

DETERMINANTS OF CASSAVA COMMERCIALIZATION IN SELECTED STATES OF THE NIGER DELTA REGION OF NIGERIA: RESULTS FROM CASSAVA COMMERCIALIZATION INDEX (CCI)

***Gabriel N. Odok, Eyo O. Edet , Theresa C. Akwo , Uket I. Ofem and Julia A Effiwat,**
Department of Agricultural Economics, Faculty of Agriculture, University of Calabar, Calabar, Nigeria

*Corresponding author, e-mail: gabrielodok6@gmail.com

Abstract

This study examines the determinants of cassava commercialization among smallholder farmers in the Niger Delta region, Nigeria. Despite Nigeria's position as the world's largest cassava producer, the commercialization of cassava remains limited in states such as Akwa Ibom, Rivers, and Edo States. This study applies the Cassava Commercialization Index (CCI) to quantify commercialization levels and assess the impact of key socio-economic and production factors. Data was collected using structured questionnaire, administered to 290 farmers selected from Akwa Ibom, Rivers, and Edo States through random sampling. From the results, the distribution of cassava farmers according to their commercialization levels were categorized into ranges (25-35%, 36-46%, etc.), with the peak distribution within the 58-68% commercialization range, with approximately 36.9% of farmers. This suggests that a substantial proportion of farmers are moderately commercialized, selling more than half of their cassava products. However, relatively few farmers exceed an 80% commercialization rate, indicating a limit to high commercialization levels among farmers in the study area, potentially due to barriers such as market access, production costs, or lack of processing facilities. The results further averred that a large portion of the sample (60.9%) reported moderate levels of commercialization between 58-68%. On the contrary, factors such as age and education level exhibited minimal impact on commercialization rates. The study concludes with policy recommendations such as, facilitating access to market, promoting technology adoption, and providing input support to farmers, thereby transform cassava from a mere subsistence crop to a viable commercial product in the Niger Delta Region of Nigeria.

Keywords: Cassava Commercialization, Niger Delta, Cassava Commercialization Index, Agricultural Policy

Introduction

Cassava commercialization refers to the shift from subsistence farming to market-oriented production, in which cassava is grown primarily for sale rather than for consumption. The Cassava Commercialization Index (CCI), a quantitative measure, evaluates the proportion of cassava production sold relative to total production. A higher index indicates greater market orientation (Govere

et al., 1999; Strasberg et al., 1999). Cassava, as a staple root crop, plays a critical role in the food security balance sheet and rural livelihood in Nigeria, which is the world's largest cassava producer, contributing about 21% of global cassava output (FAOSTAT, 2016). Despite high production rates, much of Nigeria's cassava is produced by smallholder farmers and directed toward subsistence rather than commercial markets (Akinwumi, 2012; Odok et al., 2017). The

Niger Delta region, encompassing Akwa Ibom, Rivers, and Edo States, exemplifies the potential of cassava commercialization, as the region has favourable agro-climatic conditions and high cassava yields. However, barriers such as limited market access, inadequate input supply, and lack of improved technology adoption hinder full commercialization potentials (Nweke, 2004). This study seeks to examine factors influencing cassava commercialization in the three selected states vis-à-vis the Niger Delta Region of Nigeria by employing the Cassava Commercialization Index (CCI), whose specific objectives include:

- (a) assess the current extent of cassava commercialization, its ratio, and other crop ratios in the region;
- (b) identify key socioeconomic variables and production factors influencing cassava commercialization in the region;

Relevance of Cassava Commercialization in Niger Delta

Commercialization enhances household income, employment opportunities, and rural economies (Nweke, 2004). Industrially, cassava is a key raw material for industries producing ethanol, starch, and animal feed (IITA, 2005). Based on food Security, increased market participation ensures the availability of processed cassava products such as *garri*, *fufu*, and *tapioca*. Studies show that moderate commercialization levels are attributed to small farm sizes and limited access to markets. In Akwa Ibom State, the average CCI is approximately 60%,

indicating a substantial portion of cassava production is sold (Agwu *et al.*, 2012).

Cross River State is known for high cassava production, although farmers face challenges in accessing processing facilities, thereby reducing the CCI to about 55% (Sanni *et al.*, 2014). Edo state demonstrates the highest commercialization level among the other two states, with a CCI exceeding 65%, due to better road networks and access to market (Elemo, 2013).

This research addresses critical knowledge gaps in cassava commercialization, offering insights for policy development and intervention programmes to boost rural economic growth through cassava market integration.

Some Empirical Review

Cassava Commercialization: Global and Regional Trends

Recent studies underscore cassava's role in food security and economic transformation, especially in sub-Saharan Africa. Cassava has shifted from a subsistence crop to an increasingly commercialized crop in many regions due to rising demand for industrial uses (Maziya-Dixon *et al.*, 2017). Globally, cassava's diversification into biofuel, starch, and animal feed markets, particularly in Southeast Asia, demonstrates the economic potential of commercializing this root crop (Scott *et al.*, 2020). However, in Africa, the commercialization process remains impeded by structural issues, such as poor infrastructure, limited processing capacity, and reliance on traditional cultivation

methods (FAO, 2021; Otekunrin, *et al.*, 2022).

Determinants of Cassava Commercialization

1. Farm Size and Output Levels: Studies by Carletto *et al.* (2013), and others affirm that larger farm sizes enable farmers to scale production, making commercialization more feasible. Small-scale farms face constraints in reaching marketable surplus due to lower yields and limited access to inputs.

2. Market Access and Infrastructure: Adeoti *et al.* (2021) and Iheke, *et al.* (2024) highlight the significance of road networks and market proximity in promoting commercialization. Market distance has a direct impact on transportation costs, discouraging farmers from selling in larger, urban markets (Atagher, 2013).

3. Adoption of Improved Varieties and Technology: Martey *et al.* (2020) found that adopting improved cassava varieties can significantly enhance yields and marketability. Improved varieties are often more resilient to pests and diseases, allowing for consistent and high-quality output that appeals to commercial markets (Nweke, 2013; Kavuma *et al.*, 2023)

4. Household Labour and Size: Family labour is essential in smallholder cassava production. Studies by Osondu *et al.* (2014) and Adeoti *et al.* (2014) suggested that larger household sizes contribute to labour availability, which supports both cultivation and commercialization activities. However, the dependency ratio within households can

affect how much labor is allocated to cassava versus other economic activities.

5. Price Incentives and Input Costs: Pricing structures for cassava impact farmers' willingness to commercialize. Studies have shown that high input costs and low farm-gate prices reduce the incentives for smallholder farmers to invest in commercial cassava production (Elemo, 2018).

Methodology

Study Area

This study focuses on Akwa Ibom, Rivers, and Edo States in the Niger Delta. These states are among Nigeria's top cassava-producing states and exhibit varying levels of cassava commercialization influenced by socio-economic, environmental, and infrastructural conditions.

Sampling Procedure and Sample Size

Sampling Procedure: A multi-stage sampling technique was employed. Firstly, states and local government areas were randomly and purposively selected based on the level of cassava production activities. From the sampling frame obtained from each state, a total of 110, 75, and 105 were randomly selected from the three sampled states (Cross River, Akwa Ibom and Delta respectively), to give a total of 290 farmers.

Primary data were gathered through structured questionnaires covering socio-economic characteristics, farm size, input use, technology adoption, market access, prices etc.

Data analysis**Cassava Commercialization Index (CCI)**

The CCI measures commercialization as the ratio of gross value of cassava sales to gross value of cassava output. This index enables quantification of the commercialization rate and has been successfully applied in other studies, such as by Govereh *et al.* (1999) and Strasberg *et al.* (1999) (see formula 1).

Formula:

$$CCI = \frac{\text{Value of Output sold (₦)}}{\text{Value of Total output harvested (₦)}} \times 100 \quad (1)$$

A multiple regression analysis was undertaken using four functional forms: linear, double log, semi-log and the exponential to examine the factors influencing commercialization of the cassava in the area of study.

The Regression model is as shown below:

$Y =$

$$X_1B_1 + X_2B_2 + X_3B_3 + X_4B_4 + X_5B_5 + X_6B_6 + X_7B_7 + X_8B_8 + X_9B_9 + X_{10}B_{10} + \dots + e_1$$

Where: X_1 = Adoption level (dummy)

X_2 = Farm Size (hectares)

X_3 = Household Size (numbers)

X_4 = Age of Farmer (Age)

X_5 = Educational Level (No of years in school)

X_6 = Distance to Market (Km)

X_7 = Age of Cassava Enterprise (Years)

X_8 = Cassava Planting Option (dummy)

X_9 = External Input Used (dummy)

X_{10} = Price of Cassava (₦/ton)

Results and Discussion

Key variables, including farmer age, household size, education level, farm size, and distance to market, were summarized (Table 1). A large portion of the sample (60.9%) reported moderate levels of commercialization, between 58-68%.

Table 1: Descriptive statistics on the socio-economic variables in the area

Variable	Mean	Std Dev	Min	Max
Farmer Age	45.2	12.1	20	70
Household Size	5.8	2.4	2	10
Farm Size (hectares)	2.5	1.3	0.5	8
Distance to Market (km)	12.3	5.6	3	25
Adoption of Improved Varieties (%)	64.7	15.8	20	100

Source: Fieldwork (2023)

Distribution of Cassava Farmers by Extent of Commercialization in the study area

The chart below shows the distribution of cassava farmers according to their commercialization levels, categorized into ranges (25-35%, 36-46%, etc.). The peak distribution falls within the 58-68% commercialization range, with approximately 36.9% of farmers (Fig.1). This

suggests that a substantial proportion of cassava farmers are moderately commercialized, selling more than half of their cassava production. However, relatively few farmers exceed an 80% commercialization rate, indicating a limit to high commercialization levels among farmers in the study area, potentially due to barriers like market access, production costs, or lack of processing facilities.

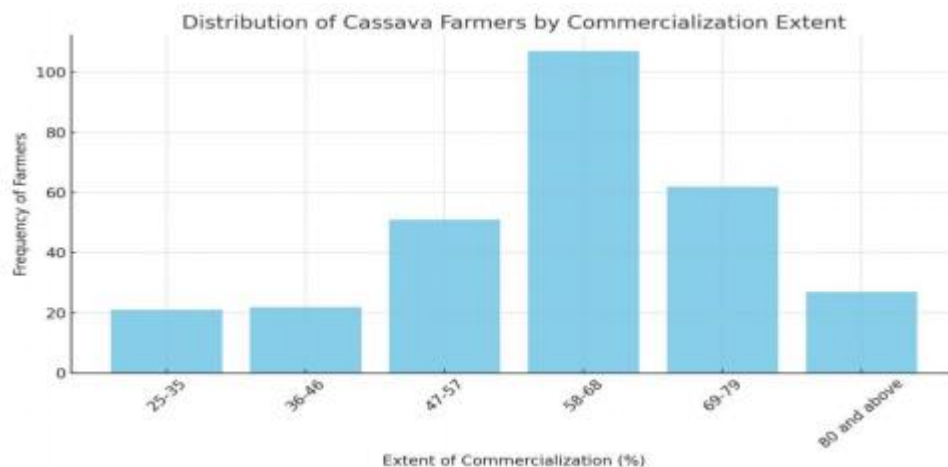


Fig. 1: Distribution of Cassava Farmers by Commercialization index in the Region

Cassava Commercialization Index Relative to Crops Inter-crop with Cassava

Table 2 compares the commercialization index for Cassava with the different crops inter-crop with cassava in the study area. Cassava stands out with a commercialization index of 60.9%, much higher than other crops such as maize (21.7%), yam (15.5%), melon (12%), and cocoyam (11.7%) (Fig.2 and

Table 2). This indicates that cassava is the most commercially viable crop among those studied, likely due to its demand and versatility in the region. The significant drop-off in commercialization index for other crops underscores cassava's unique role in the local agricultural economy, suggesting it could be a focal point for policy and market interventions aimed at commercialization.

Table 2: Commercialization index for Cassava and other intercrops in the study area

Crops	Gross Value of Crop Sales (₦)	Gross Value of All Crops Produced (₦)	Commercialization Index (%)	Category
Cassava	127859.6	209950	60.9	High
Maize	45550	209950	21.7	Low
Yam	32600	209950	15.52	Low
Melon	25170	209950	11.99	Low
Cocoyam	24640	209950	11.74	Low

Source: computed from Authors Field Data (2023)

Determinants of Commercialization of Cassava Farmers

To estimate the determinants of commercialization of cassava farmers in the study area, four functional forms the OLS multiple regression model were tried and fitted with the data. Table 3 shows that all the functional forms of regression were statistically significant at 1% probability level ($p < 0.01$) implying that any of functional forms was adequate in estimating and explaining the variations in extent of commercialization of cassava farmers. However, the extent of commercialization was best estimated and explained using the double logarithmic functional form which explained 88.4% of the total variation in the dependent variable. Furthermore, other statistical and econometric considerations such as the number of significant coefficients and their conformity to *a priori* expectations were in favour of the double-log functional form. The F-statistic value of 210.476 was statistically significant at 0.01 level, implying goodness of fit and that the independent variables were important explanatory factors of the variations in the dependent variable.

The coefficients of adoption level (X_1), and external inputs use (X_9) were significant at

1% level, while the coefficients of farm size (X_2), household size (X_3) and distance to market (X_6) were significant at 5% level, implying that these variables are the determinants of extent of commercialization of cassava in the study area. The coefficients of age of farmer (X_4), education level (X_5), age of cassava enterprise (X_7) and price of cassava (X_{10}) were not significant at 5% level of probability, implying that these variables are not determinants of extent of commercialization of cassava in the study area. Therefore, hypothesis III which stated that, the socioeconomic characteristics of cassava farmers have no significant influence on the extent of cassava commercialization in the study area, is hereby rejected with respect to the significant variables, and accepted with respect to the non-significant variables.

The coefficient of household size (X_3) was positive and significant at 0.05 level, indicating direct significant effect of household size on extent of commercialization. This positive coefficient implies that a unit increase in the household size will raise the extent of commercialization of cassava by 5.4%. This indicates that the household members were not economic dependents and sometimes

joined in cassava production activities resulting to less expenditure on labour. The result is in conformity with a priori expectation and in agreement with Osondu, *et al.*, (2014) assertion that more adult persons in the household meant that more quality labour would be available for carrying out farm activities. According to Zekeri and Tijani (2013) family labour contributes positively to increase in output of farm produce.

Distance to market (X_6) had a significant negative coefficient at 0.05 probability level. This implies that increased kilometer coverage decreases the extent of commercialization of cassava. This finding is in line with a priori expectation and results obtained in Atagher (2013) study among ADP cassava farmers in Benue state, Nigeria.

The coefficient of external inputs used (X_9) was positive and significant at 1% level implying a highly positive significant contribution of use of external inputs to cassava commercialization. This agrees with the findings of Martey *et al.* (2012), Taiwo and Adebayo (2024) that improvement in agricultural technology and external inputs

use leads to improvement in farm productivity and commercialization.

The coefficient of adoption level (X_1) was positive and significant at 1% implying a positive significant contribution of the variable to extent of commercialization. This implies that 1% increase in adoption level would tend to increase extent of commercialization by 0.50%. The sign of the coefficient is in line with a priori expectation, the result implies that adoption of more improved cassava varieties facilitates extent of commercialization than using cheap traditional cassava varieties. The findings conform with that of Phillips *et al.* (2005), Agwu *et al.* (2013). The coefficient of farm size (X_2) was positive and statistically significant at 0.05 probability level.

The sign of the coefficient is in conformity with a *priori* expectation and agrees with the findings of Carletto *et al.* (2013), who reported that farm size would increase as the resource holding capacity of farmers' increases, hence increase in output and commercialization. Farmers would be more disposed to increased commercialization when their outputs increase as a result of increase in farm size.

Table 3: Regression results of Determinants of cassava commercialization in the study area

Functional Forms	Linear	Exponential	Semi-log	Double-log
Constant	-28145.235	10.476	-62301.7	7.596
	(-1.220)	(48.438) **	(-1631)	(15.311) **
A doption Level (X1)	125.168	0.002	69715.55	0.5
Farm Size (X2)	(-0.759)	(1.230)	(2.222) *	(3.228) **
	1373.881	0.008	1061.657	0.010
Household Size (X3)	(1.771)	(1.496)	(1.061)	(2.457)
	3913.851	0.042	57383.045	0.541
Age of Farmer (X4)	(1.138)	(1.309)	(1.690)	(2.217)
	2227.061	0.006	1295.885	0.015
Education Level (X5)	(1.380)	(0.395)	(0.432)	(1.276)
	341.752	0.012	25139.210	0.17
Distance to Market (X6)	(0.327)	(1.220)	(1.108)	(0.560)
	-131.013	-1.003	-2337.689	0.009
Age of Cassava (X7)	(-0.709)	(-1.557)	(-2049)	(-2.513) *
Enterprise	31209.171	-0.045	2284.993	0.632
Cassava planting (X8)	(1.265)	(1.437)	(1.345)	(1.475)
Option	0.685	2.583	4087.676	0.013
External Inputs Used (X9)	(0.796)	(0.320)	(0.551)	(1.399)
	17185.203	0.555	8455.977	0.280
Price of Cassava (X10)	(2.908)**	(10.023)	(1.849)	(4.726) **
	-5004.076	0.045	-2352.235	0.035
	(-1.310)	(-1.333)	(-1.028)	(-1232)
R Squared (R ²)	0.791	0.844	0.767	0.884
F-value	105.467**	150.714**	225.588**	210.47**
Sample size (n)	290	290	290	290

Figures in parantheses are t-values; *Significant at 5%; **Significant at 1%

Source: Computed from Authors Field Data (2023)

Conclusion and Policy Recommendations

The analysis indicates that farm size and technology adoption are critical for commercialization. The negative effect of market distance underscores the need for improved rural infrastructure, which could reduce transaction costs and enhance market participation. The positive impact of household size on commercialization reflects labor availability's importance, indicating that family labor can drive productivity. Based on the results, it was therefore, concluded that factors such as farm size, market access, and technology adoption significantly influence commercialization rates. Targeted policies and investments in infrastructure, input provision, and market support are essential to realize the commercialization potential of cassava in the region. Given this scenario, policy recommendations arising from the study were to:

1. Enhance Market Access: Develop and maintain rural road networks to reduce transportation costs and facilitate access to urban markets.
2. Promote Technology Adoption: Increase extension services and subsidies for improved cassava varieties to boost productivity and commercialization rates.
3. Expand Input Support Programs: Provide access to affordable inputs through government or cooperative support, addressing the financial barriers to input adoption.
4. Develop Cassava Value Chains: Encourage investments in processing facilities to expand cassava's value-

added market, thereby creating more commercial opportunities for smallholder farmers.

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