Journal of Agriculture and Rural Development Studies
Volume 3 – Issue 1 – 2026
ISSN Online 3061-2756
www.imadr.jards.ugal.ro

DOI https://doi.org/10.35219/jards.2026.1.17

Socio-Economic Structure and Income Distribution Dynamics in the Cocoa Beans Value Chain of Ogun State, Nigeria: Implications for Sustainable Agricultural Development

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ARTICLE INFO

Article history:
Received: March 12, 2026
Accepted: March 31, 2026
Published: March 31, 2026

JEL Classification:
D31, O13, Q12, Q13, Q18

Keywords:
Cocoa value chain; Income distribution; Socio-economic structure; Sustainable agricultural development; Smallholder farmers; Sustainability

ABSTRACT

This study examined the socio-economic structure and income distribution dynamics among cocoa beans value chain actors in the Ijebu produce inspection areas of Ogun State and assessed their implications for sustainable agricultural development. Despite the economic importance of cocoa to Nigeria's non-oil export sector and rural livelihoods, persistent disparities in value capture across actors continue to raise concerns about equity, efficiency, and long-term sustainability. Using a cross-sectional survey design, primary data were collected from 41 cocoa farmers, 47 local middlemen (Barakunas), 42 storekeepers, and 12 merchants operating within the grading zones of Ijebu Ode, Ogbere, and Ajebandele. Descriptive statistics and the Chi-square (χ^2) test of independence were applied to analyze socio-demographic characteristics, income distribution, and enterprise structures across stakeholder categories. The results revealed statistically significant differences in socio-demographic profiles ($\chi^2 = 35.0$, $p < 0.001$), income distribution ($\chi^2 = 25.98$, $p < 0.001$), and enterprise characteristics ($\chi^2 = 48.01$, $p < 0.001$) among value chain actors. Farmers were generally older and operated predominantly small-scale farms, with over half cultivating less than six hectares. Income distribution patterns showed notable disparities, with a large proportion of middlemen earning below ₦0.5 million annually, while merchants dominated higher income brackets and controlled larger storage capacities and seasonal tonnage volumes. Educational attainment and capital intensity increased progressively downstream along the value chain, indicating structural stratification and concentration of economic power among actors engaged in aggregation and trade. The study concluded that significant structural heterogeneity exists within the cocoa value chain, influencing value capture, market participation, and sustainability outcomes. These disparities have implications for generational renewal, investment capacity, and inclusive agricultural development. Strengthening farmer cooperatives, expanding access to finance, promoting youth participation, and improving farm-level post-harvest infrastructure were identified as critical policy priorities.

1. Introduction

Cocoa remains one of the most strategic agricultural commodities in West Africa and a critical source of rural livelihood, foreign exchange earnings, and agro-industrial development. Globally, countries such as Côte d'Ivoire and Ghana dominate production, while Nigeria remains a historically significant

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producer within the global cocoa economy. In Nigeria, cocoa contributes substantially to non-oil export earnings and supports thousands of farming households and downstream market actors (Oginni et al., 2024). Ogun State, particularly the Ijebu zones, constitutes an important cocoa-producing belt, where farmers, licensed local middlemen (Barakuna permit holders), registered storekeepers, and merchants interact within a structured produce inspection system. Despite cocoa's economic importance, concerns persist regarding unequal income distribution, structural inefficiencies, and sustainability challenges along the value chain.

The research problem addressed in this study stems from the persistent socio-economic disparities observed among cocoa value chain actors and their implications for sustainable agricultural development. While cocoa production generates significant revenue, evidence suggests that value capture is unevenly distributed across actors, with smallholder farmers often earning disproportionately lower returns relative to downstream intermediaries and merchants (Oluyole et al., 2023). Furthermore, differences in education, gender participation, farm size, asset ownership, and access to market information may reinforce structural inequalities within the chain (Donkor et al., 2022; Fasakin et al., 2023; Karakara et al., 2024; Akinrotimi, 2024; Susandi et al., 2025). Such disparities can undermine long-term sustainability by discouraging productivity investments, limiting generational renewal, and weakening rural economic resilience. In the context of Nigeria's agricultural diversification agenda and sustainable development goals, understanding these structural dynamics is both socially and scientifically imperative.

From a scientific standpoint, value chain analysis has evolved beyond mapping actor linkages to examining governance structures, income distribution, and power asymmetries (Lang et al., 2023). Empirical studies in West Africa have explored cocoa productivity constraints, market liberalization effects, and certification impacts (Adesiyan et al., 2023). However, limited disaggregated evidence exists on intra-chain socio-economic differentiation within specific Nigerian cocoa clusters, particularly in Ogun State. Existing Nigerian studies often emphasize production constraints or export performance, with less attention to statistically validated socio-demographic and enterprise characteristics across multiple stakeholder categories. Moreover, few studies integrate socio-economic structure with income distribution dynamics to derive sustainability implications at the sub-national level. This creates a knowledge gap regarding how actor heterogeneity influences sustainable agricultural development outcomes in localized cocoa economies.

Socially, the study holds significant value because cocoa-dependent communities rely heavily on value chain participation for household welfare, employment generation, and intergenerational mobility. Unequal access to capital, land, education, and market opportunities can entrench rural inequality and reduce incentives for sustainable practices such as farm rehabilitation, climate adaptation, and quality enhancement (Aluko et al., 2024). Scientifically, examining socio-economic structure using inferential statistics provides empirical rigor in identifying whether differences among actors are statistically significant, thereby strengthening policy relevance. By situating actor-level characteristics within a sustainability framework, the study contributes to debates on inclusive agricultural commercialization, equitable value distribution, and rural transformation.

Accordingly, the primary objective of this study is to evaluate the socio-economic structure and income distribution dynamics among cocoa beans value chain actors in the Ijebu produce inspection areas of

Ogun State, Nigeria, and to assess their implications for sustainable agricultural development. Specifically, the study seeks to:

1. Examine the socio-demographic characteristics of cocoa value chain stakeholders;
2. Analyze their economic profiles, including income distribution patterns;
3. Assess enterprise and production characteristics such as farm size, work experience, ownership structure, storage capacity, and labour utilization; and
4. Determine whether statistically significant differences exist among actors across these variables.

The study is guided by the following research questions:

1. What are the socio-demographic differences among farmers, local middlemen, storekeepers, and merchants in the cocoa value chain?
2. How is income distributed across these stakeholder categories?
3. Do production scale and enterprise characteristics significantly differ among actors?
4. What are the sustainability implications of observed structural inequalities within the cocoa value chain?

In line with these questions, the study tests the following hypotheses:

H_{01}: There is no significant difference in socio-demographic characteristics among cocoa value chain actors in Ogun State.
H_{02}: There is no significant difference in income distribution across cocoa value chain stakeholders.
H_{03}: There is no significant difference in enterprise and production characteristics among actors in the cocoa beans value chain.

The alternative hypotheses posit that significant differences exist across stakeholder categories.

By addressing these hypotheses, the study contributes to agricultural economics literature by linking socio-economic differentiation with sustainable agricultural development outcomes. It also provides evidence-based insights for policymakers, cooperative bodies, and regulatory agencies seeking to promote inclusive growth within Nigeria's cocoa sector. Ultimately, strengthening equity and efficiency within the cocoa value chain is essential for enhancing productivity, improving rural livelihoods, and ensuring the long-term sustainability of agricultural commercialization in Ogun State and beyond.

2. Literature Review

The cocoa sector plays a significant role in rural economies and global commodity markets, particularly in West Africa where the crop contributes substantially to employment, export earnings, and livelihood security. Countries such as Côte d'Ivoire, Ghana, and Nigeria dominate global cocoa production and supply a large proportion of the world's cocoa beans. In Nigeria, cocoa remains a major non-oil agricultural export commodity and a key driver of rural economic activity in producing states such as Ogun, Ondo, Osun, and Cross River (Afolayan, 2020; Oginni et al., 2024). Previous studies have highlighted that cocoa production and marketing systems involve a complex network of actors including farmers, aggregators, processors, exporters, and regulatory agencies (Onumah et al., 2023; Rodríguez et al., 2023). However, the distribution of economic benefits within these value chains is often uneven,

with primary producers typically receiving a smaller share of total value compared with downstream actors who control aggregation, storage, and trade (Saediman, 2026). This structural imbalance raises important questions about equity, sustainability, and efficiency within agricultural value chains.

The theoretical foundation of this study is primarily anchored in Global Value Chain (GVC) theory, which examines how economic activities are organized across different actors and how value is created and distributed along production and marketing networks. According to GVC theory, governance structures within commodity chains determine the distribution of power, resources, and profits among actors (Bair & Mahutga, 2023; Suder et al., 2024). In agricultural commodities such as cocoa, actors who control strategic nodes, such as processing, storage, and bulk trade, often capture a disproportionate share of the value generated (Barrett et al., 2022). This perspective provides a useful framework for analyzing the structural relationships among farmers, middlemen, storekeepers, and merchants within the cocoa value chain in Ogun State. By examining differences in socio-economic characteristics, enterprise scale, and income distribution across these actors, the study seeks to identify how structural positioning within the chain influences economic outcomes.

Closely related to the GVC perspective is the Agricultural Household Model, which explains how farm households simultaneously function as production and consumption units within rural economies (Zhichkin et al., 2022; Musumba et al., 2022; Geffersa, 2023). This model emphasizes that decisions regarding production, labour allocation, and market participation are shaped by household characteristics such as education, family size, asset ownership, and access to capital. In cocoa-producing communities, these factors strongly influence farmers' productivity, technology adoption, and income levels. Empirical studies in West African cocoa systems have shown that limited farm sizes, low levels of formal education, and restricted access to credit often constrain farmers' ability to scale production or invest in improved post-harvest technologies (Kehinde, & Ogundeji, 2022; Ngwang & Bime, 2023; Attiogbé et al., 2024). As a result, many smallholder farmers remain confined to low-value segments of the commodity chain, reinforcing persistent income disparities between producers and downstream traders. Another theoretical lens relevant to this study is Sustainable Agricultural Development Theory, which emphasizes the integration of economic viability, social equity, and environmental stewardship in agricultural systems (Rosário et al., 2022; Hariram et al., 2023). Within this framework, sustainability is not only determined by ecological practices but also by equitable distribution of resources and opportunities among actors. Scholars argue that agricultural systems characterized by persistent income inequality and structural exclusion are less resilient and less capable of sustaining long-term productivity (Eliseu et al. 2024; Darmawan, 2025). In the cocoa sector, issues such as ageing farmer populations, limited youth participation, and unequal value distribution have been identified as key barriers to sustainable development (Kuhn et al., 2023; Amuda & Alabdulrahman, 2024; Frimpong et al., 2025). Consequently, understanding the socio-economic structure of the cocoa value chain is critical for designing policies that enhance inclusiveness and resilience.

In addition, the study draws on concepts from Rural Development and Social Economy frameworks, which emphasize the importance of inclusive participation and equitable economic opportunities in rural markets (Popa et al., 2024). These frameworks highlight how socio-demographic characteristics, including gender, education, and household size, can influence access to market opportunities and determine who benefits from commercialization processes (Chen & Li, 2024). For example, research has

shown that women often face barriers to accessing land, credit, and marketing networks in many agricultural value chains, limiting their participation in higher-value activities (Mayanja et al., 2022; Ezeudu & Obimbua, 2024; Mwale & Mwange, 2025). Similarly, disparities in education and market information can create unequal bargaining power among value chain actors, reinforcing structural inequalities.

Despite the growing body of literature on cocoa production and marketing, several gaps remain. Many existing studies focus primarily on production constraints, agronomic practices, or export performance (Suh & Molua, 2022; Ogunya & Tijani, 2022; Donkor et al., 2023), with limited attention to the socio-economic differentiation among actors operating within localized marketing systems. Furthermore, few studies simultaneously analyze socio-demographic characteristics, enterprise scale, and income distribution across multiple stakeholder categories within a regulated grading system (Díaz-Montenegro et al., 2025). This lack of integrated analysis limits the understanding of how structural differences among actors influence economic outcomes and sustainability within the cocoa value chain. The present study addresses this gap by empirically examining the socio-economic structure and income distribution dynamics among farmers, middlemen, storekeepers, and merchants within the Ijebu produce inspection areas of Ogun State.

By grounding the analysis in value chain theory, agricultural household models, and sustainability frameworks, the study provides a comprehensive theoretical basis for examining how socio-economic characteristics shape participation and value capture within the cocoa marketing system. This integrated perspective allows the research to contribute to broader debates on inclusive agricultural commercialization, rural transformation, and sustainable commodity value chains in developing economies.

3. Methods

This study adopted a cross-sectional survey design using a quantitative research approach to examine socio-economic structure and income distribution dynamics among cocoa beans value chain actors in Ogun State, Nigeria. The quantitative approach was considered appropriate because the study sought to establish measurable differences among stakeholder groups and test statistically significant relationships using inferential statistics (Adams & Carodenuto, 2023). A cross-sectional design enabled the collection of data from multiple categories of actors at a single point in time, allowing comparison across farmers, middlemen, storekeepers, and merchants within the cocoa value chain.

The study was conducted in the Ijebu areas of Ogun State, Southwestern Nigeria, where cocoa harvest, post-harvest handling, and marketing activities are concentrated. The study area comprises three officially recognized grading zones: Ijebu Ode zone, Ogbere zone, and Ajebandele zone, with two, three, and five gazetted grading stations respectively. These grading stations serve as regulatory and quality control points within the cocoa marketing system and form the institutional backbone of the produce inspection framework in Ogun State.

Study Population and Sampling Procedure

The study population comprised cocoa beans supply chain stakeholders operating within the designated produce inspection grading zones in the Ijebu cocoa-producing areas of Ogun State. These stakeholders

included cocoa farmers (producers), local middlemen known as Barakunas (permit holders involved in aggregation and primary marketing), registered storekeepers, and cocoa merchants. The study focused on stakeholders involved in the production, post-harvest handling, and marketing of dried cocoa beans along the cocoa supply chain. The study area consisted of three grading zones—Ijebu Ode zone, Ogbere zone, and Ajebandele zone—within the Ijebu produce inspection areas of the state. These zones collectively account for approximately 80% of the total cocoa beans output in the state according to the Produce Inspection Services. Within the zones are ten gazetted grading stations where cocoa beans aggregation, inspection, and marketing activities are carried out. The stations include Ijebu Igbo, Saasa, Aba Baale, Atoyo, Ajelanwa, Area J4, Laagan, Oloke Ali, Ajebandele, and Atakobo. A multi-stage sampling technique was adopted for the selection of respondents. In the first stage, the three grading zones were purposively selected due to their strategic importance in cocoa production and marketing in the state. In the second stage, the gazetted grading stations within the zones were identified as operational aggregation points for cocoa beans transactions. In the third stage, cocoa supply chain stakeholders operating within the identified stations were selected using purposive and proportionate sampling techniques to ensure adequate representation of each actor category. Using a cross-sectional survey design, primary data were collected from a total of 142 respondents drawn from the stakeholder population. The sample consisted of 41 cocoa farmers, 47 Barakuna permit holders (local middlemen), 42 registered storekeepers, and 12 cocoa merchants operating within the grading zones. This distribution ensured representation of actors at different stages of the cocoa supply chain, thereby enabling comprehensive analysis of socio-economic and enterprise characteristics across stakeholder groups.

Data Collection Instruments and Procedure

Primary data were collected using a semi-structured questionnaire designed specifically for cocoa beans stakeholders operating at different stages of the supply chain. The instrument was structured to capture information on stakeholders' experiences, knowledge of cocoa production, processing, and marketing, as well as post-harvest handling practices and operational constraints. The questionnaire contained several thematic sections including:

1. **Socio-demographic characteristics:** age, gender, marital status, educational attainment, religion, and household size.
2. **Economic characteristics:** income categories and tonnage of cocoa beans handled per season.
3. **Enterprise characteristics:** farm size, storage capacity, work experience, labour type, and ownership structure.
4. **Knowledge acquisition pathways:** sources of knowledge related to cocoa production, processing, and marketing such as formal training, apprenticeship, extension services, and personal experience.
5. **Post-harvest practices:** fermentation methods, drying techniques, and storage practices adopted by stakeholders.
6. **Marketing practices and constraints:** challenges encountered during production, post-harvest handling, and marketing, as well as stakeholders' suggestions for improving the efficiency and quality of cocoa beans in the supply chain.

The questionnaire included both closed-ended and open-ended questions in order to generate quantifiable data while also capturing contextual insights from respondents. To facilitate effective communication and reduce response bias, the questionnaire was administered in the language best understood by the respondents, including English and local dialects where necessary, with trained enumerators providing clarification when required.

To ensure validity and reliability, the questionnaire was developed in line with established agricultural household survey methodologies such as the guidelines provided by the Food and Agriculture Organization (FAO) and the World Bank Living Standards Measurement Study (LSMS) framework. Content validity was ensured through expert review by agricultural economists and extension specialists familiar with cocoa value chain systems. A pilot test was conducted in a neighboring cocoa-producing community outside the sampled grading stations to refine the clarity, sequencing, and response categories of the instrument.

Reliability of scale-based items was assessed using internal consistency measures, particularly Cronbach's alpha coefficient. Following the recommendations of Gültürk (2024), a threshold value of 0.70 and above was considered acceptable. Necessary adjustments were made after the pilot test to improve the clarity, reliability, and consistency of the measurement items used in the study.

Data Analysis

Data collected were coded and entered statistical software for analysis. Descriptive statistics including frequencies and percentages were used to summarize socio-demographic, economic, and enterprise characteristics across stakeholder categories.

To determine whether significant differences existed among farmers, middlemen, storekeepers, and merchants, the chi-square (χ^2) test of independence was employed. The chi-square test is appropriate for categorical data and is widely used to assess associations between categorical variables (Zhou, 2023). Statistical significance was determined at the 1% and 5% probability levels.

The analytical framework focused on examining actor heterogeneity and income distribution dynamics within the value chain. By comparing distributions across categories, the study evaluated structural inequalities and their implications for sustainable agricultural development.

Ethical Considerations

Ethical principles guiding social science research were strictly observed throughout the study. Participation was voluntary, and informed consent was obtained from all respondents before administering the questionnaire. The purpose of the study was clearly explained, emphasizing that information provided would be used solely for academic and policy research purposes. Confidentiality and anonymity were guaranteed. No personal identifiers were included in the data analysis or reporting. Respondents were assured that their responses would not affect their business operations, licensing status, or relationship with regulatory authorities. Enumerators were trained to conduct interviews respectfully and without coercion. Data were securely stored and accessed only by the research team. These measures ensured compliance with standard ethical guidelines for research involving human participants (Belmont Report, 1979).

Methodological Contribution

While the statistical tools employed (descriptive statistics and chi-square analysis) are well-established methods in agricultural economics research, the novel contribution of this study lies in its integrated stakeholder-level comparison within a regulated cocoa grading system. By simultaneously examining socio-demographic structure, income distribution, enterprise scale, and post-harvest practices across multiple actor categories within defined grading zones, the study provides a structured empirical basis for assessing sustainability differentials within a localized cocoa value chain framework. This methodological integration strengthens policy relevance by linking structural inequalities to sustainable agricultural development outcomes in Ogun State, Nigeria.

4. Results

The results are presented in line with the study objectives and were analyzed using descriptive statistics (frequencies and percentages) alongside the Chi-square (χ^2) test of independence to determine statistically significant differences among cocoa value chain actors. Statistical significance was assessed at the 1% and 5% levels. Table 1 reveals marked socio-demographic differences across farmers, local middlemen, storekeepers, and merchants.

Table 1. Socio-Demographic Characteristics of Respondents

Socio-Demographic Characteristics		Farmers (%)	Local Middlemen (%)	Store keepers (%)	Merchants (%)	X^2	p- value
Age	<41	20	44	21.2	18.2	35	0.001
	41-50	25	48.9	21.2	36.4		
	51-60	28	6.7	45.5	36.4		
	>60	28		12.1	9.1		
Gender	Male	78	85.1	90.5	91.7	21.4	0.001
	Female	22	14.9	9.5	8.33		
Marital Status	Single	4.9	2.1		8.33	17.9	0.001
	Married	85.4	87.2	97.6	91.7		
	Widow/ Widower	9.8	6.4				
	Divorce		4.3	2.4			
Education	No Education	22	4.3			41.9	0.001
	Vocational	4.9					
	Primary	19.5	15.3	7	16.7		
	Finished Secondary	22	71.7	83.7	33.3		
	Secondary	17.1					
	OND/NCE	9.8	6.5	4.7	25		
	HND/BSc	4.9	2.2	7	25		
Religion	Christianity	37.5	37.8	41	75	52	0.001
	Islam	62.5	62.2	59	16.7		
	Traditional				8.3		
Household Size	<6	16.2				32.6	0.001
	6-10	32.4					
	11-15	27					
	>15	18.9					

Source: Field Survey, 2022/2023.

Age distribution differs significantly ($\chi^2 = 35.0$, $p < 0.001$), with farmers relatively older i.e. 56% above 50 years (28% aged 51–60 and 28% above 60)—while 92.9% of middlemen are below 50 years. Storekeepers and merchants cluster within the economically active 41–60 years bracket. Gender composition also shows significant variation ($\chi^2 = 21.4$, $p < 0.001$), with male dominance increasing downstream (78% among farmers to 91.7% among merchants), indicating declining female participation along higher-value nodes. Educational attainment differs significantly ($\chi^2 = 41.9$, $p < 0.001$); 22% of farmers lack formal education, whereas storekeepers and merchants show no representation in this category, and 50% of merchants possess tertiary qualifications (OND/NCE or HND/BSc). Religion ($\chi^2 = 52$, $p < 0.001$) and household size ($\chi^2 = 32.6$, $p < 0.001$) are also statistically significant, with farmers exhibiting larger household sizes consistent with labour-intensive production systems. Collectively, these findings confirm generational, gender, and human capital stratification across the value chain.

Building on these structural characteristics, Table 2 presents significant income distribution differences among actors ($\chi^2 = 25.98$, $p < 0.001$), leading to rejection of H_{o2}.

Table 2. Economic Characteristics of Respondents

Economic Characteristics		Farmers (%)	Local Middlemen (%)	Store keepers (%)	Merchants (%)	X^2	p- value
Average income (per ₦1,000,000)	< 0.5	16.7	78.7	46.3		25.98	0.001
	0.51-1	27.8	19.2	34.2			
	1.01-1.5	8.34	2.1	2.4			
	1.51-2	8.34		4.9	58.3		
	2.01-4	22.2		2.4			
	4.01-6	2.8					
	6.01-8	13.9		2.4	8.3		
	>8.01			4.9	8.3		

Source: Field Survey, 2022/2023.

Farmers display income dispersion: 22.2% earn ₦2.01–4 million and 13.9% earn ₦6.01–8 million annually, yet 16.7% earn below ₦0.5 million, indicating internal heterogeneity. Middlemen are heavily concentrated in the lowest income category, with 78.7% earning below ₦0.5 million, reflecting limited capital base and thin margins. Storekeepers show moderate concentration, with 46.3% earning below ₦0.5 million and 34.2% between ₦0.51–1 million. Merchants dominate higher brackets: 58.3% earn ₦1.51–2 million and 16.6% earn above ₦6 million.

Table 3 further deepens the analysis by revealing significant enterprise and production differences (H_{o3} rejected). Work experience varies significantly ($\chi^2 = 48.01$, $p < 0.001$): farmers exhibit longer tenure, with 12.2% exceeding 40 years of experience, while middlemen cluster within 11–20 years (51.1%) and merchants concentrate within 21–30 years (41.7%).

Table 3. Farm/Enterprise (Production) Characteristics of Respondents

Production Characteristics		Farmers (%)	Local Middlemen (%)	Store keepers (%)	Merchants (%)	X^2	p-value
Work experience (years)	<11	17.1	46.8	34.2	25	48.01	0.001
	11—20	17.1	51.1	31.7	25		
	21-30	2.4	2.1	29.3	41.7		

Production Characteristics		Farmers (%)	Local Middlemen (%)	Store keepers (%)	Merchants (%)	X^2	p-value
	31- 40	2.4		4.9	8.3		
	>40	12.2					
Farm Size (hectare)	<6	52.6				46.02	0.001
	6-10	31.6					
	>10	15.9					
Store size (tonne)	<6		100	12.8			
	6-10			51.3			
	11-15			30.8			
	25-50			5.1	55.5		
	51-75				11.1		
	76-100				22.2		
	>100				11.1		
Farm Ownership	Inherited	26.8				11.92	0.002
	Acquired	43.9					
	Leased	14.6					
	Gift	7.3					
	Others	7.3					
Average tonnage storage/Season	<51	100	100	50		21.65	0.016
	51-100			20	7.7		
	101-150			20	46.2		
	151-200			10	30.8		
	>200				15.4		
Types of Labour Employed	Family	39	40.4	17.5	11.1	12.96	0.001
	Hired	58.5	53.2	75	55.6		

Source: Field Survey, 2022/2023

Farm size distribution among farmers confirms smallholder dominance ($\chi^2 = 46.02$, $p < 0.001$), with 52.6% operating ≤6 hectares. Storage capacity highlights pronounced downstream scale concentration: 100% of middlemen operate below 6 tonnes, whereas 55.5% of merchants store 25–50 tonnes and 33.3% exceed 75 tonnes. Farm ownership patterns are significant ($\chi^2 = 11.92$, $p = 0.002$), with most farmers acquiring (43.9%) or inheriting (26.8%) land. Seasonal tonnage storage handled differs significantly ($\chi^2 = 21.65$, $p = 0.016$); farmers and middlemen manage less than 51 tonnes, whereas merchants dominate higher volumes (46.2% handle 101–150 tonnes and 15.4% exceed 200 tonnes). Labour use also varies ($\chi^2 = 12.96$, $p < 0.001$), with farmers and middlemen partially relying on family labour (39% and 40.4%), while storekeepers (75%) and merchants (55.6%) depend more on hired labour.

Taken together, the results reveal a clearly stratified cocoa value chain characterized by socio-demographic differentiation, income concentration, and scale-based enterprise disparities. The rejection of all three null hypotheses (H_{01}, H_{02}, H_{03}) confirms that statistically significant differences exist across actor categories in socio-demographic profiles, income distribution, and production structures. The evidence demonstrates that as one moves downstream along the chain—from farmers to merchants—there is a transition from ageing, small-scale, family-labour-based production to more

capital-intensive, higher-income, and larger-scale commercial operations. These interlinked results collectively address the study objectives by establishing that structural heterogeneity significantly shapes value capture and economic positioning within the cocoa beans value chain of Ogun State.

5. Discussion

The findings reveal pronounced structural heterogeneity along the cocoa value chain in Ogun State, characterized by demographic, educational, and scale-based differentiation among actors. The ageing profile of farmers reflects a broader concern within West African cocoa systems regarding generational renewal and the long-term continuity of primary production (Sonwa et al., 2019). In contrast, younger participation among middlemen suggests relatively lower entry barriers compared to land acquisition, which remains capital-intensive and inheritance-driven. Educational disparities further reinforce hierarchical positioning within the chain, with merchants exhibiting higher tertiary attainment. This concentration of human capital downstream enhances coordination capacity, access to market information, and price negotiation strength, thereby reinforcing value capture advantages as predicted by global value chain governance theory (Merino-Gaibor et al., 2026). Thus, socio-demographic and educational differences are not merely descriptive attributes but structural determinants of economic positioning.

Closely linked to these structural characteristics is the observed pattern of income inequality and enterprise scale differentiation. The results align with value chain theory, which posits that actors controlling aggregation, storage, and bulk trade tend to capture higher economic rents than primary producers (Karg et al., 2025). Merchants' dominance in storage capacity and high seasonal tonnage indicates capital-intensive commercialization and stronger control over market flows. Meanwhile, the predominance of smallholder farm sizes constrains economies of scale, mechanization potential, and capacity for climate-smart investment at the production level. From a sustainability perspective, three interrelated concerns emerge: the ageing farmer population threatens production continuity; income concentration downstream may discourage reinvestment at farm level; and small-scale dominance limits productivity-enhancing innovation. These findings reinforce arguments that equitable value distribution is fundamental to rural sustainability and inclusive agricultural development (Stepanenko et al., 2023). Notably, some results reveal internal heterogeneity within actor groups. A segment of farmers reported relatively high-income levels (₦6–8 million), suggesting that farm size variation, productivity differentials, or partial vertical integration may enable certain producers to overcome structural disadvantages (Ezeudu & Obimbua, 2024). Conversely, the relatively low-income concentration among middlemen, despite their intermediary role, may reflect intense competition, narrow marketing margins, or limited bargaining power within the chain (Donkor et al., 2022). These nuances highlight that value chain positions are shaped not only by structural roles but also by capital access, experience, and market strategy (Teye & Nikoi, 2023). Policy responses should therefore focus on strengthening farmer cooperatives, facilitating youth engagement in production, improving access to credit, and investing in farm-level post-harvest infrastructure to reduce dependence on downstream actors. While the study is geographically limited to the Ijebu grading zones and constrained by its cross-sectional design and self-reported income data, it provides a strong empirical foundation for future research employing longitudinal and econometric approaches to deepen understanding of governance, contract systems, and environmental sustainability indicators within Nigeria's cocoa sector.

6. Conclusions

This study examined the socio-economic structure and income distribution dynamics among cocoa beans value chain actors in the Ijebu produce inspection areas of Ogun State, Nigeria, and assessed their implications for sustainable agricultural development. The findings demonstrate that the cocoa value chain is structurally differentiated along demographic, economic, and enterprise dimensions, with statistically significant disparities across farmers, middlemen (Barakunas), storekeepers, and merchants. The age distribution reveals an ageing production base, while the aggregation and trading functions are relatively younger and more commercially oriented. Educational attainment increases progressively along the chain, with merchants exhibiting higher levels of formal education compared to primary producers. Income distribution patterns indicate value concentration at downstream nodes, particularly among merchants with larger storage capacities and higher seasonal tonnage. Farm size remains predominantly small-scale, and labour use shifts from family-based at the production level to hired labour at higher commercial tiers. Collectively, these findings confirm the rejection of the null hypotheses (H_{o1}, H_{o2}, H_{o3}), establishing that significant socio-demographic, income, and enterprise differences exist among cocoa value chain actors. Beyond descriptive differentiation, this study makes integrated contributions across sustainability science, agricultural economics, agribusiness management, rural development, value chain analysis, and social economy scholarship by demonstrating that sustainable cocoa systems depend not only on ecological practices but also on equitable socio-economic structures. The evidence shows that income inequality and an ageing farmer population may constrain reinvestment, innovation adoption, and generational renewal, thereby weakening system resilience. Empirically, the chi-square analysis strengthens micro-level understanding of income stratification and asset concentration within a localized commodity chain, revealing that merchants' control over storage capacity and high-volume trade reflects market power asymmetries consistent with value chain governance theory. From an agribusiness perspective, differences in education, experience, and enterprise scale are closely linked to control over higher-value market functions, illustrating vertical differentiation within the grading system. In rural development terms, the dominance of smallholder production and high dependency ratios signals structural vulnerability that requires improved access to finance, asset strengthening, and enhanced producer participation in value addition. Finally, within the social economy framework, gender imbalance and educational disparities shape participation and reward distribution, and the declining female presence downstream highlights institutional barriers to inclusive commercialization that must be addressed to achieve equitable and sustainable value capture.

Overall, the study achieves its objectives by systematically evaluating socio-demographic profiles, income distribution patterns, and enterprise characteristics across cocoa value chain actors and determining the statistical significance of these differences. The evidence confirms that structural heterogeneity strongly influences economic outcomes within the cocoa sector of Ogun State. The sustainability implications are clear: equitable value distribution, generational renewal in farming, and enhanced productive capacity at the primary production level are critical for ensuring long-term agricultural development. In conclusion, sustainable agricultural development in cocoa-producing regions cannot be achieved through production-focused interventions alone. It requires deliberate restructuring of value chain relationships to promote inclusive income distribution, strengthen smallholder competitiveness, and balance economic power across actors. By empirically linking socio-

economic differentiation to sustainability outcomes, this study provides a robust foundation for policy reforms aimed at enhancing resilience, equity, and efficiency within Nigeria's cocoa value chain. Thus, building on the conclusion that structural heterogeneity and downstream value concentration significantly shape income outcomes within Ogun State's cocoa value chain, the policy implications point toward deliberate institutional and market restructuring to promote inclusive and sustainable development. Policymakers should prioritize strengthening farmer cooperatives to enhance collective bargaining power, improve price negotiation capacity, and facilitate joint investment in fermentation, drying, and storage infrastructure at the farm level, thereby reducing excessive dependence on merchant-controlled facilities. Targeted youth engagement programmes, including land access schemes, start-up grants, and agribusiness incubation, are essential to address the ageing farmer population and ensure generational renewal. Expanding access to affordable credit and crop insurance through agricultural development banks and microfinance institutions would enable smallholders to scale operations, adopt climate-smart technologies, and invest in productivity-enhancing inputs. Regulatory reforms within grading and marketing systems should promote transparency in pricing, reduce information asymmetry, and encourage equitable participation of women through gender-responsive financing and training initiatives. Capacity-building programmes focused on financial literacy, value addition, and market intelligence can further strengthen upstream actors' competitiveness. Implementing these measures would likely improve income distribution equity, stimulate rural employment, enhance system resilience, and foster a more balanced and sustainable cocoa economy aligned with national agricultural transformation and poverty reduction goals.

Acknowledgements

We sincerely appreciate the cocoa farmers, local middlemen (commonly called the Barakunas), registered storekeepers, cocoa merchants, field enumerators and agricultural extension officers in Ijebu areas of Ogun State, Southwestern Nigeria, for their support during data collection. We also acknowledge the valued opinion from anonymous reviewers and confirm that no financial support was received for this research or manuscript preparation.

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