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PROFITABILITY ANALYSIS AND SOCIO-ECONOMIC DETERMINANTS OF MAIZE OUTPUT IN RIJAU LOCAL GOVERNMENT AREA OF NIGER STATE, NIGERIA

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ABSTRACT
The study assessed the profitability of maize production and socio-economic determinants of maize output in Rijau Local Government Area of Niger State, Nigeria. A multi-stage sampling technique was used in selecting 120 maize farmers. Descriptive statistics was used to assess the socio-economic characteristics of the farmers, while budgetary technique was used to determine the profitability of maize production in the study area. Socio-economic determinants of maize output were assessed using multiple regression analysis. The result showed that 25.8% of the respondents had farming experience of 6 to 10 years; majority (34.2%) had non-formal education, and 46.7% were cultivating 0.1 to 2.0 hectares of land. The study further disclosed that total variable cost accounted for 96.8% (₦133,200.5) of the total cost of production and depreciation on fixed cost that represented 3.1% (₦4,246.41) of the total cost of maize production in the study area. The return per Naira invested was ₦3.47 inferring that for each naira invested, ₦2.47k was realised as profit, hence, maize production in the study area was found to be profitable. The regression analysis revealed that farm size (23.185) and household size (8.886) significantly ($P \leq 0.01$ and $P \leq 0.05$, respectively) determined the output level of maize producers in the study area. This could be an indication of non-adoption of improved farm practices. It was recommended that effort should be made in providing efficient and accessible extension service system in order to educate farmers on the importance of improved farming practices and adoption of advanced technology.

Keywords: Maize output, Profitability analysis, Socio-economic variables, Net farm income, Rijau.

INTRODUCTION
Maize is the seed of a monocot plant, *Zea mays* belonging to the grass family gramineae. It is a cereals crop that produces grains which can be used as food for human beings as well as livestock. Nigeria is the 14th largest producer of maize in the world (Food and Agricultural Organization [FAO], 2013). It is appraised that 70% of maize farmers are small-scale farmers producing 90% of the total farm output (Cadini & Angelluci, 2013). According to Iken and Amusa (2004), maize crop production in Nigeria has begun as a subsistence production which has progressively risen to commercial production on which numerous agro-allied industries exclusively rely on as source of raw materials. Maize is an essential staple food crop produced on a large scale in Nigeria. According to FAO (2013), it is rated as the second most produced crop in Nigeria with an estimated output of 9,180,270 tonnes. Thus, this crop has big impact in the economics of developed and developing countries, with per capita consumption of 40kg/year in Sub-Saharan African countries of which Nigeria is inclusive (Hassan *et al.*, 2014).

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Maize has been in the diet of numerous Nigerians for centuries and its production as identified by Fajemisin (1985), originates primarily from three features: first, it can be prepared easily into different forms of meals which accounts for about 65% of the daily total caloric intake of rural people; second, the income realized from the production of maize crop, and third, maize crop has faster biomass recovery and it also prospers in intercropping system (Ezeaku *et al.*, 2002). In line with the three mentioned factors, demand for maize continued to increase in Nigeria with livestock industry consuming more than half of the total maize production annually. Rising demand for maize is also not unconnected with increasing population growth, rapid agro-based and livestock industry growth, and rapid urbanization. Despite this economic importance of the maize crop in Nigeria, its supply to meet the demand of the teeming population is not achieved. Ogundari and Ojo in 2007 postulated that agricultural production in Nigeria is increasing at 2.5% annually while population is estimated to be increasing at 3.2% annually (National Population Commission [NPC], 2006; Hassan *et al.*, 2014; and Ogundari and Ojo, 2007). Thence, this creates demand-supply disparity of food in the country. National requirement for maize is estimated at about 16 million tonnes. With production around 10.3 million tonnes in 2013, supply deficit is about 5.7 million tonnes (National Agricultural Extension Research Liaison Services, Maize Bulletin, 2014).

The demand for maize is on the increase relative to its supply as evidenced from the recurrent rise in its price. This trend has immense implication on the food security condition and economic growth of Nigeria's economy. Several studies have implicated farmers' socioeconomic characteristics among the key factors that influence yield on farmers' fields (Ammani *et al.*, 2016). This study therefore seeks to determine the profitability of maize production in Rijau local government area and the socio-economic variables influencing maize output in the study area.

MATERIALS AND METHODS

The Study Area

The study was carried out in Rijau Local Government Area (LGA) of Niger State. It is bordered in the north by Zuru and Fakai Local Government Areas of Kebbi State, in the south by Gulbin-Boka ward of Mariga (Bangi), Magama and Kontagora Local Government Areas (LGAs), and in the east and west by Sakaba, Dirin Daji and Yauri LGAs of Kebbi State. Rijau local government area is made up of 11 wards namely; Rijau Centre, Darangi, Magajiya, Sabon Garin Ushe, Dukku, Dugge, Genu, Bunu, Warrari, and Sahoma-Jama'are wards. The entire region is situated in Northern Guinea Savannah zone of Nigeria, with a population of 230,255 people (Niger State Bureau of Statistics, 2014). It has a land area of 3,432.2km^2. The headquarters of Rijau Local Government is the town of Rijau, which lies at 11^{0}06`N and 5$^0$16`E.

Sampling Technique and Sampling Size

A Multi-stage sampling technique was used to collect data from 120 maize farmers. The first stage involved random selection of four (4) wards from the 11 wards of Rijau LGA; the second stage involved the random selection of two (2) farming communities from each of the selected wards, and thirdly the random selection of 15 maize farmers from the selected farming communities in the study area.

Method of Data Collection

The study made use of primary data that was derived by survey research method using a structured questionnaire in collecting relevant data. Information on socio-economic variables such as age, educational level, farm size, access to extension services and membership of

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cooperative society were collected. Other information collected included the input and output outlined within cost content of the farmers.

Methods of Data Analysis

Descriptive statistics was used to describe the socio-economic characteristics of maize farmers, budgetary technique to determine the profitability of maize production and multiple regression analysis to determine socio-economic variables influencing maize output.

Production simply means the transformation of series of inputs or resources through a particular technology to give an output. According to Jhingan (2003), production was defined as a functional relationship between input and output which shows the degree of changes in output with difference in input during a specified period of time. Production is all economic activities other than consumption. Successful management in agricultural production reckons on appropriate elucidation of revenue and cost profiles of an enterprise. In this elucidation, financial success can be accredited to enterprise of which the profits exceed costs. Whether the accounting profits of enterprise is satisfactory to acknowledge an enterprise as victorious is debatable.

Costs and returns analysis has been greatly utilized by many researchers in determining the profitability of a farm enterprise. In spite of the problems associated with this technique as a basis for profitability appraisal, researchers find it convincing to use. Bernard (2003) identified two major problems of using costs and returns analysis. These include;

i. Costs and returns analysis do not depict the relative importance of each of the resources in production.
ii. The technique is location bound and specific in pertinence for the reason that money is used as the common unit of measurement and the prevailing price of the estimates (Sadiq *et al.*, 2013).

The budgetary technique involves the utilization of net farm income (NFI) and gross margin (GM) in determining the profitability of a farm. The Net farm income is the difference between the total revenue and farm expenditures while gross margin is the difference between gross income and total variable cost and it is used where fixed cost is negligible. Net farm income and return on Naira invested (ROI) was used to determine the profitability of maize production in Rijau LGA.

Following Olukosi and Erhabor (1988); and Lawal *et al.* (2013), the net farm income was estimated based on per hectare this is expressed as:

NFI = GM – TFC … (1)
GM = TR – TVC … (2)
TR = Py. Y … (3)

where;
NFI = Net Farm Income
GM = Gross Margin (₦)
TFC = Total fixed cost/ha (₦) (average annual depreciation cost for all fixed inputs)
TR = Total revenue
Py = Price per unit of output (₦)
Y = Total quantity of output (kg) per unit per hectare

The return on Naira invested (ROI) was obtained following Lawal (2008) thus:

$$ROI = \frac{Total\ revenue}{Total\ cost\ of\ production} \quad \ldots (4)$$

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The multiple regression analysis was used to determine the socio-economic variables influencing maize output. Three functional forms of the ordinary least square (OLS) method namely; Linear, Semi-log, and Cobb-Douglas were fitted to the data collected from the field.

The implicit form of the model was specified as:

$Y = (X_1, X_2, X_3, X_4, X_5, X_6, e_t)$ … (5)

where;

Y = Maize output

X_1 = Farm size (Ha)

X_2 = Age (yrs)

X_3 = Farming experience (yrs)

X_4 = Educational level (No. of years spent in school)

X_5 = Household size (No. of person per house)

X_6 = Membership of cooperative society (dummy; Yes = 1, No = 0)

U = error terms

The explicit forms of the functional forms of the model are specified as:

$Y = b_0 + b_1X_1 + b_2X_2 + b_3X_3 + b_4X_4 + b_5X_5 + b_6X_6 + e_t$ (Linear) … (6)

$InY = Inb_0 + b_1InX_1 + b_2InX_2 + b_3InX_3 + b_4InX_4 + b_5InX_5 + b_6InX_6 + e_t$ (Double-log) … (7)

$Y = Inb_0 + b_1InX_1 + b_2InX_2 + b_3InX_3 + b_4InX_4 + b_5InX_5 + b_6InX_6 + e_t$ (Semi-log) … (8)

RESULTS AND DISCUSSION

Socio-economic Characteristics of the Respondents

Table 1 presents the results of socio-economic characteristics of maize farmers. Age is one of the determinants of productivity of labour and of significance particularly when considering the form and nature of farm operations (Abubakar and Sule, 2017). The study reveals that, 80.8% of the respondents are still in their productive age of between 20 to 50 years. This implies that, majority of the respondents in the study area are still energetic and responsive/active to continue maize production. This finding is in line with the result reported by Sadiq *et al.* (2013) who found that farmers within the age bracket of 19 – 49 years are economically active and at their productive stages. It was observed that 19.2% of the respondents are within the age category of 51 years above. The respondent's highest level of education modal class was non-formal education with 34.2%, followed by tertiary 27.5%, secondary 26.7% while primary education was 11.7%. In spite of the substantial difference in number of people enrolment to formal education and non-formal education, still there is the need for extension agents to sensitise rural farmers on the importance of formal education in order to avail them to keen in adoption of new innovation. Similar suggestion was raised in the study carried out by Sadiq *et al.* (2013) on profitability and production efficiency of small-Scale maize production in Niger State, Nigeria; that extension workers should do more by sensitizing farmers on the importance of formal education.

From Table 1, majority of the respondents (80.8%) had farming experience of 1 to 20 years while 19.2% had farming experience that range between 21 and 31 years and above. By implication, this result revealed that maize farmers of the study area have acquired sufficient knowledge in maize production. The modal class for farm size of the respondents was 46.7% that lied between 0.1 – 2.0 hectares, while 52.2% of the respondents had farm size of between 2.1 to 6.0 hectares and 4.2% had farm size above 6.1 hectares. This result implies that, maize production in the study area is in the hands of small-scale farmers. According to Ibrahim *et al.* (2012), size of farm is an important contributor to the quantity and types of technology required.

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Table1: Socio-economic Characteristics of the Maize Farmers

Characteristics	Frequency	Percentage
Age (years)		
10 – 20	4	3.3
21 – 30	22	18.3
31 – 40	45	37.5
41 – 50	26	21.7
51 Above	23	19.2
Highest level of education		
Non-formal	41	34.2
Primary	14	11.7
Secondary	32	26.7
Tertiary	33	27.5
Farming experience		
1 – 5	30	25.0
6 – 10	31	25.8
11 – 15	17	14.2
16 – 20	19	15.8
21 – 30	9	7.5
31 & Above	14	11.7
Farm size (ha)		
0.1 – 2.0	56	46.7
2.1 – 4.0	45	37.5
4.1 – 6.0	14	14.7
Above 6.1	5	4.2
Access to extension services		
Yes	40	33.3
No	80	66.7
Membership of cooperative society		
Yes	36	30.0
No	84	70.0
Non-farm activity		
Yes	51	42.5
No	69	57.5

Source: Field survey; 2017

Access to extension services plays a vital role in technology adoption as the result (Table 1) further revealed that majority of the respondents (66.7%) lack access to extension services. Thus, this has significant effect on the adoption of technology. About 70.0% of the respondents do not belong to any form of cooperative society while 30.0% of the respondents were members of cooperative society. The modal class for non-farm activity was 57.5% for the

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respondents that were not engaged in any non-farm activity, 42.5% were engaged in non-farm activity that earned them income aside from farming. By implication, this result showed that majority of farmers of the study area are not engaged in any form of non-farm activity, thus depend solely on farming to earn income.

Costs and Returns Associated with Maize Production

The derived costs were classified into variables and fixed cost constituents. The variable costs include cost of: seed, herbicide, labour, transportation, and fertilizer, while the fixed costs components include the cost of: oxen, sprayer, cutlass and hoe. These components were depreciated overtime using the straight line depreciation method. Maize production profitability was determined using the estimated average costs and returns analysis depicted in Table 2.

Table 2: Average Costs and Returns of Maize Production per Hectare/Naira

Variable	Unit price (₦/kg)	Quantity/ha	Value (₦)/ha	% of Total cost
Maize revenue	113	4221kg	476,973	
Variable inputs:				
Labour:				
Family (Man-day)		11	17,304	12.6
Hired (Man-day)		29	40,572.5	29.5
Seed (kg)	1500	23	6,510	4.7
Fertilizer (kg)	182.29	231	42,109	30.6
Agrochemical (Litres)	980.42	6	5,882.5	4.3
Transportation			3,938.5	2.9
Processing	200		8,442	6.1
Storage (Bags)	200		8,442	6.1
Total variable cost			133,200.5	96.8
Fixed inputs:				
Sprayer		1	1,244.33	0.9
Hoe		3	989.58	0.7
Cutlass		2	212.5	0.2
Oxen		1	1,800	1.3
Total fixed cost			4,246.41	3.1
Total cost			137,446.91	100
Gross margin/ha			343,772.5	
Net farm income (NFI)			339,526.09	
Return on Naira invested (ROI)			3.47	

Source: Field survey, 2017

The gross margin per hectare earned by the small-scale maize farmers averagely was ₦343,772.5 per hectare. The total variable cost was ₦133,200.5 whereas depreciation on fixed cost was ₦4,246.41. Thus, fixed cost was negligible as such gross margin per hectare was used as indicator for the measurement of maize profitability. The return per Naira invested was estimated at ₦3.47 inferring that for each naira invested ₦2.47 was realised as profit. Hence, maize production in the study area is profitable. It could be observed that the ROI of ₦3.47 was higher when compared with the 1.13, 1.26, and 2.27 reported by Zalkuwi *et al.* (2010), Awaisu (2015) and Momoh (2016).

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Labour constitutes 42.1% of the total cost of production, followed by fertilizer 30.6%, processing 6.1%, storage (bags) 6.1%, seed 4.7%, and agrochemical 4.3% then transportation 2.9%. The study revealed that total variable cost accounts for 96.8% (₦133,200.5) of the total cost of production while depreciation on fixed cost represents 3.1% (₦4,246.41) of the total cost of maize production in the study area. This finding corroborates with the finding of Zalkuwi *et al.* (2010) who reported that variable cost represents 97% of the total cost of production while depreciation on fixed cost accounts for 3% of the total cost of production.

Regression Results of Socio-Economic Determinants of Maize Output

Three (3) functional forms of ordinary least square were tested; linear, semi-log and double-log. Linear was chosen as the lead equation based on the coefficients of multiple determinants (R^2) and the coefficient signs in line with the a priori expectations. In Table 3, the adjusted R-square value of 0.598 indicates that 59.8% of the observed variation in maize production could be attributed to the combined influence of the socio-economic variables included in the regression equation while the remaining 40.2% could be attributed to error and variables not included in the equation. The F-value of 30.492 is statistically significant at 1% probability level which confirms the significance of the model.

It was found that farm size and household size were positive and significant variables which influenced maize output in the study area. This implies that increase in these variables will lead to increase in the level of maize output in the area. This finding agrees with the findings of Ajah and Nmadu (2012) and Lawal and Adigun (2012) that household size and farm size significantly influenced output of the farmers.

Table 3: Regression Result on the Socio-economic Variables Influencing Maize Output

Variables	**Coefficient**	**Std. Error**	**t-Values**
Constant	28.292	20.992	1.348
Farm size (X_1)	23.185***	1.844	12.574
Age (X_2)	-0.536	5.328	-0.101
Farming experience (X_3)	-0.193	0.435	-0.443
Educational level (X_4)	0.670	0.585	1.145
Household size (X_5)	8.886**	4.387	2.025
Membership of cooperative society (X_6)	-11.370	7.820	-1.454
R^2	0.618		
Adjusted R^2	0.598		
F-value	30.492***		

Note: ***significant at P≤0.01; **significant at P≤0.05

CONCLUSION AND RECOMMENDATIONS

The study revealed that total variable cost accounted for 96.8% (₦133,200.5) of the total cost of production while depreciation on fixed cost represented 3.1% (₦4,246.41) of the total cost of maize production. The gross margin per hectare earned by the small-scale maize farmers averagely per hectare was ₦343,772.5 while the return per Naira invested was estimated at ₦3.47; this infers that for each naira invested ₦3.47 was realised as profit. Hence,

maize production in the study area is profitable. The regression analysis revealed that farm size and household size have significant effect on the output of maize in the study area.

It was recommended that effort should be made in providing efficient and accessible extension service system in order to educate farmers on the importance of improved farming practices and adoption of advanced technology. In view of the profitable nature of maize production in the study area, it is recommended that farming inputs such as fertilizer, seeds and herbicide should be made available at subsidized rate in order to encourage farmers to expand production.

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