Agricultural Journal 3 (2): 134-141, 2008
ISSN: 1816-9155

Resource Use Efficiency among Maize Grower Households in Ekiti State, Nigeria

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Abstract: The importance of efficiency use of resources in production of any agricultural product cannot be over-emphasized. The study empirically examined the efficiency use of resources among the maize growers in four Local Government Areas of Ekiti State, Nigeria. Descriptive and regression analyses were employed to analyse the data collected with the aid of structured questionnaire from 202 maize farmers. Cobb-Douglas production function was chosen as a lead equation based on economic, econometric and statistical criteria. Descriptive analysis showed that the modal age group for the maize farmers was 41-50 years. It was observed that farmers had fairly large household sizes with an average of 8 people per household. Ninety three percent of the respondents were educated. Also, 74% of the respondents made maize production their primary occupation. Most (81%) of the respondents were small scale farmers. The farmers were faced with quite a number of problems. The regression analysis revealed that land (X_1), family labour (X_2) hired labour (X_3), seeds (X_4) and working capital (X_5) were statistically significant at 1, 5 and 10% level out of the 6 postulated farm inputs. Also, F-value was statistically significant at 1% level of significance. The coefficient of multiple determination (R^2) of 0.79 shows that about 79% variations in maize output were caused by variations in the six postulated explanatory variables. When Marginal Value Product (MVP) for each variable was compared to its factor cost, it was revealed that all the farm inputs used by the maize farmers were inefficiently utilized. X_1, X_3 and X_4 were under-utilized while X_2, X_5 and fixed capital (X_6) were over utilized. The return to scale value 1.15 showed that the farmers were operating in the stage one of the production surface. This is the stage where increasing return to scale operates. Finally, some recommendations were made in order to increase the production of maize in Ekiti State and Nigeria at large.

Key words: Efficiency use, resources, farmers, maize grower, agricultural product, MVP

INTRODUCTION

Maize is one of the main cereal staples of Nigeria. It originated from a direct domestication of a Mexican annual grass known as *Zea mays*. Maize is widely cultivated throughout the south, west, east and middle belt of Nigeria (Ojo, 2004). It is the desire of most countries to be self-sufficient especially in food. One of the objectives of any production unit is to utilize factors of production efficiently in order to earn high profit. The importance of maize production to Nigerians economy is already well known and therefore would not need to be over-emphasised. Maize is greatly needed in Nigeria as food for livestock and food for man. The crop is widely consumed across all geographical regions and income groups in Nigeria. From socio-economic viewpoint, maize makes significant contribution to the economy in terms of employment and income to various people.

Over the years the production pattern of this crop has been fluctuating, as shown by Table 1, due to government intervention and the environmental conditions under which production takes place.

This fluctuation in production output has had serious implications not only in the farmers' incomes but also on the ability to use the available resources efficiently. It is therefore, necessary to examine and establish a trend in the use of farm inputs so as to be able to evolve policies that would help not only in sustaining an increasing trend in the production of maize but also in ensuring stability in the farmers incomes through an effective use of the limited farm resources.

This study seeks to:

- Examine the socio-economic characteristics of maize producers.
- Determine the resource use efficiency levels with respects to maize enterprise.
- Identify the factors militating against maize production.

Table 1: Maize output in Nigeria between 1990-2003. ('000 tonnes)

Year	Output
1990	5.768
1991	5.810
1992	6.346
1993	6.291
1994	6.417
1995	6.931
1996	6.217
1997	6.285
1998	6.435
1999	6.515
2000	6.491
2001	6.592
2002	6.198
2003	7.019

Sources: Federal Office of Statistics (Various Issues), CBN Statistical Bulletin (Various Issues)

MATERIALS AND METHODS

Study area: This study was based on farm level data collected from maize growers in Ekiti State, Nigeria. The state, comprising sixteen Local Government Areas, is located between Longitudes 4^0 45^1 to 5^0 45^1 East of Greenwich Meridian and Latitude 7^0 15^1 to 8^0 5^1 North of Equator. It lies South of Kwara and Kogi States as well as East of Osun State. It is bounded in the East and in the South by Ondo State. The state is mainly an upland zone, rising above 250 m above the sea level. The state enjoys tropical climate with two distinct seasons. These are the rainly season (April-October) and the dry season (November-March). Tropical forest exists in the South, while Guinea Savannah occupies the northern peripheries. Agriculture is the main occupation of the people which provides income and employment for more than 75% of the population. The main cash crops are cocoa, kolanut, coffee, cashew and oil palm while the food crops are yam, maize, cassava, rice, pepper and so on.

Sources and method of data collection: The data mainly from primary sources were collected from 220 maize growers selected from 4 Local Government Areas (LGAs) using multi-stage sampling techniques. The LGAs, randomly selected include, Ijero, Irepodun/Ifelodun, Ikole and Ikere. The second stage involved a random selection of 55 maize growers from each of the 4 LGAs, thus making 220 farmers. Selection of equal number of farmers was done in order to reduce biasness associated with such research.

The data were collected with the aid of detailed questionnaires administered to selected farmers in the study area. The questionnaires were pretested for modification. Information was sought on socio-economic and demographic characteristics such as; age, sex, educational qualification of the household head, farming experience, other occupation, farm income, non-farm income and so on. Data were also collected on the costs and quantities used of the following farm inputs; labour, fertilizer, herbicide, planting materials, farm tools and land area under cultivation. But analyses were based on data obtained from only 202 maize growers in the study area. This was due to loss of interest by 18 farmers.

Analytical techniques: Descriptive and quantitative analyses were used to analyse the data collected. Descriptive analytical tools such as the frequency distribution, percentages, mean, mode, standard deviation and standard error were used to analyse the socio-economic and demographic characteristics of the farm households in the study area. Multiple regression technique was used to analyse resource-use efficiency and productivity.

Specification of model: Regression analysis was used to examine the functional relationship among selected variables. The Ordinary Least Square (OLS) method was used to estimate the production function for maize farmers. The production function states the technical relationship between inputs and outputs.

The multiple regression function estimated in the study can be expressed as

$$Y_i = b_o + b_1 X_1 + b_2 X_2 + \ldots + b_6 X_6 + e_i \qquad (1)$$

Where:

Y_i = Output of maize by the farmer i (Kilogram).
b_0 = Constant.
X_1 = Land input planted to maize (hectares).
X_2 = Amount of family labour employed (Mandays).
X_3 = Amount of hired labour employed (Mandays).
X_4 = Planting materials (seeds) (kilogram).
X_5 = Value of other working capital utilized in Naira (e.g., herbicides, pesticides and fertilizer).
X_6 = Value of fixed capital used in Naira (depreciation value of farm tools and other equipment utilized).
e_i = Error term.

Four functional forms of the equation were tried and the one producing the best fit was chosen. The functional forms tried were the semi log, linear, Cobb-Douglas/ double log and exponential.

The best fit was selected on the basis of the coefficient of multiple determination (R^2), the 't' and 'F' ratios and the reasonableness of the magnitudes of the coefficients. The four functional forms fitted by a least square multiple regression technique can be explicitly written as follows:

$$Y_i = b_0 + b_1 X_1 + b_2 X_2 + \ldots + b_6 X_6 + e_i \ldots\ldots\ldots \text{Linear} \quad (2)$$

$$\text{Log } Y_i = \log b_0 + b_1 \log X_1 + b_2 \log X_2 + \ldots + b_6 \log X_6 + e_{i \ldots} \text{ Cobb – Douglas} \quad (3)$$

$$\text{Log } Y_i = b_0 + b_1 X_1 + b_2 X_2 + \ldots + b_6 X_6 + e_i \ldots\ldots\ldots\ldots \text{Exponential} \quad (4)$$

$$Y_i = b_0 + b_1 \log X_1 + b_2 \log X_2 + \ldots + b_6 \log X_6 + e_i \ldots \ldots\ldots \text{Semi log} \quad (5)$$

Where, Y_i, b_0, X_1 … X_6 and e_i are as defined earlier.

Cobb-Douglas production function was chosen as lead equation. From the production function selected, the following physical quantities were calculated for each input used in production of maize by the farmers in the study area. These are: Marginal Physical Production (MPP), Elasticity of Production (ELP) and Marginal Value Product (MVP). Also Return to Scale (RS) was calculated. These enabled us to know how input resources were utilised.

Marginal Physical Product (MPP) indicates the change in the quantity of maize output that is expected from a unit change in the independent variable assuming other variables are fixed (Ogundari and Ojo, 2005) using the lead equation (Cobb-Douglas), the MPP for each input was computed by the equation below.

$$MPP_{Xi} = b_i \times \frac{Ym}{Xmi} \quad (6)$$

Where:

MPP_{Xi} = Marginal Physical Product of Input i (i = 1, 2,……, 6).
b_i = Partial differentiation of each input with respect to total product.
Ym = Geometric means of the maize output.
Xmi = Geometric means of the input i used in maize production.

Elasticity of Production (ELP) was used to measure the degree of responsiveness of the maize output to change in the variable inputs. It has been shown that the coefficients of the function are equal to the elasticities of production in respect to the different inputs (Olayide and Heady, 1982). In other words, from Eq. 1, b_1, b_2, b_3… b_6 are the elasticities of production of the input items, X_1, X_2, X_3, … X_6, respectively.

The Cobb-Douglas production function (lead equation) has some unique features which are relevant in the calculation of returns to scale. These are:

When $\sum_{i=1}^{6} bi = 1$, it implies constant return to scale

When $\sum_{i=1}^{6} bi < 1$, it implies decreasing return to scale

When $\sum_{i=1}^{6} bi > 1$, it implies an increasing return to scale

The Marginal Value Product (MVP) of each input shows the expected increase in output that could result from the use of an additional unit of the input multiply by the average price of the output. At a given level of technology, MVP of inputs could be used as yardsticks for measuring resource use efficiency. Also, on resource adjustments, they provide the framework for policy decisions. A negative marginal value productivity shows that output could be increased by using less of that resource while positive MVP implies that output could be raised by using more of a given resource. It is of importance to note that the magnitude of the MVP must be compared with the acquisition cost of the input in order to know the worthwhileness of increasing or decreasing the level of resource use.

A resource is considered to be efficiently used when its marginal value product is just sufficient to offsets its cost. That is basic condition that must be satisfied to obtain efficient use of resource is the equality of marginal value product to factor cost. The marginal value product of input i can be given by the following equation.

$$MVPx_i = P_Y \times \frac{dY}{dXi} = b_i \times \frac{Ym}{Xmi} \times P_Y \quad (7)$$

Where,
P_Y = The unit price of output
d = The partial derivatives sign

Other variables are as earlier defined
That is, if

- $MVPx_i > Px_i$ implies that input x_i should be increased.
- $MVPx_i < Px_i$ implies that input X_i should be reduced.
- $MVPx_i = Px_i$ implies that input X_i is used to optimum level.

Where:
Px_i = The unit price of input i
$MVPx_i$ = Marginal value product of input i

RESULTS AND DISCUSSION

Demographic and socio-economic characteristics of the sampled maize growers: Table 2 shows the age structure

Table 2: Demographic and socio-economic characteristics of respondents

Variable	Frequency	(%)
Age group (years)		
=30	21	10
31-40	70	35
41-50	95	47
51-60	9	4
Above 60	7	4
Household size		
Less than 2 people	4	2
2-5 people	64	32
6-9 people	107	53
10-13 people	20	10
More than 13 people	7	3
Education		
No School training	15	7
Primary school	62	31
Secondary school	112	56
Tertiary	13	6
Primary occupation		
Farming	150	74
Trading	11	6
Civil servant	35	17
Others	6	3
Secondary occupation		
None	120	59
Farming	61	30
Trading	18	9
Others	3	2
Farm size (ha)		
=1	164	81
1.1 – 2.0	26	13
2.1 – 3.0	7	4
3.1 – 4.0	5	2
Farming experience		
1-5	10	5
6-10	23	11
11-15	83	41
16-20	40	20
> 20	46	23

Source: Field survey (2006)

of the respondents and the modal age group was 41-50 years with a frequency of about 47%. In addition, 10% were aged 30 years and below; 35% were in the age bracket 31-40 years and 55% were 41 years and above. This reveals that majority of the maize growers in the study area were aged. This could affect their productivity and the adoption of new innovations. Studies have shown that old people do not want to adopt new innovations.

Moreover, four of the farmers who were single had a household size of less than two people. Eighty five percent had between two and nine people, while 13% had not less than ten people per household. This is an indication that the maize farmers have fairly large household sizes in the study area and this would assist in providing family labour which is one of the resources needed to boost production of maize. In addition, Table 2 also reveals that about 7% of the sampled maize growers had no formal education and 31% had primary education. Sixty two percent had not less than secondary education. This educational background will assist the farmers to read and understand agricultural production information which are necessary to enhance maize production.

Occupationally, 74% (majority) of the respondents were farmers. This is in proper conformity with the expectation since the study was directed at farmers. Just 6% were traders and 17% were government employees as shown in Table 2. Also, about 59% of the respondents had no secondary occupation. This shows that they were solely farmers. But about 30% saw farming as their secondary occupation and 11% were engaged in trading and other economic activities as their secondary occupation.

Furthermore, according to Table 2, 81% of the maize growers have farm size of one hectare or less. The average size of maize farm in the study area was 0.78 ha. This size may not be unconnected with the fragmented landholdings. This shows that in the area, farming was dominated by small-scale producers. It has been shown that small farm size is capable of keeping productivity low (Onemolease and Ukoedo-Okoje, 2005). With regard to the years of exposure of the maize growers to farming, Table 2 shows that majority (61%) of the respondents had experience ranging between 11 and 20 years. This reveals that the respondents were experienced farmers.

Regression analysis results: Table 3 shows the coefficient of six independent variables for four different forms of production functions fitted into the data collected on maize production from the study area. The lead equation (Cobb-Douglas) was chosen based on the econometric, economic and statistical criteria already stated. This is presented below.

$$\begin{aligned} \text{Log } Y &= \log b_0 + \log b_1 X_1 + \text{---} + \log b_6\ x_6 + e_i \\ &= -1.320 + 0.309\, X_1 + 0.230\, X_2 + 0.251\, X_3 \\ &\quad + 0.290\, X_4 + 0.041\, X_5 + 0.032\, X_6 \\ &\qquad (0.131) \quad (0.125) \quad (0.126) \\ &\quad (0.124) \quad (0.021) \quad (0.431) \end{aligned} \tag{8}$$

R^2 = 0.79
Adj. R^2 = 0.72
F = 4.01
Number of significant coefficients = 5
Figures in parentheses are standard errors.

In the lead equation, five out of the six independent variables had coefficients that were statistically significant. This shows that the first 5 variables are considered to be significantly different from zero. Significant variables are: Land, (X_1); family labour, (X_2); hired labour, (X_3); Seeds, (X_4) and working capital, (X_5). The fixed capital, (X_6) was quite insignificant. Moreover,

Table 3: The results of the four functional forms fitted into the input-output data of maize farmers in Ekiti State

Variables	Linear	Cobb-douglas	Exponential	Semi-log
Constant	523.012	-1.320	6.567	15.743
Land (X_1)	0.624 ***	0.309 *	1.341*	0.813 *
	(0.369)	(0.131)	(0.553)	(0.307)
Family labour (X_2)	0.733	0.230 ***	0.057	0.610
	(0.489)	(0.125)	(0.131)	(0.450)
Hired labour (X_3)	0.931 **	0.251 **	-0.510 ***	0.687 ***
	(0.466)	(0.126)	(0.289)	(0.409)
Seeds (X_4)	0.541	0.290 *	-0.711 *	-0.031
	(0.383)	(0.124)	(0.278)	(0.025)
Working capital (X_5)	-0.671	0.041 ***	-0.031	0.051
	(0.495)	(0.021)	(0.025)	(0.041)
Fixed capital (X_6)	0.813	0.032	-0.317	0.306
	(0.520)	(0.431)	(0.221)	(0.242)
R^2	0.47	0.79	0.52	0.61
Adj.R^2	0.45	0.72	0.49	0.57
F-statistics	2.32	4.01	1.51	2.03

*, ** and ***, significant of 1, 5 and 10%, respectively. The standard errors are in parentheses. Source: Survey data analysis, 2006

all the variables coefficients were positively signed showing that a unit decrease (increase) in each of the variables decreases (increases) the output of maize in the study area. This conforms to the theoretical and a priori expectation. X_1 and X_4 coefficients were statistically significant at the 1% level of significance; while X_2 and X_3 were significant at 10% level. Also the coefficient for X_3 was significantly different from zero at 5%. This finding shows that the major factors which affect the output of maize in the study area are land, family labour, hired labour, seeds and working capital.

In addition, the value of coefficient of multiple determination (R^2), 0.79 shows that 79% of the variation in the maize output is explained by the variation in the inputs used. Also the F-statistic was 4.01 and statistically significant at 1% level of significance. This indicates that every partial regression coefficient does not have a value of zero (although X_5 has).

Production elasticity and returns to scale: One of the advantages of the lead equation (Cobb-Douglas Production function) is, as already stated, that the coefficients measures also the elasticities of production in respect to each variable. The production elasticity shows the change in output of maize relative to a unit change in the independent variable, provided other inputs are held constant. When the ratio is equal to 1, output changes at the same rate as input and the elasticity is said to be unitary. When the ratio is greater than one, this shows that the change in output is greater than the change in input used and production is said to be relatively elastic. But when the ratio is less than one, the proportionate change in output is less than that of the input and production is said to be inelastic. Table 3 shows the elasticities of the various input resources at their mean levels.

From the estimated equation (Eq. 8) one could say that a 1% increase (decrease) in the hectarage of land (X_1) put into cultivation of maize, other variables remaining constant in value, will result in a 31% increase (decrease) in output of maize. Also, a 1% decrease (increase) in the family labour mandays (X_2) will result in a decrease (increase) of 23% in the maize output, while a 1% increase (decrease) in the hired labour mandays (X_3) will raise (lower) the output by 25%. Similarly, if seeds (X_4), working capital (X_5) and fixed capital (X_6) are increased by 1% each, this will lead to 29, 4 and 3% increase in the output respectively.

Several conclusions could be drawn from the elasticities of production values about the use of resources in the production of maize in Ekiti State and Nigeria at large. First, when the values of the coefficients were considered, land representing natural resources used in agricultural production had the highest elasticity of production. Seeds seems to come next in respect of elasticity, followed by the hired labour, while fixed capital was the least resource input in the production of maize in the study area.

Secondly, the coefficients values show that production of maize in Ekiti State was in a stage of decreasing returns in respect of the use of each of the six inputs included in the analysis. This corresponds with the general assumptions made in economic thinking about the nature of the returns in agriculture (Akatugba, 1985; Idisi, 1992).

Thirdly, the sum of regression coefficients indicates return to scale and this gives a direct measure of the percentage change in output caused by 1% change in all inputs simultaneously. As mentioned earlier, if the output changes by a greater proportion than inputs there is increasing return to scale ($\Sigma b_i > 1$). Also, if the change in the output is in the same proportion as inputs, return

Table 4: Estimated production parameters (from Cobb-Douglas)

	X_1	X_2	X_3	X_4	X_5	X_6	Y	Return to scale
Coefficient (b_i)	0.309	0.230	0.251	0.290	0.041	0.032		
Elasticity of production	0.309	0.230	0.251	0.290	0.041	0.032		1.153
Marginal product	488	3.37	7.81	6.10	0.02	0.01		
Marginal value product	48,800	377	781	610	2	1		
Geometric means	0.63	68	32	47.28	2,629.17	2,400.16	995	
Price per unit (N)	1,400	350	350	150	200	250	100	
Ratio of MVP to factor cost	34.85	0.96	2.23	4.07	0.01	0.004		

Source: Computed by author, Survey 2006

to scale is constant (Σ b_i = 1). But Decreasing returns to scale occurs when the change in inputs leads to a less than proportionate change in output (Σ b_i <1) (Handerson and Quandt, 1980). The sum of the elasticities was 1.153 indicating increasing returns to scale in maize production. This shows that maize production in the study area is in stage 1 of the production surface. That is, resources allocation and production were inefficiently done. This happened because the farmers in the study area were operating on small scale (Olayide and Heady, 1982).

Marginal Productivities (MPP): In order to deduce additional inputs needed to boost production of maize in the study area, the marginal efficiencies of the variables inputs were calculated using Eq. 6. The marginal productivities were calculated at the geometric means level of the variables used in the model because Cobb-Douglas model is a multiplicative model. Table 4 shows that the marginal productivity of one hectare of land was higher than that of one unit of any other input used in the production of maize in the study area. In contrast, a unit of fixed capital gave the lowest. The marginal productivity of hired labour used by the farmers was second in order of value, followed in order by that of one kilogram of seeds, one manday of family labour and one unit of working capital.

Marginal value products, input costs and economic efficiency: Table 4 also shows the Marginal Value Productivities (MVP) of various input factors at their geometric means. The average farm gate price per kg of maize was N100 in the study area.

The MVP of land (X_1) as an input was 48,800. This means that the return expected of an additional Naira spent as land rent will be as high as ₦48,800. The land rent in the study area was ₦1,400 per ha per annum. The positive MVP of land implies that output of maize could be raised by using more hectares of land to grow the crop. But, in order to determine the worthwhileness of increasing the level of land use, the MVP of land was compared with the acquisition cost, that is, the average annual rental value for agricultural use in the study area. This ratio of marginal returns to acquisition cost measures efficiency in resource utilization. For land the ratio (34.86) was greater than one. This again shows that little of land resource is being used under the existing acquisition cost situations.

Moreover, the family labour (X_2) and hired labour (X_3) were measured in mandays. The marginal value productivities for these factors were 337 and 781, respectively. This shows that, for each X_2 and X_3 variables, the return of any additional Naira will be more than one Naira. In the study area, the average daily wage of a casual labourer as at the time of the survey was N350 and this was used for both X_2 and X_3 variables. Though, the use of wage rate for valuation of family labour and as a guideline to labour use has often been questioned. The MVP of hired labour was higher than that of family labour by ₦444 and both variables had positive signs. Therefore, increase in the use of the 2 variables will lead to more maize production in the study area. But when the ratios of the MVP to factor costs for both resources were considered in order to know the worthwhileness of increasing the levels of the two variables, the ratio of X_3 was greater than one while that of X_2 was less than one. This implies that both resources were inefficiently used to produce maize. With this result, more of hired labour and less of family labour could be used to increase maize production.

In addition, when the planting material (seeds) was considered, the MVP of this input was 610 and positively signed. This implies that more of the input could be used to produce more maize output in the study area. Also the ratio of its MVP to factor cost (N150 kg^{-1}) was greater than one. This implies that the variable X_4 was not used efficiently, but production will be increased if more of X_4 is used.

Furthermore, Table 4 also shows the MVPs of working capital (X_5) and fixed capital (X_6) to be 2 and 1, respectively. The acquisition costs were ₦200 and ₦250, respectively. The ratios of the MVPs to factor costs were too low (less than 1). This implies that the inputs X_5 and X_6 were not used efficiently by the maize farmers in the study area. Though the positive signs signify the need to use more of the resources but this should not be done since the ratios are less than one. Hence, it is advisable to use less of the two resources in order to boost the production of maize in the study area.

Lastly, the results of the analysis showed that resources were used inefficiently in production of maize in the study area. Land (X_1), hired labour (X_3) and seeds (X_4) were underutilized while family labour (X_2), working capital (X_5) and fixed capital (X_6) were overutilized. The positive signs on all the inputs may deceive farmers to use more of them but the ratios of MVPs to factor costs indicate the worthwhileness use of the variable inputs. According to the study findings, the more the land, hired labour and seeds, the higher is the total output of maize expected.

Factors militating against maize production: As would be expected, the production of maize in Nigeria is faced with a lot of problems. The maize farmers were faced with quite a number of constraints. The land tenural arrangement in most of the study area discouraged large scale production of maize. In some places, land is owned by the communities and farmers have no claim to the land. Some of the respondents who were non-indigenes passed through the indigenes before they could get land for maize production. Also, mechanization was difficult due to fragmentation of farmlands. In addition, most of the maize farmers complained of in availability of modern farm equipment such as tractor, plough, etc. The use of outdated farm implement such as hand hoes and cutlasses were reported. Much work can not be done with these implement because plenty energy is required.

Majority of the farmers said that fertilizer, improved seeds and pesticides were in short supply and that their prices were beyond the reach of the farmers. Also, pest and disease infestation, inadequate farm labour, bad roads and inadequate feeder roads were part of the problems facing the production of maize in the study area. Some of the farmers were forced to carry out their operations on a small scale due to inadequate credit facilities. During the time of this study, cash was very hard to come by and farmers organised their production with this fact in mind.

CONCLUSION

This study was designed to examine the resource use efficiency among the maize farmers in Ekiti State, Nigeria. Also, problems encountered by the farmers were examined. Data from 202 out of 220 maize farmers sampled were used for the analysis. Four Local Government Areas (LGAs) of the state namely, Ijero, Irepodun/Ifelodun, Ikole and Ikere LGAs were used. Descriptive analytical tools and multivariate regression analysis were used to analyse the data. Four functional forms of production functions were fitted to the data. These are, semilog, linear, Cobb-Douglas and exponential. The best fit (Cobb-Douglas production function) was selected based on econometric, economic and statistical method.

The result of the descriptive analysis showed that the modal age group for the maize growers was 41-50 years. It was noticed that the farmers had fairly large household sizes with the average size of about 8 people per household. Majority (93%) of the respondent were educated. In addition, about 74% of the respondents made maize production their primary occupation. It was found out that 81% of the respondents were small scale farmers each cultivating less than 1.1 hectares of land. Eighty four percent of the farmers had not less than 11 years of farming experience. Moreover, the farmers were faced with problems ranging from unavailability of credit facilities to problem of pests and diseases.

Furthermore, the results of the regression analysis used to determine the effect of 6 farm inputs on the maize output showed that five out of the six postulated farm inputs were statistically significant. These were land, (X_1); family labour, (X_2); hired labour, (X_3), seeds, (X_4); and working capital, (X_5). Fixed capital (X_6) was statistically not different from zero. It was observed that 79% variation in the maize output was as a result of variation in the postulated independent variables. F-statistic value was statistically significant at 1% levels of significance. Elasticities of production showed that land had the highest value, followed by seeds, hired labour while fixed capital had the least. The addition of these factors' elasticities of production was 1.153. This implies that production of maize in the study area was in stage 1 of production surface. This stage is characterised by increasing return to scale and it could be seen in agriculture when the farmers operate on a small scale.

When the marginal physical productivities of the farm inputs were calculated, it was noticed that the marginal productivity of one hectare of land was higher than that of one unit of any other input used in the production of maize. When the signs (positive) of the MPPs were considered, one would conclude that all the inputs were important to boost maize production. But the interpretation was done with caution and the marginal value product of each input was compared with its factor cost (opportunity cost) in order to measure efficiency in resource utilization. It was found out that all the resources were inefficiently used to produce maize in the study area. Variable X_1, X_3 and X_4 were under-utilized while X_2, X_5 and X_6 were over-utilized.

RECOMMENDATIONS

The policy implications of these findings need to be emphasised. Based on the findings in this study, the following are proffered:

- Government should provide agricultural subsides to maize farmers by purchasing more of the necessary agricultural inputs such as fertilizer, pesticides, etc and re-sell them to farmers directly at lower prices.
- Government should help the maize farmers to purchase or build good silos.
- The issue of land tenure system should be addressed in order to encourage large scale production of maize.
- In order to control pests and diseases effectively, the Ministry of Agriculture and other agricultural agencies such as ADP, should intensify their efforts to train the maize farmers how to use insecticides and pesticides effectively.
- Adequate infrastructural facilities should be provided in the rural areas in order to discourage out movement of able men and women from these areas.

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