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FARMLAND VALUES AND PRODUCTIVITY OF ARABLE CROP FARMERS IN IMO STATE, NIGERIA

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ABSTRACT

Context and background:

Agriculture is an important sector of the Nigerian economy. Farmland provides the most important means of agricultural production and is a basic resource and requirement for human survival; and the most important economic resource most particularly for developing countries with largely rural population, where most people earn a living through agriculture. It is the livelihood of many people across the globe, such as agricultural and livestock producers, developers, and investors. This explains the intrinsic value and premium placed on farmland particularly the rural populace whose major occupation is farming.

Goals and objectives:

The study examined farmland values and productivity of crop arable farmers in Imo State of Nigeria. The study specifically examined the farmland values in the study area and its determinants, the productivity of the arable crop farmers and the determinants of productivity of the farmers.

Methodology

A multi-stage sampling technique was used in selecting 180 respondents for the study. Primary data, collected using structured questionnaire, were analyzed using descriptive and inferential statistical tools.

Results:

The results showed that the mean productivities of the male and female farmers were 6.85 and 5.65 respectively. Also, 46.67% of the farmers cultivated between 1.1–2.0 hectares with average productivity of 6.05. The mean age of the respondents was 48 years. The result showed that respondents who attained secondary education were more productive and about 77.78% were married with an average productivity of 7.46. The mean household size was 6 persons per household and the most productive group were those who had a household size of between 7-9 persons with an average productivity of 6.99. On the average, the respondents have spent about 24 years on arable crop farming. Majority (77.22 percent) of the farmers had no contact with extension agents and had lower productivity than their counterpart who had contact with extension agents. Also, only 13.89 percent of the farmers were members of cooperative societies and these farmers had higher productivity. Only 11 percent of the respondents had access to credit and they had higher productivity. The land ownership status showed that majority (77.78 percent) of the respondents are owner occupiers an average productivity of 5.91 and respondents whose major occupation was farming were 71.67% with a productivity of 6.37. The average farmland value was N235, 555. The significant determinants of farmland value were farm size, productivity, returns and duration of tenure which were all positive while and purpose of use was the only negative significant variable. The mean productivity of the farmers was 6.25. The significant determinants of productivity were innovations, education, marital status, farm size, labour and credit which were all positively related to productivity. About 58.33% of the farmers were food insecure. Farmland value had a significant positive effect on productivity. The study recommends that policies that will reduce the value/price of land and grant farmers increased access to land and finance should be implemented to enhance farm investment and hence increase the farmers productivity.

Keywords:

Farmland, Values, Productivity, Food Security

1. INTRODUCTION

Agriculture is an important sector of the Nigerian economy. According to Tsokar (2022), the agricultural sector contributed 22.35 percent of the total Gross Domestic Product between January and March 2021. In 2021, Nigeria had approximately 69 million hectares of agricultural land (Sasu, 2023). Farmland provides the most important means of agricultural production and is a basic resource and requirement for human survival; and the most important economic resource most particularly for developing countries with largely rural population, where most people earn a living through agriculture (Wang *et. al.*, 2023; Dawang *et al.,* 2014). Tavares *et al*. (2022) noted that farmland is the livelihood of many people across the globe, such as agricultural and livestock producers, developers, and investors. This explains the intrinsic value and premium placed on farmland particularly the rural populace whose major occupation is farming.

Farmland value is the price of a cultivated farmland per hectare for production in a voluntary transact ion; and land prices are differentiated based on its production attributes in agriculture as well as other activities (Anyiam *et al.,* 2021, Delbecq *et al.*, 2014). Delbecq *et al.* (2014) and Czyzewski *et al.* (2018) noted that farmland values are only partially explained by agricultural returns but in addition by multiple non-agricultural attributes of farmland contributing to its market value, which fall into three groups: population and urban influence, recreational and natural amenities, and locational characteristics. An increase in farmland value most likely is driven by a combination of various factors to include, increase agricultural productivity, high commodity production, price, expanding trade and strong demand for non -agricultural land uses (Tavares *et al.*, 2022 and Drescher *et al.*, 2001).

According to Liu *et al.* (2022) urbanization not only occupies a large amount of farmland spatially, but also economically squeezes agricultural production, resulting in farmland marginalization and causing serious threats to food security. Urbanization leads to a continuous loss of agricultural land, both directly under the form of land take, and indirectly through the use of agricultural land for non-productive rural activities and this put pressure on farmers, making farming activities harder through reduced agricultural land, negative externalities and the competition for land (Beckers, 2020). This drives the value of farmland up and poses a great threat to food security and the uncertainties created by this has hindered farmers from making long term investment on the farm due to fear of their farmland being bought over for other uses. Investment stimulates productivity and increasing agricultural productivity is key to increasing farm income, combating poverty and food insecurity and improvement in livelihoods/welfare.

Nwozor *et al.* (2019) noted that food insecurity in Nigeria is worsened by national insecurity as a result of protracted arm conflicts involving sundry groups especially the Boko Haram, Fulani herdsmen and bandits. The invasion of farmlands by these groups have resulted in many fatalities thus creating acute food insecurity and making it difficult for farmers to continue in agricultural

production optimally. This according to Fadre *et al.* (2014) has affected agricultural productivity and causing market disruption with food price shocks. This has in addition worsened the precarious poverty situation in Nigeria.

Although agriculture plays a big role in economic development and sustainability, agricultural producers are less keen to remain in the sector because of its increasingly challenging environment (Middelberg, 2014). While studies in Nigeria have empirically investigated determinants of farmland values (Anyiam *et al.,* 2021), Econometric Analysis of Agricultural Land Values in Imo State Nigeria (Ehirim *et al.,* 2017), among others, none of these has looked at the effect of farmland values on productivity. This study therefore serves to fill this gap. This study specifically estimated the value of farmland and factors influencing it; determined the productivity of the farmers and factors influencing it; examined the effect productivity on farmland value.

2. METHODOLOGY

The study was carried out in Imo State of Nigeria. The State lies within latitude 4^{o} 45^{1} N and 7^{o} 15^{1}N, and longitude $6^{o}50^{1}$E and $7^{o}25^{1}$E with an area of around 5,100Sqkm. Imo State is bounded on the east, west, north and south by Abia, Anambra, Enugu, and Rivers states respectively. Imo State is divided into three agricultural zones which are Owerri, Orlu, and Okigwe zones. The state has a population of 4,609,038 persons with a population density of 1,053/km^2 as at 2016. The predominant economic activities of the inhabitants in the state include agriculture (farming), civil service, artisanal activities and marketing. The area is in a humid climate with annual rainfall range of between 1,500 mm to 2,200 mm with an average annual temperature above 20^{o} C.

A multi-stage sampling technique was used in selecting samples for this study across the three agricultural zones. In the first stage, three Local Government Areas were purposively selected from each of these three agricultural zones in the State. In Owerri Zone, Ngor Okpala, Owerri West and Ikeduru L.G.As. were selected, Orlu Zone, Ohaji- Egbema, Oru west, and Oguta Local Government Areas were selected while Ihitte-Uboma, Onu Imo and Isiala mbano were selected in Okigwe zone. The selection of the LGA's was done based on the high agricultural activities In the second stage, three autonomous communities were randomly drawn from each of the three selected Local Government Areas of the three agricultural zones. The third stage also involved random selection of four villages from each of the autonomous communities and finally, a random selection of five farmers from each of the selected villages which forms the fourth stage, making the sample a total of one hundred and eighty farmers.

Primary data used for the study were collected with well-structured questionnaires which were administered to the sampled farmers. Data collected were analyzed using descriptive tools (such as means, frequency distribution and percentages), Ordinary Least Squares (OLS) multiple regression analysis, Total Factor Productivity (TFP), food security index and logit regression model.

The OLS model for the determinants of farmland values is specified implicitly as:

$Y = f(X_1, X_2, X_3, X_4, X_5, X_6, X_7, X_8, X_9)$ (1)

Where: Y= Farmland values or price (₦), X_1 = Farm size (hectares), X_2 = Farmland productivity (total value of outputs divided by total value of inputs), X_3 = Returns from farmland (₦), X_4= Farm location on price (dummy variable: near residential area = 1; otherwise = 0), X_5 = Years of education, X_6= Duration of tenure in years, X_7= Purpose of use (for a agriculture = 1, otherwise = 0), X_8= Community levy (₦), and X_9= Distance to farmland.

The Total Factor Productivity (TFP) is specified as:

$$TFP = \frac{\sum PjYj}{\sum P_i X_{i+TFC}} \quad (3)$$

Where: P_j = unit price of the jth arable crop in Naira; Y_j = quantity of the jth arable crop in kg; P_i = unit price of i^{th} variable input in Naira; X_i = quantity of i^{th} variable input, TFC = Total Fixed Cost.

The determinants of productivity was analysed using OLS regression model specified as:

$TFP = f(P_1, P_2, P_3, P_4, P_5, P_6, P_7, P_8, P_9, P_{10})$ (4)

Where: TFP is as previously defined; P_1=Innovation adoption (adopters =1; otherwise = 0), P_2 = Years of educational attainment; P_3= Gender of household head (dummy variable: male=1, female=0); P_4= Marital status (dummy variable: married=1; otherwise=0); P_5 = Age (in years); P_6 = Farm size (hectares); P_7= Farming experience (in years); P_8= Labour (₦); P_9 = Amount of credit (₦); and P_{10}= Farm income (₦)

The effect of productivity on farmland values was analyzed using a simple regression and the model is specified as:

$Y = f(Z)$ (7)

Where: Y= Farmland value, Z= Productivity; and all variables were as previously defined.

3. RESULTS AND DISCUSSION

3.1 Socio-economic characteristics of the farmers

The distribution of the respondents based on their socio-economic characteristics with respect to productivity is shown in Table 1. The results showed that majority 48.65% of the male famers fall under the productivity range of 0.1-6.0 as against 67.93% of their female counterpart. The mean productivities of the male and female farmers were 6.85 and 5.65 respectively. This implies that the male farmers were more productive than their female counterparts. This could be as a result of the male farmers having more access to productive resources than their female counterparts. According to UN WOMEN (2020), women experience inequitable access to agricultural inputs, including family labour, high-yield crops, pesticides and fertilizer. Equalizing women's access to agricultural inputs, including time-saving equipment, and increasing the return to these inputs is therefore critical to close gender gaps in agricultural productivity.

Table 1: Socio-economic distribution of the respondents with respect to productivity

Productivity	**Male**		**Female**	
Range	Frequency	Percentage	Frequency	Percentage
0.1-3.0	24	32.43	35	33.02
3.1-6.0	12	16.22	37	34.91
6.1-9.0	17	22.97	12	11.32
9.1-12.0	10	13.51	7	6.60

12.1-15.0	3	4.05	7	6.60
15.0-18.0	8	10.81	8	7.55
TOTAL	74	100.00	106	100.00
Mean	6.85		5.65	

Farm Size	**Frequency**	**Percentage**	**Average productivity**
0.1-1.0	76	42.22	5.49
1.1-2.0	84	46.67	6.05
2.1-3.0	13	7.22	6.99
3.1-4.0	7	3.89	6.45
Total	180	100.00	
Age range	**Frequency**	**Percentage**	**Average Productivity**
21-30	5	2.78	4.98
31-40	39	21.67	6.84
41-50	62	34.44	7.95
51-60	50	27.78	7.65
61-70	21	11.67	6.23
71-80	3	1.67	3.87
Total	180	100	
Mean	48		
Level of education	**Frequency**	**Percentage**	**Average productivity**
No formal education	16	8.89	5.64
Primary	26	14.44	5.84
Secondary	72	40.00	7.40
Tertiary	66	36.67	6.10
Total	180	100	
Marital status	**Frequency**	**Percentage**	**Average productivity**
Married	140	77.78	7.46
Single	6	3.33	6.57
Widowed	30	16.67	6.22
Separated/Divorced	4	2.22	4.75
Total	180	100	
Household size	**Frequency**	**Percentage**	**Average productivity**
1-3	15	8.33	4.71
4-6	97	53.89	6.50
7-9	48	26.67	6.99
10-12	20	11.11	6.78
Total	180	100	
Mean	6		
Farming experience	**Frequency**	**Percentage**	**Average productivity**
1-10.	41	22.78	5.25
11-20.	39	21.67	6.12
21-30	39	21.67	7.09
31-40	33	18.33	6.75
41-50	28	15.56	6.05
Total	180	100	
Mean	24.43		
Extension contacts	**Frequency**	**Percentage**	**Average productivity**

Farm Size	Frequency	Percentage	Average productivity
Contact	41	22.78	5.92
No contact	139	77.22	6.57
Total	180	100	
Membership of cooperative	**Frequency**	**Percentage**	**Average productivity**
Member	25	13.89	6.54
Non member	155	86.11	5.95
Total	180	100	
Access to credit	**Frequency**	**Percentage**	**Average productivity**
Had access	20	11.11	6.45
Had no access	160	88.89	6.05
Total	180	100	
Land ownership status	Frequency	Percentage	Average productivity
Tenant	40	22.22	6.59
Owner occupier	140	77.78	5.91
Total	180	100	
Major occupation	**Frequency**	**Percentage**	**Average productivity**
Farming	129	71.67	6.37
Others	51	28.33	6.12
Total	180	100	

Source: Field survey data, 2022.

Table 1 showed that 46.67% of the farmers cultivated between 1.1–2.0 hectares with average productivity of 6.05. The result showed that majority of the respondents in the study area were small scale farmers. According to Iheke (2010) these farms are small-sized, fragmented, scattered and not contiguous/consolidated farm holdings and this make the issue of farm mechanization difficult; a measure if reversed will increase farm productivity.

The result also showed that 34 percent of the respondents fall within the age range of 41-50 years with an average productivity of 7.95. The mean age was 48 years. This indicates that the farmers were mainly middle-aged people who are active, energetic and ready to carryout agriculture activities. This result is in agreement with the findings of Iheke and Amaechi (2015), Iheke (2016), Ayinde (2017) and Iheke and Onyendi (2017). Iheke and Onyendi (2017) stated that the risk bearing abilities and innovativeness of a farmer, his mental capacity to cope with the daily challenges and demands of farm production activities decreases with advancing age.

The distribution of respondents according to their level of formal education showed that greater number of the respondents (91.11%) had one form of formal education or other ranging from primary to tertiary education. About 40% of the respondents had secondary education with average productivity 7.40. This showed that the farmers were literate. This is desirable because according Onyeneke (2017) and Iheke *et al.* (2021), the level of education of a farmer not only increases his farm productivity but also enhances his ability to understand and evaluate new production

techniques. Also Education enhances farmers' innovativeness and effectiveness which aid food output and security (Osuji, 2017).

Table 1 showed that majority of the respondents (77.78%) were married with an average productivity of 7.46. The result showed that those were married had higher productivity. According to Iheke *et al.* (2021), Iheke and Nwaru (2014), Iheke (2010), the farm households are stable, and this stability should create conducive environment for good citizenship training, development of personal integrity and entrepreneurship, which are very important for efficient use of resources, leading to increased productivity.

According to Table 1, 53.89 percent of the respondents had a household size of between 4-6 persons and the mean household size was 6 persons per household. The most productive group were those who had a household size of between 7-9 persons with an average productivity of 6.99. This is consistent with the findings of Iheke and Ukaegbu (2015), Iheke and Amaechi (2015) and Iheke *et al.* (2021). According to Iheke (2010), large household size is desirable and of great importance in farm production as rural households rely more on members of their households than hired workers for labour on their farms. Luka and Yahaya (2012) opined that hired labour is reduced as farmers' household labour may be sufficient to assist them on their farm activities. Also, Teklewold *et. al.,* (2013) stated that availability of large household size reduces labour constraints faced during the peak of the farming season.

The years of farming showed that on the average, the respondents have spent about 24 years on arable crop farming. This implies that the farmers were reasonably experienced. Experience has a positive effect on level of production which enhances skill better utilization of farming information which may in turn minimize production cost and enhance production. Ekanem *et al.* (2015) stated that the years of farming experience of a farmer enables him to acquire practical and relevant farming knowledge which drives his ability to efficiently utilize available resources with discretion, leading to increased productivity.

The result in table 1 showed that majority (77.22 percent) of the farmers had no contact with extension agents and had lower productivity (5.92) than their counterpart who had contact with extension agents. This implies that the respondents were not substantially exposed to technical innovation; a measure if reversed would increase their productivity.

The distribution based on membership of farmers' cooperative association show that 13.89 percent of the respondents belonged to cooperative societies and had lower productivity compared to their counterparts who belong to farmers association. Iheke and Nwaru (2014) stated that cooperative societies/ farmers' associations are sources of good quality inputs, labour, credit, information and organized marketing of products.

Table 1 also showed that only 11 percent of the respondents had access to credit. Also, farmers who had access to credit had higher productivity. with a productivity of 6.45. According to Diagne *et al.* (2000) lack of access to credit is believed to have significant negative consequences for aggregate and household-level outcomes, such as technology adoption, agricultural productivity, food security, nutrition, health and overall household welfare.

The distribution based on land ownership status showed that majority (77.78 percent) of the respondents are owner occupiers an average productivity of 5.91. on the other hand, respondents whose major occupation is farming were 71.67% with a productivity of 6.37. This implies that the main source of livelihood of the respondents is farming. Also, the productivity of those whose primary occupation is farming is greater than those whose major occupation is not farming.

3.2 Farmland value

Table 2 shows that only 26.11% of the farmers had the value of their land to be between ₦201000 - ₦250000. Also, farmland value for the farmers on average was ₦235, 555.

Table 2: Estimated farmland value

Farmland values (₦)	Frequency	Percent	Cumulative
51000 - 100000	10	5.55	5.55
101000 - 150000	20	11.11	16.66
151000 - 200000	30	16.67	33.33
201000 - 250000	47	26.11	59.44
251000 - 300000	21	11.67	71.11
301000 - 350000	27	15.00	86.11
351000 - 400000	8	4.44	90.55
401000 - 450000	12	6.67	97.22
451000 - 500000	5	2.78	100.00
Total	180	100.00	
Mean	235555		

Source: Field survey data, 2022

This implies that the cost of farmland in the State is high especially for poor farmers in the State whose income is low. It equally explains why farmers have small farm size in the State. This result conforms to the findings of Ehirim *et al.* (2017) who stated that the value of land in Owerri zone is ₦278, 193.52 and added that its considerably high for agricultural production.

3.3 Determinants of farmland values

The estimated determinants of farmland values are presented in Table 3. From the Table, the double log functional form gave the best fit and was therefore, chosen as the lead equation. This was based on the magnitude of the coefficient of multiple determination (R^2), the number of significant variables and the conformity of the signs borne by the coefficients of the variables to *a priori* expectations, as well as the significance of the F– ratio. The coefficient of multiple determination was 0.846. This implies that 84.6% of the variations in farmland values is accounted for, by the included variables in the model. The F-ratio was significant at 1 percent which attests to the overall significance of the

regression model. The significant variables influencing farmland values were farm size, productivity, returns, duration of tenure and purpose of use.

The coefficient of farm size was significant at 1 percent level of significance and positively related to farmland values of arable crop farmers. This implies that the larger the farm size, the greater the value of the farmland. This result is in line with the findings of Osuji (2017) and Ehirim *et al.* (2017). Larger farms are more amenable to farm mechanization which increases productivity and hence attracts higher prices unlike fragmented farm holdings.

Table 3: Estimated determinants of farmland values

Variables	Linear	Exponential	Double log +	Semi log
Intercept	52839.43	10.31821	1.880	-325659.8
	(5.24)***	(40.99)***	(18.43)***	(-8.21)***
Farm size (X_1)	1251.14	-0.008	0.432	3708.561
	(0.49)	(-0.12)	(6.24)***	(1.38)
Productivity (X_2)	-3819.054	-0.131	1.064	-35480.91
	(-8.22)***	(-11.28)***	(17.00)***	(-14.58)***
Return (X_3)	0.056	2.06e-06	1.061	33256.84
	(6.16)***	(9.15)***	(12.21)***	(9.84)***
Location (X_4)	-6563.319	0.100	0.052	-8029.998
	(-1.32)	(0.80)	(0.52)	(-2.07)***
Education (X_5)	-901.4357	-0.018	-0.096	-4418.896
	(-2.08)***	(-1.70)*	(-1.49)	(-1.76)*
Duration of tenure (X_6)	-134.2295	0.013	0.985	-3157.388
	(-0.24)	(0.88)	(9.35)***	(-0.77)
Purpose of use (X_7)	7003.661	0.157	-0.610	-2585.217
	(1.78)*	(1.59)	(-7.33)***	(-0.80)
Community levy (X_8)	-0.2410947	-9.37e-06	-0.004	438.126
	(-2.44)**	(-3.80)***	(-0.34)	(0.95)
Distance to farmland (X_9)	17.90608	0.000	0.032	1737.802
	(0.13)	(0.01)	(0.63)	(0.88)
R^2	0.343	0.482	0.846	0.576
R^{-2}	0.308	0.455	0.828	0.554
F-ratio	9.85***	17.58***	34.50***	25.68***

Source: Field survey data, 2022

Note: *** = significant at 1%, ** = significant at 5%, * = significant at 10%, + = Lead equation (…) = t-ratios.

The coefficient of productivity was significant at 1 percent level of significance and positively related to farmland value. This implies that as the increase in productivity would increase the value of farmland. This result is also in consonance with the findings of Ehirim *et al.* (2017). Ekanem *et al.* (2015) reported that land value rises when the productivity of the land is on the increase.

The coefficient of returns from the land was significant at 1 percent level of significance and positively related to farmland value. This implies that as the returns from the farm increases, farmland value equally increases. This result is in line with the findings of Osuji (2017), Ehirim *et al.* (2017) and Anyim *et al.* (2021). According to Anyim *et al.* (2021) farmland that generated high returns to investment will experience increased value. They further stated that the productive value of land is determined by the land's ability to generate a high financial return.

The coefficient of duration of tenure was significant at 1 percent level of significance and positively related to farmland value. This implies that increase in duration of tenure leads to a corresponding increase in the value of farmland. This result is also agrees with the findings of Anyiam *et al.* (2021). They stated that the years of holding may determine the value of the farmland in the long run because the farmland may have been subjected to improvements.

The coefficient of purpose of use was significant at 1 percent level of significance and negatively related to farmland value. This implies that the value of the farmland increases if the use of the land is for non-agricultural purposes. The negative influence shown by purpose of use to the farmland could be due to the fact that many buyers now use the farmland for other non-agricultural purposes (construction of buildings for domestic, commercial and other use) which yield more income when compared to agriculture.

3.4 Level of productivity of the farmers

The productivity level of the farmers is presented in Table 4. The result shows that the mean productivity of the farmers was 6.25. This implies that, the farmers in the study area were high in productivity. Anyiam *et al.* (2021) reported a farmland productivity of 4.03. Productivity increases with increase in farm investment and adopt improved farm innovations. According to Ehirim *et al.* (2017), low productivity could be due to poor exposure of the sustainable soil management techniques coupled with the practicability and technicality of some of the techniques, conservative and less receptive nature of rural farmers in adopting improved soil management techniques.

Table 4: Productivity level of the farmer groups

Productivity	Frequency	Percent	Cumulative
0.1 - 2.0	31	17.22	17.22
2.1 - 4.0	37	20.56	37.78
4.1 - 6.0	40	22.22	60.00
6.1 - 8.0	49	27.22	87.22
8.1 - 10.0	23	12.78	100.00
Total	180	100.00	
Mean	6.25		

Source: Field survey data, 2022

3.5 Determinants of productivity

The estimated determinants of productivity is presented in Table 5. The exponential functional form gave the best fit and was therefore, chosen as the lead equation. The coefficient of multiple determination was 0.905. This implies that 90.5 percent of the variations in productivity was explained by the variables included in the model. The F-ratio was significant at 1 percent which attests to the overall significance of the regression model. The significant variables influencing farm productivity of the farmers were innovations, education, marital status, farm size, labour and credit.

The coefficient of innovation was significant at 1% level of significance and positively related to productivity. This implies that an increase in adoption of innovations would lead to increase in productivity. Iheke and Nwaru (2014) stated that innovation adoption is key to increasing farm productivity.

The coefficient of education was significant at 1 percent and positively related to productivity of arable crop farmers. This implies that increase in educational attainment increases the productivity of arable crop farmers in the study area. Education is associated with higher understanding of cropping systems that will lead to a greater productivity. This result is consistent with a priori expectation and is consistent with Iheke and Aniocha (2017), Awotide et al. (2015), Iheke et al. (2013), Onyenweaku and Ohajianya (2005) and Onyenweaku et al. (2004). According to Iheke et al. (2013) states that education sharpens the entrepreneurial capabilities of farmers, enhances their ability to understand, evaluate and adopt new and improved production techniques leading to increased farm productivity.

The coefficient of marital status was significant at 5 percent and positively related to productivity. The result implies that majority of the farm households are stable. Nwaru (2004) and Iheke (2010) noted that this stability should create conducive environment for good citizenship training, development of personal integrity and entrepreneurship, which are very important for efficient use of resources, leading to increased productivity.

The coefficient of farm size was significant at 1 percent level of significance and positively related to productivity of the arable crop farmers. This implies that an increase in farm size leads to a corresponding increase in productivity. Arguments in favour of an inverse farm size–productivity relationship with the notion that "small is beautiful" include Bardhan (1973); Sen (1975); Heltberg (1998); Lipton (2009); Hayami (2001, 2009) in Asia and Barrett et al., (2010); Carletto et al. (2016); Larson et al. (2014); Desiere and Jolliffe (2018) in Sub Saharan Africa. However, other studies show that large farms could be more efficient than their small counterparts (Jha and Rhodes 1999; Jha et al., 2000; Foster and Rosenzweig 2010; Otsuka et al. 2013; Gollin, 2018). According to Gollin (2018), large farms generate higher average labour productivity than small farms, perhaps unsurprising given the arithmetic relationships.

Table 5: Estimated determinants of productivity

Variables	Linear	Exponential +	Double log	Semi log
Intercept	6.083	1.228	4.45e-07	-14.568
	(3.28)***	(5.05)***	(0.49)	(-1.67)*
Innovations (P_1)	1.372	0.264	5.62e-08	0.707
	(2.22)**	(3.25)***	(0.84)	(4.50)***
Education (P_2)	0.100	0.042	0.718	0.734
	(1.80)*	(5.79)***	(3.29)***	(5.80)***
Gender (P_3)	0.618	-0.059	2.08e-08	1.155
	(1.18)	(-0.85)	(0.34)	(1.99)**
Marital status (P_4)	0.0763	0.193	-8.40e-08	-1.196
	(0.12)	(2.38)**	(-1.18)	(-1.77)*
Age (P_5)	0.004	0.004	-1.69e-07	0.242
	(0.13)	(1.27)	(-1.22)	(0.18)
Farm size (P_6)	-0.513	0.330	-3.96e-08	-0.252
	(-1.56)	(7.67)***	(-0.80)	(-0.53)
Farm experience (P_7)	0.012	-0.000	-5.28e-08	0.391
	(0.72)	(-0.01)	(-1.35)	(1.05)
Labour (P_8)	0.000	0.599	6.03e-08	0.278
	(3.13)***	(3.66)***	(1.09)	(0.53)

Credit (P_9)	0.000	6.184	-1	5.016
	(5.35)***	(10.34)***	(-1.3e+07)	(7.04)***
Income (P_{10})	0.000	1.65e-06	1	6.221
	(19.28)	(1.703)	(2.4e+07)	(15.39)
R^2	0.755	0.905	1.000	0.703
R^{-2}	0.740	0.894	1.000	0.688
F-ratio	52.04***	69.81***	0	44.80***

Source: Field survey data, 2022

Note: *** = significant at 1%, ** = significant at 5%, * = significant at 10%, + = Lead equation (…) = t-ratios.

The coefficient of labour was significant at 1 percent level of significance and positively related to productivity of arable crop farmers which is in line with *a priori* expectation. This implies that an increase in labour use would lead to a corresponding increase in productivity. This result agrees with the findings of Iheke and Nwaru (2014). Iheke and Amaechi (2015) stated that agricultural production has remained labour intensive in Nigeria and is an indispensable factor of production which explains the positive relationship between labour and productivity.

The coefficient of credit was significant at 1 percent level of significance and positively related to productivity of the arable crop farmers. This result is consistent with *a priori* expectation. The result reveals that increase in credit use leads to increase productivity. Farmers need credit to augment their income in other to purchase some inputs. Hence, Awotide *et al.* (2015) stated that farmers require credit mainly for agricultural production which includes purchase of inputs such as fertilizer, seed and agrochemicals (herbicides and pesticides), land acquisition, and hired labour. Access to credit is as one of the key elements for acquiring assets and increasing productivity.

3.6 Productivity and farmland value

The result of the effect of productivity on farmland value is presented in Table 6. The lead equation (semi log function) was presented. The coefficient of multiple determination was 0.936, which implies that 93.6% of the variations in farmland value was explained by productivity. The F-ratio was significant at 1 percent which attests to the overall significance of the model.

Table 6: Regression estimates of effects of investment, productivity and food security on farmland values

Variable	Intercept	Coefficient	r^2	r^{-2}	F - ratio
Productivity	58154.1	17069.96	0.936	0.914	71.21***
	(16.29)***	(8.44)***			

Source: Survey data, 2022

Note: *** = significant at 1%; (…) = t- ratios.

The coefficient of investment was significant at 1 percent and positively related to farmland values. This implies that increase in investment brings about increase in farmland values. Investment on land such as those of soil rejuvenation, sustainable soil management, structures among others increases the value of the land, making it to attract higher price.

The coefficient of productivity was significant at 1 percent level of significance and positively related to farmland value. This implies that increase in productivity increases the value of farmland. Fertile farmlands are usually productive and command higher price in the land market and this increases with increase in productivity.

The coefficient of food security was positively significant at 1 percent level of significance showing a direct relationship between food security and farmland value. This direct relationship could be as a result of using unproductive farmland which was bought high for non-agricultural purpose.

4. CONCLUSION

It could be concluded from the study that the price of land is relatively high and this limit the scale of operation of the farmers. Also, investment increases productivity which has a significant influence on food security. The study recommends that policies that will reduce the value/price of land and grant farmers increased access to land and finance should be implemented to enhance farm investment and hence increase the farmers productivity. Improved access to credit by the government and other lending agencies as well as timely provision of agricultural inputs at affordable prices to the farmers through farmer groups and related organizations should be ensured to encourage smallholder farmers to expand their production frontiers.

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Iheke, Onwuchekwa Raphael designed the work and analyzed the data, while Onyeneke, Immaculata Queen is the writer/ investigator. Igwe Kelechi Chima reviewed the work

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