FARM LEVEL EFFICIENCY OF CASSAVA PRODUCTION IN UHUNMWONDE LOCAL GOVERNMENT AREA OF EDO STATE NIGERIA

BY

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FACULTY OF AGRICULTURE

UNIVERSITY OF BENIN

BENIN CITY

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A PROJECT SUBMITTED TO THE DEPARTMENT OF AGRICULTURAL ECONOMICS AND EXTENSION SERVICES, FACULTY OF AGRICULTURE, UNIVERSITY OF BENIN, BENIN CITY IN PARTIAL FULFILLMENT FOR THE REQUIREMENTS FOR THE AWARD OF BACHELOR'S DEGREE IN AGRICULTURE (OPTION: AGRICULTURAL ECONOMICS AND EXTENSION SERVICES)

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CERTIFICATION

This is to certify that the research work on the farm level efficiency of cassava production in uhunmwonde local government area of edo state nigeria was carried out by Marvelous Eloghosa Ogedebge with the Mat. No AGR2000029 under the supervision of the department of Agricultural Economics and Extension Services, Faculty of Agriculture, University of Benin, Edo State, Nigeria.

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DEDICATION

I wholeheartedly dedicate this research work to God Almighty, the source of wisdom, strength, and inspiration. His grace has guided me through every step of this journey. To Him be all the glory.

ACKNOWLEDGMENT

With a heart full of gratitude, I give all thanks and glory to God Almighty, my source of wisdom, strength, and guidance. His grace has sustained me, His love has uplifted me, and His divine favor has made this journey possible. Through every challenge, He has been my refuge, and without His mercy, this research would not have been accomplished.

I sincerely appreciate myself for the dedication, resilience, and perseverance that have brought me this far. This journey has not been without its challenges, but through determination and faith, I have pushed through every obstacle. I celebrate my own hard work and commitment to achieving this milestone.

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Above all, I return all the glory to God Almighty, who has been my guide, my strength, and my source of inspiration. To Him alone be all the praise!

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ABSTRACT

Cassava production remains a major livelihood activity and an important contributor to food security in Nigeria. However, farmers in Uhunmwonde Local Government Area (LGA) of Edo State face several production challenges that affect their efficiency and profitability. This study assessed the farm-level efficiency of cassava production in the area, focusing on the socio-economic characteristics of farmers, cost and returns, technical efficiency, and major production constraints. A two-stage sampling procedure was used to select 120 cassava farmers from six purposively chosen communities. Data were obtained through a structured questionnaire and analyzed using descriptive statistics (means and percentages), gross margin analysis to determine profitability, a stochastic frontier production function to estimate technical efficiency, and a Likert scale to identify production constraints. The results showed that cassava farming is dominated by middle-aged, active farmers, with 74.17% being male and a mean age of 41 years. Most respondents were married (58.33%) and had moderate to high education levels, with 37.50% possessing OND/NCE qualifications. The farmers had an average of 13 years of farming experience, and 52.10% had household sizes of 1–5 persons. The cost and returns analysis revealed that cassava production is profitable, with a total revenue of ₦1,884,166.67 and a total variable cost of ₦1,022,710.51, resulting in a gross margin of ₦861,456.16. The stochastic frontier model indicated that farmers operated at a mean technical efficiency of 0.68, suggesting that they achieved only 68% of their potential output and could increase productivity by 32% without increasing input levels. The distribution of technical efficiency scores showed that 40% of farmers fell within the 0.51–0.70 range, 37.5% between 0.71–0.90, while only 3.33% attained near-optimal efficiency (0.91–1.0). Farmers also faced several constraints, with unpredictable input prices (mean = 3.02), pest and disease outbreaks (mean = 2.95), and lack of mechanized equipment (mean = 2.79) emerging as the most severe challenges. The study concludes that cassava farming in Uhunmwonde LGA is profitable yet constrained by inefficiencies and production challenges. It recommends increasing extension contact, strengthening access to subsidized inputs, and establishing community-level mechanization hubs to improve efficiency and enhance cassava productivity in the area.

1.0 INTRODUCTION

1.1 Background information

Cassava holds critical importance in Edo State, serving as a backbone for food security, rural livelihoods, and economic development (Omofonmwan, 2014). It is a major staple food, particularly in rural communities like those in the Esan region, where garri and fufu, both cassava derivatives, are dietary mainstays (Omofonmwan, 2014). Its year-round availability ensures consistent household nutrition, making it a vital crop for food security, especially when compared to more seasonal alternatives. Beyond consumption, cassava cultivation is a key source of income for thousands of smallholder farmers across the state (Oyotomhe et al., 2025). Over 72% of rural farmers in cassava-growing regions like Esan, rely on it as their primary livelihood activity (Omofonmwan, 2014). The crop supports a broad value chain that spans farming, processing, transport, and retail, providing employment and contributing significantly to poverty alleviation (Odiase and Oseyomon, 2024). Cassava's economic role is further reinforced by its industrial relevance in food, feed, and pharmaceutical sectors, as well as its growing appeal among agripreneurs seeking to adopt improved varieties and mechanized systems for greater productivity (Odiase and Oseyomon, 2024). Its adaptability to local soil and climate conditions, as well as its resistance to drought and pests, makes it particularly suitable for Edo State's agro-ecology (Omofonmwan, 2014). In all, cassava's nutritional, economic, industrial, and socio-cultural significance places it at the center of rural development and household resilience in the state.

Cassava production in Uhunmwonde LGA is largely characterized by traditional farming methods and tools that limit productivity and efficiency. Most smallholder farmers still rely on hoes, cutlasses, digging sticks, and manual graters for all stages of cassava cultivation and

processing. Land preparation, planting, weeding, harvesting, and processing are performed manually, often without precision or technological support. These traditional practices result in the underutilization of land, high labor demands, and time-consuming operations (Ehilenboadiaye et al., 2021). The adoption of improved practices such as high-yield varieties (e.g., TME 419), mechanized land preparation and harvesting, chemical weed control, fertilizer application, and extension-led training has been shown to significantly raise both technical and economic efficiency (Ehilenboadiaye et al., 2021). These innovations can double or triple output, reduce drudgery, and enhance profitability. Despite these benefits, adoption remains limited due to barriers such as poor access to credit, machinery, and extension services (Odiase and Oseyomon, 2024).

1.2 Statement of the problem

Despite the importance of cassava to food security and livelihoods in Uhunmwonde LGA, farm-level efficiency remains low. Many farmers are unable to reach their production and profit potential due to inefficient use of available resources (Oyotomhe et al., 2025). This is largely driven by poor resource use, land and inputs are underutilized, while labor is overused and costly. Contributing factors include limited access to land, credit, and improved inputs, high labor demands due to manual practices, pest and disease infestations, and weak extension services (Oyotomhe et al., 2025). Furthermore, technical efficiency remains suboptimal, with studies showing an average efficiency of just 0.76 (Oyotomhe et al., 2025). These challenges not only reduce productivity and profitability but also restrict cassava's role in addressing food insecurity and poverty in the region. Yet, there is limited empirical data specific to Uhunmwonde on how these inefficiencies manifest and how they can be addressed. This study, therefore, aims to assess farm-level efficiency in cassava production and identify key determinants affecting farmers'

performance in the area. In light of this, the study seeks to provide answers to the following questions.

1. What are the socio-economic characteristics of cassava farmers in the study area?
2. What is the cost and returns of cassava production in the study area?
3. What is the technical efficiency of cassava production in the study area?
4. What are the constraints faced by cassava farmers in the study area?

1.3 Objectives of the study

The main objective of the study is to determine the farm-level efficiency of cassava production in Uhunmwonde LGA, Edo state. The specific objective are to;

1. Describe the socio-economic characteristics of cassava farmers in the study area,
2. Determine the cost and returns of cassava production in the study area,
3. Determine the technical efficiency of cassava production in the study area,
4. Examine the constraints faced by cassava farmers in the study area.

1.4 Justification for the study

Many studies in relation to farm-level efficiency on cassava production have been conducted in Nigeria. For instance, Anyaegbunam et al. (2010) reported that the average technical efficiency of cassava farmers in Nigeria ranges between 69% and 87%, indicating considerable room for improvement in resource allocation and production management. Further evidence by Ogundari and Brümmer (2011) highlights that many cassava farmers still operate below optimal productivity levels, with efficiency often constrained by factors such as limited education, age,

and inefficient land use. Similarly, Ojiako et al. (2018) found that while cooperative membership and farming experience improve efficiency, misapplication of key inputs, such as fertilizers and labor continues to reduce output. Despite these insights, much of the existing research has focused on general or regional levels, with limited attention to specific local government areas like Uhunmwonde in Edo State.

To the best of current knowledge, no comprehensive study has directly evaluated the technical or economic efficiency of cassava production in Uhunmwonde LGA. This study is therefore essential to fill this gap by providing localized, evidence-based insights on efficiency levels, production practices, and resource use. The findings will be useful for guiding agricultural policy, extension services, and development programs tailored to the unique needs of cassava farmers in Uhunmwonde.

2.0 LITREATURE REVIEW

2.1 Conceptual Framework

Cassava production serves as a food security crop that is tolerant to low soil fertility and drought, and a major source of cash income for smallholder farmers in Nigeria. It plays a key role in poverty alleviation and human consumption, with less than 5% used in industry (FAO, n.d.). Cassava production in Nigeria is vital for food security, poverty alleviation, and income generation for smallholder farmers. Cassava is drought-tolerant, resistant to low soil fertility, and provides food year-round, making it essential for household nutrition and cash income. Most cassava is consumed locally, with less than 5% industrial use (FAO, n.d.).

Cassava production systems in Nigeria involve mostly small-scale farming with traditional and improved methods. Common systems include monocropping, intercropping, crop rotation, and fallow systems. Land and labor are major inputs, with education and youth involvement improving efficiency (Hauser et al., 2014). Farmers use various methods such as monocropping, where cassava is grown alone; intercropping, where it is grown with other crops; crop rotation, alternating cassava with other crops over seasons; and fallow systems, which allow land to rest for soil fertility restoration. Inputs mostly include land, labor, planting stems, herbicides, and sometimes fertilizer (Hauser et al., 2014). Education and involvement of younger farmers improve efficiency and productivity.

Concept and Types of Farm Efficiency

Types of farm efficiency include:

Technical efficiency: Producing maximum output from given inputs.

Allocative efficiency: Optimal input use given prices.

Economic efficiency: Combination of technical and allocative efficiency.

Technical efficiency explains how well a farmer uses available inputs to maximize output, allocative efficiency reflects how well input levels are chosen given their prices, and economic efficiency combines both to indicate overall production efficiency (Ologbon et al., 2021).

Cost and Returns in Cassava Production

Cost and returns analysis shows cassava production is profitable with gross margins and net farm income reported for sole cropping and intercrop systems. Profitability indicators include total factor productivity and net income, which vary by system (Awerije & Rahman, 2014). Cassava farming is profitable with gross margins and net incomes varying by cropping system. Sole cropping tends to yield higher output per input compared to intercrop systems. Profitability indicators include total factor productivity (TFP) and net farm income, with cassava showing good returns across farms of different sizes (Okoh, 2016).

Factors Affecting Farm Efficiency

Factors affecting farm efficiency include education, farming experience, farm size, credit access, labor availability, and use of improved technology (Ologbon et al., 2021). Education level and farming experience improve resource use, larger farm size tends to improve efficiency, access to credit facilitates input acquisition, and availability of labor and use of improved technologies enhance productivity (Igbaifua, Adeniyi, & Omolehin, 2022).

Major constraints to cassava production include limited access to land, scarcity of inorganic fertilizer, reduced soil fertility due to continuous cropping, labor intensity of traditional processing methods, and limited industrial utilization (Igbaifua et al., 2022). Limited cultivable land for expansion, scarcity and high cost of inorganic fertilizers, reduced soil fertility due to continuous cropping and reduced fallow periods, labor-intensive traditional processing methods, and low industrial demand and utilization of cassava products (less than 5%) are the key challenges facing cassava production (FAO, n.d.).

2.2 Theoretical Framework

Production Theory

The relationship between inputs and output in production theory describes the technical relationship where a production function specifies how different inputs such as land, labor, seeds, and fertilizer are transformed into an output such as cassava yield (Oni, 2016). In cassava production in Nigeria, inputs such as seed, fertilizer, labor, credit, and manure are considered critical, with each input expected to exert a positive impact on productivity and profitability (Oni, 2016). For example, fertilizer use significantly affects output, especially in nutrient-poor soils, and credit facilitates acquiring necessary inputs, leading to higher output.

Farrell's Efficiency Theory (1957)

Farrell's efficiency theory (1957) forms the basis for measuring technical and economic efficiency (Abass et al., 2019). Technical efficiency measures the ability of a production unit to obtain maximal output from a given set of inputs, while economic efficiency combines technical efficiency with allocative efficiency, which reflects the optimal use of inputs given their prices.

Farrell's approach quantifies efficiency by comparing observed production points to an efficient frontier, highlighting gaps where productivity improvements are possible (Abass et al., 2019).

Stochastic Frontier Production Function (SFPF)

The Stochastic Frontier Production Function (SFPF), developed by Aigner et al. (1977), is a statistical model used to estimate efficiency by separating random errors from inefficiency effects in production data. It recognizes that deviations from the frontier may be due to statistical noise or inefficiency, allowing for better measurement of how close a farmer or firm is operating to the production frontier. This model is widely used in agricultural economics, including studies of cassava production efficiency, to identify factors determining technical efficiency and quantify efficiency gaps (Abass et al., 2019).

2.3 Empirical Framework

Socio-economic characteristics of cassava farmers in Nigeria.

Empirical studies on the socio-economic characteristics of cassava farmers in Nigeria show that production outcomes are influenced by demographic, educational, and economic factors. The average age of cassava farmers is around 43–44 years, indicating a predominantly middle-aged population with considerable experience but limited adoption of innovations ((Uchemba et al., 2021); Ayodele et al., 2016). Males constitute the majority (51–77.5%), and most farmers are married, enhancing household labor supply (Alabuja et al., 2023).

Farmers generally have about 9–10 years of education, which supports moderate adoption of improved practices, though limited extension contact (about 3.59 visits annually) constrains technology transfer ((Uchemba et al., 2021)). Average annual incomes range from ₦374,868 to

$861,103, and most operate on small plots of less than 2 hectares (Ayodele et al., 2016). With an average of 14–15 years of farming experience, cassava producers possess practical knowledge but often lack access to modern resources (Aboajah et al., 2018).

Efficiency studies show variability across seasons, with late-season farms achieving higher productivity levels (Nwadiolu et al., 2024). Overall, cassava farming in Nigeria is dominated by smallholders who are moderately educated and experienced but limited by small farm sizes, poor extension access, and inadequate resources, all of which affect farm-level efficiency.

Cost and returns of cassava farming

Empirical studies have consistently shown that cassava production is a profitable agricultural enterprise that plays a vital role in enhancing food security and rural incomes in Nigeria and other cassava-producing countries. However, profitability levels differ depending on factors such as production systems, input use, and regional conditions.

In Ekiti State, Nigeria, Toluwase and Abdu-Raheem (2013) reported an average gross margin of ₦68,662.50 and a cost–benefit ratio of 1:2.19, demonstrating that cassava farming is economically viable. Similarly, Herbert and Nyienakuna (2012) found that in Rivers State, mixed cropping systems such as cassava/maize/yam recorded the highest gross margin of ₦64,209 per hectare, emphasizing that intercropping can enhance income diversification and profitability.

Outside Nigeria, Ribeiro et al. (2019) observed strong profitability potential in Goiás, Brazil, with a net present value (NPV) of R$49,268.45 and an internal rate of return (IRR) of 45%. Likewise, Ojiako et al. (2018) found that smallholder cassava farmers in southern Nigeria could

increase gross revenue from ₦277,400 to ₦596,000 through the adoption of improved technologies and better management practices.

Overall, evidence suggests that cassava production remains economically rewarding across different regions, though profitability is affected by rising input costs, limited access to credit, and inefficient production techniques. Strengthening farm management and promoting improved practices are therefore essential for sustaining and maximizing returns in cassava farming.

Technical and Economic Efficiency of Cassava Production in Nigeria

Ogunniyi et al., (2020) reported that the technical efficiency of cassava farmers in Nigeria ranged between 65.1% and 92%, reflecting a considerable gap between potential and actual productivity. This implies that farmers could substantially increase their output by optimizing resource use and adopting improved practices. Similarly, Bello et al. (2024) found that farming experience, land size, and the use of agrochemicals significantly influenced technical efficiency, with experienced farmers achieving higher yields due to better management and effective application of farm inputs. Akpan et al. (2020) further supported these findings, noting that increased use of agrochemicals and access to extension services positively affected technical performance among cassava producers.

In terms of economic efficiency, Nwadiolu et al. (2024) observed efficiency scores of 0.63 for early-season and 0.78 for late-season cassava farms, indicating that later planting seasons tend to yield better resource utilization. Other studies reported a mean economic efficiency of approximately 0.825, suggesting that farmers are relatively efficient in allocating resources, though not at full potential. Akpan et al. (2020) also identified farm size, labor input, and

education level as critical determinants of economic efficiency, emphasizing that better-educated farmers were more capable of managing production costs and maximizing returns.

Constraints to Cassava Production in Nigeria

Cassava production in Nigeria continues to face numerous constraints that limit its efficiency, productivity, and overall contribution to food security. Studies have shown that these challenges stem from technological, financial, agronomic, and institutional factors that disproportionately affect smallholder farmers who dominate the cassava sector.

St. John and Onah (2025) reported that postharvest losses remain a major technological challenge, with only 32.6% of farmers adopting mechanized processing technologies such as pulverizers. This limited technological adoption reduces efficiency and leads to significant postharvest waste. Similarly, Abideen (2013) observed that weak infrastructure, inadequate funding, and a shortage of skilled personnel hinder the application of biotechnology innovations that could enhance cassava yields and resistance to diseases.

Financial challenges also play a critical role in reducing production efficiency. Ogunniyi et al. (2020) identified high input costs, particularly for labor and agrochemicals, as a major barrier to optimal resource utilization. Abideen (2013) further noted that insufficient financial support for research and development restricts innovation and the scaling up of improved production technologies.

Agronomic and institutional issues further compound these challenges. Akinnagbe (2010) found that poor planting materials and inadequate agronomic practices significantly contribute to low productivity among cassava farmers. In addition, Abideen (2013) highlighted the absence of

supportive legislation and institutional frameworks as a major limitation to implementing effective agricultural interventions.

Despite these constraints, researchers agree that the potential for cassava production in Nigeria remains high if these barriers are systematically addressed. Strengthening access to modern technologies, improving financial support mechanisms, and fostering collaboration among farmers, researchers, and policymakers are critical steps toward enhancing cassava productivity and ensuring the sector's sustainability.

Research Gaps

Although several studies have examined the profitability, efficiency, and constraints of cassava production in Nigeria, there remains a notable gap in understanding the farm-level efficiency of cassava production in Uhunmwonde Local Government Area of Edo State. Most existing studies focus on broader regional or national analyses, overlooking the localized socio-economic and environmental factors that influence efficiency at the community level.

Furthermore, while past research has addressed technical and economic efficiency separately, limited attention has been given to the combined analysis of efficiency determinants, such as education, credit access, and input utilization, using farm-level data specific to smallholder farmers. Additionally, few studies have empirically linked socio-economic characteristics, cost-return dynamics, and production constraints to efficiency outcomes within Edo State, despite its significant cassava production potential.

Therefore, this study seeks to fill these gaps by assessing **the** farm-level efficiency of cassava production in Uhunmwonde LGA, focusing on the socio-economic characteristics of farmers,

profitability, technical and economic efficiency levels, and the key constraints affecting production. This localized approach provides insights that can inform targeted policy interventions for improving cassava productivity and farmer livelihoods in the region.

3.0 RESEARCH METHODOLOGY

3.1 Study Area

This study will be carried out in Edo State. Edo State is located in the south–south geo political zone of Nigeria with a total population of about 3.2 million people. It was formed in 1991 by the split of Bendel State into Edo and Delta State. It has a land mass of 19,749km with a population density of 121 people per square kilometer (Edo ADP, 2007).

The administrative capital is Benin City and it is comprised of eighteen (18) local Government Area; Akoko Edo, Egor, Esan Central, Esan North East, Esan South East, Esan West, Estako Central, Estako East, Estako West, Igueben, IkpobaOkha, Oredo, Orhionmwon, Ovia North East, Ovia South West, Owan East, Owan West and Uhunmwonde. The state is comprised of three agro-ecological zones viz; Edo south, Edo North, and Edo Central. Uhumwonde has an area of 2,033km^2 and a population of 121,749 at the 2006 census (Wikipedia contributors, 2025). The villages in Uhunmwonde Local Government Area includes, Obandan, Iguevbiahiamwen, Ogheghe, Igieduma, Ugiamwen, Igueuwangue, Ebueneki.

3.2. Sampling Procedure and Data collection method

A two-stage sampling procedure will be used for the selection of respondents. The first stage will involve a purposive selection of six communities from Uhummwonde LGA (Iguevbiahiamwen, Ogheghe, Igieduma, Ugiamwen, Igueuwangue, Ebueneki). The second stage will involve the use of a simple random sampling technique to select twenty (20) casssava farmers from each of the six communities, which will amount to 120 cassava farmers for the study.

The study will use both primary and secondary data. The primary data will be collected with the use of a structured questionnaire. While the secondary data will be collected from articles, journals, universities, government parastatals and bulletins.

3.3 Measurement of Variables

Independent variables

1. Age

2. Sex

3. Marital status

4. Level of education

5. Years of cassava farming experience

6. Household size

7. Farm size

8 Extension contact

9. Income of the farmers

Dependent variable

1. Farm-level efficiency

3.4 Data Analysis

Objective 1: This will be analyzed using frequency and percentages

Objective 2: Gross margin analysis will be used. Gross margin is the difference between the total revenue,(TR) and the total variable cost,(TVC).

GM= TR-TVC

Where GM = Gross Margin,

TR = Total Revenue (gross value of output),

TVC = Total Variable Cost.

Objective 3: A Stochastic frontier function will be employed. The tcoub douglas production function will be fitted to the frontier model of cassava production. The result will be estimated using the maximum likelihood method. The stochastic frontier production function is written as:

$Yi=f(X: \beta) +e$.....(1)

$e_i = V_i-U_i$.....(2)

Where:

Yi = Output of the ith farm

Xi = Vector of inputs used by the ith farm

B = A vector of the parameters estimated

e_i = Composite error term

V_i = Random error outside farmers control

U_i = Technical inefficiency effects

The empirical stochastic frontier model that will be employed is specified as follows:

$\ln Y1=\beta_0+\beta_1(\ln X_1 I + \beta_2 \ln X_2 I + \beta_3 \ln X_3 i + \beta_4 \ln X_4 I + \beta_5 \ln X_5 I + \beta_6 \ln X_6 I) + V_i - U_i$------- (3)

Where;

Subscripts ij refer to the jth observation of ith farmer,

In = Logarithm to base e,

Y = Output of cassava

β_0 = Constant

β_1 -β_6 = Parameters estimated

X_1 = Cassava stems (Kg)

X_2= Size of farm (acre)

X_3= Labour (man/days)

X_4= Agrochemicals (Litre)

X_5 = Fertilizer (kg)

X_6= Cost of mechanized services (₦)

V_i = Pest infestation (number of pest)

U_i = Inefficiency effect which are non- negative with half normal distribution.

It is assumed that inefficiency effects are independently distributed and Uij arises by truncation (at zero) of the normal distribution with mean Uij and variance δU^2 where Uij is specified as;

$$U_i = \delta_0 + \delta_1 InZ_1 i + \delta_2 InZ_2 i + \delta_3 InZ_3 i + \delta_4 InZ_4 i + \delta_5 InZ_5 i + \delta_6 InZ_6 i \text{----------(5)}$$

Where;

U_i = Inefficiency effect of cassava production

δ_0 = Constant

δ_1-δ_6 = Parameters to be estimated

Z_1 = Farmers age (years)

Z_2 = Household size of farmer (number)

Z_3 = Years of formal education of the farmer (years)

Z_4 = Years of farming experience of the farmer in cassava production (years)

Z_5 = income level (naira)

Z_6 = Number of contacts with extension agents (measured as number of contacts in a year)

Objective 4: Likert scale will be used to assess how strongly the farmers agree or disagree with the various constraint statements.

CHAPTER FOUR

RESULTS AND DISCUSSION

4.1 Socio-Economic Characteristics of Casssava Farmers

4.1.1 Sex Distribution

The results in table 4.1 show that cassava farming in Uhunwonde local government area is male-dominated, with 74.17% of the farmers being male and 25.83% female. This aligns with findings from Obi-Egbedi and Adeoye (2023), who reported that 76% of cassava farmers in Oyo State were male, reflecting the physically demanding nature of cassava cultivation and gendered access to farm resources. Similarly, a national study by Ayanlade *et al*. (2023) found that 78% of cassava farmers in Nigeria were men, emphasizing that men generally participate more in labor-intensive crop production. These consistent patterns suggest that gender disparities remain a significant factor in cassava farming participation across Nigeria.

4.1.2 Age Distribution

The age distribution in table 4.1 indicates that most cassava farmers in Uhunwonde local government area fall within the economically active range, with 34.17% aged 29–35**,** 30.83% aged 36–45**,** and 33.33% aged 46–55, indicating that cassava farming in the area is dominated by productive, middle-aged adults. This pattern aligns with the findings Sanusi *et al*. (2016) who found that cassava farmers in Ogun State were predominantly between 30 and 55 years, showing that middle-aged individuals are more likely to participate due to their physical strength,

experience, and access to farmland. These consistent trends suggest that cassava farming remains an enterprise driven by active-age individuals across Nigeria.

4.1.3 Marital Status

Table 4.1 reveals that majority of the cassava farmers in Uhunwonde are married (58.33%), followed by 40% who are single and 1.67% who are divorced. This distribution agrees with findings by Bello et al. (2025), who reported that cassava farming in Nigeria is predominantly practiced by married individuals, noting that marriage often provides household labor support and stability needed for agricultural activities.

4.1.4 Household Size

The study reveals that 52.1% of cassava farmers in Uhunwonde have household sizes between 1-5 persons, with an average of 5 persons per household. This pattern aligns with findings by Bello et al. (2025), who reported that Nigerian cassava farmers typically maintain moderate to large household sizes, which serve as an important source of family labor for farming operations.

4.1.5 Educational Level

Table 4.1 indicates that 37.50% cassava farmers in Uhunwonde attain OND/NCE, and 30.83% with HND/B.Sc, 12.50% completed primary school, while only 4.17% have no formal education. This reflects a relatively high level of educational attainment among cassava farmers in Uhunwonde. A study by Ayodele, Alfred, and Akinnmoyegun (2016) in Ondo State found that 85% of cassava producers had some formal education, suggesting that higher education among cassava farmers is common in Nigeria and may improve adoption of agricultural innovations and effective farm management (Ayodele et al., 2016).

4.1.6 Farming Experience

The results in table 4.1 shows that 33.61% of cassava farmers in Uhunmwonde LGA have 6–10 years of farming experience, 38.66% have 11–15 years, and 27.73% have 16 years or more, with a mean of 13.19 years. This indicates that most farmers are relatively experienced, which can positively influence farm-level efficiency. Supporting this, Anyanwu, Kalio, Olatunji, and Akonye (2014) found that farming experience significantly improves technical efficiency among cassava farmers in Rivers State, as experienced farmers are better at managing resources and adopting improved practices. Similarly, Gbigbi (2021) reported that more experienced cassava farmers in Delta State exhibited higher efficiency levels. Therefore, the predominance of experienced farmers in this study suggests a potential for higher productivity and better farm management in the area.

4.1.7 Contact with Extension Agents

Table 4.1 indicates that 54.53% of cassava farmers in Uhunwonde LGA report yearly contact with extension agents, 35.09% report quarterly contact, and 10.53% have contact only monthly, while none report weekly contact. This suggests that overall extension engagement is quite low and infrequent. Research supports that this limited extension contact may hamstring technical efficiency: for instance, Asogwa, Umeh, & Ater (2006) found that extension contact is significantly and positively related to technical efficiency among Nigerian cassava farmers. Also, a study in Ondo State found access to extension agents to be one of the determinants of efficiency for cassava producers (Ajayi and Olutumise, 2018).

4.1.8 Annual Income

The results in table 4.1 shows that the majority of cassava farmers in Uhunmwonde LGA earn between ₦3,000,000 and ₦3,999,999 annually, with 30.00% earning ₦2,000,000–₦2,999,999, 23.3% earning ₦1,000,000–₦1,999,999, and only 8.33% earning ₦4,000,000–5,000,000, giving a mean annual income of ₦2,554,167. This suggests that cassava farming provides a moderate income for most respondents. Previous study by Gbigbi (2021)) found that cassava farmers in Nigeria earn between ₦2,000,000–₦2,999,999 annually, reinforcing the findings of this study.

Table 4.1 Socioeconomic characteristics

	Frq	%	mean
Sex			
Male	89	74.17	
Female	31	25.83	
Age (Years)			
29-35	41	34.17	
36-45	37	30.83	41
46-55	40	33.33	
56-60	2	1.67	
Marital status			
Single	48	40	
Married	70	58.33	
Divorced	2	1.67	
Household size			
1-5	62	52.10	5
6-10	57	47.90	
Highest level of education			
No Formal Education	5	4.17	
First school living certificate	15	12.50	
Junior secondary school	0	0	
Senior secondary school	18	15.00	
OND/NCE	45	37.50	
HND/B.Sc	37	30.83	
Post Graduate	0	0	
Farming experience			
6-10	40	33.61	
11-15	46	38.66	13.19
16 and above	33	27.73	

Contact with Extension agent			
Weekly	0	0	
Monthly	12	10.53	
Quarterly	40	35.09	
Yearly	62	54.53	
Annual income			
₦1,000,000-₦1,999,999	28	23.3	
₦2,000,000-₦2,999,999	36	30.00	₦2,554,167
₦3,000,000-₦3,999,999	46	38.33	
₦4,000,000-₦5,000,000	10	8.33	

Source: field survey, 2025

4.2 Cost and Returns Analysis

The cost and returns analysis for cassava production in Table 4.2 shows a total revenue (TR) of ₦1,884,166.67, with variable costs (VC) of ₦1,022,710.51. The gross margin (GM), is ₦861,456.16, which suggests a high profitability potential from cassava cultivation in Uhunmwonde LGA.

These findings align with those of Oshioriamhe, Uwagboe, and Akarue (2025), who found that cassava farmers in their study realized a total revenue of ₦990,826.67 against a production cost of ₦174,346.00, yielding a gross margin of ₦816,480.67 (gross margin ratio = 0.824), showing that cassava production was very profitable in their context. Similarly, Gbigbi and Chuks- Okonta (2021) reported in Delta State that cassava production's total cost was ₦221,500, total revenue ₦398,000, and profit (net return) ₦176,500, with a benefit- cost ratio (BCR) of 1.80, emphasizing resource use efficiency and profitability.

Another study by Jatto, Adeoye & Oke (2020) in Oyo State showed a gross margin of ₦72,318.75 per hectare and a benefit-cost ratio of 1.85 (i.e., for every ₦1 invested, farmers earned ₦0.85 in profit), indicating that even at smaller scales, cassava production can yield good returns.

These comparative studies support the view that cassava farming, when properly managed with access to inputs like fertilizer, quality cuttings, labor, and good agronomic practices, can generate substantial gross margins. The high gross margin suggests that farmers in Uhunmwonde LGA are operating under favorable conditions or have optimized key cost components. However, it also underscores the need to maintain or further improve input-use to sustain and possibly increase profitability.

Table 4.2 Cost and Returns

	qty	Cost
Revenue		1,884,166.67
Variable cost VC		
Cassava stems (kg)	137	194,204.17
Herbicides (liters)	20.48	124,041.67
Fertilizer (kg)	14.2	313,916.67
Labor (Man-days)	27	169,214.67
Farm equipment	6	95,500.00
Transportation		125,833.33
Total VC		1,022,710.51
GM= TR-TVC		861,456.16

Source: field survey, 2025

4.3 Production information

4.3.1 Land Ownership and Acquisition

The results in table 4.3 shows that 63.33% of the cassava farmers in Uhunmwonde LGA own the land they farm on, while 31.67% do not. Among the owners, 49.40% acquired it thorough inheritance, 30.12% obtained it through family allocation, and 20.48% purchased it. This pattern mirrors findings in other Nigerian cassava-producing regions; a recent study in Edo State showed that land tenure is frequently secured through family inheritance and traditional land rights (Oshioriamhe, Aiyedun, and Ebukiba, 2025). Studies on land tenure in Nigeria also highlight that inheritance remains a dominant mode of land acquisition among cassava farmers, which supports the idea that such ownership can promote long-term investments in soil fertility and farm expansion (Adetomiwa, Iseoluwa, and Babatunde, 2020).

4.3.2 Farm Size

The findings indicate that 41.67% of farmers operate on farm sizes between 2-3 hectares, 34.17% farm on 3-4 hectares. 19.7% cultivate 1-2 hectares, and 5% operate on less than 1 hectare. This indicates that cassava production is dominated by small- to medium-scale farms. This is consistent with findings from Ekiti State, where Owoeye & Toluwase (2018) found that 67.5% of cassava farmers operate on farms of 3 hectares or less, highlighting the prevalence of smallholder farming.

4.3.3 Source of Farm Labour

The results show that 63.33% of farmers utilize both hired and family labor, 35.83% rely solely on hired labor, while only 0.8% depend on family labor. This is broadly in line with other

empirical evidence from cassava farming in Nigeria. Ndubueze- Ogaraku et al. (2024) found that in Delta State, about 44% of cassava farmers use a combination of self (family) and hired labour for their operations. Also, in Oyo State, Abila (2012) reported that a mix of family, hired, and contract labour is very common in cassava production.

Table 4.3 Production information

	Frq.	%
Own land on which you farm		
Yes	82	63.33
No	38	31.67
How You acquire land		
Bought	17	20.48
Inherited	41	49.40
Family	25	30.12
Lease	0	0
Farm (Ha)		
<1	6	5
1-2	23	19.7
2-3	50	41.67
3-4	41	34.17
Source of farm labour		
Hired	43	35.83
Family	1	0.83
Both	76	63.33

Source: field survey, 2025

4.4 Technical Efficiency of Cassava Farmers

The results of the stochastic frontier analysis show that cassava farmers in the study area operate at varying efficiency levels, with a mean technical efficiency of 0.68, indicating that farmers are producing at 68% of their potential output. This implies that an additional 32% increase in cassava output is attainable if existing resources are used more efficiently.

The distribution further reveals that 40% of the farmers fall within the 0.51–0.70 efficiency range, while 37.5% fall within the 0.71–0.90 range, suggesting that a large proportion of cassava farmers exhibit moderate to high efficiency. Only 3.33% of the farmers operate within the near-perfect efficiency category (0.91–1.00), whereas 6.67% fall below 0.30, indicating considerable inefficiencies among a minority. These findings are consistent with those of Ogundari and Ojo (2007), who found average efficiency levels ranging between 0.64 and 0.76 for Nigerian food crop farmers. Similar results was reported by Ogunniyi (2011), who found that cassava farmers in Oyo State, operated at moderate efficiency levels, confirming that the observed technical inefficiency pattern aligns with trends in cassava systems in Nigeria.

The Maximum Likelihood Estimates further indicate that cassava stem input (0.18, $p < 0.05$), labour (0.25, $p < 0.01$), farm size (0.48, $p < 0.01$), and fertilizer (0.15, $p < 0.05$) positively and significantly influence cassava output. Specifically, a 1% increase in cassava stem cuttings raises output by 0.18%, underlining the importance of quality planting material; a 1% increase in labour input increases output by 0.25%, reflecting the labour-intensive nature of cassava farming; a 1% increase in farm size expands output by 0.48%, the strongest effect, confirming substantial economies of scale; and a 1% increase in fertilizer application boosts output by 0.15%, highlighting the role of nutrient management on often depleted soils. These findings agree with

Afolami et al. (2015), who emphasized the importance of improved stem availability, and with Sunday et al. (2020), who identified labour and farm size as major determinants of cassava productivity. The negative and significant coefficient of agrochemical use (–0.12, $p < 0.05$) implies that a 1% increase in agrochemical application actually reduces output by 0.12%, probably due to overuse, incorrect timing, or poor-quality products. The gamma value of 0.88 indicates that 88% of the variation in cassava output is due to technical inefficiency rather than random shocks, reflecting the considerable scope for efficiency improvement.

Although none of the inefficiency variables were statistically significant, their coefficient signs offer relevant insights. Age and education both had negative coefficients, suggesting that older and more educated farmers tend to be more efficient, consistent with findings Ofiaju et al. (2025), who linked experience and education to better decision-making and adoption of improved practices. Household size showed a positive coefficient, indicating that larger households may experience labour coordination challenges. This aligns with Agom and Inyang (2024) who found that larger household sizes was significantly associated with higher inefficiency, indicating that coordination challenges and limited human capital can hamper optimal production. Farming experience unexpectedly showed a positive coefficient, implying that experience alone does not guarantee efficiency, especially when farmers rely on traditional practices. Extension contact also showed a positive coefficient, suggesting that extension services in the area may be inadequate in frequency or effectiveness. This findings is supported by Abdu-Raheem, Oluwatusin, and Kolawole (2023), who reported that formal education and farming experience reduce inefficiency, while the number of extension visits has a direct bearing on technical inefficiency.

Table 4.4 Maximum likelihood estimate of stochastic production frontier of cassava farmers

	coefficient	standard-error	Z	P value
Constant	7.82	1.35	5.79	0.000
Cassava Stem(Kg)	0.18**	0.08	2.25	0.024
Labour	0.25***	0.07	3.57	0.000
Farm size (Ha)	0.48***	0.09	5.33	0.000
Fertilizer(Kg)	0.15**	0.06	2.50	0.012
Agrochemicals(L)	-0.12**	0.05	-2.40	0.016
Inefficiency Model				
Constant	-0.28	4.65	-0.06	0.952
Age (years)	-0.16	0.13	-1.23	0.219
Household Size	0.72	0.61	1.18	0.238
Education(Years)	-0.58	0.55	-1.05	0.293
Farming experience(Years)	0.15	0.14	1.07	0.285
Extension agent contact	1.05	0.80	1.41	0.190
sigma-squared	1.62	1.20		
gamma	0.88			
log likelihood function	-92.41			
Prob > chi2	0.000			
Number of Observations	120			

Source: field survey, 2025

***, ** and * significant at 1, 5 and 10% respectively.

Distribution of cassava farmers by technical efficiency

Range	Frq	%
0.10–0.30	8	6.67
0.31–0.50	15	12.50
0.51–0.70	48	40.00
0.71–0.90	45	37.50
0.91–1.0	4	3.33
Mean	0.68	

4.6 Constraints to Cassava Production

Cassava farmers in the study area face several production constraints that significantly hinder efficiency and output. The most severe challenges identified were unpredictable input prices (mean = 3.02), pest and disease outbreaks (mean = 2.95), and lack of mechanized equipment (mean = 2.79), all rated as high constraints. These results are consistent with findings from Ofiaju et al. (2025), who reported that price fluctuations in agro-inputs and high pest incidence remain major threats to cassava production in Delta State. Similarly, Agom and Inyang (2024) found that inadequate mechanization reduces timeliness of operations and contributes to lower technical efficiency among cassava farmers in Akwa Ibom.

Inadequate access to fertilizer (mean = 2.58) also emerged as a high constraint, aligning with Oshioriamhe *et al*. (2025), who noted that fertilizer scarcity and rising prices significantly limit yield potential in Edo State. Other moderate constraints included poor access to credit, inadequate extension services, insufficient land, poor road infrastructure, inadequate storage facilities, and theft, which mirror observations by Moses *et al.* (2024), who emphasized that weak rural infrastructure, poor extension contact, and absence of storage technology reduce farmers' profitability and increase post-harvest losses.

Table 4.6 Constraints to Cassava Production

S/N	Challenges	Mean	Std. dev
1	Unpredicted prices of inputs	3.02*	1.16
2	Inadequate access to fertilizer	2.58*	0.91
3	Lack of mechanized equipment	2.79*	1.14
4	Pest and disease outbreak	2.95*	1.12
5	Poor access to credits	2.31	0.79
6	Inadequate extension services	2.25	0.93
7	Inadequate land	2.24	0.90
8	Poor road infrastructure	2.11	0.83
9	Inadequate storage facilities	2.15	0.71
10	Theft	2.19	0.78

*Mean ≥ 2.5 = High Challenge

Source: Field Survey, 2025.

CHAPTER FIVE

5.0 SUMMARY, CONCLUSION AND RECOMMENDATIONS

5.1 Summary

This study assessed the farm-level efficiency of cassava production in Uhunmwonde Local Government Area of Edo State. Specifically, it described the socio-economic characteristics of cassava farmer, determined the cost and returns of cassava production, determined the technical efficiency of cassava production, and examined the constraints faced by cassava farmers in the study area. The study was conducted in Edo State, Nigeria, with a focus on Unhunmwonde Local Government Area. A two-stage sampling procedure was used for the selection of 120 cassava farmers from six purposively chosen communities. Data were collected through a structured questionnaire and analyzed using: Descriptive statistics (means, and percentages) to assess socio-economic characteristics. Gross margin analysis to evaluate cost and returns. Stochastic frontier function to estimate technical efficiency. Likert scale analysis to assess constraints faced by farmers.

Results showed that 74.17% of farmers were male, while 25.83% were female. The majority (34.17%) were aged 29-35 years, with a mean age of 41 years, indicating that middle-aged individuals dominate cassava farming. 58.33% of respondents were married, supporting the role of household labor in cassava farming. 52.10% had households of 1-5 persons, which helps provide family labor. 37.50% had OND/NCE , 30.83% had HND/B.Sc, and 15% had senior secondary education. The mean farming experience was 13.19 years, with 38.66% of farmers having 11-15 years of experience. The average annual income was ₦2,554,167, with 38.33% earning between ₦3,000,000-₦3,999,999.

The cost and returns analysis revealed that cassava production is profitable in Unhunmwonde LGA . The total revenue was ₦1,884,166.67, while total variable cost amounted to ₦1,022,710.51, resulting in a gross margin of ₦861,456.16. These findings show strong profitability and align with recent studies that highlight cassava as one of the most economically viable crops among smallholders in Nigeria.

The stochastic frontier production model indicated that cassava farmers operate at a mean technical efficiency of 0.68, implying that they achieve only 68% of their potential output. 40% of farmers had efficiency scores between 0.51–0.70, while 37.5% fell between 0.71–0.90, while only 3.33% achieved near-optimal efficiency (0.91 - 1.0).

Farmers also faced several constraints affecting cassava production. The most severe were unpredictable input prices (mean = 3.02), pest and disease outbreaks (mean = 2.95), and lack of mechanized equipment (mean = 2.79).

5.2 Conclusion

Based on the findings of the study, it was concluded that, Cassava production in Uhunmwonde LGA is dominated by active, middle-aged, and mostly male farmers, many of whom are married and possess moderate to high levels of education. Farmers also have considerable farming experience, averaging over 13 years, and most cultivate on inherited or family land. However, extension contact remains low, indicating the need for stronger advisory support to enhance farmers' knowledge and production practices.

Cassava production is a profitable enterprise in the study area. The gross margin of ₦861,456.16 demonstrates that cassava farming provides substantial income for households and remains a viable economic activity capable of improving farmers' livelihoods.

The stochastic frontier analysis revealed that cassava farmers operated at a mean technical efficiency of 0.68, meaning they achieved 68% of their potential output. This indicates that significant efficiency gains are possible without increasing input levels. Improvements in input use—particularly cassava stem quantity, fertilizer application, labour efficiency, and optimal farm size—can enhance productivity, while better management of agrochemicals is needed to avoid negative effects on output.

Farmers faced multiple constraints, with unpredictable input prices, pest and disease outbreaks, and lack of mechanized equipment being the most severe challenges.

5.3 Recommendations

Based on the findings, the following recommendations were made;

1. Increase extension contact immediately by deploying more extension agents to the area and mandating monthly training sessions for cassava farmers on improved production and input management.
2. Government should provide subsidized inputs directly to farmers through farmer cooperatives to reduce the high cost of fertilizer, agrochemicals, and cassava stems.
3. Establish community mechanization hubs equipped with tractors, sprayers, and processing tools that farmers can rent at low cost to reduce labour constraints and boost efficiency.

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RESEARCH QUESTIONNAIRE

DEPARTMENT OF AGRICULTURAL ECONOMICS AND

FACULTY OF AGRICULTURE

UNIVERSITY OF BENIN

BENIN CITY

Dear respondent,

I am an undergraduate student of the above-named institution carrying out research to gather useful information on the topic: "**FARM-LEVEL EFFICIENCY OF CASSAVA PRODUCTION IN UHUNWONDE LOCAL GOVERNMENT AREA OF EDO STATE NIGERIA**". I hereby solicit your assistance by responding to the questions below accurately, all information given will be kept absolutely confidential and only used for the purpose of this study.

Thanks for your cooperation.

OGEDEBGE ELOGHOSA MARVELOUS

INSTRUCTION: Please tick (✔)where applicable

SECTION A: SOCIO-ECONOMIC CHARACTERISTIC

1. Sex: Male [ ] Female [ ]

2. Age: _____(years)

3. Marital Status: (a) Single [ ] (b) Married [ ] (c) Divorced [ ]

4. Highest Educational Level attained: (a) No formal Education [ ] (b) First School living certificate [ ] (c) Junior Secondary School [ ] (d) Senior Secondary School [ ] (e) OND/NCE [ ] (f) HND/B.Sc. [ ] Post Graduate [ ]

5. Cassava farming experience _____(years)

6. Household Size: persons_____

7. Contact with extension agent. Weekly [ ], Monthly [ ], Quarterly [ ] and Yearly [ ]

8. Annual income _____

SECTION B: COSTS AND RETURNS OF CASSAVA PRODUCTION.

9. What is your average yiels per hectare?_____(tons)

10. Average price per ton of cassava sold? ₦_____

11. Quantity of cassava sold in the last production cycle?_____(tons)

12. Total revenue from cassava production? ₦_____

VARIABLE ITEMS	**QUANTITY**	**COST**
Cassava stems		
Herbicides (liters)		
Fertilizer (kg)		

Labor (Man-days)		
Mechanized services		
Transportation		
Other(Specify)		

SECTION C: PRODUCTION INFORMATION

1. Do you own the land on which you farm? Yes ( ) No ( )

2. If yes how did you acquire it? Bought ( ) inherited ( ) family land ( ) Lease ( )

3. What is your farm size? _____Ha

4. What is your source of farm labour (a) Hired ( ) (b) family( ) (c) Both ( )

5. How many man/days do you use on the farm per production season _____

SECTION D: CONSTRAINTS ASSOCIATED WITH CASSAVA PRODUCTION.

S/N	**Challenges**	**Strony Disagree**	**Disagree**	**Neutral**	**Agree**	**Strongly Agree**
1.	Unpredicted prices of					

	inputs					
2.	Inadequate access to fertilizer					
3.	Lack of mechanized equipment					
4.	Pest and disease outbreak					
5.	Poor access to ceredit					
6.	Inadequate extension services					
7.	Inadequate land					
8.	Poor road infrastructure					
9.	Inadequate storage facilities					
10.	Theft					