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DETERMINANTS OF CASSAVA FARMERS PRODUCTIVITY IN OYO STATE, NIGERIA

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Abstract

Using primary data, the study analyzes the factors that affect cassava farmers' production in Oyo state, Nigeria, using cross-sectional data obtained from 330 cassava farmers through a multistage sample and a well-structured questionnaire. Data collected was analyzed using inferential statistics (Cobb Douglas production model analysis) using software for statistical analysis (STATA). The empirical results of the analysis revealed that farming experience was positively significant at (β= 0.220, $p<0.01$), farm size (β= 0.504, $p<0.01$), age of respondents (β= 0.188, $p<0.01$), credit (β = 0.182, $p<0.01$), mode of cultivation (β = 0.05, $p<0.01$), cassava stem used (β = 0.069, $p<0.01$) respectively, except land used duration which was negatively signed and significant (β = -0.164, $p<0.01$) to cassava productivity. The F Statistics was 71.420 and R^2 of 0.781 obtained indicated that the explanatory variables explained 78% level of variation in cassava output. The study therefore confirmed that all the significant variables were the major determinant of cassava farmers' productivity in the study area.

Key words**:** *cassava, Cobb Douglas, determinants, productivity, Nigeria*

INTRODUCTION

Agriculture has always been an important sector of Nigerian economy which depends largely on small scale farmers using traditional farming methods. In order to secure and maintain food security, agricultural systems need to be transformed to increase the productive capacity and stability of these smallholder agricultural productions [6].

In Nigeria, the sector is almost entirely dominated by small scale resource poor farmers living in the rural areas, with farm holdings of 1-2 hectares, which are usually scattered over a wide area [15]. The size-distribution of these holdings has been defined by previous studies and evidenced in literature as small-scale farms which range from 0.10 to 4.99 hectares, medium scale farms, from 5.0-9.99 hectares and large scale from 10 hectares and upward [18];[23];[10].

[9] defined land as an important factor of production in agricultural sector on the whole. Land serve as a social security function to most Nigerians because after all else have failed they could still return to their villages to stake a claim on a portion of the family land and raise crops on this for subsistence. It also determines the level of productivity in agricultural production. Available information shows that in southern Nigeria for example, there was consistent decline in yield per hectare of major food crops between 1995 and 2000 [2].

Cassava is important not only as a food crop but even more so as a major source of income for rural households [3]. The world production of cassava root was estimated to be 184 million tonnes in 2002. The majority of production is in Africa where 99.1 million tons were grown; 51.5 million tonnes were grown in Asia and 33.2 million tonnes in Latin America and the Caribbean [7]. As at 2018 the Food and Agriculture Organization Statistics database recorded that Nigeria is the largest producer of cassava in the world, with about 59 million metric tonnes annually from a cultivated area of about 3.7 million hectares. Cassava annual cultivation was 45,721,000; 43,410,000; 44,582,000; 36,822,300; 42,533,200, 52,403,500, 47406770,

56,328,480, 57,643,271 and 57,134,478 million tonnes in 2006, 2007, 2008, 2009, 2010, 2011, 2013, 2014, 2015 and 2016 respectively while Land area harvested was 3,481,900, 4,120,166, 6,401,996, 6,741,300 and 7,102,300, 6,216,434 and 6,261,047 hectares in 2010, 2011, 2012, 2013, 2014, 2015 and 2016 respectively [8]. More than 60% of the cassava produced is consumed by farmer's household, cassava industries and breweries locally while the remaining 40% are exported to other countries such as China [16].

Since then, the demand for Cassava products globally has increased, making the cultivation to increase but not enough to meet up with demand. It's due to this that the research work is analyzing the determinants of cassava farmer's productivity in the study area.

Hypotheses testing

The Hypothesis was reported in null form hypotheses (Ho): that farmer's socio-economic characteristics and farm specific factors does not determine the cassava farmers' level of productivity in the study.

MATERIALS AND METHODS

This research was conducted in Oyo State, Nigeria. The State is situated in the country's southwest with thirty-three (33) Local Government Areas make up Oyo State, which is divided into four (4) agricultural zones: Saki, Ibadan-Ibarapa, Ogbomoso and Oyo, Zones. The State total land area was about 27,249,000 square kilometers with a total population of about 5.6 million. It is situated between Latitude 7^{o}N and 19^{o}N and Longitude 2.5^{o}E and 5^{o}E of the meridian. It is bordered by Ogun State in the southern part, by Kwara State in the north, partly bordered by Ogun State and Republic of Benin in the western part and Osun state in the east.

Sampling technique

The study sample comprises of the registered Cassava farmers across four agricultural zones in Oyo State.

Two-stage sampling method was used to select the respondents; a total number of three hundred and thirty (330) respondents were selected.

Data collection and analysis

The study used data mainly from primary source. The data (primary source) were obtained from the farmers' with the use of structured questionnaire and interview schedule.

The data collected was analyzed using inferential statistics; Cobb Douglas production model, with a four functional model which were fitted for the analysis of the data using STATA analytical tool.

Model specification

The model used for the estimation was given as:

$Y = b_0 + b_1X_1 + b_2 X_2 + b_3X_3 + b_4X_4 + b_5X_5 \ldots\ldots\ldots\ldots + b_{12}X_{12} + \mu$ ……. (1)

Yi = f (Xij, αj) … (implicit form) …… (2)

Y= f (Xs) …… (3)

Y= (X_1, X_2, X_3 …Xn) …… (4)

Explicitly:

Linear

$Y=a+b_1X_1+b_2X_2+b3X_3+b_4X_4+b_5X_5+b_6X_6+b_7X_7+b_8X_8+b_{12}X_{12}+e$ ……....(5)

Double log

$LnY = a+ b_1lnX_1 + b_2lnX_2 + b_3lnX_3 + b_4lnX_4 + b_5ln X_5 + b_6ln X_{6\ldots} + b_{12}ln X_{12}+e$.....(6)

Semi-log

$Y = a+ b_1lnX_1 + b_2lnX_2 + b_3lnX_3 + b_4lnX_4 + b_5ln X_5 + b_6ln X_{6\ldots\ldots} + b_{12}ln X_{12}+e$ … (7)

Exponential

$LnY=a+b_1X_1+b_2X_2+b_3X_3+b_4X_4+b_5X_5+b_6X_{6\ldots} \ldots\ldots\ldots\ldots + b_{12}X_{12}+e$ ……..….(8)

where:

Y = Cassava yield (kg/ha)

X_1 = Farming experience (years)

X_2 = Farm size (ha)

X_3 = Educational level (dummy)

X_4= Types of Land ownerships (dummy)

X_5 = Land use duration (years)

X_6 = Age of respondent (years)

X_7 = Credit (Naira)

X_8 = Labour use (man days)

X_9 = Mode of cultivation (dummy: local/manual = 0, mechanized = 1)

X_{10} = Fertilizer used (quantity)

X_{11}= Stem used (bundles)

X_{12} = Sustainable Land Management Indices (discreet and continuous)
e = error term
b = Parameter estimated
a = Constant

RESULTS AND DISCUSSIONS

Table 1 discussed the determinants of the farm-specific and socio-economic factors in crop output. Different functional forms were fitted for the determination of crop output among the farmer. The functional forms of linear, semi log, exponential and double log were fitted, but the double log was chosen as the lead equation due to its conformity with *a priori* expectation in terms of signs and magnitude of the coefficient, the number of significant variables and the coefficient of multiple determinations (R^2) [21]; [17].

The regression results in linear form revealed that years of farming experience was positively significant ($p<0.01$) and it is similar to the findings of [11]; [1] that farmers had the capability to apply or not apply sustainable practices on their farm, especially when taking into account the farmers' ages and years of experience, which were similarly significant ($p<0.01$) which is in line with the expectations that the older the farmers the higher their experience and the better they become. This is also at variance with the finding of [13] and [14]. Farm size cultivated, credit used, Stem use and mode of cultivation by the farmer were positive and significant ($p< 0.01$).

Table 1. Determinants of farm-specific and socio-economic factors in cassava output

Variables	Linear	Double log	Exponential	Semi-log
a = Constant	4.968	-0.125	1.046	-85.052
X_1 = Farming experience	0.633***	0.220***	0.007***	19.323***
	(6.537)	(6.616)	(6.002)	(6.301)
X_2 = Farm size	3.083***	0.504***	0.035***	40.373***
	(4.928)	(10.534)	(4.703)	(9.164)
X_3 = Educational level	-0.641	-0.041	-0.008	-1.735
	(-0.706)	(-0.925)	(-0.773)	(-0.423)
X_4= Types of Land ownerships	0.839	0.059	0.007	7.858*
	(0.999)	(1.195)	(0.660)	(1.730)
X_5 = Land use duration	-0.245**	-0.164***	-0.003***	-13.125***
	(-1.800)	(-4.625)	(-2.284)	(-4.017)
X_6 = Age of respondents	0.093	0.188***	0.002***	7.408
	(1.182)	(2.153)	(2.507)	(0.924)
X_7 = Credit	0.000***	0.182***	0.000***	15.456***
	(5.430)	(3.401)	(5.357)	(3.131)
X_8 =Labour use	-0.527	0.012	0.025	-1.672
	(-0.201)	(0.434)	(0.803)	(-0.680)
X_9 = Mode of cultivation	5.696***	0.051***	0.067***	4.411***
	(3.246)	(2.856)	(3-184)	(2.692)
X_{10}= Fertilizer used	-1.497	-0.022	-0.032	-0.899
	(-0.648)	(-0.944)	(-1.174)	(0.417)
X_{11}= Stem used	0.001***	0.069***	0.000***	0.005***
	(4.110)	(3.042)	(3.723)	(3.002)
X_{12} = SLM Index	1.162	0.029	0.047	-4.721
	(0.174)	(0.426)	(0.594)	(-0.756)
R^2	0.604	0.781	0.599	0.666
F Statistics	43.849	71.420	43.144	54.932

(*)=p<0.01; (**) =p<0.05; (***) =p<0.10. Note: Values in parenthesis are t-values.
Source: Authors Data Analysis, 2019.

These implies that a unit increment the combination of any of the positive significant variables will probably increase cassava output [22], [4] and this is similar to [11] result and supported by the work of [19] that the existence of significant relationship between the farm size and cassava output can be attributed to economy of scale, since large

hectare would translate to increased production area and access to credit and good variety of cassava stem use will bring a better output, except land use duration which had a negative relationship with the crop output and significant ($p<0.01$).

This could bring about a reduction in the level of output which may be due to the continuous use of the same portion of land over a long period of time (i.e. more than 14 years) by the farmers.

This also conforms to the work of [20]. However, land fallow periods long enough can restore farm productivity [5].

The R^2 of 0.781 obtained shows that 78.1% value can be explained by the model specified but the unexplained 21.9% can be captured by the error term. Since farming experience, farm size, land use duration, credit, age of respondents, cassava stem use and mode of cultivation significantly affect cassava output. Therefore we do not reject the hypothesis (H_A).

CONCLUSIONS

The study clearly concluded that cassava farm size cultivated by the farmers, farming experience in years, age of farmers, credit, cassava stem use and mode of cultivation by the farmer were positively significant ($p<0.01$) except land use duration which was negatively signed but significant ($p<0.01$) to the crop outputs.

R^2 was 78.1% which explain the level of variation in the crop outputs per hectare due to the explanatory factors, it is implied that an increase in productivity will equate to a unit increase in the combination of inputs utilised.

Its however, recommended that good combination of these variable inputs may enhance productivity and sustainable agricultural production, continuous use of the same portion of land over a long period of time (i.e. more than 10 years) by the farmers may have negative effect on productivity, therefore land fallow periods long enough and better land use practices and managements can reclaimed the land viability and enhance farm productivity in the study area.

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