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# ECONOMICS OF CASSAVA PRODUCTION AMONG FARMING HOUSEHOLDS IN OJU LOCAL GOVERNMENT OF BENUE STATE, NIGERIA

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## ABSTRACT
Cassava plays a critical role in food security, energy security, poverty alleviation, and the economic sustainability of millions of smallholders in developing countries, including Nigeria. Its relevance to the food security in rural and urban areas demand increased processing of its tubers into many products that can satisfy consumers' diverse tastes. This study, therefore, focused on economics of cassava production among farming households in Oju Local Government Area, Benue State, Nigeria. A multi-stage sampling method was used to select 120 respondents for the study. Primary data were employed with the use of structured questionnaire instrument and were analyzed through descriptive statistics, budgeting techniques, and multiple regression analysis. The result revealed that most cassava farmers (62%) were male, 62% were married, and 70% were literate. The average household size was 5 persons, and the average farming experience was 9 years. Additionally, 70% of the farmers lacked access to credit, while 79% were not part of any cooperative association. The cost and return analysis showed that cassava farmers earned an average gross return (total revenue) of ₦205,000 per/ha, with total variable costs of ₦142,000 and fixed costs of ₦16,650. The total production cost per farmer was ₦158,650 per/ha, resulting in a net farm income of ₦46,350 and a gross margin of ₦63,000. The return on investment (₦0.29) indicated a profit of 29k for every naira invested. The multiple regression analysis identified age, educational level, farming experience, farm size, and cooperative membership as significant factors influencing cassava output. The study concluded that cassava farming in the area was profitable. The following are the recommendations, that increasing the levels utilization of farm size, education and farming experience will result in an increase in the level of output of cassava. Also, farmers be recommended to form goal driven association groups and pool resources together to improve upon their finances.

**Keywords**: Analysis, cassava, households, production, rural

## INTRODUCTION
Cassava (*Manihot esculenta*) is an annual crop widely grown in tropical and subtropical regions for its starchy tuberous roots, which serve as a major carbohydrate source. It is a drought-resistant crop, capable of thriving in soils with low nutrient levels. In Nigeria, cassava is critical for food security and poverty alleviation (Omoluabi & Ibitoye, 2024). Beyond human consumption, cassava and its derivatives are widely used in animal feed production, pharmaceutical and industrial processes, and various security applications. Key areas where cassava products play a leading role include medical and industrial alcohol production, bakery flour, sweeteners like glucose and fructose for fruit juice production, beverage distillation, cassava chips, and fillers for pharmaceutical tablets (Olutumise *et al*., 2024).

Its potential extends to livestock feed formulation, textiles, plywood, paper, brewing, and chemicals (Morgan *et al*., 2021). According to the International Fund for Agricultural Development (IFAD, 2013), cassava serves as a staple for approximately 600 million people in Africa. In Nigeria, cassava generates more cash income for rural households than other staples. Its appeal to smallholder farmers lies in its carbohydrate-rich composition, diverse end uses, and year-round availability, which make it superior to more seasonal crops like grains, peas, and beans. Cassava plays a critical role in food security, energy security, poverty alleviation, and the economic sustainability of millions of smallholders in developing countries, including Nigeria (OECD-FAO, 2016).

Despite Nigeria's position as the largest global producer of cassava, significant challenges remain in improving cassava yield per hectare (Omoluabi & Ibitoye, 2024). Factors such as high production and processing costs, transportation challenges, and infrastructural deficits limit the ability to add value to cassava in terms of quantity, quality, shelf life, and safety, which are critical for export and GDP growth. Nigeria's diverse climate supports the cultivation of numerous food and cash crops, including cassava, yam, millet, sorghum, sweet potato, oil palm, and cocoa (Ajayi & Olutumise, 2018). While a few engage in commercial farming, most Nigerian farmers practice subsistence farming, producing primarily for family consumption (Mary & Edwin, 2016; Olutumise *et al*., 2021). As the world's largest exporter of dried cassava, accounting for 77% of global exports (Olutosin & Barbara, 2019), Nigeria traditionally processes fresh cassava roots into products like *garri*, *fufu*, and flour (Morgan *et al*., 2021). Cassava's dual role as a food and cash crop adds to its flexibility and appeal, particularly for resource-poor farmers.

Numerous studies have analyzed the economics of cassava production across different states in Nigeria. Examples include works by Nandi *et al*. (2011) in Cross River State, Akerele *et al*. (2018) in Ogun State, Sanusi *et al*. (2020) in Kwara State, and Morgan *et al.* (2021) in Bayelsa State. However, limited research exists on cassava production in Oju Local Government Area of Benue State, leaving a gap in the literature. This study basically seeks to describe the socio-economic characteristics of rural cassava farming households; estimate the costs and returns of cassava production among rural farming households and assess the factors influencing cassava production among rural farming households.

## MATERIALS AND METHODS

### Study Area

The study was carried out in Oju Local Government Area (LGA) of Benue State, Nigeria. Oju LGA is bordered by Obi and Gwer-East to the north, Konshisha and Yala to the east, Izzi and Ebonyi to the south, and Ado to the west. It has a population of 168,491 according to the 2006 National Population Census, which grew to an estimated 243,300 by 2023. Covering a land area of 1,283 square kilometers, the elevation ranges from 200 to over 500 meters above sea level. Oju LGA experiences a tropical savanna climate with temperatures typically ranging from 63°F to 89°F, rarely dropping below 57°F or exceeding 93°F. The rainy season extends from late March to early November, with September receiving the highest average rainfall of 209 mm, and December the lowest at 2 mm.

The LGA consists of eleven council wards: Adokpa, Ibilla, Idelle, Iyeche, Oboru Oye, Oju, Okpokpo, Okudu, Owo, Ukpa, and Ainu. The inhabitants are predominantly farmers, traders, and civil servants, with approximately 80% engaged in agriculture (Ogah *et al*., 2024). The area boasts fertile land and a variety of crops such as yam, rice, benniseed, guinea corn, palm produce, soybeans, maize, millet, groundnuts, and cassava. Livestock rearing, fishing, and hunting are also common. The Igede ethnic group is the dominant population in the area (Asom *et al*., 2023).

### Sampling Technique and Sampled size

The study population comprised all cassava farmers in Oju LGA. A multi-stage sampling technique was employed to select participants. In the first stage, five wards —Ukpa, Owo, Okudu, Okpokpo, and Idelle—were purposively selected based on their significant involvement in cassava production. Next, a preliminary survey was conducted within these wards to determine the total number of cassava farming households. In the final stage, 50% of the cassava farming households in each selected ward were randomly sampled, resulting in a total sample size of 120 rural farming households (Table 1).

**Table 1: Sample Size Selection Procedure**

| | Communities | Sampling frame | Sample Size (50%) |
|---|---|---|---|
| 1 | Owo | 46 | 23 |
| 2 | Okudu | 47 | 24 |
| 3 | Okpokpo | 49 | 24 |
| 4 | Idelle | 51 | 26 |
| 5 | Ukpa | 45 | 23 |
| | **Total** | **237** | **120** |

**Source:** Field Survey (2024)

### Method of Data Collection

Data for the study were primarily sourced from respondents through structured questionnaires distributed to rural cassava farming households.

### Method of Data Analysis

Both descriptive and inferential statistical methods were employed to analyze the data. Descriptive statistics, including means, frequencies, and percentages, were used to address Objective I. Budgetary techniques were applied to achieve Objective II, while multiple regression analysis was utilized to address Objective III.

### Model Specification

### Farm Budgeting Model

The profitability of cassava production was evaluated using the gross margin analysis and net farm income. Gross margin analysis was calculated as the difference between Total Revenue (TR) and Total Variable Costs (TVC). The model was expressed as:

GM = TR - TVC … (1)

Where,

GM = Gross margin measured in Naira/hectare

TR = Total revenue or Total value of production (TVP) measured in Naira/hectare

TVC = Total variable cost (Naira/hectare)

Net Farm Income (NFI) represents the difference the total revenue (TR) and total cost (TC) of the cassava farmers. It was computed as:

NFI = TR – TC ---------(2)

Where,

NFI = Net farm income

TR = Total revenue (quantity of cassava harvested x unit price).

TC = Total cost (Total variable cost + total fixed cost)

RRI = NFI/TC X 100 … (3)

Where,

RRI = Rate of return on investment

NFI = Net farm income

TC = Total cost

**Multiple Regression Model**

Multiple regression analysis was used to determine the socio-economic factors that affect cassava output. The explicit form of exponential model was selected as the best fit;

$LnY = b_0+b_1X_1+b_2X_2+b_3X_3+b_4X_4+b_5X_5+b_6X_6+b_7X_7 + b_8X_8+ b_9X_9+ui$

Where,

$Y_i$ = Output of cassava (kg)

$X_1$= Age of respondents (Years)

$X_2$= Gender (male=1, Female=0)

$X_3$= Educational qualification (Years of formal education)

$X_4$= Household Size (Numbers)

$X_5$= Farming experience (years)

$X_6$= Extension Service (Number of Contact)

$X_7$= Marital status (married = 1, single = 0)

$X_8$= Farm size (hectares)

$X_9$= Cooperative Membership (Member =1, Non-member = 0)

ui = error term

## RESULTS AND DISCUSSION

### Socio-Economic Characteristics of Cassava Farming Households

The socio-economic characteristics of cassava farming households are presented in Table 2. The analysis indicates that the majority (64.2%) of household heads engaged in cassava farming were aged between 21 and 50 years, with a mean age of 45 years. This suggests that most cassava farmers are within their productive years, which enhances their efficiency in farming activities. This finding aligns with Morgan *et al.* (2021), who reported that most respondents in Ogbia Local Government Area of Bayelsa State, Nigeria, were also in their productive age. Regarding gender, the results show that 62% of cassava farmers were males, indicating that cassava farming in the study area is male-dominated. This could be attributed to the high labor demands and limited mechanization in the region. This observation is consistent with Oladoyin *et al.* (2022), who noted that male dominance in cassava farming in Akoko, Ondo State, Nigeria. Educationally, 70% of cassava farmers had formal education, reflecting a high level of enlightenment among the farmers. This enhances their receptiveness to agricultural extension services and the adoption of best practices to improve yields. Similar findings were reported by Akerele *et al*. (2018), where most small-scale cassava farmers had formal education, including tertiary qualifications.

In terms of marital status, 62% of the cassava farmers were married. Household size result revealed that over half (54%) of the farmers had households comprising five or fewer members, with an average household size of five. Farming experience result shows that 58% of farmers had 5 to 10 years of experience, with a mean farming experience of 9 years. Farmers with greater experience are more knowledgeable about efficient production systems and better equipped to adopt new technologies, improving their productivity. This finding corroborates Oladoyin *et al*. (2022), who reported that most cassava farmers in their studied area were married and experienced. Additionally, 39% of cassava farmers identified farming as their primary occupation.

Farm size result indicated that 42% of farmers cultivated more than 3 hectares, with an average farm size of 3.1 hectares. About 57.5% of farmers achieved cassava yields of more than 1500 kg per hectare, with an average yield of 1750.33 kg. On cooperative membership, 79% of farmers were not members of any cooperative association. The reasons for the non-association of members included, farmers are mostly small scale and unaware of any association. Membership in cooperatives offers benefits such as resource pooling, access to production facilities, and improved extension service delivery. However, the low membership rate suggests limited access to these advantages. Furthermore, 79% of cassava farming households lacked access to credit facilities, which hinders their ability to invest in improved farming practices and technologies.

**Table 2: Distribution of cassava Farmers by their Socio-Economic Characteristics**

| Variables | Frequency | Percentage | Mean |
|---|---|---|---|
| **Age (Years)** | | | |
| 21 – 30 | 12 | 10 | |
| 31 – 40 | 24 | 20 | 45 |
| 41 – 50 | 41 | 34.2 | |
| > 50 | 43 | 35.8 | |
| **Sex** | | | |
| Male | 74 | 62 | |
| Female | 46 | 38 | |
| **Marital Status** | | | |
| Single | 19 | 16 | |
| Married | 74 | 62 | |
| Divorced | 17 | 14 | |
| Widowed | 10 | 8 | |
| **Household Size (Members)** | | | |
| ≤ 5 | 65 | 54 | |
| 6 – 10 | 50 | 42 | 5 |
| > 10 | 5 | 4 | |
| **Educational Level** | | | |
| Informal | 36 | 30 | |
| Primary | 21 | 17.5 | |
| Secondary | 31 | 25.8 | |
| Tertiary | 32 | 26.7 | |
| **Farm size (ha)** | | | |
| ≤ 1 | 17 | 14.2 | |
| 1.1 – 2 | 22 | 18.3 | 3.1 |
| 2.1 – 3 | 28 | 23.3 | |
| >3 | 53 | 44.2 | |
| **Farming Experience (Years)** | | | |
| < 5 | 22 | 18 | |
| 5 – 10 | 69 | 58 | 9 |
| > 10 | 29 | 24 | |
| **Annual Income (₦)** | | | |
| < 20,000 | 8 | 6.7 | |
| 20,000-50,000 | 10 | 8.3 | |
| 51,000-100,000 | 50 | 42 | |
| >100,000 | 52 | 43 | |
| **Main Occupation** | | | |
| Trading | 26 | 21 | |
| Farming | 47 | 39 | |
| Civil servant | 15 | 13 | |
| Private employment | 12 | 10 | |
| Crafts and artisans | 20 | 17 | |
| **Association Membership** | | | |
| Yes | 25 | 21 | |
| No | 95 | 79 | |
| **Access to Credit Facilities** | | | |
| Yes | 25 | 21 | |
| No | 95 | 79 | |
| **Cassava Output (Kg/ha.)** | | | |
| < 500 | 8 | 6.7 | |
| 500 – 1000 | 12 | 10 | 1750.33 |
| 1001 – 1500 | 31 | 25.8 | |
| > 1500 | 69 | 57.5 | |

**Source: Field Survey (2023)**

**Profitability of Cassava Production**

The profitability of the cassava production was examined using costs and returns analysis as presented in Table 3. The total variable cost for cassava production was ₦ 142,000 per hectare, while the total fixed cost was ₦ 16,650 per hectare, giving a total cost of ₦ 158650 per hectare. The total revenue stood at ₦ 205,000 per hectare. The gross margin and net farm income were ₦63,000 and ₦46,350 per hectare, respectively. Table3 also showed that the cost of fertilizer accounted for 31.7 % of the total cost of cassava production, followed by the cost of labour and the cost of raw materials (bundles) and herbicides, representing 21.1%, 15.8 % and 14.1% of the total cost of production, respectively the study area. This implies that high-cost of fertilizer has a great impact on the profitability of cassava production in the study area. It was revealed that cassava production is profitable as depicted by the net farm income of ₦ 46,350.

Also, the return on a naira invested was ₦ 0.29. This implies that for every ₦ 1 invested 29k was return as profit. Moreover, the return to naira invested has a positive sign indicating profitability of cassava production. This finding aligns with Sanusi *et al*. (2020), who reported that cassava farming was a profitable venture in Irepodun Local Government Area of Kwara State, Nigeria.

**Table 3: Costs and Returns Analysis per Hectare of Cassava Production in the Study Area**

| **Variable Costs (VC)** | **Amount (₦/ha.)** | **Percentage (%)** |
|---|---|---|
| cost of Planting Material (bundle) | 22,500 | 15.8 |
| cost of Fertilizer (bags) | 45,000 | 31.7 |
| cost of Pesticides (Litres) | 7,000 | 4.9 |
| cost of Herbicides (Litres) | 20,000 | 14.1 |
| Labour (Man days) | 30,000 | 21.1 |
| cost of Transport (in bags) | 17,500 | 12.3 |
| **Total Variable Costs (TVC)** | **142,000** | |
| **Fixed Cost (FC)** | | |
| Rent on Land | 15,000 | |
| Hoes | 300 | |
| Cutlasses | 450 | |
| Basin | 700 | |
| Depreciation om equipment | 200 | |
| **Total Fixed Costs (TFC)** | **16,650** | |
| **Total Costs (TC)** | **158,650** | |
| **Total Revenue (TR)** | 205,000 | |
| **Net Farm Income (TR-TC)** | 46,350 | |
| **Gross Margin (TR-TVC)** | 63,000 | |
| **Rate of Return on Investment** | 0.29 (29%) | |

**Source:** Field Survey (2023)

**Factors Influencing Cassava Production among Rural Farming Households**

The result of multiple regression model is presented in Table 4. The coefficient of determination ($R^2$) was 0.9929, indicating that 99.29% of the variability in cassava output was jointly explained by the specified independent variables in the model. The adjusted $R^2$ value of 0.9924 (99%) further supports the robustness of the model. The F-value of 1944.9 was statistically significant at a 1% level, signifying that the overall regression model was highly reliable. The dependent variable, cassava output, was regressed on factors including age, gender, educational attainment, farming experience, marital status, farm size, cooperative membership, and household size.

The coefficient for age (-177.64) was negative and statistically significant at the 5% level, indicating that as cassava farmers' age increased, their output decreased. This suggests that older farmers may be less inclined to take risks or adopt innovative practices that could boost production. This finding aligns with Aboajah *et al*. (2018), who reported a similar negative effect of age on cassava production in Benue State, Nigeria. The coefficient for educational level (1369.8) was positive and statistically significant at the 5% level. This implies that higher educational attainment among cassava farmers leads to increased cassava output, likely due to better access to and understanding of improved farming techniques. This result corroborates Akerele *et al*. (2018), who found a positive relationship between farmers' education and cassava output in Yewa North Local Government Area of Ogun State, Nigeria.

The coefficient for farming experience (1015.5) was positive and statistically significant at the 1% level. This indicates that increased farming experience enhances cassava output, as experienced farmers are more

knowledgeable about effective production systems. This finding is consistent with Aboajah *et al.* (2018), who observed that farming experience significantly influenced cassava production in Benue State.

The coefficient for farm size (50169.3) was also positive and statistically significant at the 1% level, suggesting that larger farm sizes contribute to higher cassava output. However, this result contradicts Angba and Iton (2020), who found a negative relationship between farm size and cassava output in Akpabuyo LGA of Cross River State, Nigeria. Lastly, the coefficient for cooperative membership (8308.2) was positive and statistically significant at the 1% level. This indicates that membership in cooperatives positively impacts cassava production by providing farmers access to pooled resources, shared knowledge, and extension services.

**Table 4: Multiple Linear Regression Analysis for Factors influencing Cassava Production among the Rural Farming Households in the Study Area**

| Variables | Coefficients | Standard Error | t Stat | P-value |
|---|---|---|---|---|
| Intercept | -942.71 | 3923.7 | -0.2403 | 0.8106 |
| Age | -177.64 | 85.527 | -2.0770 | 0.0401** |
| Gender | 467.13 | 1488.0 | 0.3139 | 0.7542 |
| Educational Qualification | 1369.8 | 618.67 | 2.2141 | 0.0289** |
| Household Size | 233.64 | 311.48 | 0.7501 | 0.4548 |
| Farming Experience | 1015.5 | 223.50 | 4.5438 | 0.0000*** |
| Marital Status | -106.81 | 739.27 | -0.1445 | 0.8854 |
| Farm Size | 50169.3 | 599.51 | 83.684 | 0.0000*** |
| Cooperative Membership | 8308.2 | 2054.6 | 4.0437 | 0.0000*** |
| Multiple R | 0.9965 | | | |
| R Square | 0.9929 | | | |
| Adjusted R Square | 0.9924 | | | |
| F Statistic | 1944.9 | | | 0.0000*** |

**Source: Field Survey (2023)** ***** and ** = Significant at 1% and 5%**

## CONCLUSION

The study concluded that cassava production in the study area was profitable. Key factors significantly influencing cassava production in the study area included age, educational qualifications, farming experience, farm size, and cooperative membership.

## RECOMMENDATIONS

Based on the study findings, the following recommendations were proposed: that the positive and significant relationship between farm size, education and farming experience with output implies that increasing the levels utilization of each of these inputs will result in an increase in the level of output of cassava. The result showed that farmers' membership of association increases the level of output of cassava. Therefore, farmers be recommended to form goal driven association groups and pool resources together to improve upon their finances.

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