Resource-Use Efficiency and Profitability of Maize Production in Lafia Local Government Area of Nasarawa State, Nigeria

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Abstract: This study examined the resource-use efficiency and profitability of maize production in Lafia Local Government Area of Nasarawa State, Nigeria. Primary data were collected with the aid of structured questionnaire administered on 70 respondents who were purposively selected through random sampling technique. The parameters of production function were estimated using double log production function analysis. The values of the parameters were used to estimate the productivity and profitability of the factors of production. The result shows that the coefficient of multiple determinations (R^2) was 0.87 implying that about 87% of the variation in the output of maize could be explained by the inputs indicated by the significant F- ratio. The study revealed that the total variable cost of maize production was N51, 901.2/ha, the total farm revenue was N61, 764.0439/ha, the gross margin obtained was N9, 862.8439/ha and the average rate of returns was 0.19 indicating that the maize farmers in the study area earn 19kobo on every naira invested in maize production. Various constraints encountered by the groups of farmers were identified. The study revealed that maize farmers in Lafia were making profit. Although, the level of profit made was low when compared with other studies. Consequently, it can be concluded that if the yield of maize is to be increased, the use of important inputs such as land, labour, seed and fertilizer have to be efficiently utilized.

Introduction

Maize is becoming a miracle seed for Nigeria's agricultural and economic development. It has established itself as a very significant component of the farming system and determines the cropping pattern of the predominantly peasant farmers, especially in the Northern States [1]. Maize has been of great importance in providing food for man, feed for livestock and raw materials for some agro-based industries. It is a basic staple food for large population groups particularly in developing countries. Maize has a great potential for food security and poverty alleviation. Therefore, this study is timely since maize has been analyzed as one of the major staple food that can remedy food insecurity in the tropics especially Nigeria.

This study will assist farmers to increase their productivity to feed the growing population and also export to other countries and assist in determining the optimum resource use in relation to scarce resources. The study will provide useful information to investors in maize production. It is hoped that this work will be of assistance to researchers who will identify other areas for further studies. This study will also be important in understanding the resource use levels, production efficiency and aid policy makers in creating efficiency-enhancing policies.

[2] enlisted Nigeria amongst the nations that were technically unable to meet their food needs from crop production given their low level and inappropriate use of inputs. The report emphasized that the situation is likely to remain so even at intermediate level of inputs at sometimes between year 2000 and 2025. However, the importance of maize in addressing food insecurity cannot be overemphasized, with Nigeria producing 43% of maize grown in West Africa. Maize is the most important staple food in Nigeria. It accounts for about 43% of calorie intake [3]. Maize has consumption quantity of 53.20 g/capital/day [4]. Apart from animal feeding, it is the key to agro-allied industrial raw materials from which many products are

manufactured. With regards to food, processed maize is used in several ways-'ogi', 'Eko' (wrapped semi-solid pap), 'moinmoin'. It can be eaten as roasted or boiled; it can also be cooked along with beans. In some local areas, it can be pounded along with yam, cocoyam and water-yam. As a result of the different uses into which maize can be put, there has been an increase in its demand over the years.

Maize production in Nigeria has not been sufficient enough to meet the needs of people and livestock. Supply has not been able to meet demand despite the introduction of improved packages. Akande [5] reported that the domestic demand of 3.5 metric tonnes far outstripped domestic production of 2.0 metric tonnes, hence the increase in its price. To meet domestic demand, various efforts were made by various governments to raise the level of production but with limited success. In view of the high demand for maize and the need for food security, there is a need to study the relative potentials of maize farmer approaches to raising maize productivity. [6] noted that the high variations in annual domestic production of rice, wheat and maize in Nigeria can be ascribed to the decline in hectares cultivated and the productivity or yield per hectare. The productivity of farmers can be raised by adoption of improved production technologies or improvement in efficiency or both. But with the low rate of adoption of improved technologies by farmers in Nigeria, improvement in efficiency becomes the best option in productivity enhancement in the short run.

Agriculture in Nigeria is dominated by small-scale farmers who are engaged in the production of the bulk of food requirements of the country. In spite of the fact that these small-scale farmers occupy a unique and pivotal position, they belong in the poorest group of the population and as such cannot invest much on their farms [7]. Maize (*Zea mays*) is the third most important staple food in the world today after rice and wheat and a staple food of great socio-economic importance in the Sub-Saharan Africa [8].

Introduced in Nigeria in the 16th century, maize is the fourth most consumed cereal during the past two decades, below sorghum, millet and rice [9]. It is the third most important cereal after sorghum and millet [10]. 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 crops [11]. In Nigeria, the demand for maize is increasing at a faster rate daily [12]. This may be due to the fact that grain is being used for feeding poultry and also serve as the main food for many households [13].

[14] 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 [15] 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 561,397.29 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/ton in 1980 to N36000/ton in 2003 and to about N300,000/tonne in 2016.

It among the primary food staples, maize consumption is widespread across the country and among households of different wealth. It is widely used in the preparation of traditional foods. Main local dishes include pap, tuwo, gwate and donkunu, with the cereal cooked, roasted, fried, grounded, pounded or crushed form [16]. 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 over time does not only serve as the source of food for man and livestock but also a source of income and foreign exchange [17].

Grains produced in Nigeria are maize, rice, cowpea, soybean, sorghum, millet, millet and groundnut. The greater proportion of the grains produced in Nigeria is maize because of its ability to thrive under different ecological condition. [18] 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 southwestern part of Nigeria where at least 30% of the crop land has been devoted to small-scale maize production under various cropping systems [19].

Objectives

i.   determine the resource-use efficiency in maize production in the study area;
ii. determine the profitability of maize production in study area; and
iii. identify the constraints faced by the respondent maize production in the study area.

Methodology

The study was conducted in Lafia Local Government Area of Nasarawa State, Nigeria. The population of the area is 330,712 [20]. The area is located between latitude 09◦ 33'N and longitude 09◦ 33'E. Its shares common boundaries with Obi, Keana, Nasarawa Eggon, Doma, to the East, East-South, North and West and Quan pan Local Government Area of Plateau State to the East-North respectively. The major ethnic groups in the area include Kanuri, Hausa/Fulani, Alago, Migili, Akye, Tiv, Gwandara, and Rinder. Some of the crops grown include; Yam, Maize, Rice, Millet, Soyabean, Beniseed (Sesame), Cassava, Sweet Potatoes, and Cocoyam. Farmers in the study area also keep livestock and animals such as Cattle, Poultry, Goats, Sheep, and Pigs. And the permanent tree crops planted by farmers include: oranges, Mangoes, and Cashew.

Sampling Techniques

The study was conducted in seven villages in the study area. These villages were purposively selected based on the prevalence of maize production and they include Assakio, Agyaragu, Akurba, Akunza, Ashige, Adogi, and Sabo-Gida. Ten maize farmers were randomly selected from each of the seven villages to give a total number of 70 maize farmers who formed the respondents.

Method of Data Collection

For the purpose of this study, only primary data was used. The primary data was collected using interview method, with the aid of structured questionnaire which was used to collect information on input-output as well as the socioeconomic characteristics of the respondents. The primary data covered: i) demographic information such as age, gender, educational level, marital status, household size, farm size and farming experience, ii) production information on maize such as inputs used (fertilizer, seed land, labour and chemicals) and output, and iii) Market information like prices of inputs, output and quantity sold.

Analytical Techniques

Production function analysis was adopted in analyzing objective 1; gross margin analysis was used to achieve objective 2, while descriptive statistics was employed in examining objective 3.

Descriptive Statistics: The descriptive statistics involves the use of simple percentages, means, frequency, distributions and tables.

Production Function Analysis: [21] defined production function as the physical relationship between output and inputs used in production.

Marginal productivity and resource use efficiency

The marginal value product (MVP) of the resources used was estimated by multiplying the marginal physical product and the prices of the output. The value was then compared with the cost of the resources, Marginal Factor Cost (MFC) in order to make inference on efficiency of resource use. The following was estimated to determine the efficiency of resource use:

$r = MVP/MFC$ ....(1)

Where:

r = efficiency ratio

where;

r =1, resources employed by the farmer are efficiently utilized.

r >1, resources employed by the farmer are under-utilized

r <1, resources employed by the farmer are over-utilized

The efficiency of the input occurs when

$MVPx_i = MFC = Px_i$ ....(2)

Where:

$MVP_{yi} = MPPx_i \cdot P_y$

$MFC = Px_i$

Px_i=unit price of variable input x

P_y=unit price of output Y

$MPPx_i$=marginal physical product of input xi

MVP=marginal value product of input x

MFC=marginal factor cost $(\Delta TC/\Delta x_i = Px_i)$

The elasticity of production (Ep) was estimated and the sum of the elasticity was used to estimate the returns to scale as follows:-

$Epx_i = \Delta y/\Delta x_i \cdot x_i/Y$ ....(3)

$Epxi = b_i/x_i \cdot x_i/Y$ ....(4)

$\sum Epxi = b_i/Y$ ....(5)

Where:

$\sum Epxi$ =Returns to Scale (RTS)

Ep=Elasticity of production

X_i=the input under consideration

Y=output

$\Delta y/\Delta x_i$=marginal product of x_i

Y/x_i=average product of x_i

b_i =elasticity coefficient of input

RTS = 1 constant RTS; >1 increasing RTS; <1 decreasing RTS

Gross Margin Analysis

The gross margin analysis involves evaluating costs, returns as well as profitability of an enterprise. Gross margin (GM) by definition is the difference between the gross farm income (GI) and total variable cost (TVC) [22].

GM = GI - TVC

Where;

GM =Gross margin (N/ha)

GI = Gross income (N/ha)

TVC = Total variable cost (N/ha)

Marginal Value Productivities and Resource Use efficiencies for Maize Farmers

The efficiency ratio was computed for each input by comparing the Marginal Value Product (MVP) to its Marginal Factor Cost (MFC) as shown in Table 1. Analysis of the resource use efficiency in Table 1 shows that farm size (land), seed and fertilizer were under-utilized by the farmers in the study area based on their efficiency ratio which is greater than 1. The result further revealed that the resource use efficiency of labour input was less than 1 suggesting that labour was over utilized by the farmers. This can be attributed to the high cost of hired labour incurred. However, the overall implication of this finding is that resources were not efficiently utilized. To achieve optimal allocative efficiency of variable inputs, policies and programmes should be directed to maize farmers in order to increase their level of input use.

Table 1: Estimated efficiency ratio (r)

Variable input	MVP	MFC	EFFICIENCY
Farm size (X_1)	2040360	3000	680.12
Seed (X_2)	132.3	70	1.89
Hired Labour (X_3)	-9840	600	-16.4
Family Labour (X_4)	-211.8	600	-0.353
Fertilizer (X_4)	464.48	80	5.806

Source: Field survey, 2014

Cost and Returns

Table 2 shows that the variable cost per hectare was estimated at N51,901.2. As a result of this investment, the farmer's generated average revenue from the sale of maize grains and associated by-products was as well estimated at N62,776.0. The Gross margin per hectare was N10,875 suggesting that maize production is profitable in the study area. Further analysis on the return on investment showed that maize has a profitability index of 0.21 indicating that the farmers in the study area earn 21kobo on every naira invested in maize production .The implication of this finding

is that maize production is profitable in the study area with about 21% turn over on investment, however there is room for further improvement if resources used in production are effectively and efficiently utilized.

Table 2: Cost and returns of Maize production

Variables	Quantity	Unit price ((₦)	Value (₦/ha)
Rent on Land	1.6	3000	4800
Seed (kg)	65.64	70	4594.8
Labour (man-day)	69.32	600	41592
Fertilizer(kg)	11.43	80	914.4
Total Variable Costs			51901.2
Output (Kg/ha)	826.2	76.14	62776.0
Gross Margin /ha			10875
GM/Naira Invested			0.21(21 Kobo)

Source: Field survey, 2014

Constraints Faced by Farmers

Table 3 represents the various problems as observed to be associated with maize production by farmers in the study area. The result revealed that 97.14% of the farmers suffered from weed infestation problem, 87.14% had problems of poor seed, price at harvest and migration, aging and other diseases, 77.14% revealed government policies as their constraints, with 38.57% indicating lack of improved storage facilities as a major challenges faced by them. 27.14%, 15.71% and 11.43% faced with problems of pest and diseases, inadequate capital and working tools respectively. Farmers that faced the challenges of getting extension services for improved technologies and other best practices constituted 8.57%. The complex nature of these constraints could impact negatively on maize production and yield in the study area.

Table 3: Distribution of maize farmers according the constraints faced

Constraints	Frequency	Percentage
Poor maize seed	61	87.14
Problem of weed	68	97.14
Poor price at harvest time	61	87.14
Migration, ageing, and other diseases	19	87.14
Problem of pest and diseases	6	27.14
Lack of extension contact	56	8.57
Inadequate tools	8	11.43
Inadequate capital	11	15.71
Poor storage facilities	27	38.57
Poor government policy	54	77.14

Source: Field survey, 2014

Conclusion

The main objective of this study was to determine the Resource-Use Efficiency and Profitability of Maize Production in Lafia Local Government Area of Nasarawa State, Nigeria

The study revealed that the average seed rate been used by farmers was 65.64kg and the average fertilizer used was 11.43kg. The result revealed that resources used in maize production in the study area were not efficiently utilized. The result also revealed that the total variable cost of maize production was estimated at N51, 901.2/ha with total farm revenue put at N62,776.0/ha, and the gross margin obtained was N10,875/ha, the average rate of returns was 0.21 indicating that the farmers in the study area earn 21kobo on every naira invested in maize production. The implication of this finding is that maize production is profitable in the study area with about 21% turn over on investment. Various constraints encountered by the group of farmers includes; poor maize seed, problem of weed, poor price at harvest time, migration, ageing, and other diseases, problem of pest and diseases, lack of extension contact, inadequate tools, inadequate capital, poor storage facilities and poor government policies. It can be concluded that if the yield of maize is to be increased, the use of important inputs like land, labour, seed and fertilizer have to be efficiently utilized. It is therefore recommended that; the farmers should be encouraged to go into large-scale production. There should be adequate inputs and readily available and affordable, improved distribution network. Farmers should be encouraged to form viable cooperative societies to enable them have access to formal sources of credit and subsidized inputs. Farmers should have access to viable extension services to improve their knowledge of farm management. There should be adequate market with good stable prices for maize farmer's products that will encourage maize production.

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