



Effects of Farm Input Application on Maize Yield in Selected Local Government Areas of Taraba State, Nigeria

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ABSTRACT

The study analyzed the effects of farm input application on maize yield in selected local government areas of Taraba state, Nigeria. The specific objectives were to: describe the socioeconomic characteristics of the maize farmers; estimate the costs and returns associated with maize production; determine major farm inputs utilized by maize farmers; and identify the constraints facing maize farmers in the study areas. Multistage sampling technique and Taro Yemane formular were used to select 245 respondents from the study areas. Primary data were collected and analyzed, using descriptive statistics and farm budgetary techniques. The results revealed that most (57%) of the respondents were male, 64% were married, and had a mean farming experience of 17 years. The majority (80%) of the respondents had acquired one form of education. While 56% of maize farmers had farm sizes ranging from 2-4ha, 51% of them had no contact with extension agents. The result also revealed that the gross margin was ₦64,258 per hectare, with 0.14 Kobo return on investment. The high cost of transportation, cost of inputs, and inadequate capital were the major constraints for the farmers in the study areas. The study recommends that extension workers should be deployed to the study areas. In addition, the government should introduce a good agricultural input policy aimed at providing essential farm input. This initiative would enhance the availability and affordability of these inputs, ultimately reducing production costs and increasing farmers' income.

Keywords: Farm input, Production, Maize farmers and Constraints

INTRODUCTION

Maize (*Zea mays* L.) is among the most extensively cultivated crops globally, with over 900 million hectares allocated for cultivation (World Health Organization, 2021). The largest producer of maize is the United States, which contributes approximately 40% to the world's total production, followed by China, Brazil, Argentina, and South Africa (United States

Department of Agriculture (USDA, 2020). In Africa, maize is grown on roughly 33 million hectares, representing 17% of the cultivated land in sub-Saharan Africa. Nigeria stands out as a leading maize producer on the continent, contributing 16% of the total yield, (Food and Agriculture Organization, 2022). The crop was introduced to Nigeria in the sixteenth century and has since become the fourth most popular

grain, following rice, sorghum, and millet (FAOSTAT, 2012).

In sub-Saharan Africa, particularly in Nigeria, maize functions not only as a major staple food but also as fodder, an energy source, and a model plant for agricultural studies (Page 76, 2003). It serves as a significant source of food, animal feed, and raw materials for various agro-based industries (Troyer, 2006). Commonly referred to as corn, maize is nutritionally valuable, containing fiber (8.5%), oil (4.8%), sugar (3.0%), and ash (1.7%) (Oyewole et al., 2020).

As a staple food crop in Nigeria, maize is cultivated across various agro-ecological zones for both subsistence and commercial purposes, supplying essential raw materials for agro-based industries (Iken and Amusa, 2004). Many households in Nigeria rely heavily on maize for food and nutrition (CBN, 2005; Fadina and Barjolle, 2018). In the 2016/2017 cropping season, Nigeria's maize production was estimated at 10.5 million tons (FAO, 2017). While production levels matched consumption during this period, approximately 200,000 tons were exported to neighboring countries such as Chad, Cameroon, Benin, and Niger (as reported in the Grain and Feed Annual Report by the United States Department of Agriculture, Foreign Agricultural Service, 2017).

Maize production plays a crucial role in enhancing food security in Nigeria, where it is preferred over other crops such as sorghum and millet (Sertoglu et al., 2017). The significance of maize is underscored by its contribution to job creation and economic development, with production increasing by 25.24% from 2000 to 2010 (FAO, 2017).

The crucial role of maize production can further be seen in the heavy reliance on maize as a source of unrefined material and diet in Nigeria (Grote, 2021). However, maize production in Nigeria has been declining due to several factors, including poor soil fertility and inadequate use of farm inputs. According to the National Agricultural Research Institute (NARI, 2019), maize production in Nigeria has

drastically declined from 12.6 million metric tons in 2010 to 6.4 million metric tons in 2018. This negative development was possible due to some major problems encountered by maize farmers concerning the supply of fertilizer, herbicide, and seeds which are not always available when required and the price is not affordable. Most of the time, the farmers do not get it when it is needed; and even if they get it, the quantity is far below the requirement (Banful et al. 2010). Therefore, it is important to analyze the effects of farm input application on maize yield in selected local government areas of Taraba state, Nigeria. This study primarily describes the socioeconomic characteristics of maize farmers; estimate the costs and returns associated with maize production; determine major farm inputs utilized by maize farmers; and identify the constraints facing maize farmers in the study areas.

METHODOLOGY

The Study Area

This study was carried out in three Local Government Areas (LGAs) in Taraba State, Nigeria: Ardo Kola, Gassol, and Ussa Local Government Areas. Ardo Kola is a Local Government Area that has a total land area of 2,262 km² with a population of 86,921 people (NPC, 2006). The main agricultural activities include fishing and the cultivation of staple foods such as maize, rice, guinea corn, beans, and melon. Additionally, the essential social amenities in this area include schools and a hospital. (Taraba State Government, 2020).

Gassol Local Government Area (LGA) is situated on latitude 8°38'00"N and longitude 10°46'00"E with a total land area of 5,548/km² and a population of two hundred and forty-four thousand, seven and forty-nine (244,749) people (National Population Commission, 2006). The major agricultural activities include fishing and the production of yam, maize, rice, guinea corn, beans, and melon (Taraba State Government, 2020). Ussa Local Government Area covers a land area of 1,495 km² with a population of 92,017 people

according to the National Population Census, 2006. The primary occupation of the residents is agriculture, with significant activities focused on palm oil processing and the cultivation of staple crops such as maize, rice, guinea corn, and cassava (Taraba State Government, 2020).

The study areas (Ardo-Kola, Gassol and Ussa) have a total population of Four hundred and twenty-three thousand, six hundred and eighty-seven (423,687) people, with the land mass of 9,305 km².

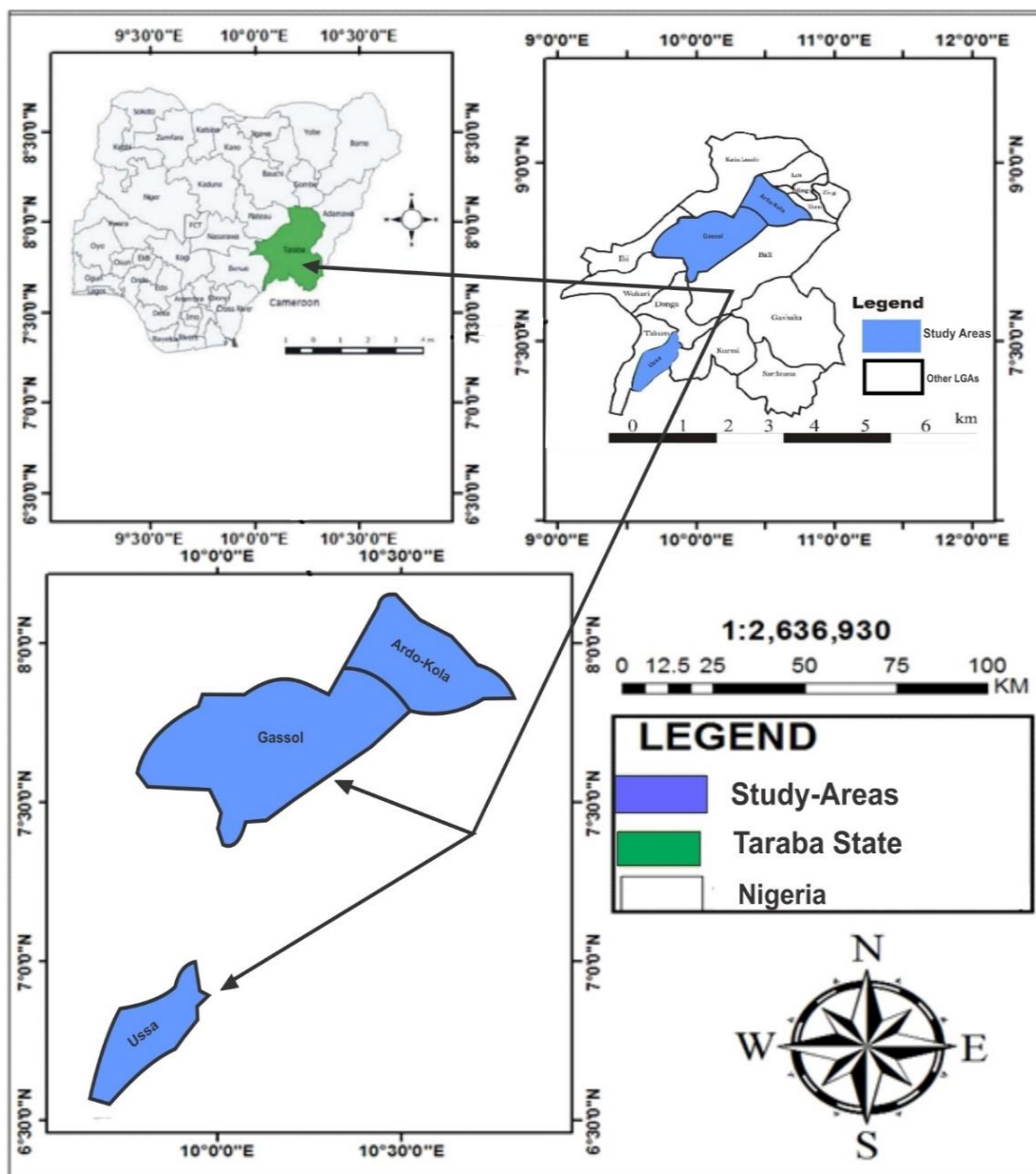


Figure 1: Map of Nigeria and Taraba State showing the Study Areas

Source: Geography Department, Taraba State University (2023).

Sampling Procedure and Sample Size

In this study, a multistage sampling technique was employed. In the first stage, three Local Government Areas (LGAs) were

purposively selected from three Agricultural Zones: Ardo Kola LGA from Zone I, Gassol LGA from Zone II, and Ussa LGA from Zone III, based on the prevalence of maize

farming in these areas. In the second stage, four villages were purposively selected from each of the LGAs, leading to a total of twelve villages. In the third stage, simple random sampling was used in the selection of sample size of 245 maize farmers, using the Taro Yemane formula, as shown below:

$$n = \frac{N}{1+N(e)^2} \quad 1$$

Where:

n = Sample size

Table 1: Sample Size of the Study Area

Agricultural Zone	LGA	Ward	Village	Population	Respondents
Zone I	Ardokola	Iware	Sibre	24	9
			Iware	37	14
		Jauro Yinu	Mallum	40	15
			Jauro Yinu	34	13
Zone II	Gassol	Namnai	Koppi	44	17
			Buba Liman	34	13
		Mutum Biyu	Mutum Biyu	105	41
			Tura Keke	44	17
Zone III	Ussa	Lissam I	Kaduna	46	18
			Yamusa	59	23
		Kwesati	Tutuwa	68	26
			Kwesati	99	39
Total	3	6	12	634	245

Source: Field Survey, 2024

Method of Data Collection

Data were collected using structured questionnaires, administered to maize farmers during the 2023 cropping season, with the help of trained enumerators in the study areas. Hence, information regarding the outputs and inputs utilized during the cropping season was collected.

Method of Data Analysis

Descriptive statistics such as frequency, percentage, mean, and standard deviation were used to achieve objective (i), (iii), and (iv). Farm budgeting techniques known as Gross Margin Analysis, net farm income and return on investment were employed to achieve objective (ii).

Gross margin analysis

$$GM = GI - TVC \quad 2$$

Where:

N = Number of maize farmers (sampling frame) = 634

e = Margin error = 0.05

$$n = \frac{634}{1+634(0.05)^2} = 245$$

Simple random sampling used in obtaining 245 respondents was based on the proportional size of the maize farmers' population in their villages as presented in the Table 1 below

GM = Gross Margin (₦/ha).

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

TVC = Total Variable Cost (₦/ha) i. e. summation of the cost of inputs such as fertilizer, seed, herbicide, insecticide, labour and transportation

$$GI = Py \cdot Y \quad 3$$

Where:

GI = Gross Income (₦/ha)

Py = Price per unit output (₦)

Y = Total quantity of output (kg)

Net farm income

This is the difference between total revenue and total cost of production. It can be expressed as:

$$NFI = TR - TC \quad 4$$

Where:

NFI = Net Farm Income (₦/ha)

TR = Total Revenue
 TC = Total Cost
 TC = TVC+TFC 5

TVC = Total Variable Cost
 TFC = Total Fixed Cost
 The fixed inputs such as sprayer, hoes and cutlass were depreciated using the straight-line method given by

$$D = \frac{PV - SV}{NY}$$
 6

Where:
 D = Depreciation (₦)
 Pv= purchase value of fixed input (₦)
 Sv = Salvage value of life of asset (₦)
 Ny = number of years of life of asset

Profitability measure

Profitability measures were calculated using Return on Investment (ROI). This was determined using:

$$ROI = \frac{\text{Profit from investment}}{\text{Cost of investment}}$$
 7

RESULTS AND DISCUSSION

Socioeconomic Characteristics of Respondents

Table 2 shows the result of the socio-economic characteristics of respondents. From the Table, the majority (57%) of respondents were male, with 43% female, indicating that more males were engaged in maize production than females. This is in line with Akinwale, Justine, and Ojo, (2024) findings on Factors Influencing Farmers' Attitudes to Adopt Drought Tolerant Maize Varieties in Ondo State, Nigeria, where they reported that the Majority (69.0%) of the maize farmers were male while 31.0% were female. The age distribution revealed that the average age of the maize farmers was 43 years with a minimum of 18 years and a maximum of 60 years. This shows that the farmers were strong and vibrant and still economically active in production. Besides, it entails that the farmers have the potential

to produce more if they are supported by the concerned agencies with the required farm inputs. This aligned with Abdulaleem *et al.* (2017) who undertook an Analysis of Cost and Return in Maize Production among Small-scale Farmers in Osun State Nigeria. They found that most of the farmers were adults with a mean age of 42.3 years. The marital status results showed that the percentages of single, married, widow, widower, and divorced were 16%, 64%, 9%, 7%, and 4% respectively. However, the majority (64%) of maize farmers were married. This indicates there is a likelihood that the farmers would engage their family labour to carry out most of their farm operations to boost their output. This is in line with the findings of Oshaji, Ukewuihe, Osuji, Ukoha, Obinna-Nwandikom, and Isaiah, (2023) on Socioeconomic factors that influence performance in the maize value chain: a case study of Commercial Agriculture Development Project (CADP) in Nigeria reported that 88. 1% of the respondents are married. The result of farming experience revealed that the majority (33%) had 21-30 years of farming, 11-20 years had 29%, 21-30 had 29%, and above 31 had 9% with a mean farming experience of 17years, and with a minimum of 2 years and a maximum of 40 years. This shows that the farmers had good experience and possessed reasonable know-how in maize production in the study areas which could result in continuous optimum production. This finding shared the same view as Abdullahi *et al.* (2021) on the Effects of Socio-Economic Features of Maize Farmers on the Adoption of Maize (Bundled Services) In Kano State, Nigeria. They showed that the average years of farming experience was 17 years with a minimum of 1 year and a maximum of 35 years, respectively. Farming experiences are important because the higher the farmers' experience in farming, the better the

production capacity of the farmers will be. Educational attainment revealed that most (36%) of farmers had secondary education, 14% had primary education, and 30% had a diploma and above. This suggests that 80% of the respondents had different types of formal education which gave them the ability to efficiently utilize limited resources and maximize their output. This conforms with Kehinde, Ojo, and Ogundeji, (2024) who studied the Impact of participation in social capital networks on the technical efficiency of maize producers in Southwest Nigeria. They found that the majority (80.83%) of the farmers had one form of formal education or the other. The mean household size for maize farmers was 6 people with a minimum of 2 people and a maximum of 10 people. The result further showed that 59% of the farmers had a household size of 1-5 persons, 39% had 6-11 persons, and 2% had 11 persons and above indicates that there was the possibility of having more hands to help carry out the activities of maize production. This is in harmony with Yahaya et al. (2020) who evaluated Costs and Returns in Maize Production in Lere Local Government Area, Kaduna State, Nigeria. They reported that most (38%) respondents had household sizes ranging from 1-5 members, 36% of them had household sizes ranging from 6-10 members, 16% of them had household sizes that were between 11 – 15 people and 10% of the maize farmers have family members that comprised of 16 persons and above. The findings revealed that the average farm size was 2.2ha with a minimum of 0.5ha and a maximum of 4ha. It further revealed that the

majority (56%) of respondents had farm sizes within the range of 2-4ha. This denotes that the maize farmers in the study areas were small-scale farmers. This confirms the findings of Tukura et al. (2021) in their study “Effect of Socio-economic Characteristics on Maize Farmers in Zing Local Government Area, Taraba State, Nigeria.” They reported that most (63.86%) of the farmers had small farm holdings. The majority (51%) of respondents had no contact with the extension agents while 41% had contact with extension agents, this suggests that most of the respondents neither have nor possess the knowledge of new technologies useful to produce maize. This agrees with the findings of Alim, et al., (2022) on Socio-Economic Determinants of Poverty among Small Scale Maize Farmers in Karu Local Government Area, Nasarawa State, Nigeria which showed that all the farmers (100%) had no contact with the extension service for the year 2019 regarding maize production.

Costs and Returns Associated with Maize Production Per Hectare

In agricultural production, costs must be incurred to achieve a specific level of output. These costs include both variable and fixed expenses. Once production occurs, the output is then sold to generate income or revenue for the farmers. Return or revenue is calculated by multiplying the output by its unit price (Py. Y). The analysis of average costs and returns per hectare can be found in Table 3.

Table 2: Socioeconomic Characteristics of maize farmers

Variable	Frequency	Percentage (%)	Mean	Min	Max	SD
Sex						
Male	140	57				
Female	105	43				
Age (Year)			43	18	60	10.17
≤ 20	5	2				
21-30	31	13				
31-40	68	28				
41-50	94	38				
≥51	47	19				
Marital status						
Single	39	16				
Married	157	64				
Widow	22	9				
Widower	16	7				
Divorce	11	4				
Experience (Year)			17	2	40	10.04
≤ 10	72	29.39				
11-20	71	28.98				
21-30	80	32.65				
≥31	22	8.99				
Level of Education						
No formal education	50	20				
Primary school	33	14				
Secondary school	89	36				
Diploma & above	73	30				
Household size			6	2	10	2.44
≤ 5	144	59				
6-10	95	39				
≥11	6	2				
Farm size (Hectare)			2.2	0.5	2	0.6
≤ 1	106	43				
2-4	136	56				
≥5	3	1				
Extension Contact						
Yes	120	49				
No	125	51				

Source: Field Survey (2024)

The findings indicate that the Total Cost (TC) per hectare in the study amounted to ₦219,678, which included a Total Variable Cost (TVC) of ₦185,742 and a Total Fixed Cost (TFC) of ₦33,936. This resulted in a Gross Margin of ₦64,258. The Total Revenue (TR) generated from maize production was reported to be ₦250,000, leading to a Net Farm Income of ₦30,322. These results suggest that maize production in the region is economically viable. This agrees with the findings of Girei *et al.* (2018) on the Economics of Small-Scale Maize Production in Toto Local

Government Area, Nasarawa State, Nigeria. Thus, reported that the Total Revenue of ₦218,677.00 was earned per hectare while the total variable costs incurred were ₦48, 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 ₦71,025.50/ha respectively. The return on every ₦1 invested generated 14kobo. This shows that for every one naira invested per hectare would generate a return of 14 kobo in the study area.

Table 3: Average Cost and Returns Associated with Maize Production per Hectare

Variables	Cost (₦)	Percentage (%)
A. Variable Cost		
Fertilizer	43, 416	23.4
Herbicide	32, 699	17.6
Pesticide	3, 545	1.9
Seed	17, 433	9.4
Labour	42, 930	23.1
Transport	36, 570	19.7
Storage	9, 149	4.9
Total Variable Cost (1)	185, 742	100
B. Fixed Cost		
Land	26, 430	77.9
Depreciation of Equipment (sprayer)	6, 986	20.6
Depreciation of farm tools (hoe and cutlass)	520	1.5
Total fixed cost (2)	33, 936	100
Total cost of production	219, 678	
C. Total Revenue		
Average output (500kg) x Average unit price (₦500)	250, 000	
D. Gross Margin (TR--TVC)	64, 258	
Net Farm Income (TR-TC)	30, 322	
Returns on Investment (NFI/TC)	0.14	

Source: Field Survey, 2024

Major Farm Inputs Utilized for Maize Production

The utilization of inputs describes the different kinds of resources used by respondents in their production. The distribution of respondents who used various farm inputs for maize production is presented in Table 4. The result showed that the top three farm inputs used by respondents for maize production include seed (32.7%), fertilizer (26.5%), and herbicide (20.4%). This suggests that fertilizer, seed, and herbicide are farmers'

most used inputs in the study areas, indicating that a substantial proportion of farmers use these inputs for maize production. This agrees with Tiri *et al.*, (2015) who disclosed that, as part of the Market Stability Scheme for input subsidies, farm inputs, including fertilizers, insecticides, herbicides, and improved seeds were distributed to registered individual smallholder farmers via an electronic system.

Table 4: Distribution of Major Farm Inputs Utilized for Maize Production

Input	Frequency	Percentage (%)
Fertilizer	65	26.5
Herbicide	50	20.4
Insecticide	20	8.2
Seed	80	32.7
Labour	30	12.2
Total	245	100

Source: Field Survey (2024)

Constraints of Maize Production Facing Maize Farmers

Constraints are the challenges farmers encounter in the process of production. These constraints are arranged based on their level of severity. Table 4.7 indicates that the leading challenge faced by maize farmers in production was the high cost of transportation, which accounted for 29.4% and ranked highest among the various issues. This was followed by the high cost of inputs at 24.9% and inadequate capital at 20.4%. This suggests that the steep transportation costs have significantly impacted the purchasing power of maize

farmers, contributing to their inability to acquire sufficient farm inputs necessary for maize production in the study area. This concurs with Abdulaleem *et al.* (2017) who conducted a study to determine Costs and Returns in Maize Production among Small-scale Farmers in Osun State Nigeria. They found that the majority (58.9%) of the respondents reported high transport costs as their constraint in maize production. Furthermore, high prices of farm inputs were another factor militating against maize production in the study area and about 30.0% of the respondents were affected by this problem.

Table 4: Distribution of Constraints of Maize Production Facing Maize Farmers

Constraint	Frequency	Percentage (%)
High cost of transportation	72	29.4
High cost of inputs	61	24.9
Inadequate capital	50	20.4
High labour cost	17	6.9
Shortage of farm inputs	14	5.7
Low output	12	4.9
Political pressure	11	4.5
Input Diversion	4	3.3
Total	245	100

Source: Field Survey (2024)

CONCLUSION

The study concluded that farm input applications affect Maize Yield in the study areas. The farmers were still at their prime age with an average age of 43. The study concluded that male farmers are dominant and married, and they had attained one form of education or the other. The study also concluded that socioeconomic factors influenced their capacity, hence increasing their potential output. Despite the growing costs of agricultural input, the result of the

study shows that for every ₦1 invested in maize production, ₦0.14 was made. This result emphasizes the feasibility of maize production in the research areas. The study also concludes that the major constraint faced by the farmers in the study areas, like high transportation costs, affects maize production, and mostly reduces the purchasing power of the farmers, which directly minimizes output and general welfare of the farmers.

RECOMMENDATIONS

Based on the study's findings, the following recommendations were made:

- It is recommended that the Taraba State Agricultural Development Programme (TADP) should deploy extension workers to the study areas to address the

current shortage of extension personnel who can educate maize farmers on the best ways to adopt Good Agricultural Practices (GAP).

- The government should introduce an agricultural input policy aimed at

providing essential farm supplies such as fertilizer, herbicides, tractors, and seeds. This initiative would enhance the availability and affordability of these inputs, ultimately reducing production costs and increasing farmers' income.

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