, answers to these questions will provide the fulcrum upon which the beauty of agribusiness will be more appreciated in years to come.

CONCLUSION

The mask of poverty, worsening food crisis in Nigeria and other parts of the world and other developmental issues are outside the current capacity of farmers to deal with but strong leadership, policy and education can address their limitation in a manner never imagined. The concomitant realization is that nations exploit resources available to them for their optimum

benefit. With the right leadership and incentive, Nigeria and indeed Africa can exploit its large human resources to change the narrative in the food ecosystem. This is a tremendous opportunity for Nigeria in terms of untapped market opportunities and raw resources which leadership at all level can leverage for the common good of all.

RECOMMENDATIONS

Whilst the recommendation of this paper is implied,

1. Greater emphasis must be placed on solidification of agricultural content to be more business driven; reorganization and restructuring educational programs; collaborations between and among Universities on one hand and private sectors, and implementation of the recommendations of NIRP in line with the current transformation agenda on agriculture and global best practices on comparative advantage. This will help the country to develop as well as transform its value chain to support production.
2. There is need to create enabling environment for education sector to thrive in research by empowering and incentivizing them to be research hubs with high technological interconnectivity among other universities in a way that they are powered to collaborate and unrestrictedly share information. Equally, it will be a welcome development to design a centralized database that houses several intervention programmes while designing them to have working linkages to other research hubs. This is where we need to leverage the benefits of technology and communication inputs in agriculture. This will encourage knowledge management and sharing while identifying the areas of weaknesses, and control measures to be adopted to put programmes on track. In other words, this peculiar role of entrepreneurship education has opened this vintage for greater linkages and collaborations in a cross-matrix manner.

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AGRICULTURAL PRACTICES USED BY CROP FARMERS FOR CLIMATE CHANGE ADAPTATION AND MITIGATION IN EMOHUA LOCAL GOVERNMENT AREA OF RIVERS STATE, NIGERIA

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ABSTRACT
The study on indigenous agricultural practices that farmers in Emohua Local government Area of Rivers State were adopting for mitigating climate change. Multistage sampling procedure was employed to select a sample of 120 farmers for the study. Interview schedule was used for data collection. Data were analyzed using descriptive statistics (mean, percentage, ranking). Results revealed that 79.2% of the crop farmers were aware of climate change but 84.9% got the information from the media (especially Radio and Television). Shifting cultivation (94.16 %), change of planting date (72.5%), bush, fallowing (65%) crop rotation (62.5% were the major agricultural practices adopted for reducing the effects of climate change. The major constraints to effective climate change adaptation relates to poor agricultural extension service (mean 2.32), inadequate land for cultivation (mean 2.51), unpredictable changes in climate that make planning of planting and harvesting dates difficult (mean 2.26) and excessive sunlight, heat, rainfall, flood and erosion (mean 2.24). The study recommends that the Agricultural Extension Service should mount vigorous enlightenment campaigns on climate change with comprehensive information content on agricultural practices that enhances climate change adaptation. There is the need to integrate indigenous knowledge into the body of scientific knowledge of adaptation and mitigation of climate change for more effective and efficient results.

Key words: Climate change, Agricultural practices, Indigenous knowledge, climate change adaptation

INTRODUCTION
Most of the programmes which successive governments in Nigeria implemented to achieve food security for the citizenry have been adjudged ineffective (Aminu & Anono, 2012). Food security was conceptualized by the Food and Agricultural Organization (FAO) (2002) as a condition where all people at all times have physical and economic access to sufficient, safe and nutritious food to meet their dietary needs and food preferences for an active and healthy life. FAO (2021) posits that the four aspects of food security (accessibility, utilisation, availability, and stability) will be disrupted by climate change, except adequate adaptation and mitigation process is put in place. Although several factors have been blamed for low food production in Developing Nations, the effects of climate change have been identified as a major threat to sustainable food production (Ngukimbin and Shinku 2021). It could hamper the progress made towards "world without hunger." It is, perhaps, the most serious environmental threat facing mankind worldwide. Nigeria is particularly vulnerable to climate change because of its over-dependence on rain-fed agriculture and geographical location (Ifeanyi-Obi, Togun, Lamboll, Adesope & Arokoyu 2017). Climate Change has been defined by Intergovernmental Panel on Climate Change (IPCC 2014) as a statistically significant variation in the weather pattern that persist for decades or longer caused by human and non-human activities. In 2006, Ziervogel *et al,* noted that the two extremes of the expected challenges of climate change in Nigeria have been increases in rainy and dry

seasons while temperatures are generally high with annual mean of about 27°C. Diurnal variations are more pronounced than seasonal differences. Chikezie, Ibekwu, Ohajianya, Orebiyi, Henri-Ukoha, Ukoha, Osuji & Anthony (2016) also reported an unstable rise and fall trend in temperature and rain day in Southeastern Nigeria within 1984-2014. Mbwambo, Mourice & Tarimo (2021) explained that, as temperature rises, it's effect on agricultural crops is expected to be remarkably felt with consequences on millions of smallholder farmers, including an increasing burden of plant/animal diseases and insect pests. In the same vein, Okorie, Elenwa & Isife *(*2020) asserts that climate change and unstable weather condition has impeded arable crop production and availability. The negative impacts of climate change on crop production such as temperature rise, delay in start of rainfall, windstorms, heat stress, drying up of water bodies and flooding among other (Chikezie *et al.* 2016) are real.

The search for effective and efficient panacea to the problem of climate change has often neglected indigenous knowledge which has often been labeled as inferior knowledge. Although, United Nations Educational, Scientific and Cultural Organisation (UNESCO 2019) asserted that indigenous knowledge makes a vital input to climate change policy and Sustainable Development Goal 13 on climate action; by observing changing climates, coping with the effects and contributing to global mitigation efforts. Hence, development professionals are increasingly appreciating the value of indigenous knowledge in solving agricultural, environmental and rural development problems. According to Chidiebere-Mark, Ejike, Nwaiwu, Nwankwo & Ibe (2018) climate change is a global phenomenon that cannot be solved by scientific methods alone therefore, there is need to look for alternative solutions. They added that, there is much to learn from indigenous, traditional and community-based approaches to natural disaster management. Indigenous knowledge has been viewed by UNESCO (2017); Adger, Pulhin, Barnett, Dabelko, Hovelsrud, Levy, Spring & Vogel *(*2014) as the understanding, believes and skills of local peoples, developed through long and multigenerational histories of interactions with nature and adjusting to highly variable and changing ecological and social conditions. Important climate change adaptation options used by crop farmers highlighted by Henri-Ukoha (2020) include: crop rotation, early and late planting, mixed cropping, minimum tillage, change in planting dates, intercropping, relocation of farm lands, construction of drainages among others.

Concerns have been on the increase about future climate change impacts on the agricultural sector particularly in Africa. According to Ifeanyi-Obi *et al* (2017), the IPCC Fourth Assessment Report showed that Africa is one of the most vulnerable (due to its geographical location and socioeconomic characteristics) continents to the changes in climate. This is mainly due to their low adaptive capacity and numerous stressors. It also noted several African countries including Nigeria will witness serious decline in their agricultural production by the year 2020 with worst effect on subsistence farmers, which will adversely affect the continent's food security. Consequently, quite a substantial amount of empirical work has been done to provide estimates of the link between climate change and agricultural production (Odjugo, 2010). However, much needs to be done to provide information on indigenous agricultural practices that farmers are adopting for adaptation and mitigation of climate change in Nigeria. Robinson and Herbert (2011) noted that integrating indigenous knowledge into climate change policies can lead to the development of effective adaptation strategies that are cost-effective, participatory and sustainable. Thus, the study focused on the indigenous agricultural practices adopted by farmers for adaptation and mitigation of climate change in Emohua Local Government area of Rivers State, Nigeria. Specifically, the study ascertained farmers' awareness of climate 'change; assessed

farmers' major source of information about climate change; identified indigenous agricultural practices adopted by farmers for climate change adaptation and mitigation; and identified the constraints farmers face in adapting and mitigating climate change impact in the study area.

METHODOLOGY

The population of study included all farmers in the 10 communities that make up Emohua Local Government Area of Rivers State. Multistage sampling procedure was employed to select a sample for the study. Firstly, stratified random sampling technique was employed to select 3 out of the 6 larger communities and 2 from the 4 smaller communities. Thereafter, systematic random sampling of one farmer from every three houses in the selected 5 communities was made. Only 120 farmers who responded to all items on the interview schedule comprised the sample for the study. A 45-item interview schedule was used for data collection while descriptive statistics (mean, percentage, ranking) were used for data analyses.

RESULTS AND DISCUSSION

Awareness of Climate Change

Awareness of Climate Change by Farmers is Presented in Table 1.

Table 1: Awareness of Climate Change by Farmers in the study area

Item	Not Aware		Aware	
	Freq (n)	Percentage (%)	Freq (n)	Percentage (%)
Farmers Awareness of climate change	25	20.8	95	79.2

Source: Field Survey 2021

Table 1 indicates that a majority (79.2%) of sampled farmers were aware of climate change while, 20.8% were not aware, implying that majority of the farmers were already aware of the reality of climate change. The farmers awareness of the existence of climate change will enable them make informed decision on the best adaptation and mitigating strategies to adopt in coping with the adverse effect of climate change in their production. This result is in line with the finding of Chidiebere-Mark *et al.* (2018); Idoma and Mamman (2016) who discovered that majority of the sampled farmers in their study area were already aware of climate change. This is a step in the right direction, since awareness is the first step in the process of finding appropriate solution to the problem of climate change.

Major Sources of Information for Farmers about Climate Change

The Major Sources of Information for Farmers about Climate Changeis presented in Table 2.

Table 2: Major Sources of Information for Farmers about Climate Change in the study area

S/N	Sources of Information	Frequency	Percentage	Ranks
1	Extension Agents	3	2.5	4
2	Other farmers	4	3.3	3
3	Friends and neighbours	12	10	2
4	The Media (Radio and Television)	101	84.2	1
	Total	120	100	

Source: Field survey 2021

Table 2 revealed that majority of the farmers obtained information about climate change from the media (particularly, Radio and Television). About101 of the sampled 120 farmers (representing 84.9%) obtained climate change-related from information from the media. Only 1.7% obtained

information on climate change from Extension Agents. This result confirms the findings of Okorie *et al. (*2020); Bobadoye, Jimoh, Bobadoye, Adio, Aluko & Iroko (2019), who reported that majority of the arable crop farmers in their study area got climate information through radio and television. This may connected to its low cost, wide range of coverage, use of local language and low maintenance cost (Oyekale, 2015). Moreso, in a study of sources of information on climate change among arable crop farmers in Adamawa State, Nigeria, Yohanna, Ndaghu & Barnabas (2014) also reported that the Extension Agents were not among the major sources of utilized by farmers. This appears to be an indication of ineffective extension service. Under the Unified Agricultural Extension Service, it is the Extension agent who is expected to play dominant role in disseminating all production-related information to famers in his or her circle.

Indigenous Agricultural Practices used by Crop Farmers for Climate Change Adaptation and Mitigation

Indigenous Agricultural Practices used by Crop Farmers for Climate Change Adaptation and Mitigation is Presented in Table 3.

Table 3: Indigenous Agricultural Practices used by Crop Farmers for Climate Change Adaptation and Mitigation

S/N	Indigenous Farming Practices	Freq (n)	Percent (%)	Ranks
1	Shifting cultivation	113	94.2	1
2	Bush fallowing	78	65	3
3	Planting economic trees in-between crops and farm (agro-forestry)	15	12.5	9
4	MuIching to conserve soil water	55	45.8	6
5	Planting of cover crops to improve soil water retention	47	39.2	7
6	Application of manure to improve soil fertility	24	20	8
7	Change in planting and harvesting dates	87	72.5	2
8	Use of irrigation	7	5.8	10
9	Making ridges across slopes in the farm to prevent	68	56.7	5
10	Adoption of crop rotation	75	62.5	4

Source Field survey 2021

As indicated in Table 3, indigenous agricultural practices that crop farmers adopted for mitigation and adaptation to climate change include: shifting cultivation (94.2%), change of planting and harvesting dates (72.5%), bush fallowing (65%), crop rotation (62.5%), making of ridges across slopes to prevent erosion (56.7%), use of mulching to conserve soil water (45.8%) and planting of cover crops to improve soil water retention 39.2%). The implication of this result is that the farmers adopted a variety of indigenous climate change coping strategies to guide against climate risk on their crop production in the study area. The result is in consonance with the findings of (Chidiebere-Mark, *et al.* 2018; Akintonde, Luwasa & Purnamita (2016) and Ike and Ezeafulukwe 2015) who identified adjustment of planting dates, mulching, mixed farming and cover cropping among other as some of the local coping strategies adopted by farmers in climate change risk. Most farmers in the area of study did not use application of manure, use of irrigation and planting of economic trees. It should be noted that Nigeria is particularly vulnerable to climate change because of its over-dependence on rain-fed agriculture (Gezu and Moges 2018). Only 5.8% of the farmers adopted the use of irrigation. The use of irrigation is not indigenous to farmers in the area

of study. The low adoption of irrigation may be because it is capital intensive and most farmers are resource poor.

Constraints in Farmers' Use of Indigenous Practices in Adapting and Mitigation of Climate Change

Constraints in Farmers' Use of Indigenous Practices in Adapting and Mitigation of Climate Change is presented in Table 4.

Table 4: Constraints in Farmers' Use of Indigenous Practices in Adapting and Mitigation of Climate Change in the study area

S/N	Constraints	Mean score	Rank
1	Inadequate land for cultivation which makes bush fallowing impossible	2.51	1
2	Widespread illiteracy among farmers	1.07	10
3	Flood and erosion occasioned by climate change	2.24	4
4	Unpredictable changes in climate that makes planning of planting and harvesting difficult	2.25	3
5	Excessive sunlight	2.15	5
6	Excessive rainfall	2.14	6
7	Poor Agricultural Extension service delivery	2.32	2
8	Lack of Government's support to farmers in mitigating climate change	1.93	7
9	Over-emphasis on scientific knowledge as the only panacea to climate change mitigation	1.68	8
10	Condemnation of indigenous knowledge as crude and ineffective means of mitigating climate change	1.35	9
11	Inadequate information to fanners on climate change	1	12
12	High cost of irrigation technology	1.03	11

Source: Field Survey 2021

*Mean $\geq$ 2.0 is a serious constraint

The results of data analysis presented in Table 4 indicates that the more serious constraints that most farmers face in using indigenous farming practices for mitigating climate change relates to the issue of inadequate land (mean 2.51) for cultivation. This may be attributed to land ownership system, poverty level as well as high population growth, which makes the adoption of shifting cultivation or bush fallow(allows the land to recover from long period of use) impossible. Umunakwe *et al.* (2015); Onubuogu & Esiobu (2014) also identified inadequate land as one of the major constraints that debarred the farmers in their study area from adopting indigenous farming practices for climate change adaptation and mitigation. Another serious constraint is poor agricultural extension delivery (mean 2.32). The role of agricultural extension in adoption of any climate change coping strategy is key since they are change agents and are supposed to relate agro- meteorological information to farmers to enable them make informed decision on when and how to adjust in their agricultural practices as a result of changing climate. Climate change demands new approaches, attitude and farm practice in order to adapt to the new conditions (Okorie, *et al* 2020). Unpredictable changes in climate that make planning of planting and harvesting dates difficult with mean 2.26, excessive rainfall, flood and erosion (mean 2.24) and excessive sunlight and heat (mean 2,15) were also found to be limiting factors to the sampled farmers in the use of indigenous practices for climate change adoption in the study area.

CONCLUSION

The study has shown that most farmers were aware of climate change but the media (Radio and Television) were their major source of information. Shifting cultivation, change of planting and harvesting dates, bush fallowing, crop rotation, use of mulching and planting of cover crops were the indigenous agricultural practices used by farmers in the study area for adaptation and mitigation of climate change. Constraints faced by farmers include inadequate land for cultivation, poor agricultural extension delivery and excessive sunlight, heat, rainfall, flood and erosion.

RECOMMENDATIONS

In view of the findings of this study, it was recommended:

1. That the Agricultural Extension Service be made more responsive to climate change information-needs of farmers. Vigorous enlightenment campaigns with comprehensive information content on agricultural practices that are most effective adaptation and mitigation of climate change should be mounted in the study area.
2. Development Experts and Scientists should integrate indigenous knowledge into the body of scientific knowledge of climate change adaptation and mitigation for effective and efficient results for more effective and efficient results.
3. The government should increase access to land for genuine farmers. Land that are lying fallow across the States may be allocated to farmers who are ready to use them for productive purposes.

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TECHNICAL EFFICIENCY OF POULTRY FARMERS IN PORT HARCOURT AND OBIO/AKPO MUNICIPAL COUNCIL AREAS OF RIVERS STATE, NIGERIA

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ABSTRACT

This study examined the technical efficiency and inefficiency of the poultry industry in Obio Akpo and Port Harcourt municipal council Areas of Rivers State. Specifically, it also evaluated the socio-economic characteristics of the farmers which may be a determining factor in their levels of technical efficiencies or inefficiencies. Data were collected from 50 sampled poultry farms (layers and broilers respectively) with the aid of structured questionnaire and multistage random sampling technique. The data were analysed using descriptive statistics, stochastic frontier production function and the maximum likelihood estimates. The study revealed the industry was male dominated with the active labour force largely represented. The respondents were significantly literate and household size suggests family labour was well supplied. Returns to scale was >1 in all the enterprises. The estimate of sigma squared for layer enterprises was 0.4180 and statistically not significant at 1% probability while that of broilers at 0.0976 was significant. The gamma estimate for layers and broiler enterprises were 0.8471 and 0.0238 respectively and show that the unexplained variations in output in the various enterprises are the major sources of error. Determinants of technical inefficiencies in the two enterprises studied produced mixed results that may need further evaluation.

Key words: Technical efficiency, technical inefficiency, poultry, layers, broilers

INTRODUCTION

Poultry production is of significant importance in our cultural values and menus and rearing them remains a major livestock activity in Nigeria. It is profitable and a means of poverty alleviation (Pakage, Hartono, farani, Z & Nugroho, 2015; Nchinda & Thieme, 2012). Poultry keeping has evident advantages over other forms of livestock keeping because it is a good converter of feed to protein, production cost per unit comparatively is low, a high return to investment if management is efficient and it has a short production period. However, poor performances recorded in some poultry farms have been attributed to inefficiency in inputs uses. This was assumed after considering the technical efficiency of some poultry farms by some researchers. Pakage et al (2015) in their study agree with the findings of Nchinda et al (2012) in Haiti that found that poultry production was economically profitable especially at the family level. However, the efficiency of resource use was not adequately considered. Hence, a major objective of this study is the determination of the technical efficiency of the poultry industry in the study Area.

For small scale poultry production to grow sustainably, the technical efficiency and productivity must be enhanced. However, there is limited verifiable information about the level of technical efficiency of the poultry industry in Nigeria; they assert that there is no available study on the technical efficiency of small scale poultry in Nigeria as at 2006 believing previous studies on technical efficiency in the Nigerian Agricultural sector focused on calculating simple ratio

measures like labour, capital, feed efficiencies, etc which they think can be misleading, because each of these measures only considers a given input in isolation. In the words of Carvalho, Zilli., Mendes., Morello & Bonamigo (2015), the technical efficiency of a farmer can be determined by comparing his production inputs to output with those of his contemporaries. When a farmer uses more inputs for a determined production level compared to other farmers, he is assumed inefficient.

Productive (technical) efficiency is the capacity to increase output with given resources and technology. It is a comparative measure between obtainable output and a possible maximum output on the production frontier. The possible maximum of each economic unit in use is the value estimated from the frontier function. If obtainable output of the given economic unit is below the possible maximum, it means the production process of the economic unit is inefficient. Farrell (1957) divides efficiency into two features: technical efficiency and allocative efficiency (Elsevier, 2018). The concept of efficiency also evaluates the relative performance of the processes used in transforming a given amount of inputs into outputs.

The major reason in measuring the technical efficiency in production is to ascertain the responsiveness of the resulting output to different inputs. Variations in the responses may be due to differences in production technology used by firms, efficiency in production processes and context in which production takes place. Juan and Iglesias (2013) also corroborates this idea and thinks the very reason in measuring the efficiency of production processes is to ascertain the level of responsiveness of the yields (output) or profit to different levels of input(s) applications noting that variations if any in responsiveness of output or profit to input applications that may be different from the norm may be due to differences in technology that is used by firms in the industry (Juan & Iglesias, 2013). Consequently, economic efficiency can be linked as a function of technical efficiency.

Several empirical studies on poultry production in Rivers State focused largely on constraints, economic analysis or profitability. Some researchers have used the ordinary least squares (OLS) estimation techniques only in their assessments. The use of the ordinary least squares (OLS) in estimation makes it difficult in determining farm level efficiency because it seems to provide only an average function, despite been consistent estimate of the parameters. To overcome this limitation, the stochastic frontier function was developed and used by many researchers to estimate efficiency in agricultural production. This has the ability to assess the inefficiency of individual farmers as well in a sample because it does not attribute all deviation to efficiency difference (Ohajianya., Mgbada., Onuh., Henri-Ukoha., Ben-Chendo & Godson-Ibeji,, 2013). The poultry industry in the Niger Delta where the study Area focused is seen by many scholars to be technically inefficient. Survey suggests a poor performance or technical inefficiency of the industry with inputs use. In another study, the evidence advanced by Pakage et al(2015) on economic efficiency aligns with the findings of Nchinda et al(2012) in Haiti that points to small scale poultry ventures been economically profitable but did not however study the efficiency in resources use. The broad objective of this study therefore is to evaluate the the technical efficiency levels of the small scale poultry industry in Port Harcourt and Obio/Akpo municipal council Areas; prominent towns in the Niger Delta.

Evidences suggest that a critical issue in poultry production in the study Area is case of low production and production inefficiency in resource utilization. This has adversely affected the production chain. Amanze (2017) and Ezeh, Anyiro and Chukwu (2012), in alignment with other researchers' opinions believe that increases in all livestock production in Nigeria depends largely

on expansion rather than higher productivity of resources which is evident in several farm firms the study Area. This implies inadequacy in the production and supply chain; therefore, there is the need to provide poultry farmers needed information to sustain the poultry industry in Nigeria.

Specifically therefore, the study evaluated the poultry industry production functions to determine the levels of technical efficiencies and inefficiencies. This is necessary because the poultry production capacity of farms has to increase rapidly to cope with the increasing demand for poultry meat due to population increases. It should be noted that presently, there are limited up-to-date information on productivity, efficiency levels, or related performances of the sector.

METHODOLOGY

The research was conducted in Rivers State in the south-south geopolitical zone of Nigeria. By geographical positioning, it is bounded in the north by Imo, Abia and Anambra; in the east by Akwa Ibom State; the south by the sea and the West by Bayelsa and Delta States. The capital city is Port Harcourt and, Obio/Akpor the largest industrial hub of the South-south geopolitical zone where the study took place. Rivers state lies at latitude 4°45 and 4°.87 north and longitude 6°50 and 6°.93 east covering an area of 10,432.3 sq km. The State has a population of 5,198,716 (census figures) and a population density of 468 people per square kilometer (Inemesit, 2013).

The target population of the research were the broiler and layers poultry farmers. Relevant and necessary information were gathered using a personal interviews and questionnaire administration. The questionnaire was divided into two sections. One was designed to capture the processors personal data; the other use of inputs. Arithmetic expressions, mathematical and econometric tools were used to capture some of the specific objectives of the study. The Stochastic Frontier Production Function (SFPF) was used in analyzing the technical efficiency of the farmers.

The production technology of the poultry farmers in Obio/Akpor and Port Harcourt Local government Areas was specified by the frontier production function as:

$1.In Y = \beta 0 + \beta 1 \ln X_1 + \beta 2 \ln X_2 + \beta 3 \log X_3 ..... \beta n \ln X_{n + (Vi-Ui)}$

Where ln= Natural logarithm.

Y = Numeric number of broilers (and layers as the case may be) within the production period

2.X_1= stock size

3.X_2 = quantity of feed (kg)

4. X_3 = labour

β_0 = constant term

$\beta 1 - \beta n$ = Regression Coefficients (parameters to be estimated)

Vi = random error term/variable which is assumed to be identically and independently distributed normal mean of zero and independent of Ui

Ui = Non-negative random variable which is assumed to account for technical inefficiency of the farm

RESULTS AND DISCUSSION

Socio-economic characteristics of the poultry farmers

Table1 shows the frequency distribution of respondents according to their socio-economic characteristics and discussed according to plausible effects on technical efficiency.

Table1: Descriptive Statistics of Socio-Economic Characteristics of poultry farmers (Layers n= 52, Broilers n=50)

Variables	Layer Frequency	Layer Percentage	Layer Mean (X)	Broiler Frequency	Broiler Percentage	Broiler Mean (X)
Sex						
Male	29	55.8		18	36.0	
Female	23	44.2		32	64.0	
Marital status						
Single	24	46.2		27	54.0	
Married	25	48.1		21	42.0	
Divorced	2	3.8		1	2.0	
Widowed	1	1.9		1	2.0	
Age						
<20	2	3.8		2	4.0	
21-30	21	40.4		28	56.0	
31-40	17	32.7		14	28.0	
41-50	10	19.2		4	8.0	
51-60	1	1.9		2	4.0	
> 60	1	1.9	32			31
Educational Status						
No formal	1	1.9		0	0	
Primary	4	7.7		2	4.0	
Secondary	16	30.8		14	28.0	
Tertiary	32	59.6	14 year	34	68.0	14 years
Occupation						
Farmer	20	38.5		16	32.0	
Trader	2	3.8		2	4.0	
Civil Servant	16	30.8		8	16.0	
Artisans	4	7.7		6	12.0	
Students	10	19.2		18	36.0	
Household size						
1-5	28	53.8		36	72.0	
6-10	21	40.4		11	22.0	
11and above	3	5.8	6	3	6.0	5
Experience						
1-5 years	42	80.8		41	82.0	
6-10 years	9	17.3		7	14.0	
11-15 years	-	-		1	2.0	
16- 20 years	1	1.9	4 years	1	2.0	3 years

Source: Field survey, 2020

The study revealed that gender roles and enterprise ownership in the layers industry in Obio/Akpor and Port Harcourt municipal council Areas of Rivers State is dominated by the males(55.8% for the males and 44.2% for the females) and the broilers by the females(64% for the females and 36% for the males). The reason for this result was outside the purview of the study. For food security to be attained, the participation of both genders must be encouraged. The role of women in agriculture over the years has gotten government attention because of the incidences of gender biases in the Nigerian agriculture policies. Idemezue and Odia(2021)

aligning with the views of Mohammed and Abdulquadri(2012) suggest that to enhance and encourage women to participate significantly in agriculture, policies should be formulated to support women oriented programmes such as 'Women in Agriculture' (WIA) in some of the federating states. This aims at eliminating the evident gender biases in agricultural activities.

Both the married (48.1) and the single (46.2) were well represented in the industry. With this level of statistical distribution, the supply of labour will be available with the attendant economic gains all things being equal.

Age has always been an important factor and determinant in production efficiencies. In economic research, age has been a great determining factor in productivity considerations because older persons are less productive and individual job performances functionally(efficiencies) decreases from the age of 50 years (Supan & Weis, 2016; Vegard, 2003). The age profile of poultry farmers evaluated its distribution among the poultry farmers in the study Area. Persons below 20 years and those below above 60years had a marginal presence in the industry judging from the questionnaires filled and returned. The labour force (those within the age of 20-50) made up over 90% of the participants. With the quality of labour force (active group), concern should be on the extent of technical efficiency and productivity of the farms which is dependent on variables such as quality of education, technology level and resource use.

Obike et al (2016) in agreement with the assumptions of Miller (2007) has reported on the importance of education on productivity and hence efficiency. The later has also noted that education can enhance management performances that are necessary for growth and increases in productivity in a firm and consequently, can impact technical efficiency. From the survey about 90% of the respondents had basic education. Educational (human capital development) is a very important determinant of growth in an economy. It can increase cognitive development, efficiency, productivity, competences and skills.

Household size is an important aspect of subsistence agriculture in developing economies with respect to cheap labour supply. A pattern in the study suggests the bulk of labour supply was from the family. This may reduce monetary cost but, may also impact domestic consumption of the farm produce. A large household may induce reasonable pressure on the farms' economy and food demands from the farm especially in small scale ventures. Also, competencies may be compromised because the supplied labour is deemed cheap, this may affect efficiency level. Moreover, the quantity of labour in these farms suggests they are cottage establishments. Nwakeze(2005) in alignment with Obi(2015) assumptions noted that enterprises whose total cost (including working capital but excluding cost of land), not more than ₦l million, with a labour size of not more than 10 workers is a cottage enterprise. This will definitely affect the prospect of reaping the benefits of economies of scale.

Technical Efficiency Measures of Poultry Enterprises in Khana Local Government Area of Rivers State.

Output elasticity measures the extent of change in output resulting given unit change in input. The exponents' Z and β in the analysis represent the Marginal Physical output in the various products. This section evaluated the responses of inputs in both the layers and broilers enterprises in the study Area. The results obtained from the analysis for both the broiler and layers farmers from the study Area is shown by the Ordinary Least Squares (OLS) and the Maximum Likelihood Estimate (MLE) for layer and broiler production and presented in Table 3 and 4 respectively. The coefficients represent percentage changes in the dependent variables in response to unit changes in the independent (or explanatory) variables.

Estimated Production Function Result for Layers and Broilers Farmers

The Estimated Production Function Result for Layers and Broilers Farmers is presented in Table 2.

Table 2: Estimated Production Function for Layer Farmers

		OLS Estimate		ML Estimate	
Variables	**Parameters**	**Coefficient**	**t- ratio**	**Coefficient**	**t- ratio**
Constant	(β_0)	-2.6169	-4.3223***	-2.6379	-5.1733***
Feed	(β_1)	-0.0670	-0.6612	-0.0700	-0.7978
Stock Size	(β_2)	0.7930	9.3872***	0.8150	9.6796***
Labour	(β_3)	0.2782	2.3190**	0.3333	3.2648***
Inefficiency factors					
Constant	(Z_0)			-1.7278	-0.1398
Sex	(Z_1)			0.2994	0.1571
Marital Status	(Z_2)			0.5519	0.2578
Age	(Z_3)			-0.0766	-0.4132
Education	(Z_4)			-0.5359	-0.3883
Household	(Z_5)			0.3841	0.3542
Experience	(Z_6)			0.1115	0.2960
Diagnostic Statistics					
Sigma-Squared (δ^2s)				0.4180	0.4268*
Gamma (γ)				0.8471	2.3876**
Log Likelihood function				-11.1945	
LR Test				9.0614	
Mean T. E				0.8527	
RETURNS TO SCALE				1.08	

Source: Field survey, 2020

*Figures in parenthesis are t-ratio; *** = significant at 1%, **= significant at 5% and *=significant at 10%. Returns to scale:>1 = increasing returns, < = decreasing returns, 0 = constant returns*

Table3: Estimated Production Function for broiler Farmers

		OLS Estimate		ML Estimate	
Variables	**Parameters**	**Coefficient**	**t- ratio**	**Coefficient**	**t- ratio**
Constant	(β_0)	1.8207	2.8561**	1.7461	3.0183***
Feed	(β_1)	-0.1386	-1.5776	-0.1271	-1.3953
Stock Size	(β_2)	1.0346	13.1652***	1.0574	14.4716***
Labour	(β_3)	-0.1136	-1.1252	-0.0633	-0.6372
Inefficiency factors					
Constant	(Z_0)			1.7022	1.6135
Sex	(Z_1)			0.0506	0.2420
Marital Status	(Z_2)			-0.3165	-1.5011
Age	(Z_3)			0.4062	1.0483

Education	(Z_4)	-0.0435	-1.0197
Household	(Z_5)	-0.1689	-0.8492
Experience	(Z_6)	-0.0532	-1.4746
Diagnostic Statistics			
Sigma-Squared (δ^2s)		0.0976	5.4844***
Gamma (γ)		-0.0238	0.1377
Log Likelihood function		-14.4680	
LR Test			
Mean T. E		0.8553	
RETURNS TO SCALE		0.87	

Source: Field survey, 2020

*Figures in parenthesis are t-ratio; *** = significant at 1%, **= significant at 5% and *=significant at 10%*

The layers farmers had an estimate of 0.4180 sigma squared and not statistically significant, while that of the broilers at 0.0976 is significant at 1% probability giving credibility to goodness of fit and validity of the composite error term. The gamma estimates for layer and broilers were 0.8471 and 0.0238 respectively which implies that the unexplained variations in the output of layers and broilers are largely the sources of random error. By simple explanation, 84.7% and 2.3% of the variations in layers and broilers output among the poultry farmers caused by differences in their levels of technical efficiencies or inefficiencies of the farmers while 15.3% and 97.7% may be due to random effects.

Feed intakes coefficients in both layer and broiler enterprises estimated at -0.0700 and -0.1271 respectively are both negative and not significant statistically implying that for each unit increase in feed intake, output will decrease by 0.0700% in egg producing farms and 0.1271% in weight loss in layers farms holding other variables constant, suggesting feed waste. This may be impacting efficiency especially allocative and economic efficiencies. The farmers evidently are operating in stage three of a production function graph with respect to feed application.

Stock size coefficients for both layers and broilers enterprises were all positive and significant at a probability of 1% (0.8150 and 1.0574) respectively. This implies that output of egg will increase by 0.8150 units and broilers by 1.0574 units for every unit increase in stock size holding other variables constant. This agrees with the findings of (Ohajianya, Mgbada, Onu, Enyia, Henri-Ukoha, Ben-Chendo & Godson-Ibeji, 2013).

Labour with a coefficient of 0.3333 was significant at 1% probability for layers. This however contradicts Musa, Ahmed, Bello, Manza and Idris (2018) results who reported a negative and significant influence of labour. On the other hand, broilers had a negative coefficient of -0.6372 with a negative showing an inverse relationship between output and labour and implies that output of broiler will decrease by 0.6372% for every unit increase in labour. This suggests an over utilization of labour or an outright misallocation. This result aligns with those of Amanze (2017) in agreement with the views of Ezeh, Anyiro and Chukwu (2012) on the technical efficiency of broiler producing enterprises in Umuahia, Abia State.

Njinda and Thieme (2013) have in a related study in the Niger-Delta states of Nigeria stated that technical efficiency ranges between 0.09 and 0.63 in the region with a mean of 0.22, suggesting

that an average poultry farmer in the region is 22% efficient. This points to a high level of inefficiency in resources use. This study however shows a significant improvement in technical efficiency in the poultry industry in Khana Local Government Area of Rivers State(85%), a subset of the Niger Delta. The reasons for this jump in efficiency level are outside the purview of this study.

Determinants of Technical efficiency of Layer and Broiler Enterprises

Determinants of technical inefficiency as shown above suggest that the estimated coefficients in the inefficiency model had reasonable effects on the technical efficiency of the poultry farmers. The coefficient of gender for both enterprises were positive (0.2994 and 0.0506) however, were not significant at any level of probability implying that gender had some impacts on technical inefficiency decreasing technical efficiency by 0.2994% and 0.0506% respectively in the various enterprises.

Coefficients of marital status varied in both enterprises, Layer farmers had positive coefficient at 0.5519 but not significant implying a negative effect on technical efficiency. This suggests technical inefficiency increase by 0.5519 percent. In broiler farms its coefficient was negative at -0.3165 however not significant implying a positive effect of technical efficiency and negative on technical inefficiency. The reasons for this are outside the purview of this study. In layers enterprises, age was negative (-0.0766) however not significant implying that as age of layers rearing farmers increased, technical inefficiency decreased. Broiler enterprises had a positive coefficient of 0.4062 though statistically not significant at 1%, 5% and 10% probability level. This suggests that as the age of broiler farmers increased technical inefficiency increased also and decreased technical efficiency by 0.4062 percent. This agrees with the result of Tanko and Aji (2014).

Education for both enterprises had negative coefficients of -0.5359 and -0.0435 however not statistically significant. This suggests education decreased technical inefficiency of the farmers, increasing the efficiency by 0.5359 percent and 0.0435 percent respectively. Education encourages the adoption of innovations, use of modern technology.

On the other hand, household size had a positive coefficient for layer enterprises and negative for broiler enterprises, however were not significant at 1%, 5% or 10% probability level. This suggests household size decreased technical inefficiency in broiler production (-0.1689) and increase technical inefficiency in layer enterprise respectively (0.3841). This differs from the reports of (Ezeh, Anyiro & Chukwu, 2012)

Farming experience also had mixed outcomes (positive for layers enterprises and negative for broiler enterprises) however not significant at 1%, 5% or 10% probability level. This suggests that experience in layer enterprises increased technical inefficiency and decreased technical efficiency by 0.1115percent in layer enterprises. Why this out occurred is outside the purview of the study. The result also shows that broiler enterprises farmers' experiences had a negative influence on technical inefficiency (-0.0532). This is in agreement with the results obtained by (Jimmy, 2016).

CONCLUSION

The poultry industry in the study Area has a good representation of the genders that are literate enough to participate in the industry. The study shows an increasing return to scale which suggests the industry is on the first stage of a graphical production function and still has good prospects for growth. Technical efficiency has a good outlook at this level of operation (basically a cottage

industry). There are cases of technical inefficiencies which can be tackled through the employment of extension agents to help build up further the efficiency levels of the farmers

RECOMMENDATIONS

The poultry industry in the study area primarily is a small scaled industry with positive economic promises from the regression models however;

1. There is the need for a scaling up of production to meet an eventual increase in the demand for poultry products.
2. The poultry farmers should be schooled in feed management and uses as the results indicate an inefficient application of feedstuff.
3. Quality upgrade is also suggested for the labour sector. The acquisition of skilled man power is highly advised as a low coefficient or negative regression result as observed may suggest an excessive application or inefficient application of labour.

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ASSESSMENT OF PARTICIPATION OF BENEFICIARIES IN COMMUNITY AND SOCIAL DEVELOPMENT PROJECTS (CSDP) IN IMO STATE, NIGERIA

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ABSTRACT
This paper assessed participation of beneficiaries in community and social development projects (CSDP) in Imo State, Nigeria. The specific objectives of the study were to examine the socioeconomic characteristics of community member beneficiaries, ascertain the stages of project development participation of community member beneficiaries in (CSDP), determine the level of participation, and of factors influencing participation of community member beneficiaries in CSDP in Imo State. Data were collected with validated questionnaire from 216 proportionately and randomly selected beneficiary community members in CSDP in Imo State. Data were analyzed using descriptive statistics such as mean, standard deviation, frequency distribution and percentages as well as Ordinary Least Squares (OLS) multiple regression models. Results show that mean level of education, mean age, monthly income, household size and number of community development projects participated in were 9.3years, 49years, ₦38268.52, 9 persons and 4 projects. The analysis of stage of project participation of community members gave 2.39 out of a maximum of 3 points which indicates that most of the community members sometimes participated in one stage or the other in community development project implementation. The mean level of participation of community members in CSDP projects was 2.20 out of 3 points. Factors influencing level of participation of community members in development projects were found to be payment of counterpart funds, release of fund by CSDP, Community. Cohesion and Managerial ability of members, level of monitoring and evaluation of projects, and perception of community members of project ownership. Community and Social Development Projects in Imo State are very successful in terms of participation by community member beneficiaries. There is need to attract development projects that community members would perceive the expected benefits so as to win their co-operation which will lead to high level of participation.

Keywords: Participation, Community development, Beneficiaries, Social Development projects.

INTRODUCTION
Development essentially is a continuous process of generating and efficiently allocating resources for achieving greater socially satisfying needs (Shugair & Abdel, 2015).
Community participation in development projects implies that aspiration, dreams, desires and expectation of the people (beneficiaries) must be taken into consideration in such project initiation, planning and implementation. According to Community, Social and Development Project CSDP Manual (2009), the CSDP is a World Bank sponsored programme in collaboration with the federal and some state government anchored on CDC approach. For this reason, the community members take the bulk of the decisions regarding the choice of projects to be executed in their community, manage and ensure their maintenance and sustainability. Most of government projects established in the communities in Imo State collapsed and were abandoned due to inadequate management, non-continuity, inconsistency, high social and environment costs, and non-participatory nature since they were carried out through top-down approach (Ofoh, 2008). The Community and Social Development Project (CSDP) was approved in July 2003, and became

operational on April 30, 2004, and it is aimed at enhancing the standard of living of the rural populace by empowering communities and the local governments to jointly plan, design, co-finance and implement priority development projects (CSDP, 2009). This was later changed to CSDP in 2010.

The Community Driven Development (CDD) approach, which is participatory and based on the paradigm shift of bottom-up, has to a large extent revolutionized the process of development in many countries, even in other projects funded by the World Bank in Nigeria gave rise to the design of CSDP by the World Bank. One of the cardinal points is to tackle development problems of the rural populace in some states in Nigeria, including Imo State, since meaningful community development can take place through the active participation of the people joined with technical assistance from government or other rural development agencies (Synder, 2004).

The CSDP in Imo State having operated for over two decades has not been assessed adequately to provide answers to the critical questions; what is the level of participation of community members in CSDP projects? What factors influence the level of participation of community members in CSDP projects. Policies aimed at promoting national economic competitiveness and state-run public investment programmes are essential but insufficient for poverty reduction. The level which CSDP offers the opportunity to fill the critical gap by achieving immediate and lasting results at the grass roots level is yet to be ascertained in Imo State.

The objectives of the study are to examine the socioeconomic characteristics of community members, ascertain the stages of community development projects participation, determine the level of participation, and factors influencing level of participation of community members in CSDP projects in Imo State.

METHODOLOGY

Imo State, the study area is one of the five states of the agro-ecological zones located in the South Eastern part of Nigeria. Administratively, Imo State is divided into three agricultural zones, namely; Okigwe, Owerri and Orlu zones and has 27 Local Government Areas (LGAs). Imo State derives its name from, Imo River, which takes its course from Okigwe/Awka upland. It lies within latitude 4^0 45^1N and 7^0 15^1N, and longitude 6^0 $5^0$1 E and 7^0 25^1 E. The state is bounded on the east by Abia State, on the west by Delta states and on the north by Anambra State, while Rivers State lies in the South. Imo State covers an area of about 5,100sqkm. (Ministry of lands and survey, Imo State 2009). Annual rainfall varies from 1.99mm to 2,200mm. (Ministry of lands and survey, Imo State 2009).

Temperatures are similar all over the state. The hottest months are January-March, with the mean annual temperature above 26^0C. harmattan lasts for about nine weeks (i.e. from late December to late February). (Ministry of lands and survey Imo State, 2009) Imo State has an average annual relative humidity of 75 percent which is highest during the rainy season, when it rises to about 90 percent. The high temperature and humidity experienced in the state is favourable for luxuriant plant growth; which provides the state with rich beautiful vegetation of the tropical rain forest.

The State has a population of 2,485, 499 persons (National Population Commission, 2006). The population density varies from 230 persons per sq.km in Oguta/Egbema area, to about 1,400 persons per sq.km in Mbaise, Orlu, Mbano and Mbaitoli areas. The state lies in the tropical rainforest agro-ecological zone, which allows divers agricultural production. Also presently many Community-Driven projects exist in Imo State.

A representative sample of the beneficiaries was selected from the local government areas (LGAs), communities and Community Project Monitory Committee (CPMC) where CSDP intervened in the state. A multistage stratified sampling procedure was adopted to select sample. The study area was stratified into the existing three agricultural zones. This is to ensure effective coverage and representation of communities that have benefited from CSDP projects. Two local government areas were randomly sampled from Owerri and okigwe agricultural zones while two local government areas in Orlu were purposively selected. There are only two LGAs involved in Orlu agricultural zone making a total of six local government areas. The list of communities in each LGA was compiled by the researcher with the assistance of key informants in the communities such as CPMC members, community leaders and operation officers of CSDP. From this sampling frame, three communities were randomly selected from each of the six selected local government areas, making a total of 18 communities.

Also two CPMC officials, chairman and secretaries of the CSDP projects were purposively selected as they are the executives of the projects. Then 10 beneficiaries were randomly selected from each community, making 12 from each community, giving a sample size of 216 respondents. The data for this study were generated from primary sources. Interview schedule and observation were used to gather information from the community members while the structured questionnaire was administered on the CPMC members to collect relevant data. Qualitative as well as quantitative analytical techniques were used for the analysis of the data. Simple descriptive statistics such as mean, standard deviation, percentage and frequency distribution and the Ordinary Least Squares regression model were used to analyze data. Multiple regression (OLS) technique were employed to test the hypothesis.

The multiple regression model is implicitly specified as follows;

$Y = f(X_1, X_2, X_3, X_4, X_5, X_6, X_7, e)$ …… eqtn 1

Where,

Y = level of participation of community members in CSDP Projects (measured as number of CSDP Project stages fully participated in)

X_1 = Payment of counterpart fund (dummy variable, 1 for prompt payment, zero if otherwise)

X_2 = Release of fund by CSDP (dummy variable, 1 for early release, zero if otherwise)

X_3 = Community cohesion (dummy variable, 1 if there is cohesion, zero If otherwise)

X_4 = Managerial ability of CPMC members (dummy variable, 1 for good; zero for poor)

X_5 = level of monitoring and evaluation (number of times monitored and evaluated)

X_6 = Perception of community members of project ownership (dummy variable, 1 for theirs, zero for not theirs)

X_7 = level of elite capture (Number of times the elites interfered)

e = error term

Four functional forms of the model were tried namely; linear, semi-log, double-log, and exponential. The lead equation was chosen based on statistical and econometric criteria such as value of the coefficient of multiple determinations (R^2), number of significant variables and conformity to a prior expectation.

RESULTS AND DISCUSSION

Socioeconomic characteristics of community member CSDP project beneficiaries

The socioeconomic characteristics of community member CSDP project beneficiaries us presented in Table 1.

Table 1: The socioeconomic characteristics of community member CSDP project beneficiaries

Socioeconomic characteristic	Mean	Standard Deviation	Minimum	Maximum
Age (years)	49	14	25	68
Level of Education (years)	9.3	2.5	0	19
Monthly Income (Naira)	38268.52	103216	9750	63298
Household Size (No of person)	9	2	2	14
CSDP projects participated in (No)	4	2	2	6

Source: Field survey (2020)

The table showed that the mean age (49 years), level of education (9.3 years), monthly income (N38268.52), household size (9 persons) and CSDP projects (4 projects) participated which indicates that the community members were at their active stages of life, literate, and large household sizes to supply the labour needed for participation in their community development projects.

Stages/Areas of Project Development Participation

The distribution of community members according to the stages/areas of project development participation is presented in Table 2.

Table 2 Distribution of community members by stages/areas of project development participation

Types of projects	Participation in initiating	Participation in organizing	Participation in executing
Identification of projects needs	6	94	116
	(2.8)	(43.5)	(53.7)
Planning for implementation	9	103	104
	(4.2)	(47.7)	(48.1)
Mobilization of resources	5	136	75
	(2.3)	(62.9)	(34.8)
Choice of projects sites	8	73	135
	(3.7)	(33.8)	(62.5)
Monitoring/Evaluation	3	64	149
	(1.4)	(29.6)	(69.0)
Implementation of Projects	5	71	140
	(2.3)	(32.9)	(64.8)
General decision making process	7	93	16
	(3.2)	(43.1)	(53.7)
Attendance of organization meetings	8	89	119
	(3.7)	(41.2)	(55.1)
Financial contribution	123	64	29
	(56.9)	(29.6)	(13.4)

Commitment of material resource,	(e.g. 12	85	119
Land)	(5.6)	(39.5)	(55.1)
	0	81	135
Commitment of time	(0.0)	(37.5)	(62.5)
	71	102	43
Commitment of talent	(32.9)	(47.2)	(19.9)
	10	57	149
Volunteering ideas/information	(4.6)	(26.4)	(69.0)
	5	83	128
Involvement in actual work	(2.3)	(38.4)	(59.3)
	8	93	115
Mobilization/motivation of others for	(3.7)	(43.1)	(53.2)
group work/influencing roles	94	89	33
Serve in project committee	(43.5)	(41.2)	(15.3)
Mean percentage responses	10.8	39.8	49.4
Stage of project participation	2.39 out of a Maximum of 3 Points		

Source: Field survey (2020); Figures in parentheses are percentages of responses

The stages were measured on a 3-point scale of initiation (1), organizing (2) and executing (3). It further shows that 56.9percent of the community members never participated in financial contribution stage of project development, while 62.9 percent of them sometimes participated in areas of mobilization of resources.

Also, 69 percent of the community members always participated in the areas of volunteering ideas/information in the study area. Results of mean percent responses show that 10.8 percent of the community members never participated in most stages of project development, while 39.8 percent of them sometimes participated in various stages of project implementation. Also, 15.3 percent of the community members always participated in various stages/areas of development project implementation in the study area. The analysis of stage of project participated of community members gave 2.39 out of a maximum of 3 points which indicates that most of the community members sometimes participated in one stage or the other in development project implementation in the area.

Level of participation of Community Members of CSDP

The level of participation of community members by their level of participation in CSDP is presented in Table 3.

Table 3 Distribution of community members by their level of participation in CSDP

Level of participation	**Frequency**	**Percentage**
0.5 - 0.9	8	3.7
1.0 – 1.4	16	7.4
1.5 – 1.9	26	12.0
2.0 – 2.4	51	23.6
2.5 and above	115	53.3
Total	**216**	**100**

Source: Field survey (2020); Mean level of participation = 2.2 out of 3 points

The level of participation of community members in CSDP was measured on a 3-point liker type scale of never (1), sometimes (2), and always (3) over the various stages of participation in CSDP projects. The average points per respondent represented the level of participation.

The distribution of community members by their levels of participation in CDSP projects is presented in Table 3. The table shows that 53.3 percent of the community members had levels of participation of 2.5 and above, followed by 23.6 percent of the community members that had levels of participation of 2.0 -2.4. Only 3.7 percent of the community members had levels of participation of 0.5 – 0.9.

The mean level of participation of community members in CSDP projects was 2.2 out of 3 points, which implies high level of participation of community members in CSDP projects in Imo State. The high level of participation of community members was as a result of use of CDD approach which puts the community members in the Driver's seat to direct the path of development projects in the study area.

Factors Influencing Level of Participation of Community Members of CSDP Projects.

Results of multiple regression analysis on the relationship between levels of participation of community members in CSDP projects and selected variables is presented in Table 4.

Table 4 Results of multiple regression analysis on the relationship between levels of participation of community members in CSDP projects and selected variables.

Explanatory variable	Linear function	Semi-log function	Doublelog function	Exponential function
Constant	397.012	285.365	213.066	187.592
Payment of counterpart fund	17.222	17.043	0.083	0.008
	(1.074)	(1.065)	(4.005)**	(3.667)**
Release of fund by	14.194	18.904	0.051	0.008
CSDP	(1.089)	(1.063)	(4.706)**	(1.174)
Community Cohesion	14.301	10.116	0.032	0.005
	(4.483)**	(3.068)**	(2.972)**	(3.769)**
Managerial ability of CPMC	15.031	13.521	0.069	0.009
members	(1.065)	(1.397)	(3.369)**	(1.164)
Level of monitoring and	19.205	14.083	0.074	0.009
evaluation	(1.065)	(1.046)	(4.391)**	(3.321)**
Perception of community	17.912	11.117	0.093	0.006
members of project ownership	(4.454)**	(1.039)	(4.399)**	(3.278)**
Level of elite capture	-16.452	-14.772	-0.074 -0.007	
	(-1.096)	(-1.341)	(-1.211)	(-1.353)
R^2	0.495	0.451	0.724	0.604
F-value	49.476**	29.014**	79.549**	45.406**
Sample size	216	216	216	216

Source: Field Survey (2020); Figures in parentheses are t-ratios

* Significant at 5 percentage level; ** Significant at 1 percentage level

To determine the factors influencing level of participation of community members in CSDP projects in Imo State, four functional forms of the ordinary least squares multiple regression model were fitted to the data generated from the field, and the results of analyses are presented in Table 4.

The table shows that the double-log function produced the highest value of coefficient of multiple determinations (R^2), highest number of significant variables and conformed to a *priori* expectations. The double-log function was therefore taken as the lead equation, and its results were used for discussion. The double –log function produced R^2 value of 0.724 which gave F – value of 79.549 that was significant at 1 percent level, indicating that the double-log function gave a good fit to the data. The value of R^2 was 0.724 which implies that about 72 percent of the variation in the level of participation of community members in CSDP projects was accounted for by the joint action of the independent variables included in the model.

The results show that the coefficients of payment of counterpart fund, release of fund by CSDP, community cohesion, managerial ability of CPMC members, level of monitoring and evaluation, and perception of community members of project ownership were positive and significant at 0.01 level, which implies that these variables are the important factors influencing level of participation of community members in CSDP projects in Imo State. The coefficient of level of elite capture was negative and not significant at 0.05 level, which implies that this variable is not an important factor influencing level of participation of community members in CSDP projects in Imo State.

The coefficient of payment of counterpart fund was positive and significant, which implies that prompt payment of counterpart fund will likely lead to high level of participation of community members in CSDP projects. The coefficient of release of funds by CSDP was positive and significant; indicating that early release of funds by CSDP will lead to high level of participation of community members in CSDP projects. The coefficient of community cohesion was positive and significant, implying that if there is cohesion in the community where there is CSDP project, the level of participation of community members is like to be high. The coefficient for managerial ability of CPMC members will likely lead to high of participation of community members in CSDP projects. The coefficient of level of monitoring and evaluation was positive and significant, implying that increase in the number of times projects are monitored and evaluated will likely lead to high level of participation of community member in CSDP projects. The coefficient of perception of community members, of project ownership was positive and significant, which implies that community members' perception of project as theirs leads to high level of participation of community members in CSDP projects in the study area.

CONCLUSION

CSDP projects in Imo State are very successful. They have been proved to be fast, of high quality, effective, sustainable and regularly maintained when compared to government-initiated projects.

RECOMMENDATION

There is need for improvement on this by encouraging the community members to participate more in development projects, through attracting development projects that would satisfy the immediate needs of the community members.

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TECHNICAL AND ALLOCATIVE EFFICIENCY IN CATFISH FARMING IN KHANA LOCAL GOVERNMENT AREAS OF RIVERS STATE, NIGERIA

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ABSTRACT
The cat fish in recent times has witnessed a very high demand in the food menu of the people of Rivers State as it is a condiment in different dishes. This elucidated the desire to carry out this research. The study evaluated the technical and allocative efficiency of catfish farmers in Khana Local Government Area of Rivers State, Nigeria. Approximately 80 catfish farmers were sampled using structured questionnaire. Descriptive statistic was used to assess their socio-economic variables which could influence the levels of efficiency in the business. the male gender were in the majority and the age bracket of 20-60 years largely made up the labour force and were literate, pond size however suggest it was largely a micro or cottage establishment characterized by low input and output and therefore suggests a marginal industry in the study Area. The frontier production function and the maximum likelihood estimate were used in evaluating the technical efficiency levels. The catfish farmers displayed reasonable technical and allocative inefficiencies in input uses which showed various levels of input over utilization and inelasticity. The variance parameter sigma square was 1.3333 and not significant at 1% probability. The quality of allocative efficiency observed may not encourage an expansionary policy without a comprehensive scale up of factors in the industry.
Key words: Catfish, technical efficiency, allocative efficiency, inefficiency factors

INTRODUCTION
According to Umar, Makinta and Kwatanda (2014) fish farming is the rearing of fish in controlled environments such as ponds and cages, tanks and irrigated canals, reservoirs etc. it is also seen as the growing of fish (of whatever specie) in manmade environments; fed, bred, and harvested in cultured enclosure. Over the years, the need to increase fish production has been front burner and a priority however without the necessary consideration to the particular type of production environment and regards to economic analysis of the method peculiar to it. A basic requirement in investment decision is to be knowledgeable on the best method of production, which will give optimum profit to resource use. However, optimum profit to resource use will depend on the level of efficiency in resource use.

Umar., Makinta and Kwatanda (2014) believes the tasks of bridging the gap between demand and supply in fish production and consumption is enormous and the target of increasing the animal protein supply in the nation can only be attained through improved productivity and efficiency in farm resource use since most researchers believe farmers are not making efficient use of available resources. Efficiency in the combination of inputs to optimize output is a necessary farm management skill. However, many researchers have not critically examined the efficiency levels of the different management systems in fish farming in order to ascertain the most efficient and economic method in most developing countries. If aquaculture will play the expected role in ensuring adequate fish supply, the sector has to develop in an economic and sustainable manner. Umar et al (2014) stated that there are rising interests in the measurement of technical efficiency in the fisheries sector because it is necessary to identify the underlying factors impacting efficiency and measure the effects of management on technical efficiency and output. Fish

farmers they think can improve on technical efficiency by minimizing the use of certain inputs or increasing others.

Referring to Farrel (1957), Kizito and Molango (2015) defined the efficiency of a farm to consist of technical and allocative efficiencies: the two components it was pointed out combine to give a measure of economic efficiency. Efficiency in farm production should ensure that products are produced in a most profitable way with respect to the given level of output using minimum possible amount of inputs under a given technology. Economic considerations will feature prominently in the choice of production methods with considerations on their potential for economic returns and efficiency. Technical efficiency addresses the of use of given resources to maximum advantage. Production efficiency is the choosing of different combinations of inputs to achieve the maximum benefit for a given cost; and, allocative efficiency is the achieving of the right mixture of output value to input prices to maximise benefit. However, production efficiency implies technical efficiency and allocative efficiency implies production efficiency. In the face of limited resources, the adoption of production efficiency will eliminate inefficiency at minimum cost

Despite the present contributions of catfish farms to the Nigerian economy and food menu, low returns and production inefficiency may be impacting output which seems inadequate considering domestic demand. This inadequacy may be responsible for the high prices of fish and its products. Alawode and Jinad (2014) have opined that huge investments will be needed to raise production to desirable levels and economic considerations will be necessary in the selection of an appropriate aquaculture production system which will include potential for economic returns, economic efficiency and the farmers access to operating capital.

Limited studies have been conducted on the technical and allocative efficiencies in catfish production in Khana Local Government Area of Rivers State. Most of the studies so far considered catfish marketing, economic determinants of efficiency and profitability in terms of income in catfish production. Few tried to find out whether the output was optimal and; moreover, much emphasis was laid on production technology rather than on economic optimization. It is a common belief that efficiency in combining inputs to produce output is a primary task in farm management and firms using the same inputs and the same technology, yet producing different levels of output suggest one is producing inefficiently. Technical efficiency he pointed indicates a producer's ability to attain maximum output from given inputs and existing technology. Increasing technical and allocative efficiency in resource use at the farm level is a pre-requisite for sustainable aquaculture. These variations are common in the catfish industry.

METHODOLOGY

The study was conducted in Rivers State. Rivers State is one of the components of the six states that make up the south-south geopolitical zone of Nigeria. Rivers state is bounded in the north by Imo, Abia and Anambra; in the east by Akwa Ibom State; in the south by the Atlantic Ocean and, the West by Bayelsa and Delta States. Port Harcourt is the capital city. The state is located at latitude 4°45 and 4.87° north and longitude 6°50 and 6.93° east with an area of 10,432.3 sq km and population of 5,198,716 (census figures) with population density of 468 people per square kilometre (Inemesit, 2013).

The population of the study was the entire catfish farmers in Khana Local Government Area of Rivers State. Eighty local catfish farmers were selected from the study. Primary data were used and data were collected using structured questionnaire. Descriptive statistics was used to evaluate the socio-economic variables of the farmers while the Stochastic Frontier Production Function

(SFPF) and Maximum likelihood estimate were used to analyze the technical efficiency of the catfish farmers.

The production technology of the farmers in the study Area was specified by the stochastic frontier production function which is specified as.

$$InY = \beta 0 + \beta 1 \ln X_1 + \beta 2 \ln X_2 + \beta 3 \log X_3 ..... \beta n \ln X_{n + (Vi-Ui)} \quad .....1$$

Where ln= Natural logarithm.

Y = weight of catfish in KG

X_1= stock size

X_2 = quantity of feed (kg)

X_3 = labour

β_0 = constant term

$\beta 1 - \beta n$ = Regression Coefficients (parameters to be estimated)

Vi = random error term/variable which is assumed to be identically and independently distributed normal mean of zero and independent of Ui

Ui = Non-negative random variable which is assumed to account for technical inefficiency of the farm

Allocative efficiency was analysed using simple production function. The allocative efficiency is represented by MVPxn = Pxn or $Py\left(\frac{\partial y}{\partial xn}\right) = Pxn(MFC)$. This is also written as PyΔY = PxnΔXn = $\frac{\Delta y}{\Delta xn}$ = Pxn/Py. …….. 2

Where:

MVPx = Marginal value product of any of the Xs

Pxn = Marginal factor cost (of any of the Xs)

n = the number of the variables

RESULTS AND DISCUSSION

Socio-Economic Characteristics of Catfish farmers

Table 1 shows the distribution of Catfish farmers according to their socio-economic characteristics.

Table 1: **Socio-Economic Characteristics of Catfish farmers in the study area**

Variables	Frequency	Percentage	Mean (X)
Sex			
Male	54	67.5	
Female	26	32.5	
Marital status			
Single	19	23.8	
Married	61	76.2	
Age(yrs)			
20-30	7	8.9	
31-40	28	35.3	
41-50	30	37.7	
51-60	13	16.3	
> 60	2	2.6	43
Educational status			
Primary	2	2.5	

Secondary	30	37.5	
Tertiary	48	60	
Household size			
1-3	32	40	
4-6	29	36.3	
7-9	17	21.3	
10 and above	2	2.5	2
Pond size in m^2			
1-30	74	92.5	
31-60	0	0	
61-90	2	2.5	
91-120	2	2.5	
121-150	2	2.5	

Source: Field survey, 2020

The survey shows that gender roles and ownership pattern in catfish farming in Khana council Area of Rivers State has minimal attraction for the females. Mohammad and Abdulquadri (2012) in agreement with the findings of Idemezue et al (2021) has stated that the role of women in agriculture and allied sectors over the years has attracted the attention of government which has led to considerable researches on gender biases in the Nigerian agriculture. This has informed policy formulations and programmes, including 'Women in Agriculture' (WIA) units in some states of the federation. the elimination of the perceived gender bias in catfish production in the study Area must be tackled to maximize productivity in the sector because women constitute the larger population of farmers in the state.

The age profile of respondents provided information on the age variations in the catfish producing farmers in Khana council Area. Persons below 20 years of age did not feature and those above 60 years had a marginal presence in the business from the questionnaires filled and returned. The age group within the labour force (especially those within the age of 20-50) featured prominently in the trade constituting more than 70% of the respondents. Supan and Weis (2016) re-enforcing the views of Vegard (2003) aligns with the assumption that age profiles is of great importance in economic research, since older persons are functionally less productive and individual job performances(efficiencies) decreases from the age of 50 years. With the labour force within the very active group, concern should be on stepping up the technical efficiency and productivity of the farms which is determined by several variables such as education, technology and resource use.

The survey shows the catfish industry in the study Area is dominated by the married, posting a 76.2% presence. With a greater proportion of catfish farmers in study Area being married the supply of cheap family labour will be available with the attendant economic gains all things being equal. Judging from the survey a large population of catfish farmers had basic education. Obike., Ida. and Aigbokie, (2016) in tandem with Miller (2007) points to education enhancing management performances and necessary for growth and productivity in a firm and can impact efficiency and productivity. Educational attainment an aspect of human capital development is a very important determinant of growth in any economy. It enhances cognitive development, impacts efficiency and productivity, competences, skills and competitiveness.

Household size has always been of economic importance especially in subsistence agriculture in developing nations in terms of cheap labour supply and the study suggests the bulk of labour

supply was from the family. With an average of two persons per family, labour may not be a serious constraint in these basically cottage farms. However, a very large household may induce significant pressure on the farms' economy and food demands from the farm produce especially in small scale ventures and impact efficiency levels. Moreover, the labour force size of these farms suggests they are cottage establishments. Obi (2015) is in agreement with the views of Nwakeze (2005) on small scale enterprises who believes that enterprises whose total cost (including working capital but excluding cost of land) not more than ₦l million, with a labour size of not more than 10 workers is a cottage enterprise.

With over 92% of catfish farmers having a pond size of between 1-30m^2, output is bound to be small and suggests a small scale or cottage venture. The economic implication of a cottage venture is limited supply to the market and opportunity for growth or expansion without external monetary injections. A sudden increase in demand may induce inflationary effects as a consequence. Small scale industries suffer production limitations and may not compete effectively or adopt capital intensive innovative production systems when the need arises.

Technical efficiency profile of catfish farmers in Khana Local Government Area of Rivers State

The results of the technical efficiency profile analysis are shown in Table 1.

Table 1: Technical efficiency profile of catfish farmers in Khana Local Government Area of Rivers State

		OLS Estimate		ML Estimate	
Variables	**Parameters**	**Coefficient**	**t- ratio**	**Coefficient**	**t- ratio**
Constant	(β_0)	5.3746	2.3152	4.5137	0.1892
Stock size	(β_1)	0.5865	1.0095	1.5738	2.9600
Labour	(β_3)	1.1692	5.7094	1.2054	0.15590
Feed	(β_4)	0.2273	0.5485	0.5770	0.0698
Inefficiency factors					
Constant	(Z_0)			-2.8136	-0.1044
Sex	(Z_1)			0.2947	0.0314
Age	(Z_2)			-0.0139	-0.0284
Marital Status	(Z_3)			1.0126	0.0803
Education	(Z_4)			1.3986	0.4842
Household	(Z_5)			-.0.0978	-0.0080
Diagnostic Statistics					
Sigma-Squared (δ^2s)				1.3333	0.13803
Gamma (γ)				1.0000	1236.9347
Log Likelihood function				-111.3280	
LR Test				31.0702	

Source: Field survey, 2020

The result indicates the variance parameter sigma square (δ^2) to be1.3333 and not significant (*P< 0.01)*. This shows a good fit of the distributional form of the assumption for the composite error term. The gamma estimates of the catfish farmers were 1.0000. Labour had a coefficient of 1.2054 and statistically not significant at 1%, however it affected total cost of production significantly ie a unit increase in labour will increase output of catfish by about 1.2. This finding agrees with the work of Umar, Makinta and Kwatanda (2014) in Borno state where labour also had a positive coefficient. The coefficient of feed at 0.5770 was not statistically significant at 1%, however it

affected the total cost of production significantly. Quality and quantity of feed fed (0.2273 coefficients) influenced the output of fish by the value of the coefficient. Umar et al (2014) agree with this from their study.

Determinants of technical inefficiency of catfish farmers in the study Area

Coefficient of sex estimates at any level of probability was not significant (0.2947) suggesting gender of farmers affected efficiency negatively and led to increase in technical inefficiency decreasing technical efficiency by 0.2947% and agrees with the works of Umar et al (2014). Age had a negative coefficient (-0.0139) and not significant at any level of probability, however as age of increased technical inefficiency decreased. This type of result implies that as farmers gain in experience, and technical know-how agrees with the work of some scholars who reported a positive coefficient in age in Rivers State. Marital status had a positive coefficient(1.0126) also not significant at any level of probability implying it decreased technical efficiency increasing technical inefficiency by 1.01%. household size not significant at any level of probability had an estimate of -0.0978 suggested it decreased technical inefficiency as it increased. The findings of this study on education contradict that of Umar et al (2014) which had a coefficient estimate of 1.3986, positive and however not significant at $P< 0.01$ since it was found to have increased inefficiency.

Allocation efficiency of catfish farmers in Khana Local Government Area

Allocative efficiency is the combination of input mix to maximize a firm's revenue given output prices. This however may not give a true picture of efficiency because of inherent distortions and variations in farm produce prices in the study Area. The allocative efficiency estimates of the catfish farmers are shown in Table 3.

Table 3: Allocation efficiency of catfish farmers in Khana Local Government Area

	Stock size	Labour	Feed	Output
Production elasticities	1.5738	1.2054	0.5770	
Geometric mean of input & output(average weight/x)	6.8050	1.3645	0.5452	17064.56
Marginal value product(MVP)(output x coeff/geometric mean)	3946.54	15074.84	18059.89	
Marginal factor cost(MFC)(average price)	17.88	12506.25	5436.25	
Allocative efficiency indices(MVP/MFC)	220.72	1.21	3.32	
Remark	Over utilized	Over utilized	Over utilized	

Source: Field survey, 2020

The allocative efficiency indices for stock size (220.72), labour (1.21) and feed (3.32) show they are over utilized. By implication, catfish farmers can increase output and profit by reducing these resources to increase their efficiency. Labour over utilization may have resulted from family labour that is always and readily available whenever the need arises.

CONCLUSION

The catfish farmers in the study area were mostly males who experienced significant levels of input inefficiency and over utilization of resources. The variance parameter sigma square was not

significant at *P< 0.01.* The marginal participation of women must be discouraged to ensure food security in the study Area especially protein intake. On a general note, the result of the survey suggests the catfish farms were mainly a cottage industry judging from the pond sizes.

RECOMMENDATION

From the findings, the following recommendations were made:

1. Women in several instances have been at the fore front in agricultural activities and have performed creditably, however they seem to be marginalised in the catfish industry in the study Area. A holistic inclusion of the female gender is suggested. This can be achieved through the removal of every impending barrier impeding their leveraging the opportunities inherent in the industry.
2. Also, with the limited intake of animal protein in our clime, the catfish industry may need expansion. It can be easily set up with limited capital input, taking advantage of this may boost protein production and consumption with the attendant job creations.

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DETERMINANTS AND IMPEDIMENTS OF COMMUNITY PARTICIPATION IN THE CONSERVATION OF FOREST RESOURCES IN ENUGU NORTH AGRICULTURAL ZONE OF ENUGU STATE, NIGERIA

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ABSTRACT
The study specifically ascertained the determinants and impediments of community participation in conservation of forest reserve; examined the level of community participation in conservation of forest reserve; determined the impediments of rural community participation in conservation of forest resources; identified ways to enhance community participation in the conservation of forest resources and ascertained the perception of respondents on forest resource conservation in the study area. Multi-stage sampling procedure was used to select 120 respondents. Data were obtained using structured questionnaire and analyzed using descriptive statistics and multiple regression analysis. The major determinants of community participation were age and health problems ($\bar{x}$=3.49) and attendance to community meetings ($\bar{x}$ =3.37). Rural community members participated actively in the following conservation activities: patrolling the forest ($\bar{x}$=4.10), controlled forest hunting ($\bar{x}$=3.84), avoiding bush burning ($\bar{x}$=3.76) and selective logging ($\bar{x}$=3.0). Impediments to community participation in conservation of forest resources include, inadequate local people's involvement in conservation decisions ($\bar{x}$ =3.85) and poor funding ($\bar{x}$ =3.63). Impediments of participation in conservation of forest resources were: level of education (2.33)** and local people's perception of forest conservation (2.618)**. Age, health problems and attendance to community meetings were the topmost factors which influence community participation in conservation of forest resources. Community participation in forest conservation which will reflect the needs of the people and proper education of the local people to enlighten them on the dangers of forest fires and consequences of forest degradation were therefore imperative to the survival of the forest reserve. Younger people who are still energetic and at their active age should be encouraged to participate in forest conservation.

Key Words: Determinants, impediments, Participation, Conservation, Forest resources

INTRODUCTION
The participation of local communities and other stakeholders in managing and conservation of forestry resources can help to improve forest productivity, alleviate poverty, enhance environmental sustainability, and make rules governing forest access more enforceable (Bisong, Ogbonna,& Kyari, 2017).Forest in Nigeria is an important source of livelihood, Environmental services, Economic growth, Social and cultural benefits which can provide opportunities for poverty alleviation and economic development (Adeyoju, 2018; Julius, 2016). Forestry conservation refers to efforts and activities to maintain and sustain those attributes in natural forests which are essential both to human, physical and mental health and to the enjoyment of life (Obiora, 2018; Okorowu, 2020).

The world's forests and woodlands are increasingly under pressure from the growing human population and many are shrinking as a result of human-induced deforestation (Onojeghuo, Fonweban, Godstime & Onojeghuo, 2016). More active involvement of local communities is currently hampered by lack of information on potential benefits as well as lack of awareness on the mechanisms for benefit sharing (Bassey, 2019). Community awareness will enable local

people recognize how they benefit from products and services provided by forests, they will be motivated to modify their resources and land use practices and to invest time and effort in forest conservation activities. Given the right enabling environment and the right incentives, communities can and will manage forests and woodland resources for diversity (Onojeghuo*et al,* 2016). This they did through development of rules, regulations and community sanctions. Forests were also conserved for value other than the resources they contained; they provided refuge and often took a religious significance (Nnaemeka & Chukwuemeka, 2020).

The major conservation challenges in Nigeria include: the high population pressure, escalating poverty situation, conflicts, poor land use practices, inadequate laws, policies and institutional framework, poor education and inadequate involvement of community participation (Aju & Ezeibekwe, 2017; Shomkegh, Adaje & Ilerinumbe, 2017). Other threats are invasive species, land degradation and pollution occasioned by poor land use practices.

The greatest threat to our environment (forests and woodlands included) is however posed by poverty whereby people's basic needs for adequate food, shelter and health are not met. Efforts to obtain basic needs under such circumstances generally lead to destruction of forests and woodlands. According to Union of Concerned Scientist (2016), paper and wood products account for approximately 10%of total deforestation in the Southeast. While 90% of deforestation comes from cattle ranchers, soybeans farmers and palmoil plantations in Southeast of Nigeria. Deforestation rate in the southwest geopolitical zone of Nigeria is double the national average. Data on vegetation and land use changes between 1976 and 1995 reveal that the area covered by undisturbed forests in Nigeria decreased by 53.5% from 25,951sqkm in 1976 to 12,114sqkm in 1991 (Evaristus, 2016) For, instance, in Ondo State, more than 44% of the 3,075sqkm of forest reserve has been lost in the last 30 years due to a combination of activities earlier mentioned. Amakiri, (2016); Anabaraonye and Osuji, (2019) also observed that over 11,300 hectares of forest were cleared annually in Omo forest reserve in Nigeria for the establishment of monoculture plantations of indigenous and exotic tree species. The resulting high demand for forest and woodland products by a rising population creates land use conflicts and environmental degradation as forests are cleared to make way for human settlements and agriculture. Environmentalists have realized that any externally defined solutions that do not involve local people are unrealistic and ultimately fail to produce the intended results of conservation (United Nation, 2020; Duru, 2021; Akpabio, 2016). Local communities therefore have to be allowed and encouraged to become responsible for the natural resources in their territory and have an important share in the benefits for their efforts. In light of this, this study sought to ascertain the factors that influence community participation in the conservation of forest resources, examine the level of community participation in forest reserve, determine the impediments of rural community participation in conservation of forest resources identify ways to enhance community participation in the conservation of forest resources and ascertain the community members' perception of the conservation of forest resources in the study area. The study assumed that there was no significant relationship between respondents' level of participation in forest reserve and determinants of participation in conservation of forest resources.

METHODOLOGY

The study was conducted in Enugu North agricultural zone of Enugu State, Nigeria. Enugu North agricultural zone is made up of six local government areas namely:Igbo-Eze North, Igbo-Eze South, Nsukka,Igbo-Etiti, Udenu,andUzo-Uwani local government Areas (ENADEP, 2020). It also comprises of eight blocks namely Nsukka I, Nsukka II, Igbo-Etiti, Igbo-Eze North, Igbo-Eze South, Udenu, Uzo-Uwani 1, and Uzo-Uwani II. It is located between latitude 7° 21' S and 7° 36'

E and longitude 06° 45' and 7° N (Enugu State Ministry of Land, 2021). It has a land area of 7,625kmsq and an estimated population of about 3,267,837 out of 4,411,100 of the total population of Enugu State by projection (National Bureau of Statistics NBS. 2017).

The population for the study constituted all the villagers in Enugu North Agricultural Zone.A multistage sampling procedure and purposive sampling technique were adopted in the selection of 120 respondents for the study. In the first stage, three blocks (Nsuka I, Udenu and Igbo-Eze South) out of eight blocks in the zone were purposively selected for the study based on high intensity of indiscriminate exploitation, extraction and hunting of wild animals predominant there. The second stage involved random selection of four circles out of eight circles in each block. The circles selected were Okpuje, Obukpa, Ibagwa-Ani and Alor-Ulo in Nsukka 1 block; Orba, Imilike, Igugu and Obollo-Afor in Udenu block; and Ibagwa-Aka, Itchi, Ovoko and Iheaka in Igbo-Eze South block. The third stage involved the random selection of 10 community members from each circle making a total of 120 community members for the study.

Primary data were collected through the use of a set of structured questionnaire administered to the respondents. The primary data were collected and analyzed with percentages, mean and standard deviation.

To ascertain the determinants of community participation in the conservation of forest resources a five-points Likert type rating scale of strongly agree (5), agree (4), undecided (3), disagree (2), strongly disagree (1) was used. To determine the level of community participation in the conservation of forest resources a five- points Likert type rating scale of strongly agree (5), agree (4), undecided (3), disagree (2), strongly disagree (1) was used.

To examine the impediments of community participation in the conservation of forest resources in the study area was achieved using a five-points Likert type rating scale. These response options and assigned values: strongly agree (5), agree (4), undecided (3), disagree (2), strongly disagree (1) were used.

Multiple regression analysis was used in testing hypothesis one.

This was tried on the four functional forms of linear, exponential, double-log and semi-log in other to make choice for the lead model. The functions were explicitly specified thus:

Linear function:$Y = b_o + b_1x_1 + b_2x_2 + b_3x_3 + b_4x_4 + b_5x_5 + b_6x_6 + b_7x_7 + e_i$--------- …1

Semi log function:$Y = Inb_o + b_1Inx_1 + b_2Inx_2 + b_3Inx_3 + b_4Inx_4 + b_5Inx_5 + b_6Inx_6 + b_7Inx_7 + e_i$ ..... …2

Double log function:$LogY = Inb_o + b_1Inx_1 + b_2Inx_2 + b_3Inx_3 + b_4Inx_4 + b_5Inx_5 + b_6Inx_6 + b_7Inx_7 + e_i$ ……..… …3

Exponential function: $LogY = b_o + b_1x_1 + b_2x_2 + b_3x_3 + b_4x_4 + b_5x_5 + b_6x_6 + b_7x_7 + e_i$… …4

Where:

Y = dependent variable, (level of participation) (improved conservation of forest resources) measured in % or mean

e_i = stochastic error Term

b_o = Intercept

$b_1 - b_7$ = parameters to be estimated

$x_1 – x_7$ = independent variables (Factors influencing participation)

X_1 = Age -measured in years

X_2 = Attendance to community meetings – measured in no of times attended

X_3 = Level of Education – measured in no of years spent in school

X_4 = Membership of community organizations (Dummy; yes = 1 or no = 0)

X_5 = Lack of awareness on the need to conserve forest resources – Dummy: yes = 1

or no = 0)

X_6 = Laws forbidden indiscriminate forest resources use (Dummy: yes = 1 or no =0)

X_7 = Respondent's perception of forest conservation – positive or negative

ei = Error term

RESULTS AND DISCUSSION

Determinants of participation in forest resources conservation

Table 1: Determinants of participation in forest resources conservation

Determinants of participation in forest resources conservation	Mean ($\bar{x}$)	Standard Deviation
Age and health problems	3.49	1.41
Attendance to community meeting	3.37	1.32
Membership of community organization	3.16	1.65
Laws forbidden indiscriminate forest resources use	3.10	1.32
Lack of awareness on the need to conserve forest resources	3.07	1.41
Level of education	3.04	1.42
Respondent's perception of forest conservation	3.02	1.32
Grand mean	**3.18**	

Source: Field survey, 2019

The result in Table1 shows the determinants of participation in forest resource conservation were: age and health problems ($\bar{x}$ =3.49); attendance to community meetings ($\bar{x}$=3.37); membership of community organizations ($\bar{x}$ =3.16), law forbidden indiscriminate forest resources use ($\bar{x}$ =3.10); lack of awareness on the need to conserve forest resources($\bar{x}$=3.07); level of education ($\bar{x}$ =3.04) and perception of forest conservation ($\bar{x}$=3.02). The topmost determinants of community participation in conservation of forest resources were age, health problems and attendance to community meetings and could be that the forest conservation activities are too stressful for old people and those with health issues to do. Attendance to community meetings could also be a determinant for selection of those who are eligible to do the work. The implication of this finding is that age, and lack of attendance to community meetings could hinder the participation of community members in conservation of forest resources. The results showed that the standard deviation was closely packed and small. This implies that the result was reliable and dependable. This finding agreed with that of Obiora (2018) that forestry conservation was affected by the socio-economic factors of the respondents.

Level of participation in conservation of forest resources

Table1. 2: Respondents' level of participation in conservation of forest resources

Forest Conservation practices	Mean($\bar{x}$)	Standard Deviation
Patrolling the forest	4.10	0.02
Controlled forest hunting	3.84	0.02
Avoiding bush burning	3.76	0.02
Selective Logging	3.0	0.01
Reforestation	2.85	0.01
Decision making process	2.80	0.01

Nursery establishment	2.79	0.01
Afforestation	2.75	0.01
Grand Mean	3.24	

Source: Field survey, 2019
Bench mark=3.0

The result in Table 2 shows that community members participated actively in the following conservation activities: patrolling the forest ($\bar{x}$=4.10), controlled forest hunting ($\bar{x}$=3.84), avoiding bush burning ($\bar{x}$=3.76), selective logging ($\bar{x}$=3.0), and had inactive participation in reforestation ($\bar{x}$=2.85), decision making process ($\bar{x}$=2.80), nursery establishment ($\bar{x}$=2.79) and afforestation ($\bar{x}$=2.75) with a grand mean of 3.24. The results show that the standard deviation was closely packed and small. This implies that the result was reliable and dependable. The respondents' inactive participation in reforestation, afforestation, nursery establishment and decision making process could be lack of knowledge on how it is done and also as a result of non-involvement of rural communities in development management activities such as decision making process, planning among others. It could also be that communities participate in forest management and conserve forest resources if they are involved in the processes of forest planning and management and also enlightened on what to do. The implication of this finding is that conservation of forest resources could be affected because local communities invest more time and effort in forest conservation activities if they are involved in the planning process and have the knowledge of what to do. Bisong*et al.*, (2017) opined that participation of local communities and other stakeholders in managing and conservation of forestry resources can help to improve forest productivity, alleviate poverty, enhance environmental sustainability, and make rules governing forest access more enforceable. The finding is in consonance with the observation of Bassey,(2019) that more active involvement of local communities is currently hampered by lack of information and knowledge on some conservation activities as well as lack of involvement of rural communities in planning processes

Table 3: Impediments of community participation in the conservation of forest resources

Impediments of participation in forest resources conservation	**Mean ($\bar{x}$)**	**Standard Deviation**
Rapid urbanization	3.32	1.12
Instability in government policies	3.09	1.65
Land acquisition problem	3.40	0.43
Inadequate local people's involvement in conservation decision	3.85	0.47
Poor funding	3.63	0.44
Ignorance of conservation techniques due to low level of education	3.49	1.15
Poaching	3.04	0.48
Scarcity of resources due to irrational exploitation of resources	3.22	0.56
Inadequate material for reforestation	3.02	0.44
Ineffective regulations on the part of the government and farmers Union	3.13	0.70
Grand mean		**3.32**

Source: Field survey, 2019

The result in Table 3 shows that the three highest ranking challenges faced by rural community people in conservation of forest resources were inadequate local people's involvement in conservation decisions making ($\bar{x}$=85), poor funding ($\bar{x}$=3.63) and ignorance of conservation techniques due to low level of education ($\bar{x}$=3.49). Other challenges include land acquisition problem ($\bar{x}$=3.40), rapid urbanization ($\bar{x}$=3.32), ineffective regulations on the part of the government and farmers' union ($\bar{x}$=3.13), instability in government policies ($\bar{x}$=3.09), poaching ($\bar{x}$=3.04), scarcity of resources due to irrational exploitation of forest resources ($\bar{x}$=3.02).and inadequate material for reforestation ($\bar{x}$= 3.02) with a grand mean of 3.32. The results show that the standard deviation was closely packed and small. This implies that the result was reliable and dependable. The three highest ranking challenges in conservation of forest resources could be an indication that community participation in forest conservation is enhanced if they are involved in planning, decision making and implementation processes of forest conservation management. Proper education of the community members to enlighten them on the conservation techniques can also facilitate participation. Land fragmentation and tenureship could make it difficult for local people to acquire their own land resulting to indiscriminate forest resource use. The implication of this finding is that those three highest ranking challenges in conservation of forest resources could affect local people's participation in conservation of forest resources in the study area. The findings of this study is in line with the statement of Anwadike, (2020) that forest conservation in West Africa is made ineffective by various challenges relating to the local people.

Coping strategies for enhancing community participation

Table 4: Coping strategies for enhancing community participation in the forest resources

Coping strategies for enhancing community participation in the forest resources	**Mean ($\bar{x}$)**	**Standard Deviation**
Involving rural community members in decision making process	4.42	0.16
Letting them participate in benefit sharing	4.33	0.16
Enabling them share in management	4.33	0.16
Enabling them share in cost	3.67	0.11
Enabling them share in design	4.43	0.16
Letting them have equitable incentives	3.52	0.10
Devising mechanisms for resolving conflicts between groups	3.25	0.09
Giving them training on forest conservation technique	3.71	0.12
Educating them on the need to conserve forest resources.	3.54	0.10
Grand Mean	**3.91**	

Source: Field survey, 2019

The result in Table 4 shows the ways to enhance community participation in conservation of forest resources are as follows: enabling the local people to share in design ($\bar{x}$ =4.43), involving them in decision making process ($\bar{x}$ = 4.42), enabling them share in benefits ($\bar{x}$ =4.33), and enabling them share in management responsibilities ($\bar{x}$ =4.33). Other ways include enabling them share in costs ($\bar{x}$ =3.67), letting them have equitable incentives ($\bar{x}$ = 3.52), devising mechanisms for resolving conflicts between groups ($\bar{x}$ =3.25), giving them training on forest conservation techniques ($\bar{x}$ =3.71) and educating them on the need to conserve forest resources ($\bar{x}$ =3.54) with a grand mean of 3.91. The results show that the standard deviation was closely packed and small. This implies that the result was reliable and dependable. This implies that arrangements for the sharing of benefits, design, management responsibilities, and involving the local people in

decision making process are most likely to motivate participation if they are widely understood and agreed upon by all stakeholders through an open negotiating process. Special measures may be needed to ensure that women, indigenous groups, and landless households are not excluded. This finding is in agreement with that of Bassey (2019) who reported that strategies of enhancement of community participation in forest resources conservation is paramount for sustainable environment.

Rural communities' perception of the conservation of forest resources

Table 5: Rural communities' perception of the conservation of forest resources

Perception of the conservation of forest resources	Mean ($\bar{x}$)	Standard Deviation
Forest reduces soil erosion, hence need for conservation	3.62	0.13
Tree planting promotes environmental sanity and responsibility	3.44	0.11
Forest attracts tourists	3.35	0.10
Indiscriminate hunting in forest can lead to extinction of some wildlife species	3.01	0.09
Forest improves soil quality	3.05	0.08
Forest increases productivity of agricultural lands	3.06	0.08
There is need to conserve forest resources to ensure their sustainability	2.68	0.03
Forest provides habitat for plants and animals	3.03	0.08
Grand Mean		**2.82**

Source: Field survey, 2019

The result in Table 5 shows the various perceptions of the rural communities regarding forest conservation as follows: forest reduces soil erosion ($\bar{x}$= 3.62), tree planting promotes environmental sanity ($\bar{x}$= 3.44), forest improves air quality ($\bar{x}$= 3.35), forest improves soil quality ($\bar{x}$= 3.05), forest increases productivity of agricultural lands ($\bar{x}$=3.04), there is need to conserve forest resources to ensure their sustainability ($\bar{x}$= 2.68) ,forest provides habitat for plants and animals ($\bar{x}$= 2.58) and indiscriminate hunting in forest can lead to extinction of some wildlife species ($\bar{x}$= 3.11). The grand mean of rural communities' perception regarding forest conservation is 2.82. The result shows that the standard deviation was closely packed and small. This implies that the result was reliable and dependable. This signifies that the majority of the respondents had positive perceptions regarding forest conservation. Anwadike, (2020) noted that rural farmers have positive perception regarding forest conservation because they come in contact with the forest on a regular basis and this has made them to appreciate the importance of forest cover in the environment and biodiversity.

Relationship between farmers' level of participation and determinants of participation in conservation of forest resources

Table 6: Relationship between farmers' level of participation and determinants of participation in conservation of forest resources

Explanatory variable	Linear	Semi-log	+Exponential	Double-log
Constant	1.318 (4.999)***	.356 (2.555)**	1.232 (1.335)	.367 (.757)
Age/health problems	.249 (1.357)	.215 (1.160)	.239 (.926)	.180 (.690)

Attendance to community meetings	.009 (.046)	-.008(-.044)	.195 (.781)	.169 (.669)
Membership of community organization	.039 (.223)	.019 (.110)	-.187 (-.892)	-.197 (-.927)
Laws forbidden indiscriminate forest resources use	.132(.845)	.125 (.793)	.121 (.512)	.126 (.528)
Lack of awareness on the need to conserve forest resources	.012 (0.371)	.007 (.040)	.035 (.140)	.050 (.197)
Level of education	.362 (2.34)**	.383 (2.344)**	.322 (2.33)**	.318 (2.239)**
Respondent's perception of forest conservation	.290 (2.650)**	.273 (2.63)**	.563 (2.618)**	.565 (2.594)**
R^2	.293	.275	.499	.485
f-stat	1.956**	1.790	2.27**	2.154**

Figures in parentheses are t-ratios
**Significant at 5%
Source: Survey Data, 2019

The result in Table 6 shows that the exponential function produced the highest value of coefficient of determination (R^2), highest variable significance, and conformed to *a priori* expectation and was therefore selected as the lead equation and used for discussion.
The value of r^2 was .499, which implies that about 49% of the variation in rural community members' level of participation was accounted for by the determinants of community participation in forest resources conservation. The R^2 value of .499 gave F-value of 2.27 which was significant at 5% level of probability, implying that the exponential function gave a good fit to the data. The coefficient of factors influencing participation, level of education and local people's perception of forest conservation were positive and significant at 5% level, implying that increase in the above determinants of community participation leads to increase in community members' level of participation in conservation of forest resources. The economic rationale behind participation in forest management is that communities will conserve forest resources if they will only benefits from it. The F-value 2.27 obtained from multiple regression analysis shows that determinants of participation were positive and significant, implying that those factors determine the level of rural community participation in conservation of forest resources in the study area hence, rejecting the null hypothesis.

CONCLUSION

Determinants of community participation are age, health problems and technical ability to do so. However, the main impediments to effective participation of communities in conservation of forest resources include: inadequate local people's involvement in conservation decisions, ignorance of conservation techniques due to low level of education, land acquisition problem, among others.

RECOMMENDATIONS

From the findings,

1. Community participation in conservation of forest resources has a lot of challenges, but relevant stakeholders should enact enabling laws that will encourage community participation in conservation of forest resources.
2. There should be proper education of the local people to enlighten them on the dangers of forest fires and consequence of forest degradation.

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