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Economic Drivers of Cassava Product (Pupuru) among Women in Irele Local Government Area, Ondo State, Nigeria

Olutope Stephen Ojo

Agricultural Economics Department, Adekunle Ajasin University, Akungba-Akoko, Ondo State 342111, Nigeria

ABSTRACT

The growing market for cassava and its derivatives underscores the need to understand the economic dynamics of cassava value chains for sustainable agricultural development. This study examined the economic analysis of *pupuru* production in Irele Local Government Area, Ondo State, Nigeria. Using a multistage sampling technique, 120 female cassava processors were selected. Primary data were collected through structured questionnaires and interviews, and analyzed using regression, budgeting, and descriptive statistics. Results showed that most processors were married (72.5%), educated (78.3%), with an average age of 43.6 years and 25.5 years of processing experience. About 91.7% lacked access to credit, while 90% operated commercially, producing cassava products as a secondary income source. With an average Benefit-Cost Ratio (BCR) of 1.50 and a Net Profit of ₦730,135.98 per processor, *pupuru* production was found to be profitable. Key factors influencing net income included years of experience ($p < 0.05$), education ($p < 0.05$), market access ($p < 0.10$), extension services ($p < 0.01$), and loan availability ($p < 0.01$). Major challenges faced were cassava price fluctuations (mean = 4.72), high processing costs (mean = 4.20), and limited credit access (mean = 3.60). The study concluded that *pupuru* production is a viable and profitable enterprise. It recommended improved access to credit through strengthened banking infrastructure and encouraged women processors to maximize profits by leveraging the economic potential of *pupuru* production.

Keywords: Analysis; Cassava Product; Pupuru; Women

*CORRESPONDING AUTHOR:

Olutope Stephen Ojo, Agricultural Economics Department, Adekunle Ajasin University, Akungba-Akoko, Ondo State 342111, Nigeria; Email: olutope.ojo@aaua.edu.ng

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1. Introduction

Cassava processing has the potential to significantly enhance consumption, diversify applications, and improve the livelihoods of farming households by generating income, boosting rural economies, and creating jobs for micro-agro enterprises [1]. Nigeria is the world's leading cassava producer, and cassava processing remains a vital agricultural activity that contributes to household income and poverty reduction in the country [2]. Cassava (Manihot esculenta), a staple crop, provides food for over 100 million people and employment for more than four million farmers [2]. Processing is essential due to cassava's short shelf life and the need to eliminate toxic cyanide content that makes it unsafe for consumption [3]. Various techniques have been developed to convert cassava into storable products such as tapioca, starch, fufu, lafun (cassava flour), pupuru, high-quality cassava flour (HQCF), and gari. These processes rely on diverse tools and technologies to transform cassava tubers into marketable products [4]. Nigeria leads in cassava food product output, primarily through small-scale processing [5].

In Ondo State, specifically Irele Local Government Area, the locally popular pupuru serves as both a staple food and a key income source for many households. Economic analyses of pupuru production typically examine costs, benefits, market demand, sales revenue, and profitability. Such analyses provide insights into its economic impact on local communities. Despite Nigeria's dominance in cassava production, the benefits are not fully realized due to low-quality products and inefficient output stemming from traditional processing methods and a lack of modern equipment [6,7]. Enhancing processing technology is crucial to improving livelihoods, reducing rural poverty, and increasing productivity, particularly for women processors who rely on cassava for their income.

Women play a critical role in agricultural development, contributing 80% of food production and 60–80% of agricultural labor [6]. Globally, 2.5 billion people depend on agriculture for survival, with rural women facing significant barriers in accessing technology, financial resources, market information, and productive assets [6]. Rural women are essential for food security, nutrition, land management, and rural businesses. Empowering women through development initiatives can improve their personal, social, and economic well-being, as they form over half of the rural population and are integral to sustainable agriculture and rural development [8].Women dominate cassava production, processing, and commercialization in Nigeria, performing most of the labor involved [9,10]. As cassava is often considered a "women's crop" [2], it plays a vital role in household food security, a responsibility typically shouldered by women. Studies have shown that the cassava processing industry is profitable and has the potential to significantly improve the quality of life for participants [9].

1.1. Problem Statement

Understanding the impact of gender on food production in Nigerian rural households is essential for ensuring the equitable distribution of productive resources. This equitable allocation can enhance agricultural productivity, increase household farm output, and improve living standards [11]. Cassava is a critical crop for food security and economic growth in Nigeria, and its importance continues to grow. The expansion of agro-allied industries reliant on cassava has raised concerns about the potential decline in the availability of cassava products for Nigerian families [12]. The increasing demand for cassava, both as a food crop and an industrial raw material, underscores its significance [13].

The Food and Agriculture Organization [13] reports that Nigeria is the largest cassava producer globally but exports minimal quantities of cassava root. A key reason for this is the limited knowledge of cassava export preparation methods among producers. An estimated 90% of cassava produced in Nigeria is processed into food products, with garri accounting for about 70% of this. Garri production involves fermenting, drying, and grinding cassava. The remaining cassava is processed into other food products such as fufu, abacha, pupuru, elubo, and lafun.

Industrially, cassava is in high demand as a cost-effective substitute for imported semi-finished goods and raw materials. High-quality cassava flour (HQCF), for instance, is increasingly used in bread, biscuits, and confectionery production, as well as in hydrolytes for pharmaceutical products, adhesives, and seasonings [14]. Cassava is also utilized in producing native and modified starches. However, the lack of advanced processing technologies limits the production capacity of cassava products, negatively

impacting rural processors [15]. The adoption of improved technologies can have substantial economic benefits by addressing labor-intensive processes, reducing production time and effort, and increasing overall productivity. This, in turn, can enhance household income, improve the quality of life, and strengthen food security for women engaged in cassava processing [16].

Omotayo and Oladejo note that the absence of reliable data on cassava processing and sales poses a challenge for conducting economic analyses [17]. To address this, researchers may need to gather information from local producers and dealers through surveys, interviews, and other methods. Measuring the broader economic impact of pupuru production on the community may also prove challenging. Nevertheless, an economic analysis of pupuru production in Irele Local Government Area could provide valuable insights into the economic value of this local enterprise. Such analysis could inform the development of sustainable policies and initiatives that support the growth and resilience of cassava processing. Based on the above, this study will address the following key questions:

i. What are the socio-economic characteristics of women that participate in cassava production and processing in the area?
ii. Is cassava product (Pupuru) profitable in the study area?
iii. What are the factors affecting the income of women participating in cassava processing to Pupuru?
iv. What are the challenges faced by women in cassava processing businesses?

1.2. Objectives of the Study

The primary objective of this study is to analyze the economics of cassava product Pupuru production and processing in Irele Local Government Area, Ondo State, Nigeria. The specific objectives of the study include:

i. Describe the socio-economic characteristics of women that participate in cassava production and processing in the area.
ii. Estimate the profitability of cassava products (Pupuru) in the study area.
iii. Determine the factors affecting the income of women participating in cassava processing to Pupuru in the study area.
iv. Identify the constraints faced by women in cassava production and processing in the area.

1.3. Justification

Cassava processing refers to the transformation of cassava from its raw form in the field to value-added products ready for consumer use. This process encompasses various activities such as production, processing, distribution, and marketing of specific commodities [18]. In Nigeria, cassava serves as a vital staple crop and a significant source of income for farmers. Exploring the economic potential of cassava products like Pupuru can enhance food security and boost farmers' income in the region [19]. Such an investigation can provide valuable insights into the market potential of Pupuru and other cassava-based products, guiding policymakers and entrepreneurs in making informed investment decisions. This, in turn, can stimulate local economic growth and generate employment opportunities. Additionally, the study can identify the challenges and opportunities associated with improving the sustainability and efficiency of cassava production and processing in the region. The findings can inform policies and interventions aimed at promoting agricultural modernization, technological adoption, and value chain development within the cassava industry. Understanding the economic dynamics of Pupuru production and processing in Irele Local Government Area, Ondo State, is therefore essential for evaluating the potential of cassava as a driver of economic growth and development in Nigeria.

2. Methodology

2.1. The Study Area

The study was conducted in Irele Local Government Area (LGA), located in Ondo State, Nigeria, which lies in the South West geopolitical zone as shown in **Figure 1**. Ondo State consists of 18 Local Government Areas and three Senatorial Districts. With an estimated population of 3,460,877, the state covers approximately 15,500 square kilometers, featuring an agrarian landscape that supports agricultural activities. The geographical coordinates of Ondo State are approximately 7.2500° N latitude and 5.2000° E longitude. Topographically, the state is charac-

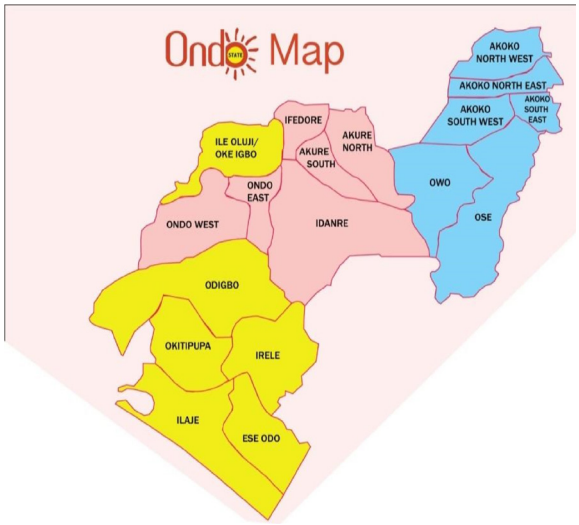

Figure 1. Map of Ondo State showing Irele Local Government Area. (Source:Wikipedia)

terized by both lowlands and hills, situated between longitude 4°30' and 6° East of the Greenwich Meridian, and latitude 5°45' and 8°15' North of the Equator. Ondo experiences a tropical climate with a monsoon pattern, marked by two distinct seasons: the rainy season from April to October and the dry season from November to March. Average annual rainfall varies, ranging from 2,000 mm in the southern part of the state to 1,150 mm in the northern region. The state's tropical rainforest zone maintains temperatures between 21 °C and 29 °C. Agriculture is the primary occupation of the state's residents, with food crop production at the subsistence level. Major crops include arable crops such as yam, maize, cocoyam, cassava, and plantain, as well as tree crops like cocoa, oil palm, and kola nut. Irele LGA, one of the 18 LGAs in Ondo State, is located in the southwestern part of Nigeria, covering an area of approximately 1,200 square kilometers. The geographical coordinates of Irele LGA are approximately 6.5634° N latitude and 4.9947° E longitude. The administrative headquarters is in Ode-Irele, with other notable towns including Igbodigo, Ayeka, Ilutitun, and Iju-Odo. The population of Irele LGA is approximately 180,000, predominantly made up of the Yoruba ethnic group.

Irele Local Government Area is mainly characterized by lowland terrain, with the Ondo State coastal plain extending through its southern region. The climate is tropical, marked by two distinct seasons: the wet season from April to October and the dry season from November to March. Agriculture is the dominant activity in the area, with cassava being the primary crop cultivated by local farmers. Other crops grown include maize, yam, plantain, and various vegetables. Additionally, fishing plays a significant role in the economy, particularly in the coastal communities of the area.

2.2. Sampling Technique

A sampling method with multistage was employed. The Irele Local Government Area (LGA) in the state was purposefully chosen for stage one due to the region's high level of cassava processing and production. From the LGA, six communities were chosen for the second stage. From each community, 20 female cassava processors and marketers were chosen for the third stage. The sample size for the study consists of 120 respondents.

2.3. Data Analysis

The study relied on primary data, which were collected through well-structured questionnaires administered during personal interviews with women cassava processors. The questionnaire gathered information on the socio-economic characteristics of the respondents, including age, gender, marital status, farming status, membership in organizations, educational background, farm size, and access to capital or credit facilities. Additionally, data on input and output prices, as well as production variables such as farm size, use of agrochemicals, labor utilization, and the types of value chains involved, were collected.

2.4. Analytical Technique

The data collected for the study were analyzed using both descriptive and inferential statistics. Descriptive statistics, including mean, percentages, and frequency distribution, were used to analyze objectives (i) and (iv). Budgetary Analysis Technique was employed to analyze objective (ii), while objective (iii) was examined using regression analysis.

2.5. Model Specification

2.5.1. Budgetary Analysis Technique

A farm budgetary model was developed to assess the

profitability of cassava product (Pupuru) production. Net income (NI) was calculated by subtracting the total cost of production from gross revenue. The total cost of production encompasses both variable and fixed costs incurred during the production period. Key profitability indicators, such as Return on Investment (ROI) and Benefit-Cost Ratio (BCR), were used to determine the feasibility of the investment.

The formula for net income is:

$$NI=TR-TC \tag{1}$$

where TR, Total Revenue (calculated as price per unit*quantity sold); TC, Total Cost of Production, which is the sum of Total Fixed Cost (TFC) and Total Variable Cost (TVC).

Thus, the net income can also be expressed as:

$$NI=P \times Q - (TFC + TVC) \tag{2}$$

where NI, Net Income accrued by the farmer from Pupuru production (₦); TVC, Total Variable Cost incurred in Pupuru production (₦); Q, Quantity of Pupuru produced (kg); P, Price per unit of Pupuru (₦/kg); TFC, Total Fixed Cost incurred (₦).

To evaluate the profitability of the investment, the Benefit-Cost Ratio (BCR) was calculated using the formula:

$$BCR = \frac{TR}{TC} \tag{3}$$

where BCR, Benefit/Cost Ratio.

For the investment in Pupuru production to be deemed worthwhile, the BCR must be greater than 1. As noted by [20], an agricultural venture is considered profitable when the following conditions are met:

1) TR > TC;
2) BCR > 1;
3) ROI > 0.00;
4) Net Farm Income and Gross Margin are positive.

2.5.2. Regression Analysis

Regression analysis was employed to investigate the socio-economic factors influencing the income of women engaged in pupuru production. Regression models are statistical tools used to explore the relationship between a dependent variable and one or more independent variables. The primary objective of regression is to identify the line (or curve) that best represents this relationship or to estimate the regression coefficients that minimize the difference between the predicted and actual values of the dependent variable.

In this study, regression analysis was used to identify factors affecting the income from pupuru production. The production function, relating income (Y) derived from pupuru sales to various explanatory variables (X_i), was formulated as:

$$Y = \beta_0 + \beta_1 X_1 + \beta_2 X_2 + \beta_3 X_3 + \beta_4 X_4 + \beta_5 X_5 + \beta_6 X_6 + \beta_7 X_7 + \beta_8 X_8 + \beta_9 X_9 + \beta_{10} X_{10} + \varepsilon_i \tag{4}$$

where Y, Gross income from pupuru production by the ith farmer (in Naira); X_1, Gender (Dummy variable); X_2, Age of the respondent (in years); X_3, Household size (number of members); X_4, Marital status; X_5, Years of experience in pupuru production; X_6, Years of formal education; X_7, Operational scale (1 = small scale, 2 = commercial, 3 = cooperative); X_8, Access to inputs (1 = Yes, 0 = No); X_9, Membership in a cooperative/association (Dummy variable); X_{10}, Access to credit (Dummy variable); ε = Error term ; β_0 = Constant

To determine the most suitable model for the data, three functional forms—linear, semi-logarithmic, and exponential—were tested. The explicit forms of these models are as follows:

1) Linear Regression Model:

$$Y = \beta_0 + \beta_1 X_1 + \beta_2 X_2 + \beta_3 X_3 + \beta_4 X_4 + \beta_5 X_5 + \beta_6 X_6 + \beta_7 X_7 + \beta_8 X_8 + \beta_9 X_9 + \beta_{10} X_{10} + \varepsilon_i \tag{5}$$

2) Semi-Logarithmic Model:

$$Y = \beta_0 + \beta_1 Log(X_1) + \beta_2 Log(X_2) + \beta_3 Log(X_3) + \beta_4 Log(X_4) + \beta_5 Log(X_5) + \beta_6 Log(X_6) + \beta_7 Log(X_7) + \beta_8 Log(X_8) + \beta_9 Log(X_9) + \beta_{10} Log(X_{10}) + \varepsilon_i \tag{6}$$

3) Exponential Model:

$$Log(Y) = \beta_0 + \beta_1 X_1 + \beta_2 X_2 + \beta_3 X_3 + \beta_4 X_4 + \beta_5 X_5 + \beta_6 X_6 + \beta_7 X_7 + \beta_8 X_8 + \beta_9 X_9 + \beta_{10} X_{10} + \varepsilon_i \tag{7}$$

This approach allowed for the identification of the regression model that best fits the data, providing insights into the factors affecting the income of women in pupuru

production.

3. Result and Discussion

3.1. Socio-economic Characteristics

The study analyzed various socio-economic factors among respondents, including age, marital status, educational level, household size, secondary sources of income, years of experience, operational modalities, access to credit, market access, and points of sale. These variables were shown as revealed in the **Table 1.** The results indicate that the mean age of the women involved in pupuru production in Irele Local Government Area (LGA) was 43.64 years, suggesting that the women are generally middle-aged but remain active in their agricultural activities. The age distribution shows that 50.0% of respondents were between 1 and 40 years, 26.7% were between 41 and 50 years, 10.8% were between 51 and 60 years, and 12.5% were above 60 years. This suggests that most of the women are in their productive years. Regarding marital status, the majority of the respondents were married (72.5%), followed by single women (18.3%), with small percentages of divorced (3.3%) and widowed (5.9%) respondents. This indicates that the majority of women in Irele LGA are likely responsible family members, which may contribute to their adoption of innovations that enhance agricultural productivity. This finding aligns with a similar study by Olaleye et al. [20], which showed that most rural farmers were married. Educational attainment among the respondents was diverse: 21.7% had no formal education, 8.3% had primary education, 25.0% had secondary education, 26.7% had tertiary education, and 18.3% had vocational training. This suggests that the women in the rural community have a reasonable level of literacy, which may support their productivity, particularly in adopting modern agricultural techniques to enhance the cassava value chain. In terms of household size, 50.0% of respondents had households of 0 to 5 persons, 45.0% had 6 to 10 persons, and 5.0% had more than 10 persons. The average household size was 6 persons, which is relatively small. This may limit the availability of household labor, potentially affecting farm size and productivity as opined by [21]. The study also examined respondents' income sources: 90.0% were involved in cassava processing, 5.0% in artisanal work related to pupuru

Table 1. Socio-economic Characteristics of the Respondents (n = 120).

Characteristics	Frequency	Percentage	Mean
Age (Years)			
40 and Below	60	50	
41–50	23	26.7	
51–60	13	10.8	
61 and Above	15	12.5	
Marital Status			
Single	22	18.3	
Married	87	72.5	
Divorced	4	3.3	
Widowed	7	5.9	
Educational level			
No formal education	26	21.7	
Adult Education	10	8.3	
Primary education	30	25	
Secondary education	32	26.7	
Tertiary education	22	18.3	
Household size			
0–5	60	50	
6–11	54	45	6
>10	6	0.8	
Secondary source of income			
Cassava processing	108	90	
Civil service	4	3.3	
Artisan work	6	5	
other works	2	1.7	
Years of experience			
<10	44	36.7	
11–20	32	26.7	
21–30	22	18.3	
31–40	13	10.8	
>40	9	7.5	
Operation modality			
Commercial	78	65	
Smallholding	35	29.2	
Cooperative	7	5.8	
Access to credit			
Yes	10	8.3	
No	110	91.7	
Access to market			
Yes	90	75	
No	30	25	
Point of sale			
Farm gate	5	4.2	
Market	90	75	
Home	25	20.8	

Source: Field survey, 2024.

production, 3.3% in civil service, and 1.7% in other activities. This indicates that most women in the region rely on cassava processing as their primary source of income, with pupuru production serving as a secondary income source. The respondents' experience in cassava production varied: 7.5% had more than 40 years of experience, 10.8% had between 31 and 40 years, 18.3% had between 21 and 30 years, 26.7% had between 11 and 20 years, and 36.7% had between 1 and 10 years of experience. On average, respondents had 25.5 years of experience, suggesting that the women were seasoned participants in the cassava value chain, which could enhance their operational performance and profitability. Regarding operational modalities, 65.0% of the respondents were commercial operators, 29.2% were smallholders, and 5.8% were engaged in cooperative activities. This shows that most of the women in the study area produce pupuru on a commercial scale. The study also found that 91.7% of the respondents lacked access to credit or financial services, which hinders the improvement of their operations. Only 8.3% had access to credit. In terms of market access, 75.0% of the respondents had access to a market to sell their products, while 25.0% did not. Finally, 75.0% of the women used the market as their point of sale, 20.8% sold their products at home, and 4.2% sold at the farm gate. This suggests that most women prefer to use the market as their primary point of sale for pupuru production.

3.2. Cost and Return Estimate of Pupuru Production

To assess the profit margin of women involved in pupuru production, the study analyzed the average revenue, total fixed costs, and total variable costs incurred as revealed in the **Table 2.** The Gross Margin (GM) was calculated as the difference between Total Revenue (TR) and Total Variable Cost (TVC), excluding fixed costs, as they remain constant regardless of production levels. The Gross Margin represents the difference between revenue and variable costs. The total revenue from selling pupuru per production cycle amounted to ₦1,181,308.00. This was calculated by multiplying the quantity of pupuru sold by the unit selling price. The total variable cost was ₦451,172.02, which included expenses such as the purchase of fresh cassava, transportation, labor costs, packaging, rent, taxes, and fuel for processing equipment. Fixed costs, including assets like the milling machine, siever, and weighing scale, were calculated using the straight-line depreciation method. The total fixed cost was estimated at ₦335,753.44 for an average pupuru producer. The Benefit-Cost Ratio (BCR) was calculated at ₦1.50, indicating that pupuru production and marketing are both feasible and profitable in the study area. According to the BCR decision rule, a BCR greater than 1 indicates profitability, a BCR less than 1 suggests a loss, and a BCR equal to 1 means the business has broken even. Since the BCR in this case is greater than 1, it implies that pupuru production and marketing in this area is a profitable and viable business.

Table 2. Profitability of Pupuru Production and Marketing.

Income	**N**
Total Revenue from sales of Pupuru per cycle	1,181,308.00
Variable Cost	
Cost of cassava procurement	281,572,00
Cost of transportation	47,560.01
Labour cost	59,080.00
Packaging cost	32,400.00
Rent	21,216.00
Cost of engine fuel	4,326.00
Tax	5,018.01
Total Variable Cost	451,172.02
Fixed Cost	
Depreciation on Milling Machine	306,503.34
Depreciation on Siever	8,602,00
Depreciation on Weighing Scale	20,648.10
Total Fixed Cost	335,753.44
Total Cost	786,925.46
Gross Margin	730,135.98
Profit	394,382.54
Profitability Indicator	
BCR	1.5
RRFC	2.17

Source: Field data 2023.

3.3. Factors Affecting the Income of Women Participating in Pupuru Production in the Study Area

The determinants of net income among women involved in pupuru production in the study area were

analyzed using the Ordinary Least Squares (OLS) regression model. Results were presented using three functional forms: linear, exponential, and semi-logarithmic as shown in the **Table 3**. The selection of the best model was based on the criteria of the lowest mean square error (MSE), higher R-squared value, significant F-statistics, and the number of significant explanatory variables. Based on these criteria, the linear regression model was chosen for interpretation.

Table 3. Factors Affecting Income of the women producing pupuru.

Variable	Linear	Exponential	Semi-logged
Sex	–0.0840 (0.293)	–0.414 (0.338)	–0.0541 (0.108)
Age	–0.0120 (0.110)	–0.153 (0.681)	–0.0356 (0.953)
Household Size	–0.135 (0.348)	0.6761 (0.269)	–0.0477 (0.369)
Marital Status	0.0871 (0.910)	0.099 (0.19)	–1.0770 (0.006)
Years of Experience	0.2650** (0.012)	0.0431* (0.036)	0.1043* (0.012)
Years of Education	0.1810** (0.016)	0.0238* (0.173)	0.279 (0.217)
Operation modalities	1.0806 (0.601)	0.0369* (0.025)	0.472* (0.013)
Access to Market	0.2150* (0.012)	0.0854 (0.307)	0.0372 (0.191)
Access to Extension	0.3020*** (0.002)	0.3291** (0.016)	–0.0510 (0.508)
Access to Credit	0.293*** (0.006)	0.0343** (0.009)	0.648** (0.011)
Constant	0.1252 (0.002)	0.6020 (0.184)	0.0520 (0.001)
R^2	0.6400	0.5129	0.5020
Adjusted R^2	0.6100	0.5013	0.5010
Prob F	0.0000	0.0011	0.0013
Root MSE	0.2827	0.0730	0.0658

Source: Field Data, 2023. ***, $p < 0.01$; **, $p < 0.05$; *, $p < 0.1$.

The linear model recorded the lowest MSE of 0.0000618 and an R-squared value of 0.640, indicating that the independent variables collectively explained 64.0% of the total variation in net income. The F-statistic was 4.23, showing the overall model significance at the 1% level. Positive coefficients suggest a direct relationship between the explanatory variables and net income, while negative coefficients indicate an inverse relationship. The coefficient for years of experience was positive and significant at the 5% level. Specifically, a one-year increase in experience would increase the net income of women by 0.265 units. This underscores the importance of accumulated skills and expertise in enhancing income generation, holding other factors constant. Contrary to expectations, the coefficient for years of education was negative and significant at the 5% level. A one-year increase in education resulted in a decrease in net income of 0.181 units. This suggests that higher levels of education might divert attention away from pupuru production, thereby reducing profitability, as opposed to the initial expectation that educated women would manage resources more efficiently and generate higher revenues.

Access to market had a positive and significant effect on income at the 10% level. An improvement in market access increased net income by 0.215 units. This aligns with the expectation that better market access enhances the sale of products, thereby increasing revenue for pupuru producers. The coefficient for access to credit was positive and highly significant at the 1% level. A unit increase in access to credit led to a 0.293-unit rise in net income. This highlights the critical role of credit facilities in enabling women to inject more capital into their businesses, thus boosting productivity and income. The coefficient for access to extension services was also positive and significant at the 1% level. Increased access to extension services was associated with higher net income for women pupuru producers. This implies that women who receive adequate advisory and support services are better equipped to improve production processes, leading to higher revenues.

These findings provide valuable insights into the factors influencing the income of women in pupuru production and highlight the need to focus on improving market access, credit facilities, and extension services while addressing the challenges associated with education in this context.

3.4. Constraints Faced by Women in Pupuru Production

The study identified the key challenges faced by women involved in *pupuru* production in the study area. The results in the **Table 4** revealed that price fluctuations in cassava raw materials, with a mean score of 4.72, were

the most significant challenge, ranking 1st. This was followed by the high cost of processing facilities, which ranked 2nd with a mean score of 4.20. Lack of access to credit facilities ranked 3rd, with a mean score of 3.60. Other constraints included low profitability of *pupuru* products (mean score: 1.80), ranked 4th; inadequate market access (mean score: 1.64), ranked 5th; high labor costs (mean score: 1.50), ranked 6th; and inadequate equipment and machinery, which was ranked 7th with a mean score of 1.08.

Most respondents agreed that price fluctuations in cassava raw materials (4.72), high processing costs (4.20), and lack of credit facilities (3.60) were the most pressing constraints. According to the findings, inadequate equipment and machinery, fluctuating cassava prices, high processing costs, lack of information on the cassava value chain, insufficient processing facilities, limited labor, and the complexity of processing technology were identified as challenges. However, the latter issues were considered minor constraints compared to the more critical problems faced by the women in pupuru production. These challenges highlight the need for targeted interventions to stabilize input prices, improve access to affordable processing equipment and credit, and strengthen market linkages to enhance the profitability and sustainability of pupuru production as revealed in the **Table 5.**

Table 4. Constraints faced by women in cassava production and processing in the area.

Factors	SA	A	U	D	SD	Mean	Rank
Fluctuation in prices of Cassava	35 (29.2)	41 (34.2)	28 (23.3)	14 (11.7)	2 (1.7)	4.72	1st
High Cost of processing facilities	22 (18.3)	40 (33.3)	2 (1.7)	36 (30.0)	20 (16.7)	4.20	2nd
Lack of Credit facilities	32 (26.7)	42 (35.0)	20 (16.7)	14 (11.7)	12 (10.0)	3.60	3rd
Low profitability	12 (10.0)	10 (8.3)	16 (13.3)	52 (43.3)	30 (25.0)	1.80	4th
Inadequate Market	12 (10.0)	14 (11.7)	24 (20.0)	51 (42.5)	19 (15.8)	1.64	5th
Limited and high labour cost	22 (18.3)	34 (28.3)	10 (8.3)	40 (33.3)	14 (11.7)	1.50	6th
Inadequate equipment and Machines	18 (15.0)	24 (20.0)	12 (10.0)	32 (26.7)	34 (28.3)	1.08	7th

Source: Field survey, 2023. SA, Strongly Agree = 5; A, Agree = 4; U, Undecided = 3; D, Disagree = 2; SD, Strongly Disagree = 1.

Table 5. Constraints Decision.

Constraints	Mean	Decision
Inadequate equipment and Machines	1.08	Disagree
Fluctuation in prices of Cassava	4.72	Agree
High Cost of processing facilities	4.20	Agree
Low profitability	1.80	Disagree
Lack of Credit facilities	3.60	Agree
Limited labour	1.50	Disagree
Inadequate Market	1.64	Disagree

Source: Field Data, 2023.

4. Conclusions

The study revealed that women involved in cassava-to-pupuru production were predominantly married, physically active, and economically productive. These women were experienced in pupuru production, educated, and often had secondary sources of income. They operated on a commercial scale but faced limited access to credit and other essential inputs. Despite these challenges, the women had full access to market spaces where they sold their pupuru. The findings also showed that cassava-to-pupuru production is a profitable agribusiness enterprise, with a significant margin between production costs and revenue. The study concluded that factors such as years of experience, level of education, access to credit, market access, and extension services significantly influenced the net in-

come of women engaged in this enterprise. However, the study also identified several major constraints, including price fluctuations in cassava raw materials, high processing costs, and limited access to credit facilities, as critical challenges faced by these women. To address these issues and enhance the profitability of cassava-to-pupuru production, the following recommendations were made:

1) Price Stabilization and Cassava Supply: The government should implement measures to ensure a steady supply of cassava and regulate prices, encouraging greater participation of women in the cassava-to-pupuru value chain.

2) Improved Access to Credit: Efforts should be made to bridge the gap between women processors and financial institutions, enabling better access to credit facilities.

3) Maximizing Profitability: Women involved in pupuru production should leverage the enterprise's profitability to optimize their income generation potential.

4) Infrastructure Development: The government should invest in infrastructural support for agro-processing sectors to promote growth and efficiency in the cassava-to-pupuru value chain.

These interventions would help alleviate the challenges faced by women in pupuru production and contribute to the sustainability and expansion of this profitable agribusiness.

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Institutional Review Board Statement

This work did not require ethical approval from any institution.

Informed Consent Statement

Informed consent was obtained from all subjects in the study.

Data Availability Stadonetement

Data is available with the author.

Conflicts of Interest

The author declares no conflict of interest.

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