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Economic Analysis of Maize Production in Osun State: A Case Study of Ilesa East and West of Osun State

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Abstract
The study examined the performance of maize production in Osun state and the factors affecting maize production in Ilesa East and Ilesa west Local Government areas. Data were collected with the aid of structured questionnaires from 100 respondents selected through random sampling technique. Data was analysed using multiple regression and budgetary technique.The result the profitability analysis revealed a profit per naira incurred to be N1.022k. Findings from the regression analysis shows that land used in hectares, labour in man-days, quantity of fertilizer and level of education were positive and significant factors affecting output of maize while quantity of maize seeds, herbicides and insecticides were negative and significant factors affecting maize output in the study area. Therefore, maize production will improve in the study area if there is input support like fertilizers, land, credit facility and improved education from the government, private investors or Non Governmental Organisations.

1.0 Introduction

Maize (*Zea mays*) is the third most important staple food in the world today and a staple food of great socio – economic importance in the Sub-Sahara Africa (Food and Agricultural Organization, 2003). It has been recognized to be one of the longest ever cultivated food crops. Maize is the most important staple crop grown in the hill of Nepal, where about 75% of the country's 800,000ha of maize are located (Paudyal and Poudel, 2001). Maize is also grown in several region of the world and it is referred to as the world best adapted crop.

Maize over time does not only serve as the source of food for man and livestock but also as a source of income and foreign exchange. Ransom *et. al*. (2003) reported that maize dominates the agricultural sector of Terai, employing 60% of the work force and 28% of the gross domestic product (GDP). In Nigeria, it is the third most important cereal after sorghum and millet (Ojo, 2000). Faranti (2005) in a study reported that maize farming was profitable in Akoko North East and South West Local Government Areas of Ondo-State with gross margin and net returns of N2,637.80 and N2,141.00 respectively in the previous farming year. Grains produced in Nigeria are maize, rice, cowpea, soybean, sorghum, millet and groundnut.

The greater proportion of the grains produced in Nigeria is maize because of its ability to thrive under different ecological condition. Adekunle and Nabinta (2000) reported a sustained increase in the production of maize output. Maize is the most important staple food in Nigeria and it has grown to be local 'cash crop' most especially in the southwest part of Nigeria where at least 30% of the crop land has been devoted to small scale maize production under various cropping system (Ayeni, 1991). Ogunsumi (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 FAO, about 4.7 million tonnes of maize were produced on the average between 1980 and 2003 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 561397.29 hectares of Nigerian land were planted with maize, which constitutes about 61% of total cultivable land in Nigeria. Economically, the price of maize increased from N2500 in 1980 to N36000/tones in 2003. This means, the price increased more than 14times of the price of 1980. All these data emphasised the importance of maize in the diet and the economy of Nigeria.

However, the demand for maize as a result of the various domestic uses shows that a domestic demand of 3.5 million metric tons outstrips supply production of 2.5 million metric tons (Akande, 1994). It is expected that the highest maize producer would be in the tropics, but the highest producers of maize are located in the temperate. The world number one producer is the United State of America (USA) and is the mid USA sates of Iowa, Illinois, Indiana and Nebraska are together the world highest producers. Today, yield in USA is about 10-12 metric tons per hectare while the best places in the tropics hardly produce 6-7 tons per hectares.

The performance of maize in Nigeria and other African countries can be attributed to the fact that, bulk of the country's farm, over 90% is dependent on subsistence agriculture (small holder farmers) with rudimentary farming system, low capitalization and low yield per hectare (Olayemi, 1994). In Nigeria, like other developing country, food production is closely related to peasant or subsistence nature of agriculture which farmers have practiced for century and which has been handed over to several generations. The old fashioned of agricultural system leads to low productivity and food shortage.

Moreover, Kenya economic survey (1993), shows that in the last decade, the estimated national production of the main staple food - maize, has been declining with some years being as low as 22 million (90 kg) bags compared to over 30 million (90 kg) bags attained during bumper harvests. According to FAO data, the

area planted to maize in West and Central Africa alone increased from 3.2 million in 1961 to 8.9 million in 2005. This phenomenal expansion of the land area devoted to maize resulted in increased production from 2.4 million metric tonnes in 1961 to 10.6 million metric tonnes in 2005. While the average yield (output/area) of maize in developed countries can reach up to 8.6 tonnes per hectare, production per hectare is still very low (1.3 tonnes per hectare).

The increasing population is also posing a threat on the land available for cultivation and this makes the farmer to continue the cultivation of a crop on the same land for a long period of time, this will drastically reduce yield and subsequently price and profit.

Therefore, the study determines the performance of maize production and the factors affecting maize output in the study area. According Msuya (2008), increasing productivity is crucial for improving the livelihoods of smallholder farmers, who makes the majority of the rural poor in Tanzania. He revealed that low productivity is one of the primary causes of low and unstable value added along the value chains leading to a stagnant rural economy with persistence of poverty. Hence, increasing maize productivity is crucial for improving the livelihoods of smallholder farmers in the country. Studies carried out by Amani, (2004) and (2005), Skarstein, (2005), Isinika *et. al.,* (2003), MAFC (2006), Nyange and Wobst (2005) revealed that smallholder maize productivity in the country is suffering because most smallholders do not practice high-yield farming methods, and are subsistence farmers. The aggregate response of farmers to positive prospect in maize production depend on economic viability of production, hence a comprehensive economic analysis of maize production will provide a good guide to policy makers on "what is lacking" and "what to do" to actually consistently increase physical output of the crop.

2.0 Literature review

2.1 Theoretical framework

Technical efficiency is a component of economic efficiency and reflects the ability of a farmer to maximize output from a given level of inputs (*i.e.* output-orientation). One can trace back the beginning of theoretical developments in measuring (output-oriented) technical efficiency to the works of Debreu (1951 and 1959). Since then however there is a growing literature on the technical efficiency of smallholder farmers' agriculture. The average technical efficiency of maize smallholders reported in these studies range between 0.49 among maize farmers in Kenya to 0.76 among Tanzania sugarcane farmers. This shows smallholder farmers have low and highly variable levels of efficiency especially in developing countries.

Most studies have associated farmers' age, farmers' education, access to extension, access to credit, agro-ecological zones, land holding size, number of plots owned, famers' family size, gender, tenancy, market access, and farmers' access to improved technologies such as fertilizer, agrochemicals, tractors and improved seeds either through the market or public policy interventions with technical efficiency. Farmers' age and education, access to extension, access to credit, family size, tenancy, and farmers' access to fertilizer, agrochemicals, tractors and improved seeds variables are reported by many studies as having a positive effect on technical efficiency (Amos 2007; Ahmad et al 2002; Kibaara 2005; Tchale and Sauer 2007; and Basnayake and Gunaratne 2002).

Although studies by Amos (2007), Raghbendra, et al., (2005), and Barnes (2008) found the relationship between land holding size and efficiency to be positive, a clear-cut conclusion on the influence of this variable on efficiency has not been reached as discussed in Kalaitzadonakes et al (1992) work. On the other hand, influence of the number of plots on efficiency has been reported by Raghbendra et al (2005) to be negative. This implies land fragmentation (as measured by number of plots) have a negative impact on yields. There are conflicting results on the influence of socio-economic variables such as gender on efficiency. Tchale and Sauer (2007) point out that, while some studies (in Lesotho) report gender of the farmer has no significant influence on efficiency, other studies found that gender plays an important role.

About 90% of smallholders in the study area sell their maize at home or selling per stand. However, we have included other variables we find important in addressing sources of productivity variability among maize farmers. We are assessing the effect of diversification to off-farm activities on efficiency. Due to lack of formal credit facilities, small businesses are used by smallholders to raise money which they need as working capital. This might have a positive effect on efficiency. However, in the long run this practice might not foster specialization leading to a negative impact on efficiency.

According to Skarstein (2005), R&AWG (2005) and Msuya (2007), producer associations are very important in transforming the agricultural sector into one with high productivity and high quality output. If the agriculture sector is to be transformed, producer associations (in form of farmers' cooperatives) are needed first and foremost to give the maize farmer bargaining power in the input, output and credit markets. Msuya (2007: 2865) and R&AWG (2005: 89) went a step further and showed integrated producer schemes are more suited than cooperatives in assisting farmers to address most of the constraints they face including low production and productivity. With this in mind we include in the inefficiency model a variable that take into account

involvement of smallholders in farmer associations. A district variable is included to account for agro-ecological and environmental differences between districts, as farming in the study area is greatly influenced by these factors. This will also ensure we reduce biases as a result of omitted variable, which leads to over-estimation of technical inefficiency.

3.0 Research methodology

3.1 Study area

This study was conducted in Osun State, a major maize producing community in the state. The state comprises of thirty Local Government Areas and it is located between longitudes 4°15´ to 4°45´ east of the Greenwich Meridian and latitude 7°35´ to 7°55´ north of the equator. Osun state lies in the west and east of Ekiti and Oyo State respectively and it is bounded in north and South by Kwara state and Ondo State respectively. The state exhibits two distinct seasons. These are the rainy season (April -October) and the dry season (November – March) this makes it possible for maize to be planted throughout the year.

A random sampling technique was used in selecting the samples of the study. Ilesa East and West in Osun state were selected for this study as they are one of the leading producers of maize in the state. 100 samples were used for the purpose of this study.

Primary data was collected with the aid of a well-structured questionnaire. The data collected include general information of the farmer's socioeconomic background and the efficiency of production which indicate the input – output relationship of maize which include land, labor, seeds, fertilizer, pesticide, herbicide and other factors that influence the output of maize.

The data that obtained were analyzed using profitability analysis and regression technique.

3.2 Regression technique

The multiple regression function that will be estimated for the study will be

$Y = b_o+b_1X_1 +b_2X_2+b_3X_3+b_4X_4+b_5X_5 +b_6X_6 + b_7 X_7 + U$……..1

Where Y= output of maize (kilogram)
X_1 = land input planted to maize (hectare)
X_2 = total labour (man-days)
X_3= fertilizer input (kg)
X_4=quantity of maize seeds used (kg)
X_5= herbicide (liters)
X_6= insecticide (liters)
X_7= Level of education
$b_0 – b_6$ = parameters to be estimated
U= error term.

The functions that were tried include linear and Cobb-Douglas functions. The best fit was selected on the basis of the coefficient of multiple determination (R^2), the't' and the F ratio and the responsiveness of the magnitude of the coefficient.

Linear function: $Y = b_o +b_1X_1 +b_2X_2+b_3X_3+b_4X_4+b_5X_5 + b_6X_6 + b_7 X_7 + U$

Cobb-Douglas $Log Y = Logb_o+b_1LogX_1 +b_2LogX_2+b_3LogX_3+b_4LogX_4+b_5LogX_5+ b_6 LogX_6+ b_7 LogX_7 + U$, Where Y, bo-$b_7$, X_1-X_7, U are as defined earlier

4.0 Results and discussions

4.1 Results of profitability analysis in maize production

The result as presented below shows a profit/Naira invested of about 1.02 which implies a profit of N1.02k over every N1 invested. This reveals that maize production is profitable in the study area which is in support of the findings of Oladejo and Adetunji (2012).

Variables	**(N) Mean**
Total revenue	85612.00
Total fixed cost	4732.50
Total variable cost	37589.30
Total cost	42321.80
Profit	43290.20

Profitability analysis for maize = profit / Total cost invested = N 43290.20 / N 42321.80 = 1.022 per naira 2

4.2 Result of maize productivity analysis

Finding from the analysis as presented below shows that for every 1 ha that is planted to maize, an average of 1571.57 kg of maize quantity is expected as output. This shows that maize producers in the study area are making good use of the available resources.

Efficiency of land productivity = Net output of maize 3
No. of hectare of land
1354.70 kg
.8620ha
= 1571.57 kg/ha

Regression analysis

The factors affecting total output of maize are analysed in the equation 4. The Cobb Douglas function was chosen as the lead equation because of the relative larger adjusted R^2. This shows the 99.5% of the variability in the output of maize was caused by the variables included in the model.

$\ln Y = 6.41 + 1.30\ln X_1 + 1.80\ln X_2 + 1.52\ln X_3 - 1.44\ln X_4 - 0.81\ln X_5 - 1.45\ln X_6 + .81 \ln X_7$ 4

(34.637)** (18.113)** (13.064)** (9.955)** (-9.500)** (-9.805)** (-8.631)** (14.322)**

Adj. R^2 = 0.995

** Estimates are significant at 5 % level

Land used in hectares, labour in man-days, quantity of fertilizer and level of education were positive and significant factors affecting output of maize while quantity of maize seeds, herbicides and insecticides were negative and significant factors affecting maize output in the study area. This shows that if there is 1% increase in land use, labour, fertilizer and educational level, there would be 1.3%, 1.8%, 1.5%and 0.8% respectively in the level of maize output. However, a 1% increase in the quantity of maize seeds, herbicides and insecticides would bring about 1.4%, 0.8% and 1.5% decrease respectively in the quantity of maize in the study area.

Therefore, maize production is a profitable and a viable business. Its production would be on the increase if the producers are empowered with necessary skills and production input

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