



PRODUCTIVITY OF FARMLAND VALUES IN FOOD CROP PRODUCTION IN THE NATURAL DISASTERS PRONE AREAS OF IMO STATE, NIGERIA

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ABSTRACT

This study analyzed productivity of farmland values in food crop production in natural disasters prone areas of Imo State, Nigeria. The study specifically determined farmland values, productivity of food crop farmers by farmland values, and factors influencing food crop farmers productivity in the different farmland values. Data were collected with questionnaire from 280 proportionately and randomly selected food crop farmers. Data were analyzed using descriptive statistics, farmland value model, productivity model, and multiple regression techniques. Results showed that farmland suitability index ranged from < 0.499 to 0.948 with a mean of 0.350. Majority (72.1%) of the farmers cultivated on non-suitable farmlands, 22.9% of them cultivated on marginally suitable farmlands while few (5%) of the farmers cultivated on suitable farmlands, implying that majority of the farmlands cultivated for food crop production in the study area are not suitable. Food crop farmers' productivity increases with suitability of farmland and the productivity of farmland increases from 1.35 to 2.25 and 3.14 as farmland moves from non-suitable to marginally suitable and suitable values respectively, thus making marginally suitable and suitable farmlands about 48% and 133% higher in farmland productivity than non-suitable farmlands. Farmland rent, quantity of fertilizer applied, quantity of organic manure applied, education level, quality of planting materials, and distance of farmland from farmer's home have significant influence on marginally suitable farmlands productivity. Farm size, quantity of fertilizer applied, quantity of organic manure applied, farming experience, and quality of planting materials significantly influenced suitable farmlands productivity. Crop farmers cultivating non-suitable farmland should explore measures to improve the fertility of their farmlands or minimize wastage of production resources through reduction in the size of farmlands, cultivated.

Keywords: Productivity, Farmland values, Food crop, Imo state, farmers, Farmland suitability index, Natural disaster.

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Contribution/ Originality

This study documents productivity of farmland values in food crop production in the natural disaster prone areas, using farmland value and productivity models. The paper's major contribution is finding that the majority of farmlands cultivated by the farmers is non-suitable due to the influence of natural disasters.

1. INTRODUCTION

Agricultural production is highly prone to natural disasters, and substantial proportion of the population which are rural farmers depend on agriculture for its livelihood. Natural disasters are happening more often and having an ever more dramatic effect on the productivity of food crop farmers (Delaney *et al.*, 2004).

In Imo State of Nigeria, agriculture is exposed to a large variety of risks and uncertainties from the vagaries of nature such as bad weather conditions, pest and diseases, flood, thunderstorm, erosion and fire outbreaks (Chukuezi, 2008).

A substantial part of the population of Imo State are rural farmers, most of who cultivate food crops such as cassava, yam, maize, cocoyam, melon, rice and vegetables (Obasi, 1995) and the effects of these natural disasters lead to the disruption of the rural farmer's livelihood causing a vicious cycle of falling productivity and farm incomes, and adding to the risk, damage and stress of disasters. These rural farmers are more exposed to natural disasters because they tend to live in marginal areas and depend on high-risk, low return livelihood systems such as rain fed agriculture and face many sources of vulnerability including little physical infrastructure (Ohajianya *et al.*, 2006).

The rural food crop farmers have suffered dearly in productivity loss during the occurrence of these natural disasters in the past and are still suffering the effect presently which varies along farm land values.

The farmland values and their food crop productivities are determined by the severity of natural disasters and this has not been empirically investigated in Imo State, Nigeria. Not only do these natural disasters destroy crops and disrupt food supplies, they also affect farm land quality and production potential (Stephenson, 1994).

Occurrence of natural disasters have led to crop failure, low productivity, reduced farm land quality, mass out-migration and negative economic growth (Adedipe *et al.*, 2007). Because of this, the need for reorienting and recasting for agricultural decision making and insulation of the food crop farmers from adverse impacts of natural disasters hinged on empirical evidence become more pressing.

Productivity denotes the ratio of economic output to any or all associated inputs (in real terms) or output per unit of productive input (Ehui and Spencer, 1990). Food crop productivity is the ratio of value of total output per hectare to values of total inputs used in the production process (Okon and Egbon, 1999; Freeman *et al.*, 2001; Etiosa and Agho, 2007). A low value farmland may not support increasing food crop output over years, hence food crop output on marginally suitable farmland can hardly sustain the increasing population of farm households nor solve the food security problem of Imo State, Nigeria. Therefore, a suitable farmland is brought under intense pressure of continuous cultivation leaving the marginally suitable and unsuitable farmlands minimally cultivated due to loss of fertility (Korie *et al.*, 2006; Ohajianya and Asiabaka, 2016). Productivity of farmland declines with farmland quality (Okere, 2012) and cultivation of unsuitable and marginally suitable farmlands by food crop farmers may lead to increase in farm household poverty if remedial measures are not put in place, and this is a cause for serious concern to agricultural research scientists and policy makers in Imo State, Nigeria coupled with the fact that previous researches in Imo State that focused on food crop productivity in different farmland values are very scarcity. It is based on this background that, this study analyzed farmland values, determined productivity of food crop farmers by farmland values and determined the factors influencing food crop farmers productivity in the different farmland values in Imo State, Nigeria.

2. METHODS AND MATERIALS

This study was conducted in natural disaster prone areas of Imo State of Nigeria. The State is divided into three agricultural zones of Owerri, Orlu and Okigwe and subdivided into 27 Local Government Areas (LGAs). The state is located between latitudes 5° 06' N and longitudes 7° 08'E. According to the Ministry of Lands and Survey (2012) the total land area of Imo State is 5067.20 km².

The major areas in the state that are being affected by natural disasters according to the Department of Erosion Control, Ministry of Petroleum and Environment (2006) include Owerri West, Mbaitoli, Ikeduru, AbohMbaise, Owerri North, AhiazuMbaise, and EzinihitteMbaise LGAs in Owerri Agricultural zone; Obowo, Ehime Mbano, IhitteUboma, and IsialaMbano LGAs in Okigwe agricultural zone, and Orlu, Isu, Njaba, Ideato North, Ideato South, and Orsu LGAs in Orlu agricultural zone. Farming is the major occupation of majority of the inhabitants, and major food crops cultivated include yam, cassava, cocoyam, maize, rice, and vegetables.

Purposive sampling technique was employed to select two LGAs from each agricultural zone so as to ensure the selection of LGAs that are more prone to natural disasters.

One community was randomly selected from each of the six LGAs, making a total of six communities. From each selected community, one village was sampled to get a total of six villages. The sampling frame was the list of food crop farmers in the selected villages. From this list totaling 519 food crop farmers, proportionate and random sampling techniques were used to select a sample size of 280 food crop farmers.

Data were collected with validated structured questionnaire in 2015, and analyzed using descriptive statistics (mean and percentages), farmland value model, and multiple regression techniques.

Farmland value index was analyzed using farmland value model specified as,

$$Fv_i = \frac{K_i}{T_L} \quad (0 < Fv < 1) \quad \dots \dots \dots (1)$$

where,

Fv_i= farm land value index (measured as the ratio of actual number of positive farmland management activities and the number of avoidable negative externalities by an ith food crop farmer)

K_i= Actual number of positive farmland management practices and number of negative externalities avoidable by an ith food crop farmer

T_L = Aggregates of both farmland management activities that food crop farmers responded yes and the negative externalities that food crop farmers responded No to.

As Fv_i approaches 1 (Fv_i ≥ 0.65), then farmland is very suitable for food crop cultivation. If Fv_i falls between 0.5 and 0.64, then farm land is marginally suitable. But if Fv_i approaches 0 (Fv_i < 0.5), then the farm land is non-suitable for food crop production (Okere, 2012).

Food crop productivity of different farmland values were determined using productivity model which according to Olayide and Heady (1982) and Dixon and Mac-Donald (1990) is specified as;

$$A_i = \frac{Y_i}{L_i} \quad \dots \dots \dots (2)$$

Where,

A_i= Food crop productivity of ith farmland value

Y_i = output value or total returns of food crops from ith farmland value (₦)

L_i = Rent and cost of farmland improvement in each farmland value (₦)

Factors influencing food crop farmers productivity in the different farmland values were determined using the ordinary least squares multiple regression model specified implicitly as follows;

$$Pfl_i = F(X_1, X_2, X_3, X_4, X_5, X_6, X_7, e) \quad \dots \dots \dots (3)$$

Where,

Pf_i= food crop productivity of ith farmland value

X₁ = farm size (Ha)

X₂ farm land rent (₦)

X₃=Quantity of fertilizer applied (kg)

X₄=Quantity of organic manure applied (kg)

X₅=Education level (Number of years spent in school)

X₆= Farming experience (years)

X₇= Quality of planting materials (Dummy variable, 1 for good quality, 0 if otherwise)

X₈=Distance of farmland to farmers home (km)

e=error term

It is expected *a priori* that the coefficients of X₁, X₃, X₄, X₅, X₆, X₇>0; X₂, X₈<0

Four functional forms of the ordinary least squares, multiple regression model; linear, semi-log, double-log, and exponential were fitted to the data so as to select the lead equation based on having the highest value of coefficient of multiple determination (R^2), highest number of significant variables, and conformity to *a priori* expectations.

3. RESULTS AND DISCUSSION

3.1. Farmland Value

The distribution of food crop farmers according to farmland value is presented in Table 1.

Table-1. Distribution of food crop farmers according to farm land value

Farmland value index	Frequency	Percentage
$\leq 0.499^*$	202	72.1
0.500	-0.649**64	22.9
0.650-	0.789***9	3.2
0.799-	0.948***5	1.8
Total	280	100
Mean	0.350	

* Non-suitable farmland

**Marginally suitable farmland

***suitable farm land

Source: Survey Data, 2015

Data in the table show that farmland value index ranged from 0.499 to 0.948 with a mean of 0.350. Majority (72.1%) of the food crop farmers cultivated on non- suitable farmlands, 22.9% of them cultivated on marginally suitable farmlands, while few (5%) of them cultivated on suitable farmlands, implying that majority of the farm lands cultivated for food crop production in the study area are not suitable.

3.2. Farm Land Productivity

The productivity of the different farmland values were determined and the results are presented in Table 2

Table-2. Productivity of Farmland Values

Variables	Non suitable farmland	Marginally suitable farmland	Suitable farmland
Total Returns offood crops	72551.63	146489.17	217892.38
Total farm land rentand cost of farmlandimprovement	53872.45	64992.64	69228.49
Productivity	1.35	2.25	3.14
Percentage charge	-	48.15	132.59

Source: Survey Data, 2015

Results in the table show that productivity of farmland increases from 1.35 to 2.25 and 3.14 as farmland value moves from non-suitable to marginally suitable and suitable values respectively, thus making marginally suitable and suitable farmlands about 48% and 133% higher in farm land productivity than non-suitable farmlands, implying that farmland productivity increases with suitability of farmland. This finding is consistent with those of [Ohajianya and Asiabaka \(2016\)](#).

3.3. Factors Influencing Food Crop Farmers' Productivity in the Different Farm Land Values

To determine the factors influencing food crop farmers' productivity in the different farmland values, four functional forms of the ordinary least squares multiple Regression model; linear, semi-log, double-log, and exponential were tried.

The double-log function produced the highest value of coefficient of multiple determination (R^2), highest number of significant variables, and conformed to *a priori* expectations.

The results of the double-log function were presented in Table 3. Results show that the coefficients of multiple determinations (R^2) were 0.469 0.792 and 0.616 for non- suitable farmland, marginally suitable farmland and suitable farmland respectively, which implies that about 47%, 79% and 62% of the variation in food crop farmers' productivity in non-suitable, marginally suitable and suitable farmlands respectively are explained by the joint action of the explanatory variables included in the multiple regression model.

The coefficients of quantity of farmland rent (X_2), quantity of fertilizer applied (X_3), quantity of organic manure applied (X_4), quality of planting material (X_7), and distance of farmland to farmer's home (X_8) with respect to the non-suitable farmlands were significant at either 0.05 or 0.01 levels. This implies that these variables influence productivity of food crop farmers cultivating non-suitable farmlands in the study area.

Table-3. Results of Double-log-function on factors influencing food crop farmers' productivity in different farmland values

Explanatory variable	Farmland		suitable farmland
	Non –suitable	marginally	
Constant	183.441	146.703	198.168
Farm size (X_1)	0.083 (1.792)	0.055 (2.787)**	0.069 (4.118)**
Farm land rent (X_2)	-0.039	-0.066	-0.085
Quantity of fertilizer applied (X_3)	(-2.511)* 0.077 (3.065)**	(-3.013)** 0.082 (3.789)**	(-1.893) 0.093 (4.226)**
Quantity of organic manure applied (X_4)	0.053 (3.404)**	0.082 (4.003)**	0.071 (4.313)**
Education level (X_5)	0.029 (1.826)	0.046 (3.017)**	0.052 (1.925)
Farming Experience (X_6)	0.091 (1.883)	0.075 (1.911)	0.087 (3.889)**
Quality of planning materials (X_7)	0.078 (2.533)*	0.094 (3.783)**	0.083 (3.917)**
Distance of farmlandTo farmer's home (X_8)	-0.063 (-3.547)**	-0.097 (-2.618)**	-0.088 (-1.526)
R^2	0.469	0.792	0.616
Number of observations	202	64	14

Figures in parentheses are t-ratios

* Significant at 5% level

** Significant at 1% level

Source: Survey Data, 2016

For marginally suitable farmlands, the coefficients of farm size (X_1), farmland rent (X_2), quantity of fertilizer applied (X_3), quantity of organic manure applied (X_4), education level (X_5), quality of planting material (X_7), and distance of farmland to farmer's home (X_8) were significant at either 0.05 or 0.01 levels, which implies that these variables are factors influencing productivity of food crop farmers cultivating marginally suitable farmlands in the study area.

The coefficients of farm size (X_1), quantity of fertilizer applied (X_3), quantity of organic manure applied (X_4), farming experience (X_6), and quality of planting materials (X_7) with respect to suitable farmlands were significant at 0.01 level of probability, implying that these variables are factors influencing the productivity of food crop farmers cultivating suitable farmlands in the study area.

4. CONCLUSION AND RECOMMENDATIONS

The study found that majority of the farmlands cultivated by farmers in Imo State, Nigeria are non-suitable for food crop production due to the influence of natural disasters, and this negatively influences food crop productivity. The productivity of food crops increases with suitability of farmlands. Food crop farmers cultivating non-suitable farmlands should explore measures to improve the fertility of their farmlands or minimize wastage of production resources through reduction in the size of farmland cultivated, while food crop farmers cultivating suitable farmlands should increase their production and improve their farm incomes through allocation of more production resources to food crop production in an optimal manner.

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REFERENCES

- Adedipe, N.O., A. Aliyu, S.O. Fagade and H.U. Ahmed, 2007. Agricultural research in Nigeria. Assessment and implications for food security. National Agricultural Research Monograph No. 23, Abuja, Nigeria: Ministry of Agriculture and Natural Resources. pp: 216-220.
- Chukuezi, N., 2008. Economic vulnerability of rural farmers to natural disasters in Imo State. M.Sc Thesis, Department of Agricultural Economics, Federal University of Technology Owerri.
- Delaney, P., A. Kaul and C. Millter, 2004. Weathering natural disasters -refocusing relief and development through improved agricultural and environmental practices. The future harvest foundation and CARE supported by USAID. The USAID Publication, 52(2): 19-23.
- Dixon, P.B. and D. Mac-Donald, 1990. Measurement of productivity. *Economic Record*, 68(2): 105-117.
- Ehui, S.K. and D.S.C. Spencer, 1990. Indices for measuring the sustainability and economic viability of farming systems. RCMP Research Monograph No. 3, Ibadan, Nigeria: IITA.
- Etiosa, U. and M. Agho, 2007. Coping with climate change and environmental degradation in the Niger Delta of Southern Nigeria. Nigeria: Community Research and Development Centre (CREDC) Edo State, 10 (1): 7-12.
- Freeman, P., J. Bayer and R. Mechler, 2001. National system for comprehensive disasters management phase. I. Inter-American Development Bank Regional Policy Dialogue, 2(1): 22-25.
- Korie, O.C., D.O. Ohajianya and N.C. Ehirim, 2006. Value chain of cassava and cassava-based products in Imo State, Nigeria. *International Journal of Natural and Applied Sciences*, 2(4): 400-404.
- Ministry of Lands and Survey, 2012. Annual Report Abstract, Owerri, Imo State.
- Ministry of Petroleum and Environment, 2006. Annual Report, Owerri, Imo State.
- Obasi, P.C., 1995. Resource use efficiency of food crop production. A case study of Owerri agricultural zone of Imo State. M. Sc Thesis, faculty of agriculture, University of Ibadan, Nigeria.
- Ohajianya, D.O. and C.C. Asiabaka, 2016. Analysis of farmland value systems and productivity of cassava in ecologically vulnerable areas of Imo State, Nigeria. Contributed Paper at the 90th Annual Conference of Agricultural Economics Society, UK, held at University of Warwick England, UK, 4th -6th April.
- Ohajianya, D.O., P.C. Obasi and J.S. Orebiyi, 2006. Technical inefficiency and its determinants in food crop production in Imo State, Nigeria. *Journal of Agricultural and Social Research*, 6(2): 19-24.

- Okere, R.A., 2012. Analysis of land value systems and productivity of cassava in Imo State. M.Sc Thesis, Department of Agricultural Economics, Federal University of Technology Owerri.
- Okon, R.N. and P.C. Egbon, 1999. Fiscal federalism and revenue allocation. The poverty of the Niger Delta in Aigbokhan B.E (Ed), Fiscal Federalism and Nigerians Economic Development Selected Papers of the 1999 Annual Conference of the Nigerian Economic Society. NES, Ibadan.
- Olayide, S.O. and E.O. Heady, 1982. Introduction to agricultural economics. Ibadan Nigeria: Ibadan University Press. pp: 19-25.
- Stephenson, R.S., 1994. Disasters and development. Disaster management programme. UNDP publication, 2(1): 16-19.

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