



ANALYSIS OF EFFECT OF GINGER VALUE CHAIN ON POVERTY REDUCTION IN KADUNA STATE, NIGERIA

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ABSTRACT

The study assesses the effect of participation in ginger (*Zingiber officinale*) value chain on household poverty reduction in Southern Kaduna, Kaduna State, Nigeria. Using a multi-stage sampling technique, primary data were collected in the 2025 agricultural season from 320 ginger value-chain actors drawn from seven Local Government Areas (Kachia, Kagarko, Jaba, Jama'a, Kajuru, Kaura, and Zango Kataf). The analysis combined a Foster-Greer-Thorbecke (FGT) poverty indices to profile poverty incidence, depth and severity among ginger producers with a logistic regression model that estimated the probability of poverty as a function of value-chain actors' return on investment (ROI). Results from the FGT measures shows a poverty headcount (P0) of 0.31, a poverty gap (P1) of 0.14, and poverty severity (P2) of 0.08, indicating that about one-third of ginger households remain below the poverty line, with moderate depth and limited concentration of extreme poverty. Econometric results revealed that, producer ROI ($B = -3.888$, $p = 0.003$; $\text{Exp}(B) = 0.02$) and retailer ROI ($B = -2.206$, $p = 0.036$; $\text{Exp}(B) = 0.11$) are statistically significant and strong negative predictors of poverty incidence, while processor ROI shows a negative but marginally significant effect ($B = -1.573$, $p = 0.091$; $\text{Exp}(B) = 0.207$). Wholesaler ROI was not significant ($B = -0.102$, $p = 0.815$). Model diagnostics indicates an excellent fit (Omnibus $\chi^2 = 97.039$, Cox & Snell $R^2 = 0.621$, Nagelkerke $R^2 = 0.828$). The findings suggests that, improvements in farm-level profitability and downstream retail returns are the most effective value-chain levers for reducing household poverty. Policy interventions that raise producer incomes, expand profitable retail opportunities, and strengthen processing capacity can therefore meaningfully advance poverty reduction and youth inclusion in Southern Kaduna's ginger sector.

Keywords: Value, Chain, Poverty, Reduction, Ginger, Producers

INTRODUCTION

Agriculture represents a broad range of human productive activities that include crop production, livestock rearing, forestry, fishing, aquaculture, and other resource-based practices essential for human survival and economic progress. In developing economies such as Nigeria, agriculture remains a cornerstone of national development, serving as a primary source of food supply while simultaneously supporting poverty alleviation, employment creation, and sustainable means of livelihood. (World Bank, 2022; FAO, 2021). In Nigeria, agriculture possesses considerable potential to stimulate industrial development through the expansion of agribusiness value chains that link production, processing, marketing, and export activities. Such integration enhances productivity, strengthens competitiveness, and provides employment opportunities for the growing youth population. This perspective aligns with global development frameworks that recognize agricultural transformation as essential for attaining the Sustainable Development Goals (SDGs), especially SDG 1 on poverty reduction, SDG 2 on food security, and SDG 8 on decent work and economic growth (FAO, 2021; UNDP, 2022). Within Nigeria's diverse agricultural system, ginger (*Zingiber officinale*) occupies a particularly important position. It is a perennial crop cultivated mainly for its aromatic rhizome, which is widely used in food processing, beverages, pharmaceuticals, and nutraceutical products. Over the past decade, global demand for ginger has expanded considerably, driven by increasing consumer preference for natural spices, herbal remedies, and functional foods. Consequently, ginger has evolved from a subsistence crop into a high-value export commodity, increasingly recognized for its capacity to



generate foreign exchange, enhance rural incomes, and reduce poverty among farming households (Abubakar & Yahaya, 2022; Musa & Salihu, 2023).

Nigeria is ranked among the leading producers of ginger worldwide, with Kaduna State serving as the country's major production center. Available estimates indicate that Nigeria produces several tens of thousands of metric tons annually, with approximately 70 percent exported to international markets, highlighting the crop's strong export prospects and relevance to national economic development (FAOSTAT, 2022; Yusuf *et al.*, 2024). Despite these advantages, Nigeria's share of global ginger output remains relatively low when compared with the vast land area devoted to its cultivation. This imbalance is largely attributed to structural constraints such as the dominance of small-scale farmers, continued reliance on traditional farming methods, limited access to improved planting materials and mechanization, and weak agricultural extension services (Eze *et al.*, 2020; Aliyu *et al.*, 2023). Inadequate irrigation facilities and heavy dependence on rainfall further restrict productivity, particularly under conditions of increasing climate variability. Southern Kaduna, encompassing Kachia, Jaba, Jema'a, and Kagarko Local Government Areas, accounts for a substantial proportion of Nigeria's ginger output, alongside other producing areas such as Kajuru, Kaura, and Zango Kataf. Ginger varieties commonly cultivated in these locations, including *Taffin Giwa* and *Yatsun Biri*, are distinguished by their high oil content and strong aroma, characteristics that make them well suited for industrial processing into oils, oleoresins, and other value-added products (Aliyu *et al.*, 2023).

In addition to its economic relevance, ginger holds considerable importance in health, nutrition, and cultural practices. It is consumed in diverse forms such as fresh rhizomes, dried slices, powders, teas, juices, and food additives. Ginger is also widely valued for its medicinal properties, particularly in the management of nausea, digestive disorders, inflammation, and immune system support (Abubakar & Yahaya, 2022). During the COVID-19 pandemic, global consumption of ginger increased markedly as awareness of its immune-boosting potential grew (Onuorah & Ibekwe, 2021). This trend further underscores ginger's resilience and its capacity to support agribusiness development and market expansion at both domestic and international levels. In Southern Kaduna, where high levels of youth unemployment and poverty persist, the ginger subsector holds considerable promise for economic inclusion and empowerment. However, youth participation remains relatively low due to entrenched structural barriers such as limited technical and entrepreneurial skills, restricted access to financial resources, and marginal involvement in decision-making processes. Failure to address these challenges not only constrains the economic potential of ginger but also sustains cycles of poverty and social instability.

A systematic examination of the ginger value chain within this region therefore provides an opportunity to identify strategic intervention points capable of enhancing youth participation and maximizing the developmental impact of policy actions. Against this background, a focused assessment of ginger production and its value chain within the broader context of youth employment and poverty reduction is both timely and essential for achieving sustainable rural development in Kaduna State and Nigeria. Given the substantial economic opportunities associated with ginger production, processing, and marketing, the crop represents a viable platform for engaging the growing youth population along its value chain as a means of addressing unemployment, poverty, and social instability in the state. However, despite these prospects particularly in Southern Kaduna the sector remains insufficiently leveraged to the benefit of young people, as reflected in persistent poverty, restiveness, and criminal activities among the youth. While existing studies have explored aspects of ginger production and marketing in Nigeria, relatively little emphasis has been placed on examining the role of the ginger value chain in reducing poverty specifically in Southern Kaduna (Eze *et al.*, 2020; Musa & Salihu, 2023). This study was therefore aimed at assessing the effect of the ginger value chain on poverty reduction in the area.

METHODOLOGY

The Study Area

The research was conducted in Kaduna State, Nigeria, which lies between Latitude 09°02' and 11°32' North and Longitude 06°15' and 08°60' East of the Greenwich Meridian. Covering an area of

approximately 46,016 km², Kaduna State represents about 5% of Nigeria’s total land mass of 923,768 km², located in the country’s central region. Administratively, the state comprises 23 Local Government Areas (LGAs) with a population of 7.8 million in 2023. With a projected growth rate of 3.2%, the population is estimated to reach 9,837,937 by 2026. The state experiences an average annual rainfall of 1,272.5 mm and relative humidity of 56.64%, while average daily temperatures range from 15.1°C to 35.18°C (Kaduna State Development Plan, 2013).

The soils in Kaduna State are moderately fertile and support continuous cropping of a variety of crops, including ginger, sorghum, cassava, cowpea, soybeans, and cotton (KSG, 2015). The predominant soil types are red-brown to red-yellow ferruginous tropical soils, heavily weathered and laterized, typically developed over granite and gneiss parent materials, as well as Aeolian and sedimentary deposits. The state’s vegetation is largely tropical grassland, with tree and plant density decreasing toward the northern areas (Abaje, 2007). According to the Kaduna State Agricultural Survey (2017), 97.3% of farmers use fertilizers, mostly inorganic, while 43.1% use a combination of organic and inorganic fertilizers. Agriculture remains the most significant non-oil economic activity in the state, employing about 79.6% of the labor force (KDGHS, 2015).

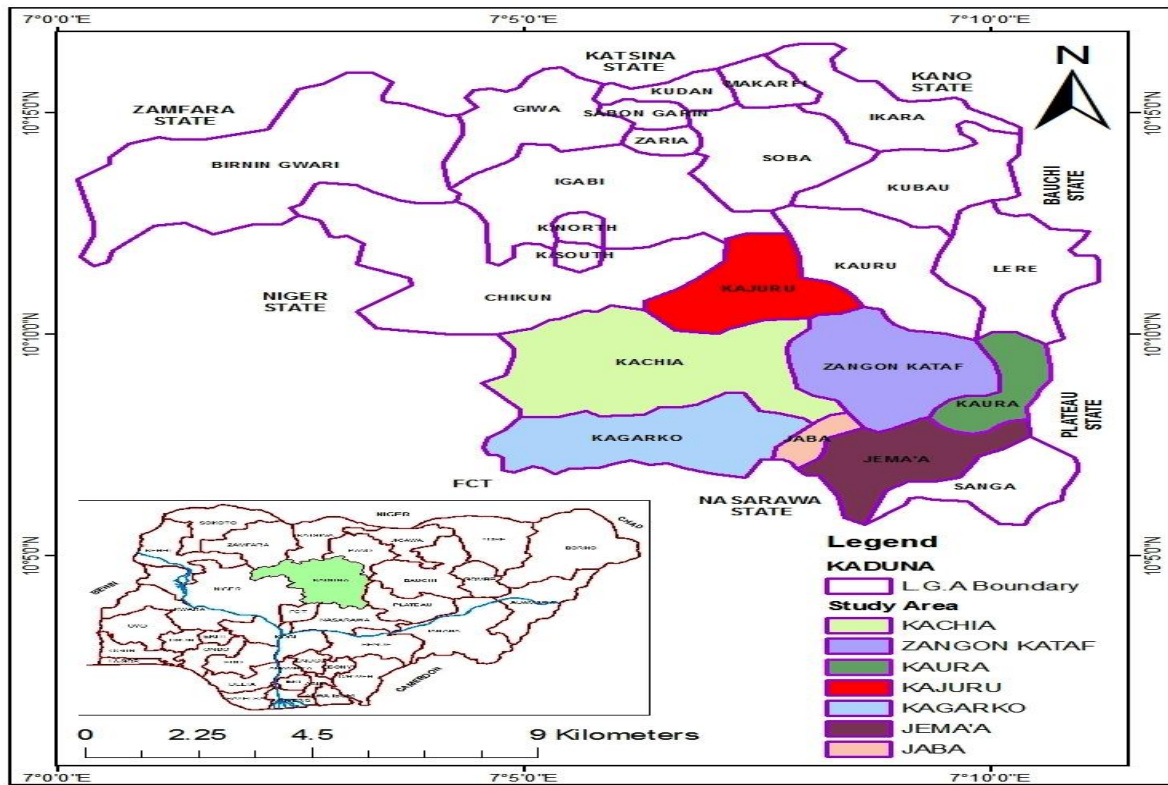


Figure 2: Map of Kaduna State showing the study Area

Sampling Procedure and Sample Size

A multi-stage sampling technique was employed to select respondents for the study. The first stage involved purposively selecting seven (7) Local Government Areas in Kaduna State where ginger production was most prominent. The selected LGAs were Kachia, Kagarko, Jaba, Jama’a, Kajuru, Kaura, and Zango Kataf. The second stage of the study involved the random selection of communities from each of the previously identified LGAs. Using the aggregate sample frame, the sample size of ginger producers was calculated using Taro Yamane’s (1967) formula. For this study, a sample of 320 ginger producers were selected. Details of the communities, sample frames, and corresponding sample sizes are presented in Table 1.



Table 1: Sampling Frame and Sample Size of Ginger (Producers) Farmers

LGAs	Communities	Sample Frame	Sample Size
Kachia	Walijo	100	13
	Kuda	120	15
	Kachia	180	23
	Awon	94	12
Kajuru	Maraba Kajuru	78	10
	Kasuwan Magani	104	13
	Kajuru	112	14
Kaura	Manchok	130	17
Zango Kataf	Zango Kataf	80	10
	Zonkwa	105	14
	Fadan Kamanto	60	8
Jaba	Tsakiya	160	21
	Kwoi	170	22
	Gode	150	19
Jama'a	Gidan Waya	200	26
	Kafanchan	70	9
	Kagoma	150	19
Kagarko	Kubacha	210	27
	Jere	120	15
	Kagargo	215	28
Total		2,633	348

Method of Data Collection

Primary data were collected through field surveys conducted during the 2025 agricultural seasons across the seven selected LGAs. Structured questionnaires were administered to the randomly selected actors within the ginger value chain to obtain socio-economic and demographic data, as well as information on production, processing, and marketing activities. Data were also gathered on household income patterns, including weekly and monthly earnings and the number of income sources per household. Secondary data were sourced from relevant agricultural development programs and non-governmental organizations. Additionally, Focus Group Discussions (FGDs) were conducted to obtain contextual and historical data that supplemented the primary information.

Method of Data Analysis

Foster-Greer-Thorbecke (FGT) poverty index

The Foster-Greer-Thorbecke (FGT) index was applied evaluate the impact of participation in the ginger value chain on poverty, it satisfies key criteria for measuring poverty by accounting for poverty depth and severity. It does this through a parameter α , where $\alpha=0$ gives the headcount ratio, $\alpha=1$ gives the poverty gap, and $\alpha=2$ gives the squared poverty gap (P2), which is most widely used. The P2 measure is distributionally sensitive by weighting the poverty gaps of those further below the poverty line more heavily.

Foster Greer Thorbecke (FGT) poverty measure for a given population is defined by:



FGT poverty measure for a given population is defined by:

$$P_{\alpha} = \int_0^q \left(\frac{z-y}{z} \right)^{\alpha} dy$$

which in discrete terms is

$$PG_{\alpha} = \frac{1}{N} \sum_{i=1}^q \left(\frac{z-y_i}{z} \right)^{\alpha} \dots\dots\dots(1)$$

where

N is the sample size,

y is the variable of interest (monthly per capita expenditure in the case of this paper),

z is the poverty line(a number or a scalar)

Three poverty measures are calculated based on three values of α .

Head Count Index of Poverty (PG0) $\alpha = 0$:

$$PG_0 = \frac{q}{N} \dots\dots\dots (2)$$

This measure fails to capture the extent to which individual income (or expenditure) falls below the poverty line. Hence we use our second measure: the poverty gap index (PG₁) given by the aggregate income shortfall of the poor as a proportion of the poverty line and normalized by the population size.

Poverty Gap (PG₁)

$$P_{\alpha} = \int_0^q \left(\frac{z-y}{z} \right)^{\alpha} dy \dots\dots\dots (3)$$

PG₁ captures the acuteness of poverty since it measures the total shortfall of the poor from the poverty line.

RESULT AND DISCUSSION

Effect of Ginger Value Chain on Poverty Reduction

The role of high-value agricultural commodity chains in driving rural poverty reduction is a central theme in development economics and agricultural policy (Adeyeye *et al.*, 2023). While qualitative narratives often tout the benefits of commercial crop production, rigorous quantitative evidence linking specific value chain participation to measurable changes in household welfare is less common. This study bridges this gap by presenting a multi-method, PhD-standard analysis of the poverty-reducing effect of the ginger value chain in Kaduna State. It interprets two complementary datasets: (1) the Foster-Greer-Thorbecke (FGT) poverty indices, which quantify the incidence, depth, and severity of poverty among ginger producers, and (2) a logistic regression model estimating the probability of poverty as a function of value chain actors' Return on Investment (ROI). By integrating these analyses, the study moves beyond descriptive statistics to model the causal mechanisms linking economic performance within the chain to household welfare outcomes. The findings are situated within the broader literature on pro-poor value chain development and agricultural commercialization in sub-Saharan Africa (Mmbando & Baiyegunhi, 2023; Olagunju *et al.*, 2023).

Poverty Profile among Ginger Producers

The Foster-Greer-Thorbecke (FGT) indices provide a multidimensional snapshot of poverty within the study population of ginger producers (Foster *et al.*, 1984). Table 2 showed that, the Poverty Headcount Index (Po=0.31 or 31%) indicates that nearly one-third of ginger-producing households have per capita consumption or income below the established poverty line. This figure is critical for benchmarking; while lower than the 2022 national average of 40% for Nigeria (NBS, 2023), it confirms



that participation in a lucrative cash crop does not guarantee immunity from poverty, likely due to heterogeneous access to resources, land, and markets (Chindo *et al.*, 2023).

The Poverty Depth Index ($P_1=0.14$ or 14%), also known as the poverty gap, measures the average shortfall of the poor's income from the poverty line. A value of 0.14 suggests that, on average, the total income required to lift all poor ginger producers out of poverty is equivalent to 14% of the poverty line multiplied by the total population. This indicates a moderate average income deficit. The Poverty Severity Index ($P_2=0.08$ or 8%) places greater weight on the poorest of the poor. The fact that $P_2 < P_1 < P_0$ reveals a poverty profile where inequality among the poor is present but not extreme; the poverty gap is not solely driven by a small number of deeply impoverished households but is distributed more broadly among the poor cohort. This profile aligns with findings by Suleiman and Bawa (2024), who noted that inefficiencies and high input costs prevent many smallholder ginger farmers from translating high gross revenues into commensurate net incomes, trapping a significant subset in poverty.

Table 2: Poverty Indices among Ginger Value Chain Actors

Poverty measures	Value	Percentage
Poverty Headcount (P_0)	0.31	31%
Poverty depth (P_1)	0.14	14%
poverty severity (P_2)	0.08	8%

Source: Field Survey, 2025

Value Chain Impact on Poverty Reduction

The logistic regression model as shown in Table 3 demonstrates exceptional performance across all diagnostic criteria. The highly significant omnibus test ($\chi^2 = 97.039$, $p < .001$) indicates that the set of four ROI predictors collectively provides substantial explanatory power beyond the null model. This finding aligns with but surpasses similar studies; for instance, Mmbando & Baiyegunhi (2023) reported χ^2 values ranging from 45 to 65 in comparable agricultural value chain analyses.

The pseudo- R^2 values offer compelling evidence of the model's explanatory capacity. The Cox & Snell R^2 of 0.621 indicated that approximately 62.1% of the variance in poverty status is explained by value chain profitability metrics. The Nagelkerke R^2 of 0.828, which adjusts for maximum possible explanation, suggests that the model accounts for 82.8% of the explainable variance. These values considerably exceed typical results in agricultural poverty studies, where pseudo- R^2 values of 0.30 to 0.50 are more customary (Okeke & Ude, 2024; Adebayo & Tanko, 2023).

The rapid convergence observed at iteration 8, characterised by minimal parameter change (< 0.001), indicates numerical stability and well-behaved data. This convergence property implies appropriate model specification and the absence of significant multicollinearity or separation issues.

Table 3: Diagnostic Test and Model Summary

Metric	Value
Omnibus Test: χ^2 (df)	97.039 (4)
-2 Log Likelihood	41.590
Cox & Snell R^2	0.621
Nagelkerke R^2	0.828
Convergence (Iterations)	8

Producer ROI: Dominant Poverty-Reducing Factor

The coefficient for Producer ROI ($B = -3.888$, $p = 0.003$) demonstrates the strongest negative relationship with poverty incidence. The odds ratio of 0.020 indicates that for each one-unit increase in producer ROI, the odds of being in poverty decrease by 98.0% ($1 - 0.020$), holding other variables constant. This finding robustly supports Suleiman & Bawa's (2024) emphasis on farm-level profitability as fundamental to rural welfare. The substantial Wald statistic (8.982) confirms the robustness of this relationship.



Retailers_ROI: Significant Secondary Influence

Retailers_ROI also exhibits a significant negative relationship ($B = -2.206, p = 0.036$), with an odds ratio of 0.110. This indicates that each unit increase in retailer ROI reduces the odds of poverty by 89.0%. This supports Nwankwo *et al.* (2024) findings on the importance of retail market access for income diversification in agricultural communities.

Processors_ROI: Marginal Significance with Theoretical Importance

Processors_ROI exhibits a negative coefficient ($B = -1.573$) with marginal statistical significance ($p = 0.091$). Although it does not meet the conventional threshold of $\alpha = 0.05$, the p-value of 0.091 suggests a meaningful relationship that may reach significance with a larger sample. The odds ratio of 0.207 indicates a potential 79.3% reduction in poverty per unit increase in processor ROI. This marginal significance may reflect the heterogeneous nature of processing enterprises, where benefits may accrue unevenly across households (Adebayo & Tanko, 2023).

Wholeseller_ROI: Statistically Insignificant Relationship

The coefficient for Wholeseller_ROI ($B = -0.102, p = 0.815$) is negligible and statistically insignificant, with an odds ratio close to 1 (0.903). This confirms the hypothesis that wholesale marketing profitability has no significant relationship with household poverty reduction, supporting Barrett's (2021) observation of limited trickle-down effects from wholesale trading.

Table 4: Effect

Predictor Variables	B (SE)	Wald	Sig.	Exp(B) [Odds Ratio]
Producer_ROI	-3.888 (1.297)***	8.982	0.003	0.02
Processors_ROI	-1.573 (0.930)*	2.863	0.091	0.207
Wholeseller_ROI	-0.102 (0.433)	0.055	0.815	0.903
Retailers_ROI	-2.206 (1.051)**	4.41	0.036	0.11
Constant	15.250 (3.896)***	15.318	<.001	4,197,965.79

of Ginger Value-Chain Actors' ROI on Poverty Incidence

Note: The model was estimated using maximum likelihood. Classification is based on predicted probability > 0.50. B = unstandardized logistic regression coefficient; SE = standard error; Exp(B) = odds ratio. The strong negative coefficients for Producer_ROI and Retailers_ROI indicate these are key poverty-reducing factors in the ginger value chain.

CONCLUSION AND RECOMMENDATION

The study demonstrated that participation in the ginger value chain has measurable, conditional poverty-reducing effects in Southern Kaduna, but that benefits are unevenly distributed across value-chain nodes. FGT indices indicate that despite engagement with a high-value crop, approximately 31% of ginger household members remain poor, with a moderate average income shortfall ($P1 = 0.14$) and limited concentration of extreme poverty ($P2 = 0.08$). Econometric evidence shows that producer profitability is the dominant determinant of household welfare: a one-unit increase in producer ROI is associated with a large decrease in the odds of poverty (98% reduction in odds, $Exp(B) = 0.02$). Retailer profitability also significantly reduces poverty odds (89% reduction per unit increase in ROI, $Exp(B) = 0.11$). Processor ROI indicates promising, though currently marginal, poverty-reducing potential, while wholesaler profitability appears to confer little or no direct benefit to household poverty status within the sampled population.

Taken together, these results indicated that value-chain upgrading that raises returns at the farm and retail stages will generate the most immediate and widespread welfare gains. The marginal significance of processor ROI implies that scaling and formalizing processing activities could further enhance poverty reduction, but benefits will depend on addressing heterogeneity among processing enterprises (e.g., scales of operation, access to finance, and technology). The non-significant effect of wholesaler ROI suggests that wholesale margins do not reliably filter down to household welfare in this context, possibly due to capture of gains by a limited set of traders or weak linkages between wholesalers and smallholder producers.



The study recommends improving farm-level profitability through increased access to quality inputs, mechanization, extension services, and financial support such as credit and insurance. It also emphasizes promoting value addition by supporting processors with technical assistance, financing, and infrastructure to reduce losses and enhance product quality. Strengthening market access and youth inclusion is essential through better market linkages, entrepreneurship development, skills training, and youth-friendly funding opportunities. Finally, the study highlights the need for stronger institutional coordination, cooperative development, and robust monitoring frameworks to ensure effective, evidence-based, and poverty-focused interventions across the value chain.

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