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
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 2,903km² 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

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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 = \( \frac{\sum X_n}{N} \)

b) **Regression analysis**

\[ Y_i = \beta_0 + \beta_1 X_{1i} + U \]

**Y** = maize output (kg)

**X** = Independent variable socio-economic characteristics.

\( \beta_0 = \) Intercept parameters.

\( \beta_i = \) Slope of estimated parameters

\( U = \) error term.

\[ Y = \beta_0 + \beta_1 X_1 + \beta_2 X_2 + \ldots + \beta_9 X_9 + U \]

**X** = Age of the Respondent (years)

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

**X** = Marital status (dummy 1=married, 0=single)

**X** = Educational qualification (years)

**X** = Farm size (hectares)

**X** = Farming experience (years)

**X** = Household size (number of persons)

**X** = labour hired (man-day)
\[ X_9 = \text{Annual Income (Naira)} \]
\[ U = \text{Error term} \]

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:
\[ \text{GM} = \text{GI} - \text{TVC} \]
Where: \( \text{GM} \) = Gross Margin (N/ha).
\( \text{GI} \) = Gross income (N/ha), i.e. the product of the total output and the unit cost of output.
\( \text{TVC} \) = Total Variable Cost (N/ha) i.e. Cost of inputs such as fertilizer, seed, hired labour, chemicals, etc.

d. Net Farm Income (NFI)
\[ \text{NFI} = \text{GM} - \text{TFC} \]
Where, \( \text{NFI} \) = Net Farm Income (N/ha)
\( \text{GM} \) = Gross Margin
\( \text{TFC} \) = Total Fixed Cost

e. Return per Naira Invested
\[ \text{Ret/N} = \frac{\text{GM}}{\text{TC}} \]
Where, \( \text{Return/N} \) = Return per naira invested
\( \text{GM} \) = Gross Margin
\( \text{TC} \) = 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 31-40 years, 24% of the respondents were not more than 20 years, 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 N1000 to N50,000 per year, 21.% earn between N51,000 to N100,000, 27% earn between N101,000 to N150,000, 4% earned between N150,000 to N200,000 while 5% earn above 200,000 per year.

<table>
<thead>
<tr>
<th>Variable</th>
<th>Frequency</th>
<th>Percentage</th>
</tr>
</thead>
<tbody>
<tr>
<td>Age (years):</td>
<td></td>
<td></td>
</tr>
<tr>
<td>&lt;20</td>
<td>24</td>
<td>24</td>
</tr>
<tr>
<td>21-30</td>
<td>34</td>
<td>34</td>
</tr>
<tr>
<td>31-40</td>
<td>22</td>
<td>22</td>
</tr>
<tr>
<td>41-50</td>
<td>15</td>
<td>15</td>
</tr>
<tr>
<td>51 and above</td>
<td>5</td>
<td>5</td>
</tr>
</tbody>
</table>
\( \bar{x} = 30.19 \)

**Sex:**
- Male: 83
- Female: 17

**Marital Status:**
- Married: 60
- Single: 37
- Divorced: 1
- Widowed: 2

**Education status:**
- Primary: 10
- Secondary: 49
- Tertiary: 25
- No formal education: 16

**Household Size**
- 1-5: 62
- 6-10: 29
- 11-15: 6
- 16 and above: 3

\( \bar{x} = 4.99 \)

**Experience (Years):**
- 1-5: 42
- 6-10: 37
- 11-15: 9
- 16-20: 4
- 21 and above: 8

\( \bar{x} = 7.87 \)

**Farm Size (ha):**
- 21
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 N48,331.012 and if the income of the farmers is raised by N1 the output will increase by N0.432.

\[
\log Y = \log(21996.912) + \log(1913.681X_1) + \log(-35914.009X_2) + \log(10131.775X_3) + \log(6117.333X_4) + \log(48331.012X_5) + \log(2194.711X_6) + \log(2195.261X_2) + \log(.-212X_8) + \log(.432X_9) + U
\]

Table 2: Regression analysis
Coefficients

<table>
<thead>
<tr>
<th></th>
<th>Unstandardized Coefficients</th>
<th>Standardized Coefficients</th>
<th>T-value</th>
<th>Sig.</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>B</td>
<td>Std. Error</td>
<td>Beta</td>
<td>T-value</td>
</tr>
<tr>
<td>(Constant)</td>
<td>21996.912</td>
<td>82156.213</td>
<td>.268</td>
<td>.268 NS</td>
</tr>
<tr>
<td>Age (years)</td>
<td>1913.681</td>
<td>1660.083</td>
<td>.167</td>
<td>1.153 NS</td>
</tr>
<tr>
<td>Sex</td>
<td>-35914.009</td>
<td>30733.827</td>
<td>-.108</td>
<td>-1.169 NS</td>
</tr>
<tr>
<td>Marital Status</td>
<td>10131.775</td>
<td>20566.378</td>
<td>.051</td>
<td>2.293**</td>
</tr>
<tr>
<td>Education</td>
<td>6117.333</td>
<td>14140.886</td>
<td>.043</td>
<td>.433 NS</td>
</tr>
<tr>
<td>Farm size</td>
<td>48331.012</td>
<td>10382.055</td>
<td>.411</td>
<td>4.655***</td>
</tr>
<tr>
<td>Farming Experience</td>
<td>2194.711</td>
<td>2332.699</td>
<td>.097</td>
<td>.941 NS</td>
</tr>
<tr>
<td>Household Size</td>
<td>2195.261</td>
<td>4067.763</td>
<td>.072</td>
<td>.540 NS</td>
</tr>
<tr>
<td>Amount Labour</td>
<td>-212</td>
<td>.403</td>
<td>-.049</td>
<td>-5.26 NS</td>
</tr>
<tr>
<td>Annual Income</td>
<td>.432</td>
<td>.188</td>
<td>.215</td>
<td>2.294**</td>
</tr>
</tbody>
</table>

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 N218, 677.00 was earned per hectare while the total variable costs incurred was N48, 082.50 per hectare; giving, a gross margin of N170, 594.50 per hectare. The total fixed cost and the total cost were estimated at N22, 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

<table>
<thead>
<tr>
<th>Item</th>
<th>Cost/Value (N/ha)</th>
<th>Percentage</th>
</tr>
</thead>
<tbody>
<tr>
<td>A. Returns</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Revenue from fresh cobs</td>
<td>49,421.002</td>
<td>22.60</td>
</tr>
<tr>
<td>Revenue from dried seed</td>
<td>159,415.533</td>
<td>72.90</td>
</tr>
</tbody>
</table>
Revenue from maize husk 9,840 4.50
Gross Income (GI) 218,677 100

B. Variable Costs

<table>
<thead>
<tr>
<th>Item</th>
<th>Cost</th>
<th>Percentage</th>
</tr>
</thead>
<tbody>
<tr>
<td>Seed</td>
<td>4,701.00</td>
<td>6.62</td>
</tr>
<tr>
<td>Labour</td>
<td>28,071.50</td>
<td>39.52</td>
</tr>
<tr>
<td>Transportation</td>
<td>1,441.00</td>
<td>2.03</td>
</tr>
<tr>
<td>Herbicide</td>
<td>1,281.50</td>
<td>1.80</td>
</tr>
<tr>
<td>Insecticide</td>
<td>1,497.50</td>
<td>2.11</td>
</tr>
<tr>
<td>Fertilizer</td>
<td>11,090.00</td>
<td>15.61</td>
</tr>
<tr>
<td><strong>Total Variable Cost (TVC)</strong></td>
<td><strong>48,082.50</strong></td>
<td><strong>67.70</strong></td>
</tr>
</tbody>
</table>

C. Fixed Costs

<table>
<thead>
<tr>
<th>Item</th>
<th>Cost</th>
<th>Percentage</th>
</tr>
</thead>
<tbody>
<tr>
<td>Cost renting land</td>
<td>12,560.50</td>
<td>17.68</td>
</tr>
<tr>
<td>Interest on loans</td>
<td>2,050.00</td>
<td>2.89</td>
</tr>
<tr>
<td>Farm tools</td>
<td>8,332.50</td>
<td>11.73</td>
</tr>
<tr>
<td><strong>Total Fixed Costs (TFC)</strong></td>
<td><strong>22,943.00</strong></td>
<td><strong>32.30</strong></td>
</tr>
</tbody>
</table>

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/N) = 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

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

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.
REFERENCES


