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APPRAISAL OF THE EFFECT OF RURAL ROAD TRANSPORT ON AGRICULTURAL PRODUCTIVITY IN ISI-UZO LOCAL GOVERNMENT AREA OF ENUGU STATE, NIGERIA

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Abstract

This study examined the effect of rural road transportation on agricultural productivity in Isi-Uzo Local Government Area (LGA) of Enugu State, Nigeria. Linking food production areas with consumption is an effective approach for resource management and enhancement of food productivity. Data for this study was derived from documentary materials, questionnaires, in-depth interviews and field observation. A total of 327 respondents from 8 communities were sampled. The questionnaire captured farmers' socio-economic characteristics, nature of the agricultural products, level of agricultural productivity, means of transportation and effects on agricultural productivity. Data collected were analysed using Percentages, Standard Multiple Regression, Analysis of Variance (ANOVA) and Productivity Index. The result from field observations revealed that majority of roads are in a deplorable state, characterised by potholes, gullies, and rough surfaces and are mainly seasonal and poorly accessible during the rainy season. The result also showed that marital status, storage facilities, farm size, distance from farm to market, and age were important in predicting agricultural production in the area. Result further revealed that 77.6% of farmers travel on untarred, bad and narrow roads. The most preferred means of transportation for farmers were bicycle and foot (head porterage) due to the poor accessibility and nature of the roads. The regression and ANOVA analysis indicated a strong and positive relationship between both variables. The coefficient of determination of 0.77 implies that 76.5% of the variation in the dependent variables (agricultural productivity) was explained by the independent variables at a 0.05 level of significance. The paper concludes that poor transportation inhibits the expansion of agricultural production in the study area, and this scenario transfers the profits from the farm to the traders and transporters rather than to the producers. It is therefore recommended that in addition to providing roads, vehicular access to the rural areas should be improved. Therefore, a reliable road transportation system is critical to effective food distribution from the rural to the urban spaces.

Keywords: Appraisal, Agricultural Productivity, Effect, Rural Road, Transportation, Isi-Uzo Local Government Area, Enugu State, Nigeria.

1. Introduction

Agriculture is one of the most important primary economic activities of man and it is the basis of the food supply of the world's population (Ajaero, Mba and Okeke, 2013). Agricultural produce consists of various food and cash crops, livestock and poultry produce, and perishables such as vegetables, tomatoes, pepper, fruit, etc. Similarly, agricultural productivity is very important to the economy of developing nations (Hine et al., 2001; Abiodun et al, 2019). It contributes to about 70 % of employment for the Nigerian populace (Matthew and Mordecai, 2016). It is also the primary food source for the people, raw materials for the agro-allied industries and earns foreign exchange for the economy. About 51.7 % of Nigeria's population mostly live in the rural area (Afolabi et al., 2016) and engage in agriculture either directly or indirectly.

Rural transportation infrastructure is vital to the overall development of agriculture (Orakwe et al., 2015). Effective and efficient rural transport system is key to smooth exchanges of the production processes from gathering raw materials, and production mobility to distributing the final product to consumers. It involves the movement of goods, people and services from the point of production to the selling point (Ikejiofor and Ali, 2014). Transportation is a key necessity for specialisation allowing production and consumption of products to occur at different locations. Transportation spurs economic expansion and promotes the rural economy (Aderamo and Magaji, 2010). Economic growth has always depended on increasing the capacity and rationality of transport (Afolabi et al. 2016). Accessible rural feeder roads play a significant role in directing mobility and accessibility of remote farms and places of production to consumption centres (Yaro et al, 2014).

Moreover, road transport is regarded as an important factor involved in agricultural productivity and development all over the world (Ojede et al., 2013). It is the only means by which food produced at the farm site is moved to different homes as well as different locations. Transport creates a market for agricultural produce, enhances interaction among geographical and economic regions and opens up new areas of economic focus. Road transportation is a necessary precursor to the development of agricultural productivity that leads to increased production, lower production costs, and improved rural livelihood (Orakwe et al., 2015).

Poor road transport in the rural areas of developing countries denies the communities access to their most basic needs. Accessibility depends on mobility (ease and frequency of movement) and proximity (distance), access may improve by greater mobility and proximity to services (piped water, local health centre) (Afolabi et al., 2016). Isi-Uzo LGA is agrarian with more than 70 percent of the population residing in the rural areas (Onoja and Unaezeh, 2008). They are mostly farmers engaged in producing agricultural goods such as palm oil,yam, garri, kola nut, rice, beans, pepper,banana, plantain, vegetables, fruits andrearing of livestock.Theseagricultural products are mainly consumed in the neighbouring urban centers.

Nonetheless, most rural areas Isiuzo inclusive, are still bedeviled by low quality all weather and accessible roads.. As noted by Ogunleye et al, (2018) most rural roads consist of pedestrians carrying loads on heads or beast of the burden. The poor roads affect not only agricultural productivity but also the socioeconomic status of the rural dwellers and production costs (Ikejiofor and Ali, 2014). Rural agricultural development is tied to accessible roads to facilitate access to market for farm inputs and the sale of products. The few road transport networks in the study area are unmotorable during the rainy season due to lack of maintenance. This renders most of the facilities inaccessible for the greater part of the year.

Therefore, the study examined the effect of rural road transportation on farmers' agricultural productivity in Isi-Uzo LGA. Thus, the following were assessed; the major agricultural produce, the available means of transportation, the farmers' agricultural productivity level, and the effect of rural road transportation on agricultural productivity. Also, recommendations were made to boost productivity and achieve sustainable food production in the area.

2. Materials and Methods

2.1 The Study Area

The study area is Isi Uzo Local Government Area in Enugu State, Nigeria. It is located between latitude 6°47'N to 6°783'N and longitude 7°43'E to 7°717'E (Figure 1). To the south, it is bounded by Ishielu L.G.A. (Ebonyi State), and Enugu East and Nkanu East LGA (Enugu State), to the west and northwest by Igbo-Etiti, Nsukka and Udenu (Enugu State) respectively, to the north and east by Ogbadibo, Okpokwu, and Ado LGAs (Benue State) (Figure 1). It has a total land mass of about 877 km^2 (339 sq. mi) occupied by twelve Communities comprising Ogo Ndago, Ikem Nkwor, Mbu, Eha-Amufu, Umualor, Neke, Isu, Leke Onueme, Ezimbo, Omanze, Agumele, and Ikem; the Local Government Headquarters.

Isi-Uzo lies within the Cross-River plains (eastern lowlands) of southeastern Nigeria (Ofomata, 1975). Ofomata (2002) categorised the geological sequences under the age of Campanian and Maastrichtian. Isi-Uzo has a low relief of less than 150 metres above mean sea level. However, there are isolated areas which rise about 5-10 metres above the general level of land. The area has a dendritic drainage pattern. The main drainage is Ebonyi River with Ankpe river as its major tributary. Isi-Uzo has two soil classes comprising the clayey loam soils formed over shales and the ferralitic brownish sand loams formed on the sandstone. Isi-Uzo has the Aw climate characterised by mean annual rainfall that ranges from 1650-2200 mm. The rainy season stretches from April to October (Phil-Eze, 2001). The area has lost much of its vegetation due to overexploitation and so now has a mosaic of the Guinea savanna. Isi-Uzo had a population of 148, 415 persons in 2006 (NPC, 2006) but projected to be about 204,468 persons in 2018. The major economic activity is agriculture. The main crops the farmers cultivate are cassava, Maize, yam, banana, plantain, rice etc. Vegetables and fruits are also grown including rearing livestock such as goats, sheep and guinea fowl. The study has both tarred and untarred roads but most of these roads are no more in usable condition including the major roads (Obollo-Afor- Eha-Amufu-Abakaliki road), especially during

the rainy season which is coincidentally, the farming season.

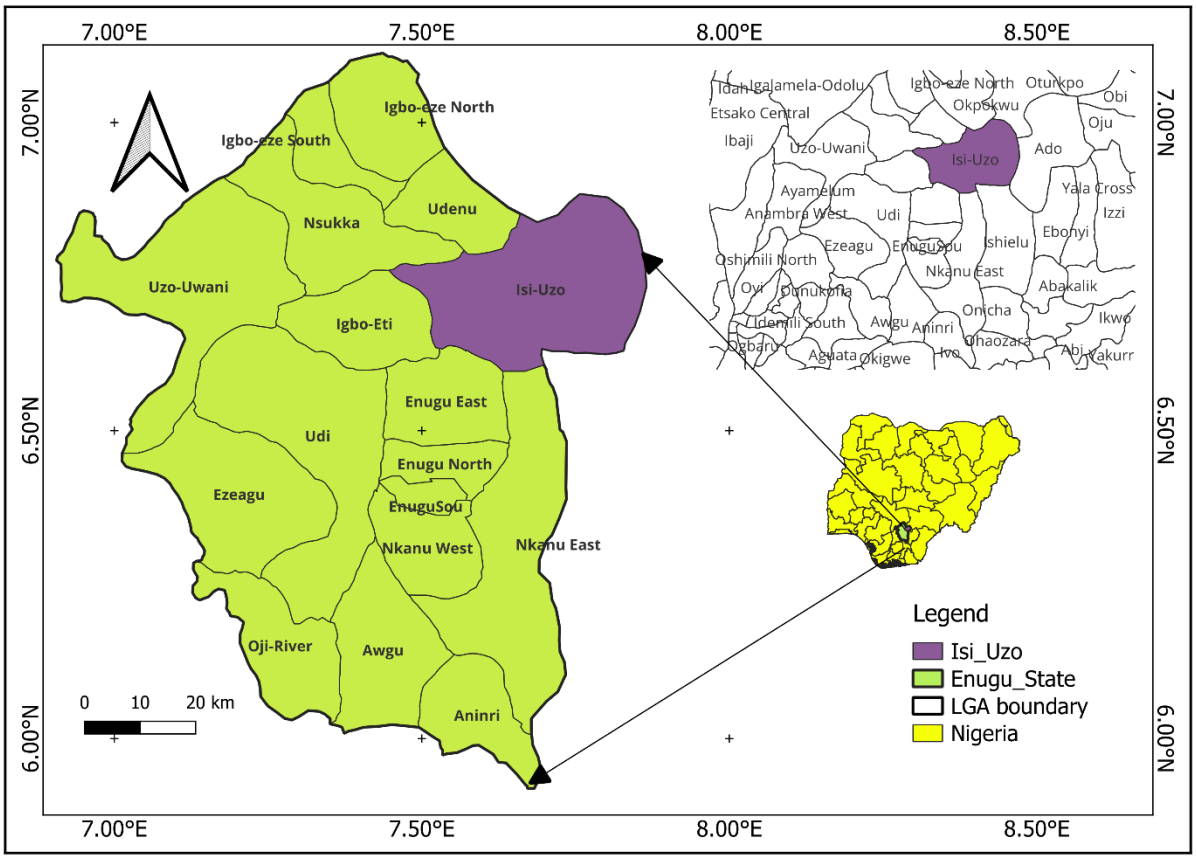

Fig 1: Map of Enugu state showing Isi-Uzo L.G.A.
(Source: Adapted from Google Maps, 2022)

3. Methods

This study adopted a descriptive survey research design which was used to obtain data on farmers' socio-economic characteristics, the nature of the agricultural produce, the level of agricultural productivity, modes and means of transportation and the effect on agricultural productivity

3.1 The Research Hypothesis

Let Ho be "there is no significant relationship between rural road transportation and agricultural productivity in Isi-Uzo LGA at 0.05 level of significance".

3.2 Population and Sample Selection

Data were collected from both the farmers and traders in Isi-Uzo Local Government Area and it was conducted in farms and community-based markets. A purposive sampling technique was employed in selecting 8 comminutes in the study area, the areas with high agricultural-intensive activities in the study area. A purposive

sampling technique was also employed to select fifty (50) respondents from each of the 8(eight) communities, thereby making a total of 400 respondents. The choice of this number of respondents was because of the inability to acquire population data for each of the communities throughout the sample frame and for equal representation of all the sampled communities. Table 1

Table 1: Sample households in the study area visited

S/N	Villages/Communities	Sample size
1	Neke	50
2	Ikem	50
3	Mbu Amon	50
4	Agumede	50
5	Umualor	50
6	Ezimgbo	50
7	Ogo ndago	50
8	Eha-Amifu	50
	Total	**400**

Source: Fieldwork 2022

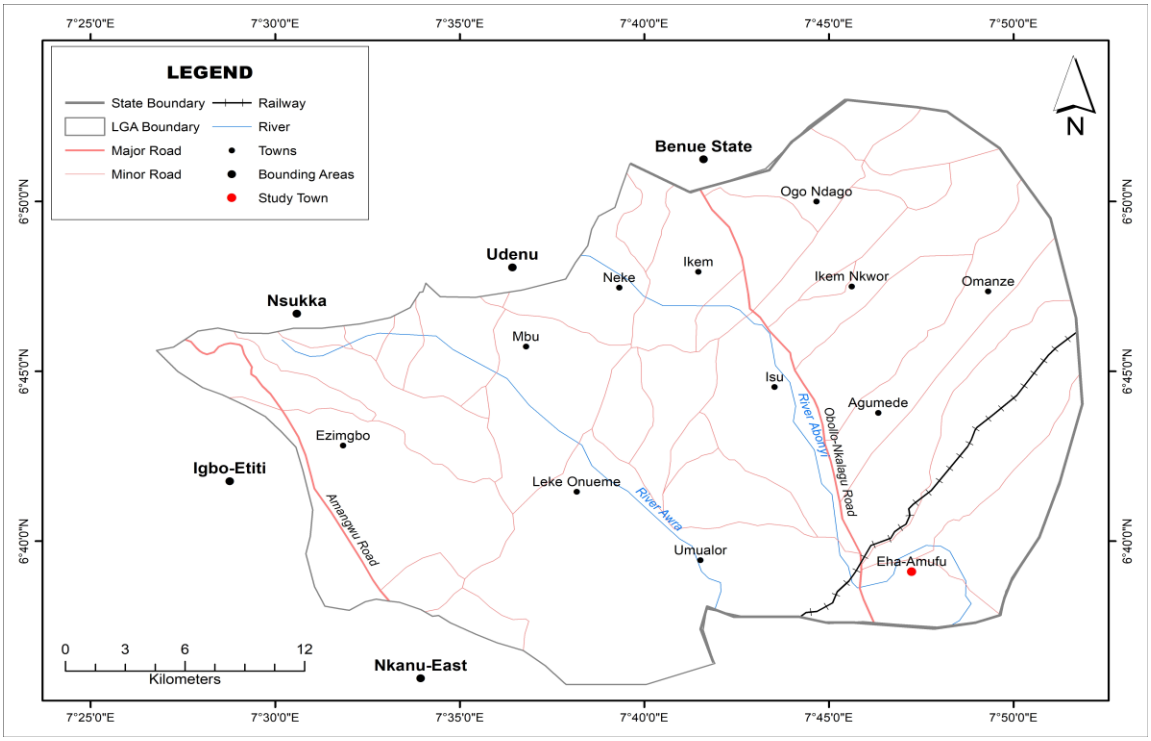

Figure 2: Isi-Uzo L.G.A. showing the Sampled Communities.
(Source: Adapted from Google Maps, 2022*)*

3.3 Data Collection

1. Primary Data Sources

Primary data sources include direct field observation, oral interviews during fieldwork, taking of pictures and the use of the questionnaire. Farmers' place of cultivation was visited as well as marketplaces. Traders and buyers of agricultural produce and drivers who use different means in transporting agricultural products were also interviewed.

2. Secondary Data

Secondary data was obtained from relevant literature. Other important materials were obtained from published and unpublished documents, textbooks, research papers, journals and the Internet.

a. Personal interview. This was conducted with registered commercial farmer and members of the farmers' cooperatives in the major farm areas to find out the operational pattern of the and production system. Some subsistence farmers who are illiterate in different communities were also interviewed in their local language with the help of an interpreter in the area to help reveal the effect of rural road transportation on agricultural productivity.

b. Questionnaire Survey: Pre-tested structured questionnaire were shared to respondent in the study area. A purposive sampling technique was used to select eight communities in the study area. This sampling technique was adopted because of the inability to acquire population data for each of the communities. In each of the communities selected, fifty (50)

questionnaires was administered to respondent and rural dwellers which were also selected at random technique. The total number of 400 questionnaires was distributed.

The questionnaire survey captured the farmers' socio-economic characteristics, the nature of the agricultural producers, the level of agricultural productivity, modes and means of transportation and the effect on agricultural productivity. The sharing and collecting of the questionnaire were carried out by the researcher and with the help of some youth in each community who can easily understand the respondents about the nature of the research work.

3.4 Data Analysis

Data collected were analyzed and presented using descriptive and quantitative techniques. In exterminating the level of agricultural productivity in the area, the Productivity index and multiple regression analysis were employed to ascertain whether agricultural activities were affected by rural road transportation in the study area.

The evaluation of relationship between dependent and independent variables was carried out using the standard multiple regression analysis. The first step consisted of defining the variables of interest. In this study, the output of agricultural produce in the study area was expressed along a set variable characteristic (gender, labour, farm size, distance from farm m to market, age, marital status, farming system, storage facilities). This was to determine the relationship between the effect of rural road transportation on agricultural productivity. The value of the dependent variable (Y) and gender, labour, farm size, distance from farm,

The descriptive technique involves the use of means, standard deviation and simple percentages and frequencies. Statistical analysis such as regression, Analysis of Variance (ANOVA) and productivity index, was also used. All analyses of the hypotheses were done at a 0.05% level of confidence. The statistical analysis package (SPSS) was used for analysis.

Descriptive statistics was used to analyze the socioeconomic characteristics of the farmers and major agricultural producers in the study area.

Descriptive statistics was also used to analyze the available means of transportation of agricultural produce across the study area and the frequency distribution of the various transportation facilities in the area.

to market, age, marital status, farming system, and storage facilities are the independent variables, represented by X1, X2, X3, X4,……....., Xn. The coefficients of the variables measure directly or indirectly the marginal effects of the independent variables on the dependent variables in the study area. The most general form for the model is:

$Y = f(X, d)$ ……..(3)

where,

Y: the dependent variable is the quantity of agricultural produces; *f*: a function to be specified; x: independent variable; b: variables measuring the independent variables

In a specific form, Equation 4.1 translates into Equation 4.2

$Y = a + b1X1 + b2X2 + b3X3 +\ldots, + bnXn + e$ …….. (4)

where, y = dependent variable (value of output of agricultural produces) a = constant

X1, X2, X3, …, …, …, …, …, Xn are independent variables (gender, labour, farm size, distance from farm to market, age, marital status, farming system, storage facilities) b1, b2, b3,…, …, …,

…, …, bn were the regression coefficients which determine the contribution of the independent variables e = residual error (which reveals the strength of b1x1 ... bn Xn;

The multiple regression analysis was relevant to this study as it assists in predicting, making inferences, testing the set hypotheses and modelling the relationships between the variables. Analysis of Variance (ANOVA) was used to establish the total variations of the within and between variables to determine the relationship between the variables.

Agricultural productivity is a quantitative term which provides an estimate of the power of agriculture to produces (Sakti and Arijit. 2012). Therefore, to analyze agricultural productivity in each sampled community, the estimated total output (kg) of farmers was carried out with the most frequently used kg weighing bag. This method of measuring agricultural productivity was adopted because it was the most common and familiar physical unit of quantifying agricultural output by farmers the total value of 50kg weighing bag of product in each sampled community was divided by 1000 to convert the value to tonnes. The productivity was therefore measured by the total output of crop yield per total hectares cultivated (Mba, 2004; Ugwu 2013) or each sampled community.

Productivity Level

Productivity (kg/Ha) = P1(kg)/A1(Ha) ……..(5)

Where: P1 is output of ith farmer in kilogram A1 is area of farmland cultivated in hectares.

4. Results and Discussion

4.1 Socio-Economic Characteristics of The Respondent

1. Gender Distribution of Respondent in the Study Area

Both men and women farmers play important roles as decision-makers in agricultural production management. Table 2 reveals that three communities in the LGA namely: Umualor, Ezimbo and Eha-Amufu have more female farmers (20%, 23% and 23%) than male farmers (15%, 17% and 22%) respectively. According to Bello et al, (2021), women are more knowledgeable in traditional agricultural product varieties, but men hadthemain responsibility for the improvement of varieties introduced in the area

Table 2: Gender Distribution of Respondent in the study area.

	Gender		Total
	Male	Female	
Neke	22 (57.9%)	16 (42.1%)	38 (100.0%)
Ikem	22 (52.4%)	20 (47.6%)	42 (100.0%)
Mbu Amon	24 (60.0%)	16 (40.0%)	40 (100.0%)
Agumede	29 (64.4%)	16 (35.6%)	45 (100.0%)
Umualor	15 (42.9%)	20 (57.1%)	35 (100.0%)
Ezimbo	20 (50.0%)	20 (50.0%)	40 (100.0%)
Ogo-ndago	26 (61.9%)	16 (38.1%)	42 (100.0%)
Eha-Amufu	22 (48.9%)	23 (51.1%)	45 (100.0%)
Total	180 (55.0%)	147 (45.0%)	327(100.0%)

Source: Fieldwork, 2022

Figure 3 reveals that across the LGA, the majority (55%) of farmers were males, while 45% were females. This implies that the gender distribution among farmers is now skewed toward the males

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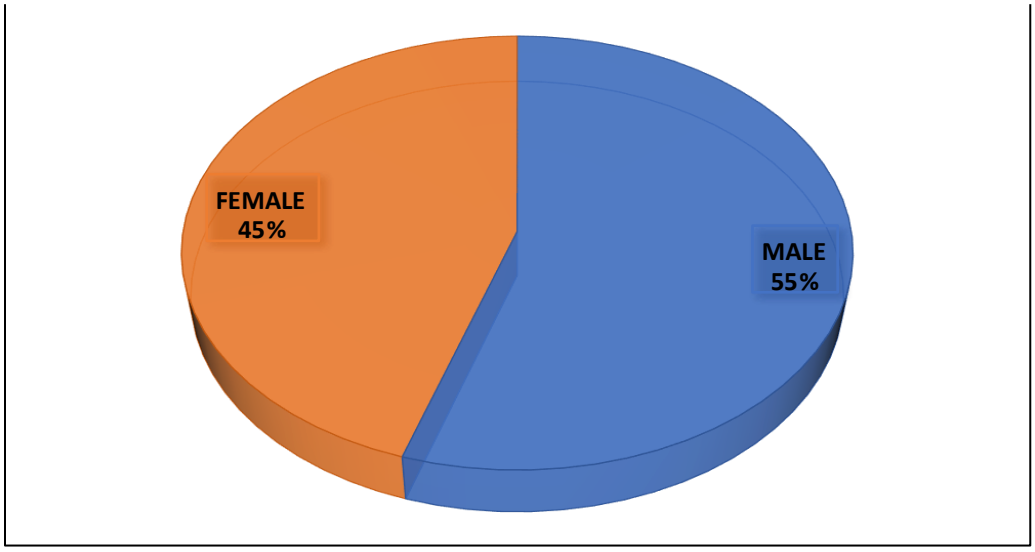

Figure 3: Representation of Gender Distribution of Respondent in the study area.

Source: Fieldwork, 2022

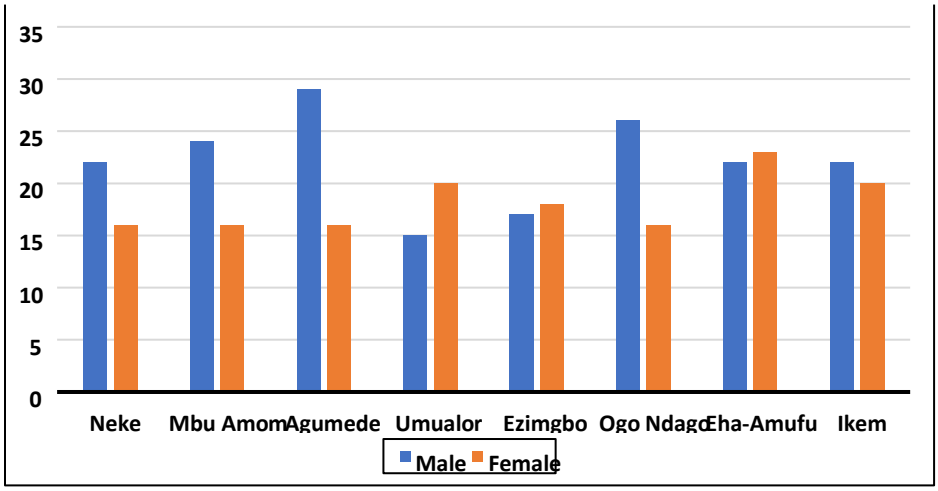

Figure 4: Gender Distribution of Respondents in the study area by communities.
Source: Fieldwork, 2022

Figure 4 shows that 58% of the farmers in Neke were males as against 42% of females. Equally, in all other communities studied. More than half of the farmers are male except in Umualor, Ezimgbo and Eha-Amufu which have a greater proportion of farmers as females especially in Umualor with 57% females against 43% males in the communities. In recent times, poverty and hardship have equally driven the women folk to farms. In all the communities and

especially in Umualor and Eha-Amufu, the women folk have to come to understand this reality in order to survive and take care of their children.

2. Age Distribution of Respondents in the Study Area

In the study, the distribution of the farmers according to their age reveals that farmers in the LGA fall mainly between 41-60 years with variations occurring spatially between the state and between different age brackets. Table 3 shows that 48% of the farmers were between the ages of 0-20 years with Neke having the lowest proportion of 4 farmers within the range. Between age brackets 0-20 years were 15% (48 farmers), between 21-40 years they were 21% (70 farmers), at age 41-60 which record the highest number of farmers 35% (113 farmers) and between 61 and above also recorded a relatively high number of farmers with 29% (96 farmers).

Table 3: **Age Distribution of Respondents in the study area.**

Table 4: **Age Distribution of Respondent in the study area.**

	Age				Total
	Below 20	21-40	41-60	61and above	
Neke	4 (10.5%)	8 (21.1%)	12 (31.6%)	14 (36.8%)	38 (100.0%)
Ikem	5 (11.9%)	9 (21.4%)	13 (31.0%)	15 (35.7%)	42 (100.0%)
Mbu Amon	6 (15.0%)	7 (17.5%)	12 (30.0%)	15 (37.5%)	40 (100.0%)
Agumede	8 (17.8%)	11 (24.4%)	13 (28.9%)	13 (28.9%)	45 (100.0%)
Umualor	514.3%	8 22.9%	12 34.3%	10 28.6%	35 100.0%
Ezimgbo	5 (12.5%)	7 17.5%	22 55.0%	6 15.0%	40 100.0%
Ogo ndago	5	9	17 40.5%	11	42
Eha-Amufu	11.9%	21.4%	12 26.7%	26.2%	100.0%
	10	11	113 34.6%	12	45
	22.2%	24.4%		26.7%	100.0%
Total	48 14.7%	70 21.4%		96 29.4%	327 100.0%

Source: Fieldwork, 2022.

Figure 5 reveals that the majority of the farmers here fall within that age category between 41-60 years, it shows that most farmers in Isi-Uzo are still in their economically productive age. Oderamo and Magaji (2010) when reported that within the age 20-60 years were defined as economically productive population, where farmers in their active years appears disposed to organize and provide the labour needed. (Nwali et al, 2022) had further observed that the average age of traditional technology of farmers was estimated to be 45 years, while that of improved technology Farmer was 50

years. They had equally noted that both cases, the average age is tending toward the declining productivity class of greater than 60 years. The implication they deduced of this is that unless the occupation witnesses the injection of young able farmers in the next decade, agricultural production will suffer a setback as the existing farmers would have reached a declining productivity level (Echebiri and Mbanasor, 2003; Fasina, 2013).

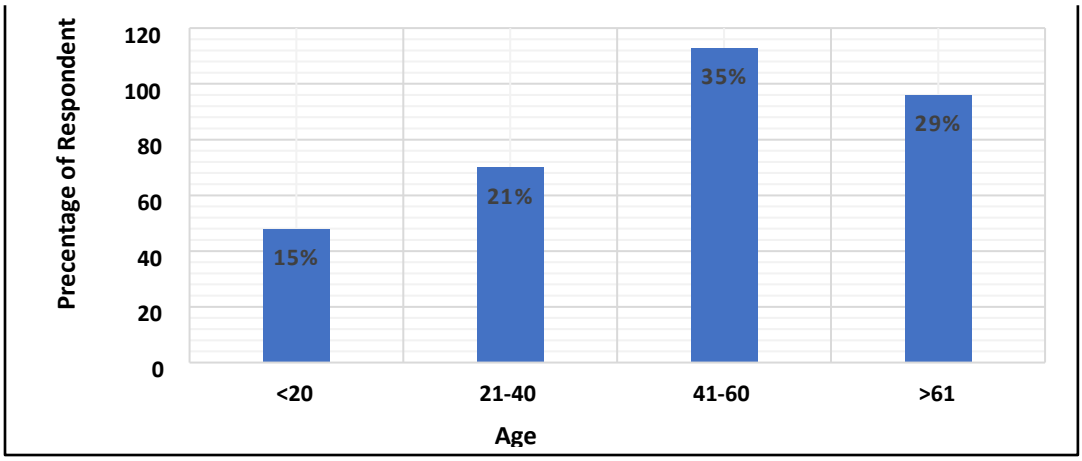

Figure 5: Age Distribution of Respondents in the study area.
Source: Fieldwork, 2022

3. Marital status of Respondent in the Study Area

Figure 6 shows that within the study area, more than 47% (155) of the farmers are married. On the whole, farmers within the groups of single with 24% (77), divorced (11) and other (18) make up the entire farmers that were sampled in the study area. Understanding of the martial status of farmers is a good pointer to the reasons for some farmers that indulge in large scale farming (Jibowo, 2012). For instance, single persons seldom or sparingly go into agricultural activities. This is because agricultural production involves a lot of processes before it gets to the consumers. These processes are usually labour and capital intensive which require a number of peopled to cooperatively carry them out. Rather most single person goes into other economic activities such as transport and most time commodify or commercializing their labour to other married farmers.

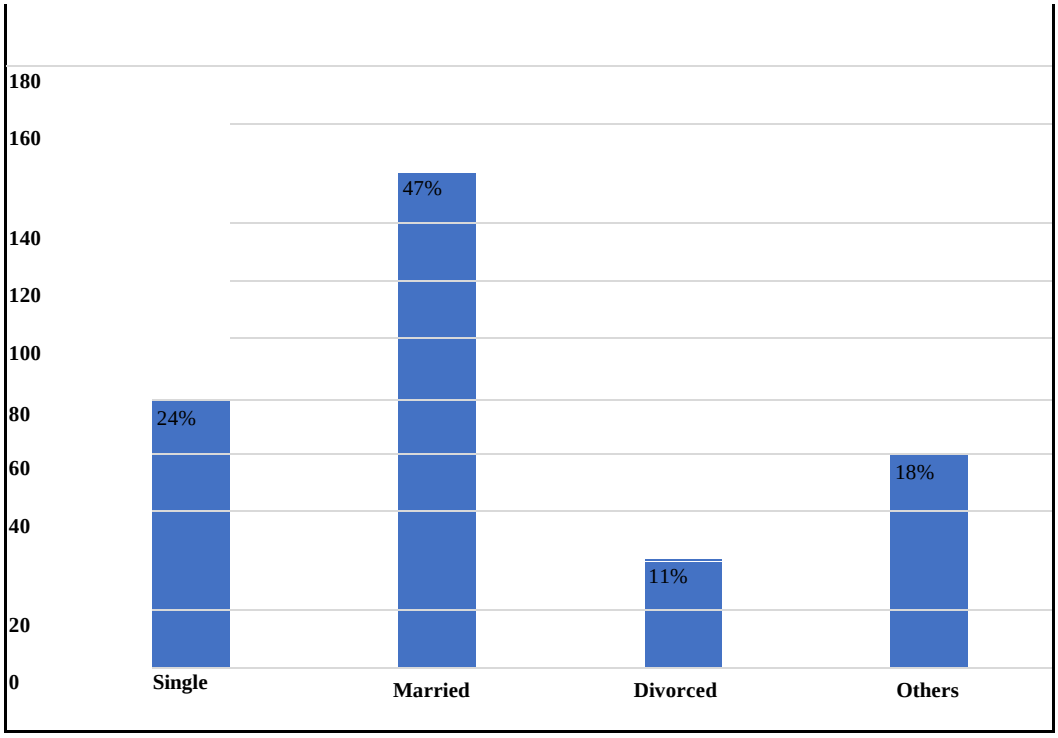

Figure 6: Martial Status of farmers in the study area.

Source: Fieldwork, 2022

Table 4 reveals that the highest proportion of married farmers is found in the Ezimgbo community with (23) as against 4 widowed and 9 single farmers respectively. According to Fatulu (2007), the vast majority of rural farmers consist of married people. The greater number of farmers that were married may be to add extra labour force as a result of lass mechanized farm practices in the study area. It was the practice among farmers since the olden days on Igbo land to marry wives and have a large number of children who would constitute their farm workforce (Ekpe and Alimba 2013; Okpoko and Okpoko, 2016).

Table 4: **Marital status Distribution of Respondents in the study area.**

		Marital status				Total
		Single	Married	Divorced	others	
	Neke	6	22	3	7	38
		15.8%	57.9%	7.9%	18.4%	100.0%
	Ikem	10	19	5	8	42
		23.8%	45.2%	11.9%	19.0%	100.0%
	Mbu Amon	8	22	4	6	40
		20.0%	55.0%	10.0%	15.0%	100.0%
	Agumede	13	19	5	8	45
		28.9%	42.2%	11.1%	17.8%	100.0%
	Umualor	8	15	4	8	35
		22.9%	42.9%	11.4%	22.9%	100.0%
	Ezimgbo	9	23	4	4	40
		22.5%	57.5%	10.0%	10.0%	100.0%
	Ogo ndago	10	18	5	9	42
		23.8%	42.9%	11.9%	21.4%	100.0%
	Eha-Amufu	13	17	5	10	45
		28.9%	37.8%	11.1%	22.2%	100.0%
		77	155	35	60	327
		23.5%	47.4%	10.7%	18.3%	100.0%
Total						

Source: Fieldwork, 2019

4. Occupation of the Respondent in the Study Area

Figure 8 shows that in the study area, most of the farmers are predominantly farmers and traders. Figure 8 revealed that a greater proportion of 85% (278 farmers) of these farmers' primary occupation is Farming. Followed by trading 10% (33 traders) and other source of income 5% in the study area.

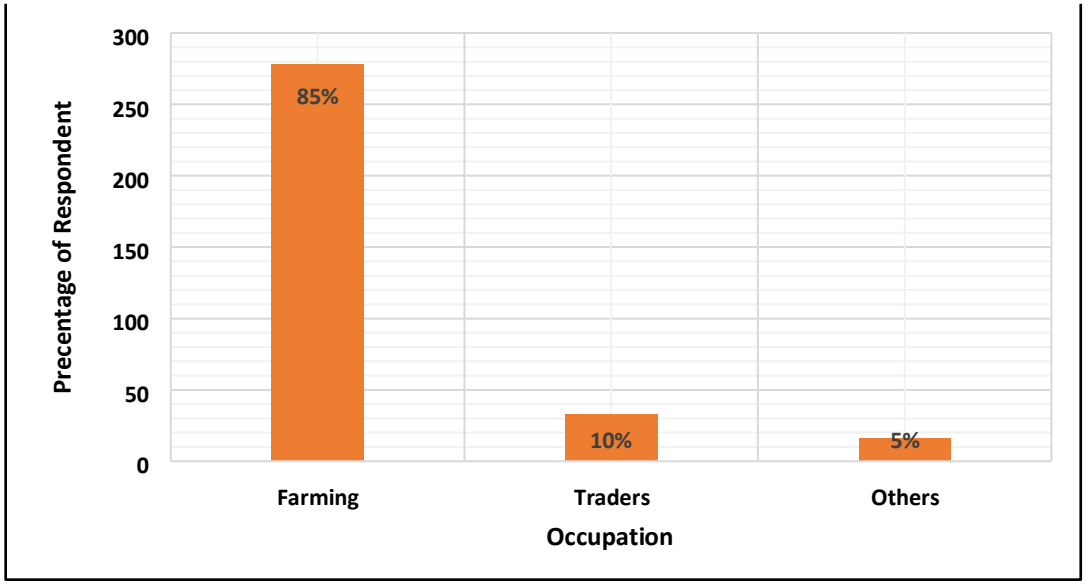

Figure 7: Occupation of Respondent in the study area.

Source: Fieldwork, 2022.

Table 5 reveals that Eha-Amufu and Agumede had the highest proportion (38 farmers each) which are primarily engaged in farming. The finding generally shows that most of the farmers' primary occupation is farming which implies that agricultural product is seen as their most viable source of income. Therefore, since farming remains one important occupation, an improved and effective system is needed in the study area to enhance their productivity.

Table 5: Occupation of Respondent in the study area.

	Occupation			Total
	Farming	Trading	others	
Neke	30	5	3	38
	78.9%	13.2%	7.9%	100.0%
Ikem	36	2	4	42
	85.7%	4.8%	9.5%	100.0%
Mbu Amon	35	3	2	40
	87.5%	7.5%	5.0%	100.0%
Agumede	38	6	1	45
	84.4%	13.3%	2.2%	100.0%
Umualor	31	3	1	35
	88.6%	8.6%	2.9%	100.0%
Ezimgbo	34	4	2	40
	85.0%	10.0%	5.0%	100.0%
Ogo ndago	36	4	2	42
		9.5%	4.8%	100.0%
Eha-Amufu			1	
			2.2%	

	85.7%		16	100.0%
	38	6	4.9%	45
	84.4%	13.3%		100.0%
	278	33		327
Total	85.0%	10.1%		100.0%

Source: Fieldwork, 2022

5. Level of Education of the Respondent in the Study Area

Education plays a significant role in skill acquisition and technology transfer. It enhances technology adaptation and the ability of farmers to plan and take risks thereby increasing their productivity. Farmer with higher levels of education are likely to be more efficient in the use of inputs than their counterpart with little or no education (Paramitha, 2019). Where many of them did not go beyond primary school and a few who attempted secondary education did not complete it, which posed great danger to improvement in agriculture.

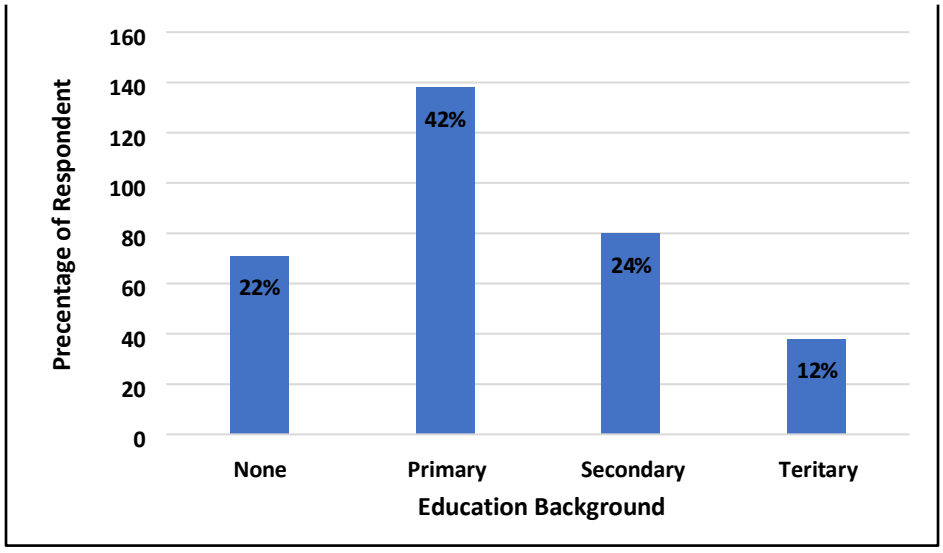

Figure 8: Education Background of Respondent in the study area.
Source: Fieldwork, 2022.

Table 6: Education Background of Respondent in the study area.

		Level of Education				Total
		None	Primary	Secondary	Tertiary	
	Neke	12	10	11	5	38
		31.6%	26.3%	28.9%	13.2%	100.0%
	Ikem	13	14	13	2	42
		31.0%	33.3%	31.0%	4.8%	100.0%
	Mbu Amon	12	19	7	2	40
		30.0%	47.5%	17.5%	5.0%	100.0%
	Agumede	9	22	11	3	45
		20.0%	48.9%	24.4%	6.7%	100.0%
	Umualor	2	22	11	0	35
		5.7%	62.9%	31.4%	0.0%	100.0%
	Ezimgbo	3	20	9	8	40
		7.5%	50.0%	22.5%	20.0%	100.0%
	Ogo ndago	10	15	8	9	42
		23.8%	35.7%	19.0%	21.4%	100.0%
	Eha-Amufu	10	16	10	9	45
		22.2%	35.6%	22.2%	20.0%	100.0%
Total		71	138	80	38	327
		21.7%	42.2%	24.5%	11.6%	100.0%

Source: Fieldwork, 2022

As shown in Table 6, the farmers that do not attend any formal education are 21.7%, those that hold primary school certificates are 42.2%, those that hold secondary school certificates are 24.5% whereas the holders of tertiary institution certificates are 11.6%.

6. Farming experience of the Respondent in Isi-Uzo LGA

Table 7 reveals that the majority of the respondents in the various communities have farming experience above 15 years. From figure 10 it could be observed that farmers with less than 15 years' experience are 28%, those between 15-30 years' experience are 36%, also does with 31-45 years' experience are 20% and those with experience above 45 are 16%. The findings show that the farmers across the LGA in Isi-Uzo were quite experienced in agricultural production. Farming involves a lot of risks and uncertainties, hence to be competent enough to handle all the vagaries of farming a farmer must have stayed on the farm for quite sometimes (Ajah and Ajah, 2014). A farmer who has been cultivating crops, say 10 years is likely to be more knowledgeable about the pattern of rainfall, the incidence of pest and diseases, and other agronomic conditions of the area than a farmer who is just coming onto the business irrespective of their level of education (Karki et al, 2020). No doubt, the

higher level of experience of the improved technology Farmer helps explain why they are venturesome innovators. It has been rightly argued that the age of a farmer may not necessarily correlate with years of experience of farming. This is explained in the fact that while some farmers start farming very early in life, some only take to farming after retiring from wage employment in either public or private service

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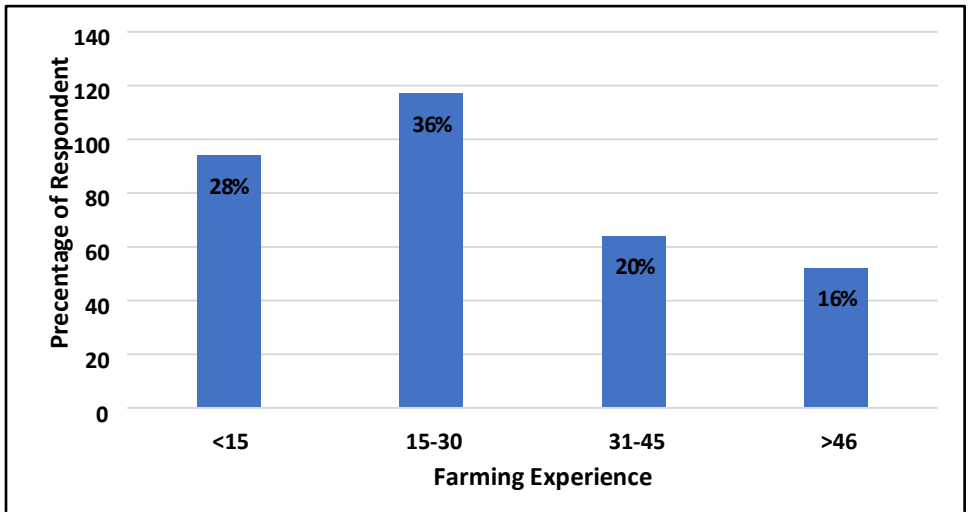

Figure 9: Farming Experience of Respondent in the study area.

Source: Fieldwork, 2019.

Table 7: **Farming Experience of Respondent in the study area.**

		Farming Experience				Total
		less than 15 year	15-30	31-45	46 And above	
Name of Community	Neke	12	12	9	5	38
		31.6%	31.6%	23.7%	13.2%	100.0%
	Ikem	8	19	8	7	42
		19.0%	45.2%	19.0%	16.7%	100.0%
	Mbu Amon	12	15	7	6	40
		30.0%	37.5%	17.5%	15.0%	100.0%
	Agumede	14	17	8	6	45
		31.1%	37.8%	17.8%	13.3%	100.0%
	Umualor	11	10	8	6	35
		31.4%	28.6%	22.9%	17.1%	100.0%
Total		12	14	8	6	40
		30.0%	35.0%	20.0%	15.0%	100.0%

	Ezimgbo	11	15	8	8	42
		26.2%	35.7%	19.0%	19.0%	100.0%
	Ogo ndago	14	15	8	8	45
		31.1%	33.3%	17.8%	17.8%	100.0%
	Eha-Amufu	94	117	64	52	327
		28.7%	35.8%	19.6%	15.9%	100.0%

Source: Fieldwork, 2022.

4.2 Nature of Agriculture Produces in the Study Area

Table 8 and Figure 10 shows that the four major food crops grown by farmers on large scale comprise yams, pepper, rice, and cassava. The reasons for the preferences for these crops range from environmental suitability to economic reasons as some are more highly priced than others like pepper while others like rice is more limited to certain locations like floodplains or where water is available. Food crops cultivated in the study area include cassava, yam, cocoyam, maize, groundnut, banana, plantain, rice, pepper, palm oil and livestock. There are variations in the production level of these crops.

Table 8: Representation of Farmer's Major Crop Product in the Study Area.

Sampled communities	**No of farmlands**	**No. of Agricultural Products**			
		Pepper	**Cassava**	**Rice**	**Yam**
		%	%	%	%
Neke	15	4 (40%)	4 (40%)	3 (30%)	4 (40%)
Ikem	15	4 (40%)	4 (40%)	2 (20%)	5 (50%)
Mbu Amon	15	3 (30%)	5(50%)	1 (10%)	7 (70%)
Agumede	15	4 (40%)	6 (60%)	-	5 (50%)
Umualor	15	4 (40%)	5 (50%)	3 (30%)	3 (30%)
Ezimgbo	15	5 (50%)	5 (50%)	2 (20%)	5 (50%)
Ogo ndago	15	4 (40%)	5 (50%)	-	6 (60%)
Eha-Amifu	15	4 (40%)	5 (50%)	1 (10%)	5 (50%)
Total	**120**	**32 (26.7%)**	**39(32.5%)**	**12 (10%)**	**40 (33.3%)**

Source: Fieldwork, 2022

Table 8 shows the variations in the major food crops produced across the 8 communities. Yam is the most widely produced crop with a total number of 40 farmlands comprising 33.3% of the 120 sampled farmlands. Its preference has cultural backing as it is valued in the eastern part of the country where yam is celebrated. This is followed by cassava with 32.5% of the farmlands. Pepper has 26.7% of the

farmlands and lastly is rice with a 10% of the farmlands producing it as their major agricultural products in the study area.

As shown in Table 1, Figures 2 and 10, most of the communities that produce rice are those on the waterlogged alluvial plain on the western part comprising communities like Ikem, southeast of Eha-Amufu and some part of Ezamgbo, Neke, Mbu Amon and Umualor. These areas are very fertile and are contributing relatively large quantity of rice produced in Isi-Uzo. The area has large expanse of land suitable for rice production and is supported by the Adarice Agricultural Scheme in Uzo-Uwani which helps in the provision of innovative strategies in farming techniques. Rice farming is restricted to certain location due to environmental suitability.

Late cassava planting occurs between September and November depending on the year's rainfall distribution. Moreover, irrigation using the tributaries of Ebonyi river supports pepper, vegetables and cassava production in Eha-Amufu, Ikem and Agumede communities during the dry season

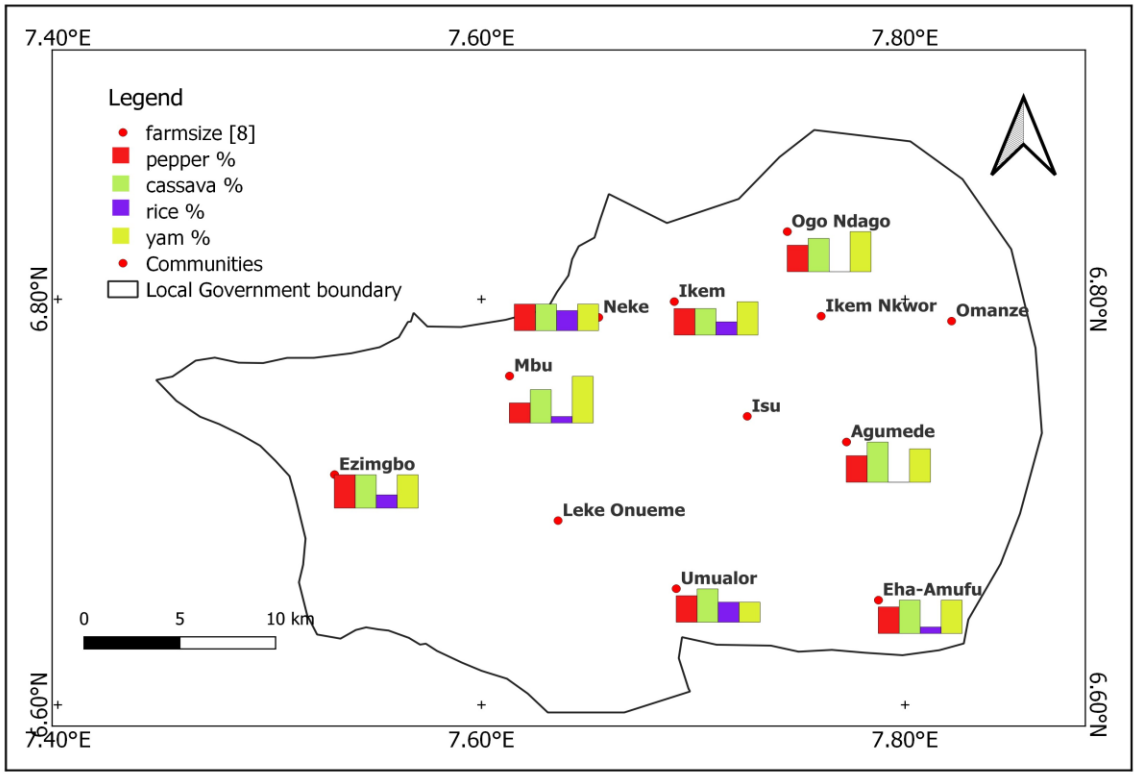

Figure 10: Farmland sizes for the four main crops in each community
(Source: Adapted from Google maps, 2022)

4.3 Nature of Rural Transport System in the Study Area

The area is dominated by footpaths and bush tracks which lead to the farmlands. These transport means escalate the problem of rural agricultural activities that threatens agricultural growth and development. Most of the roads are seasonal. In some places, slippery silty loam soils and muddy surfaces impedes transportation. Similarly, some of the tarred roads are in deplorable states with numerous potholes that limit the number of users or motorists. This problem is more pronounced in communities like Agumede and the road that link Ikem with Eha-Amufu.

The difficulty in transporting agricultural produce discourages farmers from cultivating large farmlands especially the remote ones which in most cases are the most fertile as they are on virgin lands. The perception of farmers, drivers and traders on the road conditions in the area are shown in Figure 10.

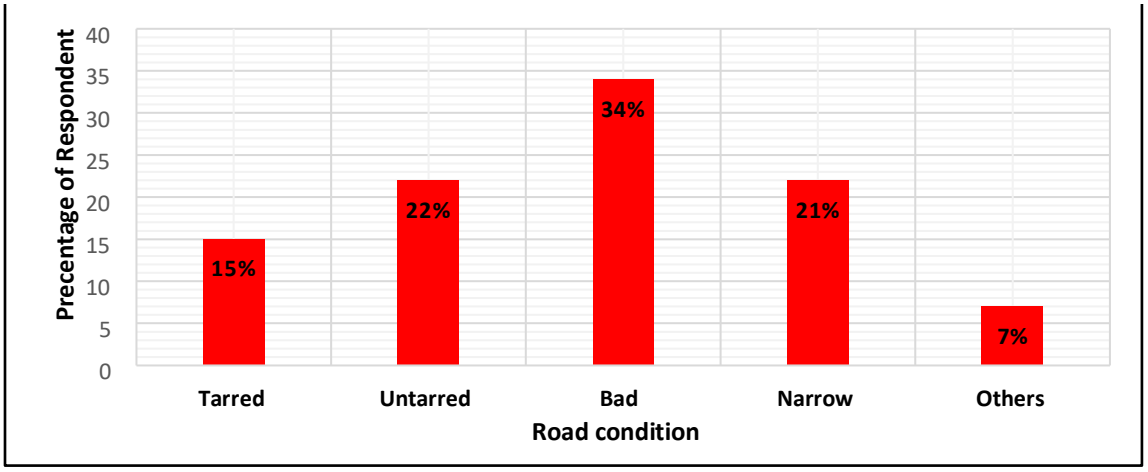

Figure 11: Perception of respondents on their road conditions.

Source: Field work, 2022

The results in Figure 11 shows that 34 % of the respondents perceive that their road is in bad state and 22 % of the respondents agreed that their roads are untarred. The result indicates that there are variations in the nature of road according to the respondents across the communities. Majority pf the respondents that agreed that their roads are tarred are in Eha-Amufu town and around the LGA Headquarters. They live in proximity to the major road that link the LGA and Eha-Amufu through Obollo-Afor to Ebonyi State. Their choice might have been influenced by the recent resurfacing and rehabilitation of the roads around the LGA headquarters and environs by the LGA chairman.

Also, factors affecting mobility and the evacuation of the agricultural produce to the neighbouring urban centres are shown in Table 10. The summary of road network quality in the study area conforms to the perception of respondents about their road type which is mostly untarred, narrow and footpaths. (Table 9).

Table 9: Perception of respondent about their major rural transport problem

Transport Issues	Frequency	Percent	Cumulative Percent
Motorable road link	78	24	24
Organised public transport	48	15	39
Car ownership	31	9	48
Roughness of road	81	25	73
long travel time	89	27	100.0
Total	**327**	**100.0**	

Source: Field work 2022.

Table 9 illustrates that 27 % of the respondents perceive that their major transportation problems were long travel time. That is, due to the deplorable state of the roads, it takes longer time to move from one point to another. The effects of transportation in their decreasing order from the respondents were roughness of road (25 %), lack of motorable road (24 %), absence of organised public transport (15 %), long distance travel and low car ownership (9 %). Thus, 76 % of the respondents agreed that road-related challenges limit the movement of agricultural produce in the area. These road-related problems comprise long travel time, inadequate motorable road and roughness of road (Table 9).

4.4 Means of Transportation in the Study Area

The untarred rough roads, low level motorised means of transport and other transportation related problems in the study area compelled the farmers and traders to adopt some mechanically propelled means of transportation such as trekking, head porterage, wheel Barrow in transporting agricultural products. This is because the ability of one to adopt a motorised means of transportation is dependent on income, availability and nature of road. The perceptions of the respondents on means of transport were shown in Figure 11.

Table 10: Percentage Distribution of Respondents Means of Transportation.

Transport means	Frequency	Percent	Cumulative Percent
Wheelbarrow	52	15.9	15.9
Foot (head portage)	70	21.4	37.3
Motorcycle	86	26.3	63.6
Buses	7	2.1	65.7
Bicycle	109	33.3	99.1
Taxi	3	0.9	100.0
Total	327	100.0	

Source: Field work, 2022

Result from Table 10 shows that the predominant means of transportation adopted by the farmers is bicycle with the value of 109 (33.3%) respondent. This is followed by motorcycle (26.3%) and foot or head portage (21.4%) with the least used means of transportation being buses and taxi (2.1%) and (0.3%), respectively. This shows that most of the roads from farm settlements to the markets are not readily accessible via motorised means of transportation.

4.5 Agricultural Productivity Level in the Study Area.

The direct measurement of number of hectares and quantity of harvested crop in each community were gotten from farmers through the questionnaire survey (Table 11).

Table 11: Estimated productivity level (t/ha) and total yield (kg and tonnes) for the major crops in the sampled communities.

Sampled Community	Yield (kg) of individual major product						
	Pepper	Rice	Cassava	Yam	Total Yield (t)	Farm size (ha)	Productivity t/ha)
Neke	1300	800	2000	2100	6.20	105	0.06
Ikem	1600	750	2150	2300	6.80	155	0.04
Mbu Amon	1200	650	2000	2400	7.25	87	0.07
Agumede	1500	-	2050	2150	5.70	90	0.06
Umualor	1100	900	1900	1750	5.65	117	0.05
Ezimgbo	850	650	2050	1950	5.50	104	0.05
Ogo ndago	1550	-	1750	2050	5.35	94	0.06
Eha-Amufu	1900	1050	2100	2300	7.35	104	0.07
Total	**11000**	**4800**	**16000**	**17000**	**49.8**	**856**	**0.46**

Source: Field work, 2022

Table 11 illustrates that among the four major grown food crops in the sampled communities, yam has the highest total output of (17000 kg). This was followed by Cassava (16000 kg) with 11000kg for pepper and finally rice with the total output of (4800kg). The low output level of rice production is due to its restriction to specific areas due to its high-water requirement. For that reason, it is mainly grown in five communities namely, Neke, Ikem, Umualor, Ezimgbo, Mbu Amon and Eha-Amufu. In terms of gross output, Eha-Amufu produced the highest total yield of 7350kg (7.35 tonnes) with yam and cassava topping the other food crops (Table 11).

4.6 The Effect of Rural Road Transportation on Agricultural Productivity in the Study Area.

The road condition has direct association with the distance in terms of travel time. The poor road conditions generally hinder the farmers from making adequate use of modern means of transportation in transporting their food products. This is because the deplorable road condition results in high transportation fare which then discourages the farmers from

engaging in extensive farming in remote and distant farms. This in turn reduces their income for most of the products do not reach the consumers due to the unavailability of efficient public means of transportation (Afolabi et al, 2018). The long-distance travel and adoption of simple means of transportation on muddy, dusty, untarred roads characterise the seasonal roads and the footpaths leading to farms. (Table 12)

Table 12: Percentage representation of the distance (km) from farm to market

Distance	Frequency	Percent	Cumulative Percent
less than 1 km	84	25.7	25.7
1-4 km	140	42.8	68.5
4-7 km	64	19.6	88.1
7-10 km	29	8.9	96.9
≥ 10 km	10	3.1	100.0
Total	327	100.0	

Source: Fieldwork, 2022

Table 12 shows that 42.8 % of the respondents covers a distance between 1 and 4km from farm to market. That is, about 68.5 5 of the respondents travel a very short distances of not over 4 km due to poor transportation facility (Table 12) while only 3.1 % cover up to over 10km. The low level of public transportation services in the area lead to keeping harvested crops in the farms for days due to the inability to transport them the market and so often they spoil in the farms. Even when farmers struggle to get the products to the market, the middlemen/traders underprice them for two main reasons. The first is that transporting them is a challenge which will cost them highly and the second is because there are few buyers to buy them in the rural market. Thus, supply is usually higher than the demand due to few buyers managing to visit the rural markets due to poor roads and yet the farmers too find it difficult taking their goods to the nearest urban markets due to the poor roads. Table 13 shows the multiple regression analysis between independent variables and agricultural productivity in the area.

Table 13: Summary of Multiple Regression Analysis between Independent Variables and Agricultural Productivity

Model	R	R Square	Adjusted R Square	Std. Error of the Estimate	Change Statistics				
					R Square Change	F Change	df1	df2	P-value
sex	0.12[a]	0.02	0.01	0.97	0.02	4.98	1	325	0.41
labour	0.17[b]	0.03	0.02	0.97	0.02	4.93	1	324	0.21
Farm size	0.18[c]	0.03	0.02	0.97	0.00	1.18	1	323	0.21
DM	0.20[d]	0.04	0.03	0.97	0.01	1.94	1	322	0.08
Age	0.39[e]	0.15	0.14	0.91	0.11	41.97	1	321	0.39
MS	0.87[f]	0.76	0.76	0.49	0.61	811.34	1	320	0.00
FS	0.87[g]	0.76	0.75	0.49	0.00	0.08	1	319	0.76
St F	0.88[h]	0.77	0.76	0.48	0.01	6.88	1	318	0.01

Source: Author's Computation, 2022

*DM is distance to market, MS is marital status, FS is farming system, St F is storage facility

It could be observed from Table 13 that marital status and storage facilities were the best predictors of agricultural output in the study area. They have correlation coefficients of 0.87 and 0.88, respectively. Therefore, based on the standard error of estimate, marital status, farming system, and storage facilities are the better predictors. However, it is only marital status and storage facility that are significant at 0.05 significance level. At 0.08 level of significance, distance to market is significant. It implies that 76.5% of its variations in marital status and storage facility account for the variations in agricultural productivity. is associated with agricultural production in the area. The negative relationship with agricultural production suggests that agricultural production decreases with changes in method of storage facilities while farming system accounted for 75 %. This result is in line with the findings of Bassey (2018) who noted that the productivity level of rural household head and welfare level of the household increase with age of the household head only up to a certain level before they start to decline.

Discussions were held with farmers and transporters in the sampled communities. From the findings, it was discovered that most of the roads linking the settlements with one another are in bad condition. It was further gathered that road transport does not only have impact on the development of the agricultural production but also on the socio-economic development of the people in all these communities. Most of them indicated that they pay high fare in order to get their produce to where needed and this in turn affects their farm income. The result of the interview with the transporters revealed that they prefer to be plying good roads linking settlements than those that are not connected with good roads. According to them, they pointed out that bad road conditions affect their cars and lorries to the extent if given option, they do not want to patronise the study area any longer. Furthermore, they indicated that their continued patronage to

these settlements is because most of drivers are indigenes of these communities.

However, the implication of rural road transportation is that it has the negative effect of restricting expansion of agricultural production. Due to poor transportation, agricultural produce attracts very low farm-gate prices in the area. For instance, a 100 kg of dried yam tubers which cost N13, 000 at Ikem market at the time of the survey (September 2022), attracted a price of about N18, 000 at Eha-Amufu main market, while it cost N20, 000 in Obollo Town at that time. Similar situations exist for other farm produce like maize, guinea corn and cassava. It is interesting to note that Ikem to Eha-Amufu is just a distance of about 15kms and the wide price differential is the result of the difficulties of transporting farm produce out of the area. As a result, some farmers in the area simply collect money below the market price and hand over their product to middlemen, who then transport the crops to far centers like Obollo, Enugu as well as some communities in Ebonyi state. This implies that, most of the profit from farming accrues to traders, transporters and other middlemen at the detriment of the farmers. Since transport cost as a proportion of production costs, increases with distance between village and fields, high transport costs may force the farmer to limit his cultivations to fields closer to the village (Modirwa (2019). Many of the farmers confirmed their willingness to expand their production if they could find better opportunities of attracting higher prices for their farm produces through good transportation network.

The relationship between the effects of road transportation and agricultural productivity can thus be predicted with the following equation:

$$Y = 1.064 + 0.045(X1) - 0.040(X2) - 0.038(X3) - 0.047(X4) - 0.025(X5) + 0.854(X6) + 0.014(X7) - 0.185(X8).$$

The equation shows that the level of agricultural output increases with storage facilities, marital status and remoteness of the farms. It however reduces with sex, labour, farm size, distance from farm to market and longer period of farming experience and old age. Also, areas with poor transport facilities are associated with higher agricultural production in the study area. this implies that, these areas have high agricultural potentials that could be adequately harnessed with improvement in transportation.

4.7 Determination of Relationship between the Effect of Rural Road Transportation and Agricultural Productivity.

In this section, attempt was made to determine the relationship that exist between several explanatory variable (gender, labour, farm size, distance from farm to market, age, marital status, farming system, storage facilities) and output of agricultural product. This was carried out to ensure logically consistent finding in consonance with the aims and objective of the study. In this respect, the hypothesis earlier formulated is started in the null form as follows.

Let Ho be "there is no significant relationship between the effect of rural road transportation and agricultural productivity in Isi Uzo Local Government Area at 0.05 level of significance".

In doing so, attempt was made to determine if there are statistically significant relationships between the variables using the multiple regression models, and Analysis of Variance.

4.8 Determination of the Relationship of individual explanatory variable to variability in Agricultural Productivity.

An attempt was made to test individual hypothesis of the study, that "there are no differences in individual relationship of the explanatory variables to variability in agricultural output values in the study area". This was to determine the contributions of the independent variables to variability in agricultural output value on individual basis. As stated earlier, the explanatory independent variables are sex, labour, farm size, distance from farm to market, age, marital status, farming system, storage facilities while agricultural output value is the dependent variable. Each of the independent variables was tested against agricultural output values using the ANOVA.

Table 14: Summary ANOVA of Relationship between Independent Variables and Agricultural Productivity.

Model		Sum of Squares	df	Mean Square	F	Sig. (P value)
X1	Regression	4.724	1	4.724	4.980	.026[b]
	Residual	308.273	325	.949		
	Total	312.997	326			
X2	Regression	9.342	2	4.671	4.984	.007[c]
	Residual	303.655	324	.937		
	Total	312.997	326			
X3	Regression	10.447	3	3.482	3.718	.012[d]
	Residual	302.550	323	.937		
	Total	312.997	326			
X4	Regression	12.254	4	3.063	3.280	.012[e]
	Residual	300.743	322	.934		
	Total	312.997	326			
X5	Regression	47.025	5	9.405	11.351	.000[f]
	Residual	265.972	321	.829		
	Total	312.997	326			
X6	Regression	237.766	6	39.628	168.560	.000[g]
	Residual	75.231	320	.235		
	Total	312.997	326			
X7	Regression	237.785	7	33.969	144.074	.000[h]
	Residual	75.212	319	.236		
	Total	312.997	326			

X8	Regression	239.376	8	29.922	129.247	.000[i]
	Residual	73.620	318	.232		
	Total	312.997	326			

Source: Author's Computation 2022

The P-values in the ANOVA (Table 14) for sex (0.026), labour (0.007), farmsize (0.012), distance from far to market (0.012), age (0.00), marital status (0.00), farming system (0.00), storage facilities (0.05), which are all less than 0.05, there is a statistically significant relationship between agricultural output value and these variables at the 95% confidence level. The R-Squared statistic indicates that the model as fitted explains 76.5% of the variability in agricultural productivity values. The adjusted R-squared statistic is 75.9%, which is more suitable for comparing models with different numbers of independent variables. In determining whether the model can be simplified, it suffices to note that the highest P-value on the independent variables is 0.026, belonging to location. Since the P-value is less than 0.05, the relationship is statistically significant at 95.0% confidence level.

5. Conclusion.

This study examined the effect of rural roads and transportation on agricultural production Isi-Uzo LGA. The study shows that sex, labour, farm size, distance from farm to market, age, marital status, farming system, storage facilities were found to be important in predicting agricultural production in the area. Although, the nature of rural transport infrastructure and service available was found to be important, the negative relationship with agricultural production indicates that poor transport facilities are associated with high agricultural production in the area. Some rural settlements in the LGA which have vast agricultural lands and high agricultural production are the most inaccessible in the area. Poor transportation restricts expansion of agricultural production in this area, this ensures that most of the profit from farming accrues to the traders and transporters rather than the producers. The high agricultural potential of the area could however be achieved with improvement in transportation. Provision of better transportation facilities will ensure higher output distribution, encourage the farmers to increase their production and reduce spoilage and wastage of farm produce in the area.

6. Recommendations

Having studied the effect of rural road transportation on agricultural productivity in Isi-Uzo L.G.A, it becomes necessary to recommend that for an improved agricultural production in the area, the following should be adhered to strictly. Interventions in the transport sector should not be limited to provision of roads alone rather, such measures that will help improve vehicle supply in rural areas should also be introduced. Solving rural transportation problem in the study area go beyond mere provision of roads because, transport services are as important as roads for ensuring mobility of people and goods.

The construction of more rural roads to connect farmlands to the markets and where the roads are in deplorable state of despair, they should be reconstructed or rehabilitated. The tremendous exploitable agricultural potential in Isi-Uzo L.G.A should be harnessed through articulated government policies in the provision of effective road transportation facilities, maintenance of existing roads and provision of other basic social amenities required by rural farmers and possibly mechanisation.

Having established the fact that transportation cost increases the price of agricultural products, it is recommended that the government with the collective will of people, establish food collecting points in the various rural areas where government can collect agricultural products and transport to urban markets. It is also suggested that government should invest heavily in rural feeder roads and again ensures adequate and proper maintenance to enable the roads to be sustainable at all seasons. Rehabilitating of rail transport for increase in linkages and connectivity which will aid evacuation of agricultural products effectively.

Finally, government should also intensify effort in the provision crops seeds, agrochemicals financial aids, subsidising of agricultural facilities, provision of services of the extension workers and given loan to farmers to assist them procure vehicles. These will impact positively on independent variables and reduce the stress as well as time wasted travelling on untarred roads to farms.

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