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Profitability Analysis of Maize Production in Ondo State

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Abstract: The broad objective of this study was to determine the profitability analysis of maize farmers in Ondo State, Nigeria. A multi stage sampling technique was employed to collect exclusively primary data from 150 maize farmers from five local governments using copies of well-structured questionnaire. The statistical tools used to conduct the analysis were descriptive statistics, regression analysis and gross marginal method. The results of the socio-economic characteristics of the farmers showed that 32% were within the ages of 20-40 years. About 69% of maize producers were male and 31% female. About 81% of the maize farmers were married while others are either divorced, single, widowed or separated. Eighty- one percent of the maize farmers had household size of 6 members. About 28% had 21-30 years of farming experience. The results further revealed that about 61% of the respondents were members of associations and about 71% of farmers cultivated less than 2 ha of maize. All the farmers had access to extension services. The profitability analysis revealed that maize enterprise is a profitable business. The total revenue is ₦1, 087, 786.00 while the total profit is ₦403, 406. Maize production in the study area is not constraints free.

Key words: Constraints · Regression Analysis · Gross Margin

INTRODUCTION

In Nigeria, like in most developing countries, the agricultural sector is of primary importance to the economy. At the time of independence in 1960, all the country's dreams hinged solidly on the productivity of agriculture. This is because the sector has some links with some other sectors of the economy. The agricultural sector used to employ 80 percent of the total population but this has declined to 65 percent [1].

Maize is the second largest cereal crop grown after rice in Nigeria, it is the third most important cereal crop after sorghum and millet. It is a staple food of great socio-economic importance in the Sub-Saharan Africa of which Nigeria is Inclusive [1].

It accounts for about 11.2% of grain produced in Nigeria [2]. The total land area planted to maize in Nigeria is above 2.5 million hectares, with an estimated yield of about 1.4 metric tonnes per hectare. In Nigeria, maize is becoming increasingly important as food crop, feed for animals and for various industrial uses. Due to the several advantages maize has over other cereals like rice, wheat, millet and sorghum it remains an important crop. Maize produces a higher output per unit of labour input and is easiest to cultivate, harvest, store, transport and process.

The demand for maize in Nigeria has been on the increase due to the following factors like increasing growth in population, income levels, urbanization and associated changes in the family occupational structure. On the contrary, the rate of supply of maize has lagged behind that of demand, leaving a wide gap between demand and supply. The reason according include agro-ecological, technical and socio-economic constraints.

Domestic production of food crop has not been able to meet the domestic demand for food. The reason for this is that there are some problems at the micro level, one of which is the relationship between inputs used in production such as seeds, land, labour and capital [3, 4]. Likely factors responsible for the decrease in the production of maize are because of little or no improved seed grown by farmers and low response to fertilizer by some local varieties. Price fluctuations, disease and pests,

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storage facilities and efficiency of resource utilization are the identified causes of low maize production in Nigeria and Ondo State in particular [5]. In view of the high demand for maize and the need for food security, there is a need to study how to raise maize productivity.

The aim of the study was to evaluate the profitability of maize production in the study area, to describe the socioeconomic characteristics of maize farmers in the study area, identify the factors influencing maize production in the study area and to identify the constraints of maize production among farmers in the study area.

MATERIALS AND METHODS

Study Area: Ondo State is one of the 36 States of Nigeria and was carved out of old Western State on 3rd February 1976, out of which Ekiti State was created in 1996, Asiegbu [6].

Ifedore is a local government area in Ondo State, Nigeria. It is located in the south west part of Nigeria. The Local government is predominantly rural, with majority of the people living in the rural areas as farmers, hunters and petty traders. Farmers in the LGA venture into various aspects of agriculture, among which are crop farming, animal husbandry and fish farming. The communities that make up the LGA include Ero, Ibule, Igbara-Oke, Ijare, Ikota, Ilara-Mokin, Ipinsa, Ipogun and Ita Oniyan, with Igbara-Oke as the headquarters.

Instrument of Data Collection: Data for this study was obtained from primary sources. The primary source involved the use of well-structured questionnaires as an instrument of data collection from sampled maize farmers. The questionnaire consisted of three main sections. Section A will be about personal data of maize producers in the study area. It covered variables such as respondent's age, educational level, family composition, farm size to mention but a few. Specifically, the section deals with socio- demographic features of the respondents. Section B focused on farm input and output details. Section C included the constraints faced by each respondent.

Sampling Techniques: A multistage sampling technique was used in selecting the respondent. The first stage involved a purposive sampling of the Ifedore local government area of Ondo state because it is one of the major maize producing local government.

The second stage was a random sampling of five communities from Ifedore local government area. The community selected are Igbara-Oke, Ibule, Ilara-mokin, Ijare and Ipinsa.

The third stage included the selection of 30 maize farmers that has at least 70% of their farms cultivated for maize production through random sampling from each town. This gives a total sample size of one hundred and fifty (150) respondent for the study.

Analytical Techniques: This section deals with the different analytical techniques and empirical specification of models was used for the analysis of different objectives of the study. Descriptive analysis which includes frequency mean and percentages was used to achieve some of the objective while the responses from it will be extracted into statistical package for social science (SPSS) which were used to analyze the data. Multiple regression analysis and gross margin analysis was used also.

Descriptive Statistics: Descriptive statistics was used to describe the socio-economic characteristics of maize producers and the constraints to maize production in the study area i.e objectives i and iv. This involves the use of central tendency such as frequency distribution, mean, component bar charts, pie charts and so on.

Gross Margin Analysis: Gross margin analysis forms the basis for farm profitability analysis. Therefore it was used for analyzing objective ii. Gross margin is the difference between gross income and total variable cost. The model is:

$$\text{Gross Margin (GM)} = TR - TVC \quad (1)$$

where:

GM = Gross margin (Naira/hectare)
TR = Total revenue (Naira /hectare)
TVC = Total Variable Cost (Naira/hectare)

Multiple Regression: Multiple regression model was used to analyze factors influencing maize production in the study area. The explicit form of multiple regression is performed as follows:

In qualitative terms, the relationship is expressed as;

$$Y = \beta_o + \beta_1X_1 + \beta_2X_2 + \beta_3X_3 + \beta_4X_4 + \beta_5X_5 + \beta_6X_6 + e_i$$

Y = Maize Output (in naira)
β_o = constant term
β_1-β_5 = regression coefficients of explanatory variable
X_1 = Farm size (hectares)
X_2 = Seed (in kg)
X_3 = Fertilizer (in kg)
X_4 = Labour (in man-days)
X_5 = Agrochemical (in kg)
X_6 = Extension Contact (in numbers)
X_7 = Education level (in years)
X_8 = Farm experience (in years)
e_i = error or disturbance term

The explicit function of the four functional equations are:

Linear:

$$Y = \beta_0 + \beta_1X_1 + \beta_2X_2 + \beta_3X_3 + \ldots.\beta_nX_n\, e \qquad \text{(Equation 1)}$$

Exponential:

$$\ln Y = \beta_0 + \beta_1 X_1 + \beta_2 X_2 + \beta_3 X_3 + \ldots\ldots.\beta n\, X_n + e \qquad \text{(Equation 2)}$$

Double Log:

$$\text{Log } Y = \beta_0 + \beta_1 \log X_1 + \beta_2 \log X_2 + \beta_3 \log X_3 + \ldots\ldots\beta_n \log X_n\, e \qquad \text{(Equation 3)}$$

Semi-Log:

$$Y = \beta_0 + \beta_1 \log X_1 + \beta_2 \log X_2 + \beta_3 \log X_3 + \ldots\ldots\ldots\beta_n \log X_n + e \qquad \text{(Equation 4)}$$

The following criteria were used to determine how well the fit of functional form of the equation:

- The statistical significance of the regression coefficients as determined by the t- test (t-value). The higher the't' value the more significant the variable is.
- The magnitude of the standard error (low values are expected)
- The goodness of fit: the magnitude of the coefficient of multiple determination (R^2).
- The appropriate of the sign of the regression coefficient.

RESULTS AND DISCUSSION

Age of Respondents: Age distribution of maize farmers in the study area is presented in Table 1 below. Majority (53.3%) of the respondent falls between age 41-60years, 32.0% of the respondent falls between age of 40 and below while 14.6% of the respondents have their ages greater than 60. This implies maize production is relatively done by young people and the respondents are still in their active and productive period. These results are similar to those obtained by Onuk *et al.* [7] in their work on economic analysis of maize production in Mangu Local Government Area of Plateau State, Nigeria

Gender of Respondents: Gender distribution of maize farmers in the study area is presented in Table 2. The majority (68.7%) are male while their female counterparts are 31.3%. This result showed that the larger number of males are involved in maize production because of the high energy demanding nature of farm chores and more so the larger amount of time it requires. This result conforms to the work of Fakayode *et al.* [8] who observed that almost all Fadama maize farm households (95.5%) were male-headed.

Level of Education: Level of education of maize farmers in the study area is presented in table 3 below. The result of education shows that 28.0% of the respondents had no formal education while about 72% had formal education. This implies that majority of the respondent had formal education which is enough to provide them with the ability to read and write, interpret messages relating to their farm operations. The result is in conformity with the studies of Fakayode *et al.* [8] , Ahmed *et al.* [9] and Onojah *et al.* [10] who observed that majority of maize farmers in their respective study area were formally educated.

Farming Experience of Respondents: Farm experience of maize farmers in the study area is presented in table 4 below. The result showed the level of experience in farming. 20.7% of the respondents have an experience of less than or equal to 10 years, 27.3% have experience of 11-20 years, 28% have an experience of 21-30 years, 16.7% have an experience of 31-40 years while 11% have an experience of >40years. The mean years of farm experience was found to be 23 years. This implies that majority of the farmers are well experienced in maize farming. This agreed with Oyewole [11] which says productivity increases with years of experience in farming as farmers master the techniques of production and avoid previous mistakes.

Table 1: Age Distribution of Respondents

Age in years	Frequency	Percentage
≤ 20-40	48	32.0
41-60	80	53.3
61-80	22	14.6
Total	150	100

Source: Field Survey, 2019

Table 2: Gender Distribution of Respondents

Gender	Frequency	Percentage
Male	103	68.7
Female	47	31.3
Total	150	100.0

Source: Field Survey, 2019

Table 3: Education level Distribution of Respondents

Level of education	Frequency	Percentage
No formal education	42	28.0
Attempted primary	17	11.3
Primary	27	18.0
Attempted JSS	1	0.7
JSS	3	2.0
Attempted SS	11	7.3
Senior secondary	35	23.3
Tertiary	14	9.3
Total	150	100.0

Source: Field Survey, 2019

Table 4: Farming Experience Distribution of Respondents

Farm experience	Frequency	Percentage
0-10	31	20.7
11-20	41	27.3
21-30	42	28
31-40	25	16.7
>40	11	7.3
Total	150	100

Source: Field Survey, 2019

Household Size of Respondents: Household size of maize farmers in the study area is presented in Table 4 below. The result showed that 21.3% of the respondent household size is less than 4, 60% of them have family size between 5-8, 15.3% also have family size ranging from 9-12 and 3.3% have family size of >13 implying that most of the respondents are nuclear families and the finding is consistent with the study of Ahmed *et al.* [9] who observed that 77.5% of maize farm households in Kura LGA of Kano were composed of less than ten people.

Marital Status of Respondents: Marital status of maize farmers in the study area is presented in Table 6 below. The result showed that majority of the respondents are married and with 80.7% while 7.3% of the respondents are single, 2.0% of the respondents are separated, 4.0% of the respondents are divorced while 6.0% of the respondents are widowed. The significance of marital status in agricultural production can be explained in terms of supply of family labour. This result agreed with Amaza *et al.* [12] which says that it is expected that family labour will be more available where the household heads are married.

Farm Size of Respondents: Farm size is the size of farm operated by the farmers. This result showed that majority (70.6%) cultivated lower than 2.00 hectares, while 25.3% cultivated between 2.01-4.00 hectares and finally 4% cultivated between 4.01-4.90 hectares. This implies that maize farmers in the study area were predominantly small-scale farmers. According to Olayide [13], small scale farms range from under 0.1 hectare to 5.99 hectares. This is also similar to result obtained by Oye [1].

Extension Visits of Respondents: Extension visit to maize farmers in the study area is presented in Table 8 below. The result showed that 32.7% had 2-5 times of extension visit, 56% of respondent had 6-9 times of extension visit, 10% of respondent had 10-13 times of extension visit while 1.3% had above 14% times of extension visit. Maize farmers in the study area has a mean of about 7 visit.

This shows that the farmers had adequate access to information on the benefits of adopting new technologies for improved agricultural productivity. While the finding is against the results of Iyagba and Anyanwu [14] who found out that 84.5% of smallholder cassava farmers in Oyigbo LGA of Rivers State had no contact with extension agents.

Cooperative Membership of Respondents: Cooperative membership of maize farmers in the study area is presented in Table 9 below. This result showed that majority of the maize farmers 60.7% were members of cooperative society while the remaining 39.3% did not belong to any cooperative society. Membership of cooperative society is believed to enhance the sharing of information on improved technologies through interactions as well as ease input acquisition and utilization of constraints faced by farmers. This findings is consistent with Oyewole [11] result.

Profitability Analysis of Maize Production in the Study Area: Table 10 showed the gross margin accrued among the respondents in the study area. The result revealed that the total fixed cost was ₦293, 400 and the total variable cost was ₦391, 340. The percentage of total fixed

Table 5: Household Size Distribution of Respondents

Household size	Frequency	Percentage
< 4	32	21.3
5-8	90	60
9-12	23	15.3
>13	5	3.3
Total	150	100

Source: Field Survey, 2019

Table 6: Marital Status Distribution of Respondents

Marital status	Frequency	Percentage
Single	11	7.3
Married	121	80.7
Separated	3	2.0
Divorced	6	4.0
Widowed	9	6.0
Total	150	100

Source: Field Survey, 2019

Table 7: Farm Size Distribution of Respondents

Farm size (Ha)	Frequency	Percentage
≤2.00	106	70.6
2.01-4.00	38	25.3
>4.00	6	4
Total	150	100

Source: Field Survey, 2019

Table 8: Extension Visits Distribution of Respondents

Extension Visit	Frequency	Percentage
2-5	49	32.7
6-9	84	56
10-13	15	10
14 and above	2	1.3
Total	150	100

Source: Field Survey, 2019

Table 9: Cooperative Membership Distribution of Respondents

Cooperative membership	Frequency	Percentage
Yes	91	60.7
No	59	39.3
Total	150	100

Source: Field Survey, 2019

Table 10: Profitability of Maize Production in the Study Area

Items	Amount (N)
FIXED COST	
CUTLASS	87, 300
HOE	66, 000
BASKET	38, 100
SPRAYER	102, 000
TOTAL FIXED COST	293, 400 (42.8%)
VARIABLE COST	
TRANSPORTATION	86, 600
LABOUR COST	151, 200
SEED	49, 440
AGROCHEMICAL COST	58, 900
FERTILIZER COST	45, 200
TOTAL VARIABLE COST (TVC)	391, 340(57.2%)
TOTAL COST	684, 740
TC PER FARMER	4, 564, 93
TOTAL REVENUE (TR)	1, 087, 786.00
GROSS MARGIN	696, 446.00
GROSS MARGIN PER FARMER	4, 642.97
Number of farmers = 150	

Source: Field Survey, 2019

cost is 42.8% while the percentage of total variable cost is 57.2% which make 100% altogether. The total cost per farmer is ₦4, 564.93 and total cost is ₦684, 740.00. The gross margin is ₦696, 446.00 while the gross margin per farmer is ₦4, 642.97. The difference between total revenue and total cost is the profit which is ₦403, 406. This showed that maize production is profitable in the study area.

Fixed Assets were depreciated using straight line method @ 5%

Gross margin = Total revenue (TR) – Total variable cost (TVC)

1, 087, 786.00 – 391, 340 = ₦696, 446.00

Profit (∏) = TR- TC

1, 087, 786.00 – 684, 740 = ₦403, 046

Profitability ratio = ∏/TC

403, 046/684, 740 = 0.58

Regression Analysis of Factors Influencing Maize Production: Four functional forms of the model were tried namely; Linear, Exponential, Double Log (Cobb douglas) and semi log. The lead equation was the double log which was selected based on the fact that it has the highest adjusted r^2 and high significance level

The result revealed that farm size, labour and agrochemical are significant factors that affected the determinant of maize output in the study area. The estimated adjusted r^2 of 0.5078 indicated that the variation in the respondents were explained by all the postulated explanatory variables. The result from the regression revealed that farm size is significant at 1%, labour is significant at 5% and agrochemical is significant at 5% and their effect on maize output are explained below

Farm Size: The result from Table 11 below revealed that the coefficient of farm size have a positive effect on maize output and it is significant at 1%. This implies that the higher the respondent farm size, the higher the effect on output of maize in the study area. The result also indicated if the impact of farm size is increased by 1 unit, there is an increase of 0.690 of farm size effect on maize output in the study area.

Labour: The result from Table 11 showed that the coefficient of labour has an inverse relationship on maize output and it is significant at 5% level. This implies that the higher the labour, the lower the effect on maize output in the study area. The result also indicated that if labour is increased by 1 unit, there will be a decrease of 3.795 of the impact of labour on maize output in the study area.

Table 11: Regression Result of Factors Influencing Maize Production

Variables	Linear Coefficient	Exponential Coefficient	Double-log Coefficient	Semi-log Coefficient
Constant	-5235.39 (11237.44)	9.6784 (0.1786)	8.6061 (0.55)	-83549.81 (37751.55)
Farm size (x_1)	25194.76 (4295.99)	0.4283 (0.0683)	0.6908*** (0.0896)	34287.05 (6072.49)
Seed (x_2)	1383.70 (1143.38)	0.0105 (0.0182)	0.1273 (0.0853)	8581.01 (5775.77)
Fertilizer (x_3)	29.2427 (46.5793)	0.0001 (0.0007)	0.0088 (0.0818)	4871.83 (5538.39)
Labour ($x_{4)}$	-2427.06 (2003.26)	-0.0792 (0.0318)	-3.7953** (1.4833)	-186937.7 (100466.7)
Agrochemicals (x_5)	2539.47 (1983.36)	0.0801 (0.0315)	4.1313** (1.5635)	209924.7 (1054.32)
Ext contact (x_6)	-1209.32 (1334.43)	-0.0458 (0.0212)	-0.0041 (0.0155)	-333.1852 (1054.32)
Education years (x_7)	671.487 (641.101)	0.0089 (0.0101)	0.0148 (0.0115)	390.7926 (779.9047)
Farm experience (x_8)	-128.520 (295.368)	0.0029 (0.0046)	0.0271 (0.0811)	-2946.203 (5494.62)
R^2	0.4556	0.4672	0.5344	0.4489
^R	0.4245	0.4367	0.5078	0.4174
F- value	14.65	15.34	20.08	14.25

Note : ***, **, * show the significance at 1%, 5% and 10%

Source: Field Survey, 2019

Table 12: Constraints of Maize Production

Constraints	Frequency	Percentage	Rank
Null access to credit	142	12.02	2nd
Lack of modern storage facilities	129	10.92	5th
Poor quality of seeds	86	7.28	9th
Pest and diseases	145	12.27	1st
Vagary of weather	132	11.17	4th
Insufficient cultivable seed	106	8.97	7th
Scarcity of labour	82	6.94	10th
Adulterated agrochemicals	96	8.12	8th
High cost of fertilizer	136	11.51	3rd
Underpricing of fertilizer	127	10.80	6th
Total	1181*	100	

*Multiple response was allowed

Source: Field Survey, 2019

Agrochemical: The result from Table 11 below showed that the coefficient of agrochemical have positive effect on maize profitability and it is significant at 5%. This implies that the higher the effect on maize output in the study area. The result also indicated that if the impact of agrochemical is increased by one unit, there is a 4.131 increase of agrochemical on maize output in the study area.

Constraints of Maize Production: The major constraints to maize farming are Pest and disease (12.02%) was ranked first. Pest and diseases infestation affect farm output, this may be caused by lack of or inadequate access to pesticides and insecticides.

Null access to credit (11.51%) was ranked second. This may be due to the risky nature of agricultural investments which makes financial institutions charge higher rates of interest on loan to farmers who they perceived as high-risk borrowers or even sometimes may not give out credit because of the nature of agriculture.

The result revealed that high cost of fertilizer (11.17%) was ranked third of the constraint faced by maize farmers. The fertilizer distribution in the study area is very much uncertain and vulnerable to seasonality of crop production. Artificial crisis is also an important factor in this context.

Vagary of weather (10.92%) was ranked fourth of the constraints faced by maize farmers. Weather fluctuation affect maize farming because rainfall cannot be predicted and temperature too cannot be predicted so this may affect output.

Lack of modern storage facility (10.80%) was ranked fifth of the constraint, this will lead to increase in loss of output. Maize output tends to perish and also stand the chance of being eaten by pest.

Other constraints are underpricing of output (8.97%), insufficient cultivable seed (8.12%), adulterated agrochemicals (7.28%), poor quality seed (6.94%) and scarcity of labour.

CONCLUSION

From the result of the analysis, it can be inferred that maize is produced in small parcels of land of less than 5 ha by young, educated and experienced farmers. It could also be concluded that maize production in the study area is profitable with revenue of ₦1, 087, 786.00 and ₦403, 046. Moreover, maize production in the study area was found to have a quiet a number of impediments such as pest and diseases, no access to credit, fertilizer scarcity, fluctuation of weather and others.

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