ECONOMICS OF SMALL-SCALE MAIZE PRODUCTION IN TOTO LOCAL GOVERNMENT AREA, NASARAWA STATE, NIGERIA

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ABSTRACT

The study examined the economics of small-scale maize production in Toto Local Government Area of Nasarawa State, Nigeria. A two-stage sampling technique was adopted for the data collection. Descriptive statistics, regression and gross margin analyses were used to analyse the data collected. The study revealed that majority of the respondents were within the active working age and most of them (83%) were male. The majority of the respondents were married and had a household size of five persons and farm size of 1-2ha. Results of the regression analysis revealed that the output of small-scale maize farmers was influenced by farm size, marital status and annual income at 1% and 5% respectively. A gross margin of ₦170,594.50 was earned from one hectare of maize farm with a return per naira invested of 2.40. The cost of labour constituted a greater proportion of the costs of production, accounting for about 58.38% and 39.52% of the total variable cost and the total cost respectively, the total cost. The problems militating against maize production in the study area were high cost of labour, pests and diseases, inadequate storage facilities, inadequate capital, marketing problems, transportation, poor access to credit facilities and high cost of inputs. The study, therefore, recommends that farmers should be properly educated by the extension agents on pest and disease control measures. Moreover, inputs should be made available to farmers at subsidized rates by relevant stakeholders.

Keywords: Maize, costs, returns, problems, small-scale, production

INTRODUCTION

Agriculture in Nigeria is dominated by small-scale farmers who are engaged in the production of the bulk of food requirements of the country. Smallholder farmers are regarded as people with landholdings of less than 10 hectares. These groups make up about 80% of Nigeria's farming population and are responsible for 80% – 90% of food production in Nigeria but they are the poorest groups in the country (Mgbenka and Mbah, 2016). Maize (*Zea mays* L.) is the world's highest supplier of calorie with caloric supply of about 19.5%. It provides more calorie than rice (16.5%) and wheat (15.0%). Maize is one of the most important staple foods in the world today; maize, rice and wheat combine to supply more than 50% of global caloric intake (World Atlas, 2017). Maize is the most important staple food in Nigeria and it has grown to be local 'cash crop' most especially in the southwestern part of Nigeria where at least 30% of the crop land has been devoted to small-scale maize production under various cropping systems (Ayeni, 1991).

Introduced in Nigeria in the 16th century, maize is the fourth most consumed cereal ranked below sorghum, millet and rice (FAOSTAT, 2012). It is the third most important cereal after sorghum and millet (Juma, 2010). It has been recognized to be one of the longest ever cultivated food crops. Maize is also grown in several regions of the world and is referred to as the world best adapted crop (IITA, 2008). In Nigeria, the demand for maize is increasing at a faster rate daily (Sadiq *et al.,* 2013). This may be due to the fact that the grain is being used for feeding poultry and also serve as the main food for many households (Ogunniyi, 2011).

Ogunsumi *et al*. (2005) established that growing maize by small-scale farmers can overcome hunger in the households and the aggregate effect could double food production in Africa. According to the FAO, about 4.7 million tonnes of maize were produced on the average between 1990 and 2015 in Nigeria and the contribution of maize to total grains produced in Nigeria increased from 8.7% in 1980 to about 22% in 2003. About 561, 397, 29 hectares of Nigerian land were planted with maize, which constitutes about 61% of total cultivable land in Nigeria. Furthermore, the FAO in 2017 reported that Nigeria produced 10.5 Million metric tons of maize in 2016/2017.

Maize consumption is widespread across the country and among households. According to the Mundi Index, maize consumption in Nigeria in 2017 stood at 10.9 million metric tons. Users of maize alone or in combination with other food material as staple food or snacks in Nigeria included but are not limited to *kunu, akamu, ogi* (in hot and cold forms), *tuwo, donkunnu, maasa, couscous, akple, gwate, nakia, egbo, abari, donkwa, ajepasi, aadun, kokoro, elekute* (Olaniyan, 2015). Following a peak in 1994 (35kg/year), per capita consumption of maize in Nigeria underwent an overall decrease through the 1990s, reaching a negative peak in 2000

(17kg/year) with a positive growth rate between 2001 and 2007 (aside from 2006, when the per capita consumption declined by 0.4 percent). Maize production in Nigeria stood at 10.7 million metric tons in 2015 (FAO, 2017) and 10.5 million metric tons in 2017 (Mundi Index, 2018). Maize has the ability to thrive under different ecological conditions, hence the widespread in its production across different parts of the country. There is evidence of sustained production rate of maize in Nigeria (Mundi Index, 2018; FAO, 2017).

Statement of the problem

Rural households continue to face poor economic conditions which affect their living standard and maize production situation. The returns to land in terms of output have been on the decrease especially where increased population and non-agricultural uses compete for land use (Babatunde *et al*., 2007). Empirical evidence suggests that improving the productivity of smallholder farmers is important for economic development because smallholder farming provides a source of employment and a more equitable distribution of income (Bravo-Ureta and Evenson, 1994). In view of the above, this study seeks to address the following research questions:

1. What are the socio-economic characteristics of farmers in the study area?
2. What is the relationship between the socio-economic characteristics of maize farmers and their output?
3. What are the costs and returns associated with maize production in the study area?
4. What are the constraints faced by small-scale maize producers in the study area?

Objectives of the study

The general objective of this study was to examine the economics of small-scale maize production in Toto Local Government Area of Nasarawa State. The specific objectives of the study were to:

i. describe the socio-economic characteristics of maize farmers in the study area;
ii. determine the relationship between the socio-economic characteristics of the farmers and their output;
iii. evaluate the cost and returns associated with maize production in the study area; and

iv. identify the constraints faced by small-scale maize farmers in the study area.

METHODOLOGY

Description of the study area

The study was conducted in Toto, one of the thirteen (13) Local Government Areas of Nasarawa State. The Local Government Area is located in the western agricultural zone of the State. The study area has three (3) districts namely: Gadabuke, Toto and Umaisha. It is located on latitude 8°25'N and longitude 7°20'E. It has an area of 2,903km^2 and a population of 119,077 inhabitants (NPC, 2006). Annual rainfall in this region ranges between 1500 and 2000mm. The period of rainfall fall spans between 7 and 8 months (April – November), it is a lowland area and is characterized by deep, fertile alluvial soils and abundant forest biomass (Binbol and Marcus, 2005). The Local Government Area is agrarian and well suited for the production of arable crops such as maize, cassava, yam, sorghum, millet, rice, cowpea, sesame, cocoyam and sweet potato.

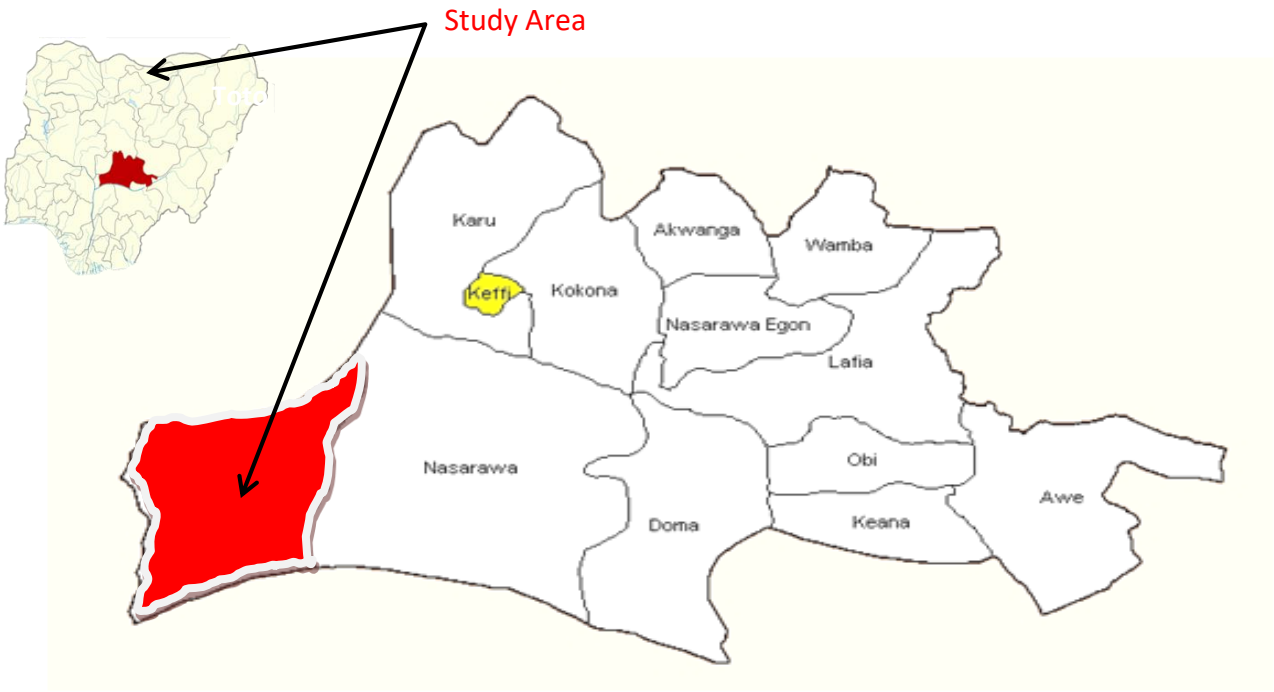

Fig. 1: Map of Nasarawa State showing the Study Area. (NSMI, 2016)

Sample size and sampling technique

The population for the study was small-scale maize farmers in Toto Local Government Area of Nasarawa State. A two-stage sampling technique was adopted for this study. In the first stage, four communities were randomly selected from each district to give a total of twelve (12) communities. The second stage involved the random selection of ten (10) small-scale maize farmers from each selected community to give a total of 120 respondents.

Method of data collection

Both primary and secondary data were used for this study. Primary data were collected with the aid of structured questionnaire which was distributed to the respondents. Data were collected on the socio-economic characteristics, inputs and output, production constraints and other related factors.

Analytical tools

The descriptive statistics such as frequency counts, percentages and means were used to achieve the first two objectives. The ordinary least square regression analysis was used to determine the socio-economic factors influencing maize production in the study area while gross margin analysis was adopted in determining the profitability of maize production in the study area.

The models are specified as follows:

a) Descriptive statistics

i) Mean = $\frac{\sum Xn}{N}$

b) Regression analysis

$Y_i = \beta_o + \beta_i X_i + U$

Y = maize output (kg)

X_i = Independent variable socio-economic characteristics.

β_o = Intercept parameters.

β_i = Slope of estimated parameters

U = error term.

$Y = \beta o + \beta_1 X_1 + \beta_2 X_2 + \ldots\ldots + \beta_9 X_9 + U$

X_1 = Age of the Respondent (years)

X_2 = Sex of the respondents (dummy 1=male, 0= female)

X_3 = Marital status (dummy 1=married, 0= single)

X_4 = Educational qualification (years)

X_5 = Farm size (hectares)

X_6 = Farming experience (years)

X_7 = Household size (number of persons)

X_8 = labour hired (man-day)

X_9 = Annual Income (Naira)

U = Error term

c.) Gross Margin Analysis

Gross margin which was used to evaluate the cost and returns associated with maize production in the study area is expressed as follows:

GM = GI **-**TVC

Where: GM = Gross Margin (N/ha).

GI = Gross income (₦ /ha), i.e. the product of the total output and the unit cost of output.

TVC = Total Variable Cost (N/ha) i.e. Cost of inputs such as fertilizer, seed, hired labour, chemicals, etc.

d. Net Farm Income (NFI)

NFI = GM-TFC

Where, NFI = Net Farm Income (₦/ha)

GM = Gross Margin

TFC = Total Fixed Cost

e. Return per Naira Invested

Ret/N = GM/TC

Where, Return/N = Return per naira invested

GM = Gross Margin

TC = Total Cost

RESULTS AND DISCUSSION

Socio-economic characteristics of the respondents

The distribution of the respondents according to their socioeconomic characteristics (age, sex, marital status, household size, experience, farm size and annual income) is presented in Table 1. Age influences the amount of physical effort being put in any economic activity (Manga *et al.* 2014).Thirty-four percent of the respondents were between the age bracket 21-30 years, 22% were between 31-40years, 24% of the respondents were not more than 20years, 15% were between 41-50 years while only 4% of the respondents were above 50 years. The mean age of the respondents was 30 years. This implies that the maize farmers in this area are very youthful and can supply an excellent amount of labour which are open to innovation and are creative. This is also similar to the findings of Issa *et al.* (2016) who determined the mean age of maize farmers in Ikara Local Government Area of Kaduna State, Nigeria to be about 40 years which is also within the active age. This shows that the farmers were young and are expected to have more energy with high vigour to practice maize farming.

Distribution of the respondents according to their sex shows that the majority (83.0%) of them were of the male gender. This agrees with the findings of Nathaniel *et al.* (2015) that majority (88%) of small scale maize farmers in Safana Local Government Area of Katsina State, Nigeria were males.

Table 1 further shows that, a large proportion (60.0%) of the small-scale maize farmers in the study area were married while 37% were single; 1% of the respondent were divorced while, 2% were widowed. Married farmers may tend to be more dedicated and possibly have a greater imperative for higher productivity in order to meet family demands for food, income, among others.

Distribution of the respondents based on the highest educational qualification obtained shows that 49% of the respondents had secondary education, 10% had primary education, and 25% had tertiary education while 16% had no formal education. This implies that the majority (84.0%) of the farmers had one form of formal educational or the other. All things being equal, farmers with basic education are better equipped for making more informed decision (Opara, 2010). Similarly, Adenuga *et al.* (2013) found that education has the tendency to significantly improve agricultural productivity.

Distribution of the respondents by household size of the respondents reveals that the majority (62%) of the farmers had household size between one to five persons. This agrees with the findings of Sadiq *et al.* (2013) who noted that majority (70%) of the respondents have household size ranging from 1-10 persons. According to Ozor and Cynthia (2010), a fairly large family size implies more family labour available for the household farm activities.

Table 1 also shows that 43% of the respondents earned between ₦1000 to ₦50,000 per year, 21.% earn between ₦51,000 to ₦100,000, 27% earn between ₦101,000 to ₦150,000, 4% earned between N150,000 to N200,000 while 5% earn above 200,000 per year.

Table 1: Distribution of Respondents According to Socioeconomic Characteristics (n = 100)

Variable	Frequency	Percentage
Age (years):		
<20	24	24
21-30	34	34
31-40	22	22
41-50	15	15
51 and above	5	5

	$\bar{x}$ = 30.19		
Sex:			
Male	83		83
Female	17		17
Marital Status:			
Married	60		60
Single	37		37
Divorced	1		1
Widowed	2		2
Education status:			
Primary		10	62
Secondary	49		29
Tertiary	25		6
No formal education	16		3
Household Size			42
1-5	62		37
6-10	29		9
11-15	6		4
16 and above	3		8
	$\bar{x}$ = 4.99		
Experience (Years):			1
1-5	42		79
6-10	37		16
11-15	9		4
16-20	4		
21 and above	8		
	$\bar{x}$ = 7.87		43
Farm Size (ha):			21

<1	1	27
1-2	79	4
3-4	16	5
5 and above	4	
		43
$\bar{x}$ = 2.00		21
Annual Income (₦)		27
1000 – 50,000	43	4
51,000 – 100,000	21	5
101,000 – 150,000	27	
151,000 – 200,000	4	
201,000 and above	5	
$\bar{x}$ = 82,315		

Source: Field survey, 2016.

Relationship between the Socio-economic Characteristics of the Respondents and their Output

The relationship between some socio-economic variables (such as age, marital status, sex, level of education, farm size, years of experience, household size, amount of labour and annual income) and the output of the respondents was determined using the regression analysis. The results are presented in Table 2. To estimate the relationship, the study adopted three different equations (linear, exponential, semi-log and Cobb Douglas). The Double-log equation was selected as the lead equation based on the value of the R^2, number of significant variables and conformity with *a priori* expectations.

The result of the regression analysis revealed that farm size was significant at 0.01 while marital status and annual income were significant at 0.05. The result implies that if farm size is increased by one hectare the income will increase by ₦48, 331.012 and if the income of the farmers is raised by N1 the output will increase by ₦0.432.

$LogY = Log(21996.912) + Log(1913.681X_1) + Log(-35914.009X_2) + Log(10131.775X_3) + Log(6117.333X_4) + Log(48331.012X_5) + Log(2194.711X_6) + Log(2195.261X_2) + Log(-.212X_8) + Log(.432X_9) + U$

Table 2: Regression analysis

Coefficients

	Unstandardized Coefficients		Standardized Coefficients		
	B	Std. Error	Beta	T-value	Sig.
(Constant)	21996.912	82156.213		.268 NS	.790
Age (years)	1913.681	1660.083	.167	1.153NS	.252
Sex	-35914.009	30733.827	-.108	-1.169 NS	.246
Marital Status	10131.775	20566.378	.051	2.293**	.023
Education	6117.333	14140.886	.043	.433 NS	.666
Farm size	48331.012	10382.055	.411	4.655***	.000
Farming Experience	2194.711	2332.699	.097	.941 NS	.349
Household Size	2195.261	4067.763	.072	.540 NS	.591
Amount Labour	-.212	.403	-.049	-.526 NS	.600
Annual Income	.432	.188	.215	2.294**	.024
Adjusted R^2 = 0.502					
R^2 = 0.570					

Source: Field Survey, 2016 NS = Not significant ** = Significant at 5% ***= significant at 1%

Cost and returns in maize production in the study area

The result of the analysis of the profitability of small-scale maize production in the study area is presented in Table 3. The result indicated a total revenue of ₦218, 677.00 was earned per hectare while the total variable costs incurred was N48, 082.50 per hectare; giving, a gross margin of ₦170, 594.50per hectare. The total fixed cost and the total cost were estimated at ₦22, 943.00/ha and N71, 025.50/ha respectively. Also, the table shows that a net farm income of N147, 651.50 per hectare while the return per naira invested was 2.40. These results indicate that maize production is a profitable venture in the study area. This result is in line with the findings of Adesiyan (2015). The result also shows that labour cost constituted a greater proportion of the costs incurred in maize production process by the farmers, accounting for 58.38% and 39.52% of the TVC and the TC respectively.

Table 3: Profitability of Maize Production in the Study Area

Item	Cost/Value (₦/ha)	Percentage
A. Returns		
Revenue from fresh cobs	49,421.002	22.60
Revenue from dried seed	159,415.533	72.90

Revenue from maize husk	9,840	4.50
Gross Income (GI)	218,677	100
B. Variable Costs		
Seed	4,701.00	6.62
Labour	28,071.50	39.52
Transportation	1,441.00	2.03
Herbicide	1,281.50	1.80
Insecticide	1,497.50	2.11
Fertilizer	11,090.00	15.61
Total Variable Cost (TVC)	48,082.50	67.70
C. Fixed Costs		
Cost renting land	12,560.50	17.68
Interest on loans	2,050.00	2.89
Farm tools	8,332.50	11.73
Total Fixed Costs (TFC)	22,943.00	32.30
D. Total Cost (TVC+TFC)	71,025.50	100
GM = GI-TVC	170,594.50	
NFI = GM-TFC	147,651.50	
Return Per Naira (Ret/₦) = GM/TC	2.40	

Source: Field survey, 2016

Constraints to small-scale maize production in the study area

The distribution of the respondents according their constraints in maize production is presented in Table 4. The majority (more than 50%) of the respondents agreed that high cost of labour, pests and diseases, inadequate storage facilities, inadequate capital, marketing problem, transportation problem, poor access to credit facilities and high cost of input were the major constraints that militate against their production activities. Issa *et al.* (2016) reported similar findings on the major constraints to adoption of improved maize production practices (IMPPs). These findings also agree with Aduba *et al.* (2013) who found that the most severe problems militating against maize production were poor pricing of maize products, high cost of labour, inadequate fund and high cost of transportation.

Table 4: Distribution of respondents according to factors militating against their activities

Constraint	Frequency	Percentage	Rank
Pest and diseases	81	81	2nd
Inadequate storage facilities	71	71	3rd
Inadequate capital	71	71	3rd
High cost of inputs	55	55	8th
Marketing problem	67	67	5th
Transportation problem	67	67	5th
Inadequate information	34	34	10th
High cost of labour	84	84	1st
Poor access to credit facilities	56	56	7th
Shared cropping problem	27	27	12th
Reciprocal labour	28	28	11th
Pilfering	42	42	9th

Source: Field survey, 2016

RECOMMENDATIONS

Based on the findings, the study therefore recommends the following:

Affordable loans should be made available to the small-scale maize producers so that they can expand their business and take advantage of large scale production, this can only be achieved by developing a unique credit administrations system for smallholder farmers.

Farmers should be properly educated by the extension agents on pests and diseases control measures especially integrated pest management (IPM) this will be more feasible if the country's current extension system is improved.

Inputs should be made available to farmers at subsidized rates and at propitious timing coinciding with critical production periods.

Farmers should adopt cost effective forms of labour like family labour, reciprocal labour and shared cropping in other to minimize the cost of labour in maize production.

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