ECONOMICS OF MAIZE PRODUCTION IN EASN SOUTH EAST LOCAL GOVERNMENT AREA, EDO STATE

BY

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BENIN CITY

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PROJECT SUBMITTED TO THE DEPARTMENT OF AGRICULTURAL ECONOMICS AND EXTENSION SERVICES, FACULTY OF AGRICULTURE, UNIVERSITY OF BENIN, BENIN CITY

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CERTIFICATION

This is to certify that this project titled: "**ECONOMICS OF MAIZE PRODUCTION IN EASN SOUTH EAST LOCAL GOVERNMENT AREA,**

EDO STATE" was carried out by **Lucky Osas ITEPU** with Matriculation Number **AGR2000024** of the Department of Agricultural Economics and Resource management, University of Benin, Benin City, Nigeria.

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DEDICATION

I dedicate this project to Almighty God for his grace, protection, supernatural supply, strength, unfailing guidance and unfailing love throughout the course of this study and to my beloved parents Mr. and Mrs. Lucky Itepu.

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ABSTRACT

This study examined the economics of maize production in Esan South East Local Government Area of Edo State. The specific objectives were to describe the socio-economic characteristics of maize farmers, estimate the cost and returns of maize production, determine input elasticities and return to scale, and identify the major constraints affecting maize farmers in the study area. A multi-stage sampling procedure was employed to select 90 maize farmers. Data were collected using a structured questionnaire and analyzed using descriptive statistics, gross margin analysis, the generalized production function (GPF), and a 5-point Likert scale.

The socio-economic results revealed that maize farming in the area is dominated by males (75.56%), with an average age of 45.68 years. Most farmers were married (57.78%) and had small household sizes averaging 5 persons. The mean farming experience was 15.31 years, while average farm size was 0.81 hectares, indicating predominantly small-scale production. The gross margin analysis showed an average total variable cost of ₦65,931.92 and total revenue of ₦86,798.33, resulting in a positive gross margin of ₦20,866.41 per farmer. Results of the generalized production function indicated that only pesticide use had a positive and significant elasticity (0.111), implying efficient and productive use. Family labour (0.018), hired labour (–0.0324), seed (–0.012), and farm size (–0.560) were either inefficient or over-utilized, with farm size showing a large and negative significant elasticity. The mean return to scale (RTS) was –0.413, indicating strong decreasing returns to scale. This suggests

that increasing input levels leads to a decline in output, likely due to input congestion, poor management, and general production inefficiencies among farmers.

The major constraints identified include pests and high input costs, while poor market access, adverse climatic conditions, and poor road networks, were considered less severe. The study concludes that although maize production is profitable, significant inefficiencies and structural constraints hinder optimal productivity. It is recommended that farmers receive training on input management, extension services be strengthened, and infrastructural improvements be prioritized to enhance maize production efficiency in the area.

CHAPTER ONE

INTRODUCTION

1.1 Background of the Study

Maize is ranked as the third most widely cultivated cereal crop globally, following wheat and rice, based on area harvested (Olaniyan, 2015). It is primarily grown by small holder farmers across more than 6.5 million hectares nationwide (Onumah *et al.,* 2022). Maize cultivation in Nigeria covers approximately 5.8 million hectares, representing about 16% of the country's arable land, with around 98% of maize farmers relying primarily on rainfall for production (Food and Agriculture Organization Statistical Database FAOSTAT, 2017). The cultivated area increased from 2.8 million hectares in 1986 to over 6 million hectares by 2011. However, there was a notable decline in the area cultivated for maize, which decreased to 5.8 million hectares in 2022 down 7% from 6.2 million hectares in 2021. As the largest cereal crop in Nigeria, maize accounted for approximately 32% of the total cereal area harvested in 2023.

In recent years, maize output in Nigeria has exceeded 12 million metric tons, elevating the country to the second-highest maize producer in Africa and establishing its position among the top producers globally (Onumah *et al.,* 2022). The average maize yield for local farmers in Nigeria ranges from 1.2 to 2 tons per hectare (Ammani, 2015). Between 1990 and 2015, Nigeria recorded an average annual maize production

of approximately 4.7 million metric tons. In 2013 alone, production reached 9,180,270 metric tons, making maize the country's second most widely grown food crop after cassava, which recorded a production volume of 52,403,455 metric tons (Food and Agriculture Organization FAO, 2013). Maize production in Nigeria stood at 10.7 million metric tons in 2015 (FAO, 2017) and 10.5 million metric tons in 2017 (FAO, 2017). In line with the Central Bank of Nigeria's 2020 decision to ban maize imports, the country set a target of producing 12.5 million metric tons that same year (Central bank of Nigeria, 2020).

Maize has become indispensable for food security in Nigeria. It is known by various local names depending on the region: Agbado in Yoruba, Igbamkpa in Idoma, Masara in Hausa, and Oka in Edo (Bini). Compared to other grains like wheat and rice, maize stands out for its adaptability and diverse uses (Erenstein *et al.,* 2022). Its grains contain vital nutrients such as proteins, fats, fiber, carbohydrates, and essential minerals (Sule *et al.,* 2014). According to Olaniyan (2015), maize is used in the preparation of popcorn, cornflakes, cornbread, and various staple foods and snacks in Nigeria, such as kunu, akamu (ogi), egbo, abari, kokoro, tuwon, agadi, elekute, and donkunn. Additionally, it serves as a key component in the production of fish bait (Ozor, 2016). Maize oil is commonly used in cooking, soup preparation, salad dressings, and gluten production (Nkamigbo, 2015).

1.2 Problem Statement

Studies indicate that although maize plays a crucial economic role for Nigeria's burgeoning population, its output has consistently failed to satisfy the nation's food and industrial requirements.

Despite its contribution, maize production remains largely subsistence-based and is dominated by middle-age male small-scale farmers with low output. Their production is influenced by other socioeconomic factors including age, education level, household size, farming experience, and access to extension services (Akinbode, 2014; Girei *et al.,* 2013).

Many small holder farmers are unable to accurately evaluate the cost and returns of maize farming. High costs, fluctuating market prices, and inefficient use of resources can reduce profitability (Yahama *et al.,* 2020). Without an analysis of costs and returns, it is difficult for farmers, policymakers, and stakeholders to make informed decisions that enhance productivity and income.

Understanding how changes in input levels affect maize output is crucial for resource optimization. However, there is a lack of empirical evidence on input-output relationships and returns to scale in maize production in the study area (Olamide, 2022). This knowledge gap prevent farmers from identifying which inputs contribute the most to output and whether expanding production leads to proportionate increase in yield.

Lastly, small-scale maize farmers face numerous constraints, including high input costs, pest infestations, credit, inadequate market access etc, these constraints continue to limit the potential of maize production despite increasing national demand (Oyetunde-Usman *et al.,* 2019).

This study is, therefore, aimed at providing answers to the following research questions:

i. What are the socio-economic characteristics of the respondent in the study area?
ii. What is the cost and return of maize production in the study area?
iii. What are the input elasticities for maize production?
iv. What is the return to scale of maize farmers in the study area?
v. What are the constraints faced by small-scale farmers in maize production in the study area?

1.3 Objectives of the Study

The general objective of this study is to assess the economics of maize production in Esan South East Local Government Area of Edo State, Nigeria. The specific objectives of this study are to:

i. describe the socio-economic characteristics of maize among small holder farmers in the study area;
ii. examine the cost and returns associated with maize production in the study area;

iii. estimate the input elasticities for maize production in the study area;

iv. examine the return-to-scale (RTS) of maize farmers in the study area;

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

1.4 Justification of the Study

Several researchers have conducted studies on the economics of maize production across different regions of Nigeria. For instance, Mohammed *et al.* (2025) assessed constraints to climate change adaptation strategies among maize farmers in Northeastern, Nigeria but failed to examine the cost and return of maize production. Similarly, Ezike *et al.* (2024) focused on the assessment of the socioeconomic determinants of maize production among smallholder farmers in Nasarawa State but did not capture the specific input elasticities, which limits the understanding of how individual inputs respond to changes in output. Other studies such as Osinowo *et al.* (2023) in the Yewa division of Ogun State mainly emphasized cost and return but did not consider return to scale, making it difficult to understand whether farmers operate under increasing, constant, or decreasing returns.

Although these studies contribute to knowledge, they share certain limitations. Additionally, most previous works were not carried out in Esan South East Local Government Area, an area with unique socio-economic characteristics, land tenure systems, and production practices that may differ significantly from other regions.

This study is different because it fills some important gaps. First, it incorporates socio-economic characteristics, which helps to explain variations in productivity among farmers. Second, it will analyse the cost and return structure and the return to scale, offering insight into whether smallholder farmers in Esan South East are operating efficiently. Third, it will estimate input elasticities, providing a more robust understanding of how different inputs contribute to maize output. Furthermore, unlike many past studies, this research identifies and ranks the major constraints faced by maize farmers in the area, providing a clearer basis for policy recommendations.

The findings from this study will benefit several stakeholders. Farmers will gain information on the most productive input combinations and the profitability of maize production in their locality. Policy makers and extension agents will obtain evidence-based insights to design targeted interventions that reduce constraints and improve productivity. Researchers and academics will benefit from the updated empirical data generated using a more flexible and comprehensive analytical approach. Ultimately, the study will support efforts toward improving food security, enhancing farmers' incomes, and promoting sustainable maize production in Esan South East LGA.

CHAPTER TWO

LITERATURE REVIEW

2.1 Concept of the Economics of Maize Production

The economics of maize production refers to the study of how maize farmers allocate scarce resources such as land, labour, capital, seed, fertilizer and agrochemicals to achieve the highest possible output at the lowest feasible cost. According to Alabi and Abdulazeez (2018), the economics of maize production involves the application of economic principles to farming decisions with the aim of maximizing profit and ensuring efficient resource allocation. This concept emphasizes how farmers combine inputs within the constraints of technology, prices and socio-economic factors to attain optimum output.

Maize production involves a technical relationship between inputs and output, and understanding this relationship is central to production economics. Alabuja, Anthony and Ebukiba (2022) noted that maize farmers operate under different technical and economic environments that influence their production decisions, level of efficiency, and profitability. Thus, the economics of maize production examines how farmers respond to input prices, output prices, risks, technology and institutional factors to achieve production efficiency.

A major component of the economics of maize production is resource-use efficiency, which evaluates how effectively farmers utilize their available inputs. Efficient

farmers either maximize output from a given level of inputs or minimize costs while maintaining output (Abdulaleem, Oluwatusin and Ojo, 2019). Understanding resource-use efficiency helps to determine whether inputs such as labour, fertilizer or seed are over utilized or underutilized. This idea is closely connected to input elasticities, which measure how output responds to changes in each input. Input elasticity analysis allows for proper adjustment of inputs to improve productivity, as shown by Ebukiba, Anthony and Adamu (2020) in their study on maize production efficiency.

Another critical idea in the economics of maize production is cost and return analysis, which evaluates the profitability of maize farming. Cost and return analysis typically includes assessing total variable cost, fixed cost, gross margin and net farm income. Studies such as Abubakar, Sule and Emefesi (2021) demonstrate that profitability analysis is essential in determining the economic viability of maize production, comparing managerial efficiency among farmers, and identifying areas where cost reduction is possible.

The production function is also fundamental in understanding the economics of maize production. The production function shows the technical relationship between input use and output. Researchers frequently employ the Cobb–Douglas or generalized production function to estimate productivity, marginal productivities and return to scale. According to Olamide (2025), the production function helps to determine

whether farmers operate under increasing, constant or decreasing returns to scale an important measure of long-term production sustainability.

In addition, the economics of maize production includes the study of socio-economic characteristics such as age, education, farming experience, household size, farm size, access to credit and access to extension services. These characteristics significantly influence farmers' ability to adopt improved technologies and manage production risks. Usman *et al.* (2025) reported that socio-economic variables play a major role in determining productivity differentials among maize farmers.

Constraints such as high cost of inputs, pests and diseases, climate variability, poor market access and limited extension services also form an important part of the economic analysis of maize production. These factors influence productivity and profitability, and identifying them helps in designing appropriate policy interventions. Alabi and Abdulazeez (2018) emphasized that addressing constraints is essential for improving maize yield and sustaining production.

Overall, the economics of maize production provides a comprehensive understanding of how maize farmers operate within an environment characterized by limited resources, price fluctuations and production challenges. It offers insights that support evidence-based policy formulation, extension services, and innovations aimed at improving maize productivity and ensuring food security.

2.2 Concept of Maize Production

Maize production involves a series of agronomic and managerial activities beginning with land preparation and continuing through planting, fertilisation, weeding, pest and disease control, harvesting, and post-harvest handling. Maize is one of Nigeria's most important cereal crops, serving as food for humans, feed for livestock, and raw material for various industries.

2.3 Concept of Production

The concept of production refers to the process by which inputs such as land, labour, capital, and management are combined to produce goods and services that satisfy human wants. In agricultural economics, production is seen as the transformation of raw materials or resources like seeds, fertilizers, and labour into consumable agricultural outputs such as maize, rice, and cassava (Aremu, 2021). According to Akinbile and Ayinde (2021), agricultural production involves the application of human and material resources to achieve output through efficient resource use and management practices. Production, therefore, is both a physical and economic process because it not only involves increasing the quantity of output but also ensuring that the activity is economically viable and profitable. Maize production, like any other form of agricultural production, requires efficient allocation of scarce resources to achieve the desired level of output while minimizing cost and maximizing returns. Production theory also serves as a basis for understanding input–output relationships and

efficiency in resource use, which are essential in assessing farm productivity and profitability.

2.4 Empirical Concept of Production

The empirical concept of production is based on the functional relationship between inputs and output. This relationship is often represented mathematically through production functions such as the Cobb–Douglas, Translog, or stochastic frontier models. These models are used to estimate input elasticities and returns to scale. Input elasticity measures the responsiveness of output to a change in the quantity of an input while holding other inputs constant. The sum of the elasticities indicates the return to scale, which helps determine whether production is increasing, constant, or decreasing as input use expands (Haruna *et al.,* 2018).

2.5 Factors Affecting Maize Production

Several interrelated factors influence maize production in Nigeria. These can be categorised as follows:

1. Biophysical Factors: Soil fertility, rainfall, temperature, and pest incidence significantly determine maize yield.
2. Farm Resources: Availability of land, labour, and capital influences the scale and efficiency of production.
3. Input Access and Use: Timely access to fertiliser, improved seed, and agrochemicals enhances productivity.

4. Human Capital: Education, farming experience, and extension services improve management decisions and adoption of innovations.
5. Institutional Factors: Access to credit, infrastructure, and market information support or limit production.

2.6 Factors Influencing Maize Production (Empirical Evidence)

Empirical studies across Nigeria have identified major determinants of maize production as farm size, seed quality, fertiliser use, labour, access to credit, and extension services. Lere (2020) reported that larger farm sizes, higher labour use, and greater fertiliser application significantly increased maize output in Kaduna State. Similarly, Konkwo *et al.* (2022) found that in Esan South East LGA, access to improved seed, fertiliser, and extension services significantly influenced productivity. Moreover, Ogunwande and Adesokan (2020) observed that credit access and education level also play important roles in determining farmers' efficiency.

2.7 Cost and Return of Maize Production

The cost and return analysis evaluates the profitability of maize production by examining the relationship between total cost and total revenue. Key indicators include gross margin, net farm income, and benefit–cost ratio (BCR). Adamawa State study (2023) found that maize production is generally profitable, with a BCR greater than one, indicating that farmers earn more than they spend on production. Major cost

components identified include labour, fertiliser, seeds, and transportation. However, high input costs and market fluctuations often limit profitability.

2.8 Constraints Faced by Small-Scale Maize Farmers

Despite its economic importance, maize production in Nigeria faces numerous constraints. Prominent among these are:

1. High cost of production inputs such as fertiliser and agrochemicals;
2. Limited access to credit facilities;
3. Inadequate extension services and poor dissemination of improved technologies;
4. Pests and diseases;
5. Post-harvest losses due to poor storage and handling;
6. Poor road and market infrastructure limiting access to profitable markets (Konkwo *et al.,* 2022).

2.9 Review of Relevant Literature

Usman *et al.* (2024), carried out a research to ascertain the effect of socio-economic characteristics of farmers on maize production in Gombe State. The study made use of 222 respondents randomly selected through a multistage sampling procedure. Data were collected via structured questionnaire, analysed with descriptive statistics, regression and correlation. Results show that most maize farmers in the area were still active and energetic with productive age of between 35 and 54years with about 62%

been married, while male dominate maize production. The respondents mostly had secondary education, with between 6 to 10 persons per household, cultivating on less than 2 hectares of farm holding with good farming experience. The study shows that respondents are not cooperative society's members neither are they accessible to adequate extension services. Furthermore, age educational status, farm size, and access to credit were noticed to significantly influence the production of maize in the study area.

The findings imply that a married male farmer within an active age, with a medium size household, who has gained reasonable experience, cultivating in large farm holding, with access to credit and extension contact will be producing large quantity of maize to offset hunger and food insecurity thereby attaining food security. Therefore, the study recommends that extension agents should be employed in the State to fill the shortfall in extension service personnel; a financial scheme should be made available to maize farmers by the government and agricultural stakeholders to increase access to credit, and the traditional land tenure system should be reviewed to increase accessibility to land for those who want to expand their farm sizes.

Ezike *et al.* (2024) studied the assessment of the socioeconomic determinants of maize production among smallholder farmers in Nasarawa State. A multistage sampling technique was used for the selection of 171 small holder farmers for the study. A well-structured questionnaire containing both open and closed ended questions was used to

collect the data for the study descriptive statistics such as percentage and frequencies and multiple regression analysis were used to achieve the objectives of the study. The socioeconomic result of the smallholder maize farmers in showed that the majority (36.3%) of the farmers were within the age range of 31-40 years of age and were mostly 76.6%) male farmers with the majority married and literate. Also, a greater number (66.1%) were members of association, 71.3% had farming experience between the range of 16-20 years with household size of 4-6, cultivating average farm size of 2-3 acres, had good contact with extension agents though only 4.1% had access to credit facility. The result of the multiple regression analysis showed that farm size, educational status and household size have positive significant effect on the output of maize at 1% and 10% level of significance respectively. The maize production technologies adopted by the majority (88.4%) of the farmers were herbicides and improved variety while the major constraints were high cost of labour, high cost of inputs and poor credit facility. The federal Government should create an enabling environment that guarantees available farmland to farmers since farm size is a critical determinant to maize production.

Julius Ajah *et al.* (2012) carried out a study on the socio-economic factors influencing small-scale maize farmers in Abuja. A multi-stage sampling technique and semi-structured questionnaire were used for data collection. A total of 160 maize farmers were interviewed in four agricultural zones (40 from each zone). Data were analyzed using multiple regression analysis and descriptive statistics. The results showed that

the land area cultivated, land rent, quantity of fertilizer applied, years of farming experience and household size were the major socio-economic factors that significantly ($p < .05$) influenced maize output. The R^2 value of 0.31 (adjusted R2= 0.26) indicated that the variables accounted for 31 percent of the variation in maize output. The mean outputs of maize per hectare and per farmer were 316.73 kg and 614.56 kg, respectively. Socio-economic results showed that the mean age of the farmers was 39 years with a substantial percentage (68.12%) of them having, at most, primary school education. Based on the results, it was recommended that farmers in the study area should be informed through extension services of the socio-economic factors that influence maize output so that the farmers can consider these factors in their production decision making process.

Osinowo, *et al.* (2023) examines the cost and return structure of small-scale maize farmers in the Yewa division of Ogun State, Nigeria. A multistage sampling technique was employed to carefully select a total of one hundred and five (105) respondents for the study and descriptive and budgetary analysis was used to analyze the data. The descriptive analysis showed that 75.24% of respondents were males with an average age of 46.88. About 79.05% of the respondents were married with an average household size of six (6) people. Likewise, the descriptive analysis also revealed that inadequate funds and capital (88.57%), pest and diseases problem (83.81%), poor soil fertility and land degradation (60.95%) and lack of irrigation facilities (54.29%) as major production constraints faced by the small-scale maize farmers in the study area.

From the budgetary analysis result, the estimated total revenue was put at ₦231,490.00, the gross margin was ₦144,685.87, and the net farm income was calculated to be N78090,621.82. The rate of return on investment in maize production in the study area is 64.33% while the profitability index is estimated to be 39.15%, indicating that small-scale maize production in the study area has a high likelihood of generating substantial returns and is considered financially viable. This study, therefore, recommends that government should actively promote and support small-scale maize production by providing farmers with the necessary resources, training, and access to finance.

Yamaha (2020) costs and returns associated with maize production in Lere local government area of Kaduna State. Data were collected from a sample of 100 maize farmers selected through multi-stage sampling procedure using questionnaire and data collected were analyzed using simple descriptive statistics and net farm income analysis. The result showed that 82% were in their working age of between 21-50 years, majority of the farmers 53% were married, 91% had formal education, in terms of farming experience, majority (68%) of the respondent had farming experience that is above one year. The result revealed that maize farming is profitable investment in the study area with a total return of ₦ 194,545.00 and net farm income of ₦ 81,275.00 per hectare with a benefit cost ratio of 1.72 and a return on capital invested of 0.42. All the farmers identified maize as an important source of food to households in the study area. However maize farming is facing several constraints such as lack of capital

(73%), high cost of farm inputs (69%), lack of credit facilities (67%), inadequate storage facilities (53%), inadequate processing facilities (50%), incidence of pests and diseases infestation (46%), poor road network (40%) and poor extension services (33%). Therefore, it is recommended that credit facilities should be provided so that farmers can have fund to purchase farm inputs such as fertilizer, pesticides and insecticides and be able to employ adequate labour, storage and processing facilities such as silo and shelling machine should be made available to farmers at subsidized and affordable price as a form of government intervention, adequate workshops and seminars especially on training farmers on methods of weed and pests control should be organized by extension agents and farmers should be encouraged to form themselves into cooperative groups so that they can pool their resources together in getting adequate funds to finance maize production activities.

Gwandi, *et al.* (2023) evaluated cost and return of maize (*Zea mays* L) production in Adamawa State, Nigeria. Specifically, the objectives of this study were set out to: examine the socio-economic characteristics of sampled maize farmers and to evaluate the costs and returns of maize production in the study area. A simple random sampling technique was adopted and used in selecting one hundred fifty (150) maize farmers in the area of study. Data were analysed using descriptive statistics and gross margin. The study shows that majority 68.7% were full time farmers with average mean of 31 years of age and about 30.96 years of farming experience. Majority (85.3%) were male farmers and only 15.3% of the respondent had no formal education with average

land holding of 1.39 hectare. The analysis of farm budgetary technique shows and reveals that maize (*Zea mays*) production in the area of study is a profitable enterprise with a gross margin of ₦72,413.05, and net farm income (NFI) of ₦46,412.25. The coefficient of gross ratio was 0.50; this implies that 50% of gross income of maize went to off-set total farm costs. The net farm income on naira invested was 0.69 and the operating ratio was 0.59. Gross ratio less than 1 is always desirable for farm business. The study recommends among other things that farmers should strengthen themselves financially by forming cooperative groups whereby members could have access to loans at a very low rate and farm inputs could be purchased in bulk to be shared among members at a reduced.

Ebukiba *et al.* (2020) evaluated Economics and Technical Efficiency of Maize Production Among Small Scale Farmers in Abuja, Nigeria; Stochastic Frontier Model Approach; Multi-stage sampling technique was adopted and used. Primary data were collected through the use of well-structured questionnaire from one hundred and fifty (150) sampled respondents in the study area. Data were analyzed to achieve the specified objectives using the following tools of analysis, Descriptive Statistics, Stochastic Frontier, Gross Margin Analysis, Financial Analysis, Five Point Likert Scale, and Principal Components Analysis. The results show that majority 40.47% of the sampled respondents were among the age range of 41-50 years of age and 25.33% were within the age bracket of 31-40 years of age. The mean age of the sampled farmers is 44 years. Which indicated that Young and energetic farmers

are able to withstand stress and adopt new innovations. Most 88.67% of the farmers were male. Majority 72.67% were married. The mean household size of the sampled respondents is 6 members per family. Majority (67%) of the small-scale maize farmers had 1-2 ha of land and the average farm size cultivated by the farmers was 2.576 ha. The factors influencing total output of maize were seed input ($P<0.01$), Farm size ($P<0.05$), quantity of fertilizer($P<0.05$), and labour input ($P<0.01$) were statistically significant variables. The results of the inefficiency components show that the factors influencing technical inefficiency includes: age ($P<0.01$), education ($P<0.01$), access to credit ($P<0.05$), farming experience, and household size ($P<0.05$) and were statistically significant. The total revenue realized by the sampled small-scale maize farmers was ₦ 238,317 on average. While the total variable costs on average basis was ₦ 109,702.93. The gross margin realized was ₦ 128667.07. The gross margin ratio was 0.54 while operating ratio calculated was 0.857 and the rate of return on investment (RORI) was 1.17. The retained component from the constraint's analysis include Lack of Improve Seed, Lack of Transportation, Poor Storage Facilities, Inadequate Capital, and Cattle Herdsmen. The retained components explained 60% of the variation of the component included in the model. The study therefore, recommends that affordable loans and adequate capital should be made available to the small-scale maize farmers, farmers should be properly trained and educated by the non-governmental organizations and extension agents on chemical application, fertilizer use and pests

and diseases control measures especially on integrated pest management (IPM). Inputs like improve seeds, fertilizer, and chemicals should be made available to farmers at subsidized rates and at appropriate time coinciding with production periods for proper usage. Provisions should be made for transportation and storage facilities for farmers, the issue of conflict between farmers and herdsmen should be brought to book and resolved amicably for peaceful coexistence.

Alabuja *et al.* (2022) estimated resource-use efficiency and factors influencing maize production in Kuje Area Council, Federal Capital Territory, Nigeria. The specific objectives were to; determine the socioeconomic characteristics of maize farmers; analyse cost and returns associated with maize production; evaluate factors influencing the output of maize production; determine the resource-use efficiency of maize production and identify the constraints faced by farmers in maize production in the study area. Multistage sampling technique was employed to select 60 sampled maize farmers in the study area. The following tools of analysis were used to achieve the specific objectives of the study. Descriptive statistics; Gross margin analysis; resource-use efficiency and Cobb Douglass production function. The results showed that majority, 75 percent, of the sampled respondents were male while 73.3 percent were married. From the results it can further be deduced that 48.3 percent of the sampled respondents attended secondary school and 31.7 percent attended tertiary institution while the rest stopped at primary school level or did not have any formal

education. The results also indicated that about 55 percent of the sampled maize farmers had household size ranges within 6-10. 100 percent of the sampled respondents had no access to credit and 83.4 percent had no access to extension services. From the analysis of cost and returns associated with maize production in the study area, the total revenue (TR) realized on average was ₦ 1,269,152.69 and the average total variable cost (TVC) was ₦ 188,462.69, the gross margin obtained was ₦ 1,080,690. With this result we can say that maize production is profitable in the study area. The results of the resource-use-efficiency revealed that farm size, seed input and labour input were underutilized while fertilizer input and chemical input were over utilized by maize farmers. The results of the Cobb Douglass production function model revealed that the factors influencing total output of maize production in the Study area were farm size ($P<0.1$), labour ($P<0.01$), chemical ($P<0.01$) and Fertilizer $P<0.05$). The major constraints faced by maize farmers in the study area include; inadequate capital, lack of fertilizer and lack of extension agent. Therefore, the study recommends that maize farmers should be encouraged to join the farmers' association, and supported with credit facilities. Government should supply inputs like agrochemicals, fertilizer and improved seed varieties to maize farmers t a subsidized rate and at appropriate time and extension agents are to guide the farmers in the usage of these inputs while mechanize farming system should be encourage by providing tractors to replace local farm implements. Good roads are essential in linking maize production areas with available markets around the study area.

One of the challenges facing smallholder farmers in Nigeria is the inefficiency of resource use. Maryam Abiodun Olamide conducted a study to investigate resource use efficiency and return to scale in maize production in the study area. Data were collected from randomly selected 120 maize farmers using a self-designed structure questionnaire in the study area. Data were analysed with the aid of descriptive statistics and Cobb-Douglas production function. Findings showed resources in the rea were inefficiently allocated. Seed, labour and fertilizer were under-utilized while arm size and pesticides were over utilized. The returns to scale analysis showed that maize farmers in the area were in irrational stage one of the production curve. The study concluded that maize farmers in the area can increase production by employing more of productive resources.

Adeola, *et al.* (2023) analyze the scale-efficiency of maize production in Funtua Local Government Area (LGA) of Katsina State, Nigeria. A multi-stage sampling technique was employed in the selection of 80 maize farmers for the study. The cross-sectional data collected with the aid of a structured questionnaire were analyzed sing descriptive statistics, data envelopment analysis (DEA) model, Tobit regression model, and net farm income. The results of the socioeconomic analysis show that maize farmers in the study area have an average age of 45 years, an average household size of 11 persons, and an average maize farming experience of 20 years. The net farm income analysis revealed a total maize production cost of ₦96,958.00 per hectare; and total revenue of 179,363.04 per hectare. Meanwhile, the return per naira invested is ₦1.85,

indicating that for every ₦1 invested in maize production in the study area, a profit of ₦0.85 was made. Furthermore, the result shows maize farmer's scale efficiency average score of 0.701 with a range and standard deviation of 0.203 to 1.00 and 0.225 respectively. The age of the farmer and their educational level were found to significantly ($p<0.05$) influence the scale efficiency of the farmers. The major constraint associated with maize production in the study is high cost of inputs. The study concluded that farmers in the area are scale efficient and are breaking even. The study therefore recommended building educational capacity of farmers and inputs subsidy to strengthen the scale efficiency of maize farmers in the study area.

Ayodele, *et al.* (2020) analyse the profitability and constraints of maize production in Chikun Local Government Area of Kaduna State. Structured questionnaire was used to generate primary data for the study. Descriptive statistics, Net farm income analysis, and profitability ratios were employed in the analysis. Results revealed that majority of the respondents (99 %) were relatively young and fell within the active age (21 – 60 years). Male respondents dominated maize production at 87 % and majorities (81%) of the farmers were married. Results further revealed that significant (71%) number of the respondents had below 11 inhabitants in their households. Educationally, 51 % of respondents had post primary education. The net farm income per hectare was ₦ 74,606.40 and gross income of ₦ 132,000.00 were obtained per hectare of maize cultivated with a return on capital invested determined at 0.57 implying that for every naira invested, the farmers makes 57 kobo (₦ 0.57) and the gross ratio was calculated

at 0.47 indicating that total farm costs was about 47% of the gross income which shows that maize production is a viable, beneficial and profitable enterprise in the study area. Major constraints faced by the farmers were poor transportation, high cost of hired labour, lack of extension services and inadequate supply of agrochemicals and fertilizer, incidence of pests and diseases infestation plus inadequate capital and credit facilities. Despite these constraints, the farmers were still able to made profit. Therefore, maize production could be one of the poverty alleviating enterprise in the study area. It is recommended that: credit facilities should be provided so that farmers can have fund to purchase farm inputs such as fertilizer, pesticides and insecticides to combat problem of pests and diseases infestation identified, improve varieties of maize should be developed and made available to the farmers so that their yield can be improved and farmers should form themselves into cooperative society so that they can pool their resources together in getting adequate funds to finance maize production activities.

Ameh, *et al.* (2020) study was conducted to assess households' food security and production constraints of maize farmers in Kaduna State, Nigeria. Primary data through structured questionnaire and interview, administered to randomly select 258 maize farmers from 20 villages and four (4) LGAs of Kaduna State, Nigeria. The research questions were analysed with aid of descriptive statistics, food security index and Tobit regression model. The result indicated that that approximately 62% of the sampled households were food secure. The food security indices for the food secure

and insecure households estimated to be 1.84 and 0.47, respectively, while the food security index for the pooled data was 2.10. The value of 1.84 for the food secure household indicates a surplus of 0.84 among the food secured households. The average daily calorie consumption for the food secure household was 4165.63 Kcal, and this implied an excess in calorie consumption of the recommended by 1905.63 Kcal. The regression result showed that the level of food security ($P<0.01$), output of maize ($P<0.01$), age of household head ($P<0.01$), household size ($P <0.01$), farming experience ($P<0.01$), and off-farm income ($P<0.10$) were found to be significantly affecting the food security status of the maize farmers. Inadequate access to credit and storage facilities and low extension service delivery were most critical constraints faced by maize farmers. The study, therefore, recommended that cooperative societies should be encouraged to enable the farmers' group to have increased access to credit, access to modern farming techniques and access to extension agents.

Mohammed, *et al.* (2025) assessed constraints to climate change adaptation strategies among maize farmers in Northeastern, Nigeria. A Multi-stage sampling procedure was employed in select 337 respondents for the study. Frequency counts, mean, percentage, ranking and factor analysis (PCA) were used to analyze the data. The results showed that over one-third (37.09%) of the farmers' age with mean of 40 fell within the age bracket of 41-50 years and majority (87.80%), (60.8%) of the respondents were male and not members of any organization while most (98.00%) of the farmers were married.. Findings further indicated that drought was the major perceived cause of

climate change (X=4.2) and farmers affirmed that land degradation causes weather variability (X=3.9). The result concludes that significant reasons contributed to low adaptation of improved climate change strategies among the respondents and respondents were less likely to adapt climate change strategies due to unfavorable government policies. The study suggested that socio-economic factor, environmental factor and climate information factor, policy factor, institutional factor, weather factor, personal and disease control factor, were the main factors affecting climate change adaptation strategies among maize farmers in the study area.

2.10 Definitions of Terms

2.10.1 Input elasticities

Input elasticity, in the context of maize production, refers to the responsiveness of maize output to changes in a particular input while holding other inputs constant. It measures the percentage change in output resulting from a one percent change in a specific input, such as labour, land, fertilizer, or seed (Alabuja, Anthony and Ebukiba, 2022).

Input elasticities are important because they indicate which resources have the greatest impact on maize production. For example, an input elasticity of 0.5 for fertilizer implies that a 1% increase in fertilizer use will result in a 0.5% increase in maize output, ceteris paribus. This helps farmers and policymakers identify inputs that are

underutilized or over utilized, enabling better resource allocation and productivity improvement.

Return to scale: This refers to the change in output resulting from a proportional change in all inputs in the production process. It indicates whether increasing all inputs will lead to a more than proportional, proportional, or less than proportional increase in output (Olamide, 2025). There are three types:

1. Increasing Return to Scale (IRS): When a proportional increase in all inputs results in a more than proportional increase in output. Example: Doubling all inputs leads to more than double output

2. Constant Return to Scale (CRS): When a proportional increase in all inputs results in an equal proportional increase in output. Example: Doubling all inputs leads to exactly double output.

3. Decreasing Return to Scale (DRS): When a proportional increase in all inputs results in a less than proportional increase in output. Example: Doubling all inputs leads to less than double output.

Understanding returns to scale helps determine the efficiency of resource use and informs decisions about whether expanding farm size or input use is economically advantageous (Ebukiba, Anthony and Adamu, 2020).

CHAPTER THREE

RESEARCH METHODOLOGY

3.1 Study Area and Scope

This study will be conducted in Esan East Local Government Area of Edo State, Nigeria. Edo State, is located in South- South geopolitical zone of Nigeria between 5° 44' and 7° 34' North of the Equator and longitude 5° 44' and 6° 44' East of Greenwich Meridian (Edo State Government, 2012 and Brinkhoff, 2013), bordering Delta to the south, Ondo to the west, Kogi to the north, and in the east by Ananbra States, with Benin City's as capital, with a Population of approximately 4.77 million people (2022 estimate), a surface area of 19,794 square kilometers. Edo State is structured into three senatorial zones: Edo North, Edo Central, and Edo South, comprising five, six, and seven Local Government Areas (LGAs), respectively. The state is characterized by distinct wet and dry seasons, the wet season occurs between April and October with break in August, it has a high mean annual rainfall that ranges from 1800 to 2780 mm and a mean temperature of 28° C. The dry season lasts from November to April with a cold harmattan spell between December and January. The climate is humid-tropical in the South and sub-humid in the North. The primary livelihood of residents in the study location is agriculture. Commonly cultivated arable crops in the region include maize, rice, cassava, plantain, yam, and cocoyam.

The study was conducted in Esan South-East Local Government Area (LGA) of Edo State, Nigeria. Esan South-East is one of the eighteen LGAs that make up Edo State. The administrative headquarters is located in Ubiaja, while other major towns include Ewohimi, Ewatto, Emu, Ugboha, Ohordua, Ilushi, Ifeku, Oria, and Orowa. Geographically, Esan South-East Local Government Area lies between latitude 6°30′ and 6°45′ North of the Equator, and longitude 6°00′ and 6°30′ East of the Greenwich Meridian. The LGA covers a total land area of approximately 1,305 square kilometres and had a population of about 167,721 people according to the 2006 National Population Census, with a projected increase in subsequent years.

The area lies within the humid tropical rainforest zone, characterized by two distinct seasons, the rainy season (April to October) and the dry season (November to March). The average annual rainfall ranges between 1,500 mm and 2,500 mm, and the mean temperature is between 25°C and 30°C.Esan South-East shares boundaries with Kogi and Anambra States to the east, Delta State to the south, and Esan North-East and Ika LGAs to the west. The area is well drained by rivers and streams, the most prominent being the River Niger and its tributaries near Ilushi, which support fishing and irrigation activities.

The people of Esan South-East are predominantly farmers, engaging in the cultivation of food crops such as maize, yam, cassava, rice, plantain, and vegetables, as well as cash crops like oil palm, rubber, and cocoa. Livestock rearing and trading are also

common economic activities. The fertile soil, favourable climate, and active rural population make the area suitable for agricultural production, particularly maize farming, which serves as both a staple food and an income source for many households.

The target population for this study comprises all maize farmers in Esan South East Local Government Area of Edo State. To ensure a representative sample, a multi-stage sampling procedure will be employed.

Stage 1: In this first stage purposive sampling was used to select three communities which includes: Ewatto, Ewohimi, Okhuesan in Esan South East LGAs, due to their active involvement in maize production.

Stage 2: At this second stage, a snowballing technique was employed to identify maize farmers in the community, to obtain a target population.

Stage 3: At this stage, a stratified sampling technique was utilized to obtain a sample size of 9 0 maize farmers across the study area.

3.2 Data Collection

Data were gathered from both primary and secondary sources. Primary data were collected using a structured questionnaires in line with the objectives of the study, while secondary were collected from journal articles, textbooks and the internet. Each farmer was given a copy of the questionnaire to fill in order to obtain the required data. During the administration of the questionnaire, the farmers were allowed to fill it out

themselves, with assistance provided as needed to explain any questions that are not well understood by the respondents.

3.3 Measurement of Variables

Income of Respondents (X2): Measured in terms of average monthly revenue or earnings from farming and non-farming activities.

Educational Status: Measured by the highest level of formal education attained (e.g.. primary, secondary, tertiary)

Experience in Farming: Measured by the number of years engaged in maize production

Farm Size: Measured in hectares allocated to maize cultivation.

Input Costs: Includes expenditures on seeds, fertilizers, labor, and irrigation

Yield: Measured in kilogram per harvest cycle.

Demographic Characteristics: Includes age, gender, marital status, households size

Production Constraints: Captured as categorical variables indicating issues like pest

Infestation, poor, access to credit, or high input costs.

3.4 Analytical Techniques

Objective 1: To describe the socio-economic characteristics of maize farmers in Esan South East LGA. Descriptive statistics such as frequency, percentage, mean, and standard deviation was used to achieve this objective.

Objectives 2: To examine the cost and returns associated with maize farming. The budget analysis such as Gross M

Margin (GM) was used here to achieve this objective

$$GM = TR - TVC \quad [3.1]$$

$$\pi = GM - TFC \quad [3.2]$$

Where:

$TR = p_y y$ =Total Revenue (₦)

TVC = Total variable cost

TFC = Total fixed cost.

π = Profit

p_y = Price per unit output (₦)

y = Total quantity of output (Kg)

Objectives 3 and 4: To estimate the input elasticities, and examine the return-to-scale (RTS) of maize production in the study area. The generalized production function (GPF) was used. The generalized production function in generic form is given as:

$$ye^{\theta y} = A \prod_{j=1}^{n} x_j^{\beta_j} \quad [3.3]$$

The equation is explicitly given as:

$$Iny + \theta y = \beta_0 + \beta_1 lnx_1 + \beta_2 lnx_2 + \beta_3 lnx_3 + \beta_4 lnx_4 + \beta_5 lnx_5 \quad [3.4]$$

Where:

Y = Maize output (kg)

X_1 = Farm size (hectares)

X_3 = Quantity of seed used (kg)

X_4 = Family Labour input (man-days)

X5 = Hired Labour input (man-days)

β_0 and β_j = Coefficients to be estimated

The input elasticity is given as:

$$\epsilon_j = \frac{dInY}{dInX} = \frac{\beta_j}{1 + \theta y} \quad [3.5]$$

$$RTS = \sum \epsilon_j = \frac{\sum \beta_j}{1+\theta y} \quad [3.6]$$

Objectives 5: Identify the constraints faced by small-scale maize farmers in the study area.

Ask farmers to rate how serious each listed constraint is using a 5-point Likert scale of:

1 = Not a problem

2 = Not serious

3 = Moderate serious

4 = Serious

5 = Very serious

Mean value x: $x > 3$ was considered serious

CHAPTER FOUR

RESULTS AND DISCUSSION

This chapter presents the results of the study on the economics of maize production in Esan South East Local Government Area of Edo State. The findings are discussed under four main sections: socio-economic characteristics of maize farmers, cost and return analysis, production function analysis, and constraints to maize production.

4.1 Socio-Economic Characteristics of Maize Farmers

The socio-economic characteristics of the respondents provide insight into their background, production capacity, and management ability. Table 1 presents these characteristics, including sex, marital status, age, household size, education, farming experience, farm size, and labour use.

Sex of Respondents

Table 4.1 shows the distribution of maize farmers in the study area by their sex. The results showed that out of the total respondents, 68 (75.56%) were male, while 22 (24.44%) were female. This shows that maize farming in the study area is male-dominated, meaning that men play a greater role in field operations such as land clearing, planting, and harvesting, which require physical strength. The lower percentage of female farmers (24.44%) could be because women in rural areas often engage more in marketing, and household care rather than in field crop cultivation.

The result aligns with the findings of Usman *et al.* (2024) in Gombe State and Ezike *et al.* in Nasarawa, who both agrees reported that men participate more actively in maize farming due to higher access to land, labour, and physical strength.

Table 4.1: Socio-economic Characteristics of Maize Farmers in the Esan South East LGA of Edo State

Variable	Freq.	%	Mean	S.D
Sex				
Male	68	75.56		
Female	22	24.44		
Marital status				
Single	37	41.11		
Married	52	57.78		
Divorce	1	1.11		
Household size			5.12	2.28
Small(1-5)	51	56.67		
Medium(6-10)	36	40.00		
Large(>10)	3	3.33		
Age			45.68	14.15
20-40	36	40		
41-60	38	42.22		
61-80	16	17.78		
Farming experience			15.31	12.95
1-20	71	78.89		
21-40	13	14.44		
41-60	6	6.67		
Education				
Primary	11	12.22		
Secondary	31	34.44		
Tertiary	34	37.78		
Non-formal	14	15.56		
Size of farmland			0.81	0.60
0-1	72	80.00		
1.1-2.0	16	17.78		
>2.0	2	2.22		
Family labour			3.39	1.61
Hired labour			2.76	1.24
Labour			6.61	2.00

Source: Field Survey, 2025

Marital Status

Table 4.1 shows that 52 (57.78%) of the respondents were married, 37 (41.11%) were single, while only 1 (1.11%) was divorced. This implies that the majority of maize farmers are married and may rely on family labour from spouses and children, which helps reduce labour costs and enhances productivity. The high percentage of married farmers also suggests social stability, which may encourage long-term investment in agriculture. This result is consistent with Usman *et al.* (2024), who found that married farmers tend to have higher productivity because they utilize household labour effectively.

Household Size

The distribution of maize farmers by their household size in the study area is shown in Table 4.1. The result showed that mean household size was 5.12 persons with a standard deviation of 2.28, indicating that most households were of moderate size. Further breakdown shows that 51 farmers (56.67%) had small households (1–5 members), 36 farmers (40%) had medium households (6–10 members), while only 3 farmers (3.33%) had large households (above 10 members). This suggests that most maize farmers have enough household members to provide family labour without overburdening household resources. Moderate household size ensures labour availability and reduces dependence on hired labour. Similar results were reported by Ayodele *et al.* (2020) and Gwandi *et al.* (2023) among smallholder farmers in Nigeria.

Age Distribution

The Table 4.1 shows the distribution of maize farmers by age. The mean age of maize farmers was 45.68 years with a standard deviation of 14.15. The age distribution shows that 36 farmers (40%) were aged 20–40 years, 38 farmers (42.22%) were aged 41–60 years, and 16 farmers (17.78%) were aged 61–80 years. This indicates that most farmers are within their productive and economically active age group, capable of engaging in physically demanding farm operations and adopting modern techniques. The few older farmers (17.78%) may be less productive due to declining physical strength, but they possess valuable farming experience. According to Osinowo (2023), maize farmers in Ogun State also fell within similar age ranges, which he identified as the most active for agricultural activities.

Farming Experience

The farming experience of maize farmers in the study area is also presented in Table 4.1. It is observed that the mean farming experience was 15.31 years, with a standard deviation of 12.95 years, showing wide variation among respondents.71 farmers (78.89%) had 1–20 years of experience, 13 farmers (14.44%) had 21–40 years, and 6 farmers (6.67%) had 41–60 years. This indicates that most maize farmers have long-term experience in farming, which enhances their ability to make sound production decisions and manage risks. Experienced farmers are also more likely to have established marketing networks and to efficiently allocate inputs. This agrees with

Adeola *et al.* (2023) who documented that experienced farmers tend to achieve higher technical and scale efficiency.

Educational Level

The result from Table 4.1 reveals that 11 farmers (12.22%) had primary education, 31 farmers (34.44%) had secondary education, 34 farmers (37.78%) had tertiary education, and 14 farmers (15.56%) had no formal education. This means that a majority (84.44%) of maize farmers in the study area are literate. Education enhances understanding of new agricultural practices, record keeping, and efficient resource management. The high percentage of tertiary-educated farmers (37.78%) also implies that educated individuals are increasingly involved in agriculture, possibly due to growing unemployment and awareness of the profitability of maize farming. The finding is similar to Ajah *et al.* (2012) and Osinowo *et al.* (2023) who reported that higher educational attainment is associated with better farm management and adoption of innovations

Farm Size

The mean farm size was 0.81 hectares with a standard deviation of 0.60. 72 farmers (80%) cultivated between 0–1 hectare, 16 farmers (17.78%) cultivated 1.1–2 hectares, while 2 farmers (2.22%) cultivated more than 2 hectares. This indicates that maize production in the study area is dominated by smallholder farmers. Small farm sizes

limit economies of scale but often allow for better land management and closer crop supervision. This agrees with the findings of Yamaha (2020) in Kaduna and Gwandi *et al.* (2023) in Adamawa State, who also reported an average maize farm size of less than 1 hectare among small-scale farmers.

Small farm sizes may limit mechanization and output, as noted by Adeola *et al.* (2023).

Labour Use

The mean family labour was 3.39 persons (S.D. = 1.61), while mean hired labour was 2.76 persons (S.D. = 1.24), giving an average total labour of 6.61. This implies that maize farmers depend more on family labour than hired labour, which helps reduce production costs. However, the reliance on family labour could limit scalability during peak periods. Osinowo (2023) observed similar patterns, noting that family labour contributes significantly to smallholder farm operations in Ogun State.

4.2 Cost and Return Structure of Maize Production in the Study Area

Table 4.2 presents the cost and return analysis of maize farmers in Esan South East Local Government Area. The analysis provides insights into the average expenditure on various inputs, total revenue realized, and overall profitability of maize production in the study area.

Table 4.2: Cost and Return Maize Production in the Study Area

Variable	Mean (N)	Std. Dev.
Cost of pesticide	46071.19	112106.4
Cost of labour	15285.13	11125.43
Cost of seed	3919.707	2377.89
Cost of transport	655.8889	1425.59
Total variable cost	65931.92	115065.1
Total revenue	86798.33	115104.2
Gross margin	20866.41	162446.6

Source: Field Survey, 2025

The result indicates that maize farmers in the study area incurred various costs on production inputs, which contributed differently to the total variable cost.

Table 4.2 shows that the mean cost of pesticide was ₦46,071.19, making it the highest component of variable costs. The very high standard deviation (₦112,106.40) indicates wide variation in pesticide spending among farmers. This suggests that pest infestation is a major constraint, forcing some farmers to spend heavily on agrochemicals. This observation is supported by Ameh *et al.* (2020), who found that pests were a significant production challenge in Kaduna State, and by Mohammed *et al.* (2025) who stated that climate change has increased pest prevalence in northern Nigeria.

The cost of labour ranked second, with an average of ₦15,285.13. This reflects the labour-intensive nature of maize production, as most farming operations such as land preparation, planting, weeding, and harvesting are carried out manually. This observation aligns with Osinowo (2023), who found that labour costs account for a significant share of maize production expenses in Ogun State. The moderate standard deviation (₦11,125.43) indicates some variability in labour use, likely due to differences in the size of farms and the use of family or hired labour.

The Table indicates that the mean cost of seed was ₦3,919.71. This relatively low cost suggests that most farmers either purchase affordable seed varieties or reuse seeds from previous harvests. This finding is consistent with Gwandi *et al.* (2023) in

Adamawa and Yamaha (2020) in Kaduna, who found that seed costs constitute a small fraction of total production costs. However, reliance on recycled seeds may reduce yield, a concern noted by Alabuja *et al.* (2022) who emphasized the importance of improved seeds for higher efficiency.

The cost of transport was the least among all variable costs, with an average value of ₦655.89. This indicates that most farmers sell their produce locally or use low-cost means such as motorcycles or wheelbarrows, which minimizes transportation expenses. This finding aligns with Ebukiba *et al.* (2020) who reported similarly low transport expenses among maize farmers in Abuja due to localized marketing and small production quantities.

From Table 4.2, the mean Total Variable Costs was ₦65,931.92, with a high standard deviation of ₦115,065.10. This wide variability suggests differences among farmers in terms of farm size, input use, pest challenges, and resource availability. This pattern is similar to findings by Usman *et al.* (2024) in Gombe State and Ezike *et al.* in Nasarawa, where variable costs were heavily influenced by labour and agrochemical expenditure.

Table 4.2 shows that the mean Total Revenue was ₦86,798.33. This indicates that the value of maize output generally exceeds production costs, implying that maize farming is profitable in the study area. The high standard deviation reveals substantial differences in output levels, market access, selling price, and productivity levels

among respondents. This variation are supported by Usman *et al.* (2024), who found out that socioeconomic characteristics influence farmers' output. Ezike *et al.* also noted that differences in farm size and input use affect revenue variation. The observation is also consistent with several studies such as Osinowo *et al.* (2023), Gwandi *et al.* (2023), and Yamaha (2020), who all reported positive revenue returns for smallholder maize producers in Nigeria.

Table 4.2 shows a mean gross margin of ₦20,866.41, confirming that maize farmers earn a positive return above variable costs. Although the gross margin has a large standard deviation, reflecting differences in productivity, the positive margin indicates economic viability. This result agrees with Alabuja *et al.* (2022), Adeola *et al.* (2023), and Ebukiba *et al.* (2020) who all found that maize farming is profitable despite variations in farm size, experience, and resource use efficiency.

On the revenue side, the total revenue (TR) realized by maize farmers averaged ₦86,798.33, while the gross margin (GM), the difference between total revenue and total variable cost was ₦20,866.41. The positive gross margin indicates that maize production is a profitable enterprise in Esan South East LGA. Despite the relatively high expenditure on pesticides and labour, farmers were able to earn revenue above their variable costs. This finding corroborates the report of Osinowo (2023), who also found maize farming to be profitable in Ogun State, although constrained by high input and labour costs. However, the high standard deviation (₦162,446.6) of the

gross margin shows that profitability varied widely among farmers, possibly due to differences in yields, input efficiency, and market access.

4.3 Input Elasticity for Maize Production in the Study Area

The generalised production function was used to estimate input Elasticities. The result is presented in Table 4.3.

Table 4.3: Results of the Generalized Production Model and the corresponding elasticities in the study area

Variables	Coefficient	Elasticity
Yield	0.094	0.063
Quantity of pesticide	0.165	0.111
Family labour	0.026 (0.116)	0.018 [0.005]
Hired labour	-0.048	-0.0324
Quantity of seed	-0.018	-0.012
Farm size	-0.832	-0.560
Constant	0.817	
F	31.74	
R^2	69.65	

Source: Field Survey, 2025, t-values in parentheses, standard deviation in brackets

The elasticity of pesticide use is 0.111, meaning that a 1% increase in pesticide application leads to a 0.111% increase in maize output. This elasticity is positive and statistically significant at 5%, indicating that pesticide use is an important contributor to productivity. The result suggests that controlling pests effectively increases yield, although the magnitude of the effect is relatively small.

The elasticity of family labour is 0.018, meaning that a 1% increase in family labour increases maize output by only 0.018%. The effect is positive but very small, and not statistically significant. This indicates that additional family labour does not significantly increase maize yield, likely because the current labour level may already be adequate or the work is not labour-intensive.

Hired labour has an elasticity of –0.0324, suggesting that a 1% increase in hired labour reduces output by 0.032%. The elasticity is negative and insignificant, implying inefficiency in the use of hired labour. Possible reasons: Poor supervision, Low worker efficiency or labour exchange.

The elasticity for seed is –0.012, meaning that a 1% increase in seed quantity reduces output by 0.012%.

The effect is negative and insignificant. This suggests over-seeding or improper seed spacing, leading to overcrowding and reduced yield.

Farm size elasticity is –0.560, meaning a 1% increase in farm size reduces output by 0.56%. This effect is negative and statistically significant at 1%.Farmers experience strong decreasing returns with farm expansion. Smallholder farmers may lack adequate labour, equipment, or management skills to efficiently manage larger plots.

The elasticity of yield in the model context shows a small value (0.063). This confirms that the general responsiveness of maize output to other aggregated factors is positive but low.

Only pesticide use has a positive and significant elasticity, meaning it meaningfully contributes to maize yield. Family labour, hired labour, and seed have very small or negative effects, showing inefficiency in their use. Farm size has a large negative elasticity, showing serious diseconomies of scale among farmers. These results show that maize production in the study area is characterized by inefficient use of inputs, and the most productive input is pesticides.

Table 4.4: Results of the return to scale in the study area

RETURN TO SCALE	FREQUENCY	PERCENT
[0, -0.500)	22	24.44
[-0.500, -0.402]	26	28.89
[-0.402, -0.304]	28	31.11
[-0.304 , -0.206]	11	12.22
[-0.206, -0.107]	3	3.33
Mean RTS = -0.413		

Source: Field Survey, 2025,

A mean RTS of –0.412 indicates that when all inputs used in maize production are increased simultaneously by 1%, output decreases by about 0.412%. This reflects a situation of strong decreasing returns to scale, specifically negative returns, which is an abnormal but important finding in farm-level production analysis. This result suggests that farmers in the study area are likely operating beyond the economically efficient scale of production. Instead of increasing output, additional inputs are actually reducing productivity. This could be due to: Overuse of labour or fertilizer (input congestion), Poor timing or management of inputs, Low-quality inputs, Inefficient production practice, Improper combination of resources, Technical inefficiency.

4.4 Constraints faced by Maize Farmers in the Study Area

Table 4.4 presents the mean scores and standard deviations of the major constraints affecting maize farmers in the study area. The variables were measured on a Likert scale where 1 = Not a problem, 2 = Not serious, 3 = Moderately serious, 4 =Serious, and 5 = Very serious.

Therefore, lower mean values indicate more severe constraints, while higher mean values show less severe challenges.

A mean value of 1.80 suggests that low selling price is one of the most severe constraints faced by maize farmers. The high standard deviation (1.61) shows

variations in farmers' experiences, likely due to differences in market distance, bargaining power, or timing of sales. This aligns with Adeola *et al.* (2023) who reported that unstable and low maize prices significantly hinder scale efficiency and discourage expansion in Katsina State. Similarly, Ajah *et al.* (2012) highlighted price instability as a major threat to income stability among maize farmers in Abuja. With a mean score of 1.70, the high cost of inputs such as pesticide, seeds, and agrochemicals is a very serious constraint. The low standard deviation (0.69) indicates that most farmers uniformly experience this challenge. This finding corresponds with Osinowo *et al.* (2023) and Yamaha (2020) who found that high input prices significantly reduce returns and profitability among small-scale maize farmers. Gwandi *et al.* (2023) also emphasized that rising fertilizer prices reduce gross margins in Adamawa State. A mean of 1.78 shows that pests are perceived as a serious to very serious constraint. The SD of 0.99 shows moderate variability among respondents. This aligns with Usman *et al.* (2024) who found that pest attacks significantly decrease maize output in Gombe State. Ameh *et al.* (2020) also noted pests as one of the major challenges contributing to low productivity among maize farmers in Kaduna. The mean of 2.19 indicates that storage facilities are considered a serious constraint. The high standard deviation (1.48) suggests that experiences differ depending on access to better storage structures. This aligns with Ayodele *et al.* (2020) and Ebukiba *et al.* (2020) who both reported that inadequate storage exposes farmers to post-harvest losses, mold attack, and forced selling at low prices. The mean (2.88) value shows that transportation cost

is a moderately serious constraint. The high SD (1.41) indicates differing levels of transportation burden depending on farm location, fuel prices and road quality, while others do not Alabuja *et al.* (2022) emphasized that transport cost significantly affects production efficiency in Kuje Area Council. It aligns with Ayodele *et al.* (2020) who noted that poor transport conditions increase total production cost. With a mean of 3.40, poor road conditions are considered a moderate constraint, meaning the issue exists but is not the most critical. The high Standard deviation (1.47) shows wide variability, some farmers face very poor access roads while others do not. This agrees with Ayodele *et al.* (2020) who found that poor roads increase transportation challenges and post-harvest losses, explaining why the constraint affects farmers differently. A mean of 3.67 shows that climate issues are less severe overall compared to other constraints. The moderate Standard deviation (1.06) suggests differing levels of climate impact on farms.

This is consistent with Mohammed *et al.* (2025) who noted that climate constraints vary widely among maize farmers depending on their adaptation strategies and location. Ebukiba *et al.* (2020) also observed mixed climate impacts among maize farmers in Abuja. The highest mean (4.42) indicates that poor market access is not considered a problem for most farmers. The low SD (0.72) shows that respondents almost uniformly agree that market access is not a major constraint. This contradicts the findings of Ezike *et al.* (2024) who reported significant market access issues for

maize farmers in Nasarawa State, suggesting that the study area has better market connectivity.

Overall, the mean values show that economic constraints such as high input cost, low selling price, poor storage, and high transportation cost are more severe than physical constraints like road, market access, and climate-related issues, a pattern consistent with the broader literature on maize production constraints in Nigeria (Usman *et al.,* 2024; Ajah *et al.,* 2012; Osinowo *et al.,* 2023; Adeola *et al.,* 2023; Mohammed *et al.,* 2025).

Table 4.5: Constraints to Maize Production in the Study Area

Variable	Mean	Std. dev.
Pest	1.778	0.992
High cost of Inputs	1.7	0.694
Climate	3.667	1.059
Poor market access	4.422	0.719
Poor road	3.4	1.467
High cost of transport	2.877	1.413
Low selling price	1.8	1.609
Poor storage	2.189	1.483

Source: Field Survey, 2025

CHAPTER FIVE

SUMMARY, CONCLUSION AND RECOMMENDATIONS

5.1 Summary

The study examined the economics of maize production in Esan South East Local Government Area of Edo State, Nigeria. The specific objectives were to describe the socio-economic characteristics of maize farmers in Esan South East Local Government Area of Edo State, determine the cost and returns of maize production, estimate the elasticities for maize production, examine the return-to-scale (RTS) of maize farmers and identify the constraints face by small-scale maize farmers. Primary data were collected through a well-structured questionnaire and personal interviews. The questionnaire captured socio-economic characteristics, production costs, revenue, and constraints affecting maize production. Secondary data were also obtained from journals, reports, internet and records from relevant institutions to complement the primary data. A multistage sampling technique was employed. Three communities were purposively selected because of its high maize production potential and the predominance of smallholder maize farmers major maize-producing communities were selected. A snowballing technique was employed to identify maize farmers in the selected communities, to obtain a target population. Simple random sampling of maize farmers was carried out, bringing the total number of respondents to 90 farmers. Data were analyzed using both descriptive and inferential statistics. Descriptive statistics

such as frequencies, percentages, means, and standard deviations were used to describe the socio-economic characteristics of the respondents. Gross margin analysis was employed to examine the costs and returns of maize production, while the generalized production function was used to estimate the elasticities and examine the return-to-scale among maize farmers. In addition, Likert scale analysis was used to identify and rank the major constraints affecting maize farmers in the study area.

5.2 Findings

The results revealed that maize production is dominated by male farmers (75.56%), who are married with an average of 45 years with a mean household of 5. They went through secondary education and mostly small-scale farmers.

The gross margin analysis revealed a mean total variable cost of ₦65,931.92 and mean total revenue of ₦86,798.33. This resulted in a gross margin of ₦20,866.41 per farmer, indicating that maize production is profitable in the study area despite high production variability.

The results of the generalized production function showed that Pesticide had a positive and significant elasticity (0.111), Family labour (0.018) had a very small positive elasticity, Hired labour (–0.0324) and seed (–0.012) had negative elasticities, suggesting inefficiency or overutilization. Farm size recorded a large negative elasticity (–0.560), significant at 1%, indicating strong diseconomies of scale.

The mean return to scale was -0.413, this finding indicates that maize farmers in the study area are operating under strong decreasing returns to scale, likely due to poor input combination, overuse of certain inputs, and technical inefficiency.

The major constraints identified by farmers include pest infestation (mean = 1.78) and high cost of inputs (mean = 1.70). Other constraints such as poor market access (mean = 4.42), adverse climatic conditions (mean = 3.67), and poor road networks (mean = 3.40) were rated as less serious.

5.3 Conclusion

Based on the findings, the study concludes that maize production in Esan South East Local Government Area, is profitable but characterized by substantial inefficiencies in input use. While pesticides positively contribute to yield, key inputs such as seed, labour, and farm size are not efficiently used, resulting in negative elasticities. The negative return to scale (–0.413) further highlights that farmers are operating beyond the optimal scale of production, whereby additional inputs result in a decline in output. Furthermore, structural challenges such as poor market access, unfavourable climatic conditions, and poor road infrastructure significantly hinder productivity and reduce profitability. To improve maize production and ensure optimal resource use, targeted interventions and capacity-building efforts are necessary.

5.3 Recommendations

Based on the findings of the study, the following recommendations are made:

1. Youth and women within the working class age should engage in maize farming as it is a profitable venture and this in turn would reduce the level of unemployment in the society.

2. The negative elasticities recorded for seeds, hired labour, and farm size suggests improper input mix. Farmers should therefore apply seeds at recommended planting densities, avoid unnecessary expansion of farmland beyond their management capacity, and use hired labour only when essential.

3. To address challenges such as pest infestation, high input costs, poor market access, and road-related difficulties, farmers should adopt integrated pest management practices, use resistant maize varieties when available, and apply ash or organic repellents as low-cost pest control techniques.

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APPENDIX
RESEARCH QUESTIONNAIRE
DEPARTMENT OF AGRICULTURAL ECONOMICS AND EXTENSION SERVICES
FACULTY OF AGRICULTURE
UNIVERSITY OF BENIN
BENIN CITY

Dear Respondent,

This questionnaire aims to gather information on the **"Economic of Maize (Oka) Production among Smallholder Farmers in Esan South East LGAs Edo State,"** Nigeria. Your responses are solely for academic purposes and will be treated with confidentiality.

Thank you for your participation.

Itepu Lucky Osas

Researcher

Section A: Socio-Economic Characteristics

1. Age: _____ years
2. Sex: ☐ Male ☐ Female
3. Marital Status: ☐ Single ☐ Married ☐ Widowed ☐ Divorced
4. Household size: _____ persons
5. Highest educational level completed: ☐ Non-formal ☐ Primary ☐ Secondary ☐ Tertiary

6. Secondary Occupation: ☐ Farming ☐ Trading ☐ Artisan ☐ Civil Servant ☐ Other (Please specify) _____
7. How many years have you been farming maize? _____
8. How many family members work on your farm? _____
9. How many hired workers do you engage per season? _____

Section B: Costs and Returns in maize Production

1. What is the size of your farmland used for maize production? _____
2. What are your estimated costs/quantity per season for the following inputs?
    a. Seeds/Seedlings: _____ / _____
    b. (Organic/Inorganic): _____ /_____
    c. Pesticides: _____ / _____
    d. Labor (Hired): _____ / _____
    e. Labor (Family): _____ / _____
    f. Irrigation/Water: _____ / _____
    g. Other (Specify): _____ / _____

9. What is your yield of maize per season? _____

10. What is the average price of maize? _____

11. Do you incur transportation costs for selling maize? (a) Yes (Estimate per season in Naira): _____ (b) No [ ]

12. How much do you spend on storage per season? ₦ _____

Section C: General Challenges

13. What are the major challenges you face in maize production? (Check all that apply)

		Not a problem	**Not serious**	**Moderately serious**	**Serious**	**Very serious**
A	Pest and disease infestation					
B	High cost of input					
C	Climate change/unpredictable weather					
D	Lack of market access					
E	Poor road					
F	High cost of transportation					
G	Poor storage					
H	Low selling price					
	Others (Please specify)					

14. What solutions do you suggest to improve maize production?

_____

_____