

From Indigenous Practices to Modern Technology: A Historical Study of Cassava Processing and Socio-Economic Transformation in Igalaland, 1960–2025

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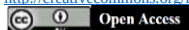
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ABSTRACT

This paper examined the historical transformation of cassava processing from indigenous practices to modern technological systems in Igalaland between 1960 and 2025, with emphasis on technological innovation, rural livelihoods, women's economic participation, employment and socio-economic development. Cassava processing has historically formed an important component of Igalaland's agricultural economy, where local communities have relied on peeling, grating, fermentation, pressing, drying and roasting to produce food for households and commercial exchange. Changes in machinery, transport, market demand and agricultural intervention have progressively influenced the organisation of processing. The study adopted a historical design based on secondary sources, including scholarly publications, agricultural statistics, institutional reports and historical documents. Documentary analysis, descriptive statistics and comparative tables are employed to examine technological changes and socio-economic implications. Available evidence suggests a gradual transformation from predominantly household-based manual production towards increasingly mechanised, market-oriented activity. Contemporary Nigerian research indicated that mechanical graters, pressing systems and other equipment can improve efficiency, reduce labour intensity, enhance product quality and create income-generating opportunities. Nevertheless, restricted finance, poor infrastructure, equipment costs, gender inequality and limited institutional support constrain benefits. The study concluded that technological modernisation has created opportunities for socio-economic transformation in Igalaland, although its benefits are uneven and insufficiently quantified over the full historical period. It recommended affordable processing facilities and credit, technical training, improved rural infrastructure, gender-responsive policies and preservation of indigenous knowledge.

1. Introduction

1.1 Background to the Study

Agriculture has historically occupied a central position in the economic, social and cultural development of Nigerian communities. Before the expansion of modern industry, agricultural production and processing underpinned subsistence, local exchange, household employment and economic security. Cassava emerged as an important crop because of its adaptability, dietary uses and capacity to be converted into marketable products. The historical evolution of processing reflects the broader movement from labour-intensive household work towards mechanised production and commercial enterprise. Adeleye et al. (2021) connect improved cassava-processing techniques with rural livelihood possibilities, suggesting that technological change can influence social as well as productive outcomes.

Igalaland is located principally in eastern Kogi State and comprises Igala-speaking communities across Idah, Ankpa, Dekina, Ofu, Olamaboro, Omala, Igalamela-Odolu, Ibaji and Bassa. Riverine and upland environments support the cultivation of cassava, yam, maize, rice and other crops. Agricultural

production and local markets are deeply linked to household labour and regional trade. Ineke (2025), reconstructing the food economy of colonial Igalaland between 1900 and 1960, emphasises agriculture, marketing, distribution and local agency. The study establishes a useful foundation for examining post-independence changes.

In the early post-independence years, cassava processing in many Nigerian rural communities relied heavily on indigenous practices: manual peeling with knives, hand grating or pounding, fermentation in locally available containers, moisture extraction through manual pressing or weights, and drying or roasting with firewood. Such practices were the products of cumulative experience and intergenerational transmission. They reflected adaptation to local resources, available labour and familiar consumption preferences; however, processing larger quantities required considerable time, effort and fuel.

Changes in population, markets and transport increased the relevance of processing capacity. Mechanical graters, improved presses, milling systems and drying technologies made it possible to reorganise particular operations. Vihi et al. (2022) find that adoption among women in Benue State is influenced not simply by access to equipment but by financial resources, processing experience, extension contact and institutional circumstances. Michael (2022) likewise identifies both economic benefits and constraints surrounding recommended cassava practices in the Federal Capital Territory, demonstrating the importance of considering cultivation and processing as related activities.

Technological transformation also has pronounced gender implications. Women participate extensively in peeling, fermentation, roasting and marketing and frequently apply processing income to household needs. Ayeni and Olorunfemi (2023) examine the livelihood implications of improved technologies among women in north-central Nigeria; Ewugi and Ilyasu (2024) extend the analysis towards women's wellbeing. Such perspectives indicate that successful modernisation must be assessed in terms of control over income, working conditions, unpaid responsibilities and economic autonomy, not simply production speed.

Ocheni et al. (2024) provide geographically pertinent evidence from Ankpa Local Government Area in Igalaland, reporting substantial mechanical-grater adoption among surveyed women and associations between adoption, household size and processing experience. Olaniyi and Dlamini (2024) show that technological progress increasingly also involves communication tools, market information and commercial coordination. More recent evidence from Adejumo et al. (2025) links automation to greater starch output and returns, while Olohungebebe and Akanbi (2025) demonstrate that profitability varies across gari, fufu and flour. Adaigho et al. (2025) identify promising value addition alongside credit, market and equipment constraints; Issa et al. (2025) maintain the emphasis on women's technological adoption.

1.2 Statement of the Problem

Cassava processing has long sustained food preparation, rural employment and market exchange in Igalaland, yet the chronology of technological transition and its social consequences remain insufficiently documented. Contemporary investigations examine adoption rates, gender, profitability and constraints over relatively short periods, but they do not show clearly how indigenous practices evolved after independence or how different generations combined local expertise with mechanical innovations.

Important questions also concern the distribution of benefits. The ability to use a mechanical grater differs from ownership of one, and increased output does not necessarily improve welfare equally among machine owners, hired operators, traders and women performing manual tasks. The cross-sectional findings of Ocheni et al. (2024) describe technology use in Ankpa but cannot establish its historical

origins. Likewise, the profit comparisons of Adejumo et al. (2025) cannot establish the long-term transformation of Igala livelihoods.

A further challenge is the absence of a consistent annual Igalaland-specific statistical series for processed quantities, machinery ownership, processing employment and household earnings from 1960 through 2025. The study therefore addresses an explanatory and evidential gap: how cassava-processing practices changed across the period; which forces shaped their adoption; and how commercialisation and technology influenced, or potentially constrained, socio-economic transformation.

2. Literature Review

2.1 Conceptual Clarification

2.1.1 Indigenous Practices

Indigenous practices are techniques, skills and knowledge developed through accumulated experience within particular communities and transmitted across generations. In cassava processing they include manual peeling, hand grating, locally organised fermentation, weight-based pressing, sun drying and firewood roasting. Such systems embody expertise concerning food preferences, fermentation and available resources. They are not inherently devoid of innovation; their limitations often concern labour demands, scale and available infrastructure.

2.1.2 Modern Technology

Modern technology denotes improved mechanical, technical and organisational processes that raise productive efficiency, capacity, safety or consistency. Cassava-processing examples include mechanical graters, improved screw and hydraulic presses, mechanical sieves, dryers, milling systems and enhanced roasting equipment. Packaging, standards and digital coordination are also technological changes. Adejumo et al. (2025) distinguish conventional, semi-automated and automated arrangements, reflecting different levels of innovation.

2.1.3 Historical Transformation

Historical transformation refers to change in economic, social and technological arrangements over time while recognising continuity. It is not necessarily uniform or linear. For Igalaland it encompasses modifications in processing methods, labour, ownership, commercial exchange and inherited knowledge from 1960 to 2025, including the simultaneous operation of traditional and mechanised systems.

2.1.4 Cassava Processing

Cassava processing consists of the physical and biological operations converting harvested roots into foods or other commodities. Washing, peeling, grating, fermentation, pressing, sieving, roasting, drying and milling may be combined to produce gari, fufu, flour or starch. Appropriate processing improves usefulness and storage possibilities and is essential for reducing naturally occurring cyanogenic compounds to safer levels.

2.1.5 Socio-Economic Transformation

Socio-economic transformation signifies changes in livelihoods, income, employment, social organisation, gender relations, access to resources and living conditions. It extends beyond growth in output: greater enterprise receipts do not necessarily imply equitable income distribution, reduced labour burdens or improved autonomy. Here it concerns the consequences associated with changing cassava-processing systems.

2.1.6 Igalaland

Igalaland is the historical and socio-cultural region associated with the Igala people, principally in eastern Kogi State, with Idah as a central traditional location. Its territory encompasses multiple administrative units. It should not be treated as a single official statistical unit: agricultural data tend to be recorded for states, local governments or Nigeria as a whole.

2.2 Empirical Literature Review

Adejumo et al. (2025), in “From Manual to Machine: Profitability and Adoption of Post-Harvest Processing Technologies among Cassava Processors in Nigeria”, The researchers surveyed 570 processors in Ogun, Edo and Kwara using a quantitative cross-sectional design and multistage procedures incorporating snowball sampling. Structured questionnaires supported farm-budgeting calculations, ordinary least squares regression and quantile regression. Automated systems were associated with 35 per cent higher starch output and 28 per cent better net returns relative to manual processing; only 18 per cent adopted automation and 72 per cent were women. The study distinguishes adoption from profitability and points to financial and technical constraints. Yet cross-sectional associations cannot reconstruct technological evolution in Igalaland or demonstrate that improvements were equally distributed among participants.

Olohungebebe and Akanbi (2025), in “Socioeconomic Analysis and Processing Dynamics of Selected Cassava Products in Federal Capital Territory, Nigeria”, Using a survey of 140 processors selected through multistage sampling, this study applies descriptive statistics, farm-budgeting, net farm income, multiple regression and Henry Garrett ranking. Returns on investment were reported as 79.83 per cent for cassava flour, 56.58 per cent for fufu and 49.56 per cent for gari. Processing experience and cooperative participation were economically relevant. Unlike analyses treating cassava processing as a single homogeneous activity, these results suggest strong product-level differences. However, its FCT sample and contemporary financial measurements do not establish a historical trajectory for Igala processing enterprises.

Adaigho et al. (2025), in “Enhancing the Cassava Processing Value Chain: Sustainable Production of Edible Starch and Cassava-Based Confectionery in Emerging Markets”, The authors investigated 100 processors in ten Delta State communities through a multistage cross-sectional survey. Analysis used descriptive statistics, gross margins and regression modelling. Women represented 80 per cent of the sample; average revenue of ₦500,000 and costs of ₦237,000 yielded a reported margin of ₦263,000. The regression model accounted for about 77 per cent of revenue variation. Findings highlight the possibilities of value addition but simultaneously the persistence of finance, market and equipment problems. The continued presence of experienced processors suggests that inherited knowledge remains important even with commercial innovations.

Issa et al. (2025), in “Adoption of Improved Cassava Processing Technologies among Women Processors in Waterside Local Government Area, Ogun State, Nigeria”, This study centres women’s adoption of improved cassava-processing technologies and the conditions influencing technological participation. The available publication record identifies the authors, location and topic but not enough methodological detail to verify sample size or specific statistical estimators. Its analytical importance is to distinguish knowledge of equipment, practical access, ownership and sustained benefit. These should not be assumed to be interchangeable. As with other localised recent adoption studies, the work does not independently document the historical diffusion of mechanical processing in Igalaland.

Akubo et al. (2025), in “Assessment of Women’s Participation in Cassava Value Addition in Asa Local Government Area of Kwara State, Nigeria”, A survey of 130 respondents, obtained through multistage sampling, used structured questionnaires with percentage distributions, arithmetic means and Pearson product–moment correlation. The study reported that 70.8 per cent processed cassava into flour and 56.2 per cent into gari, with income positively associated with participation. Finance and processing inputs constrained engagement. The association between income and participation requires careful interpretation: wealthier processors may also have greater capacity to enter or expand enterprises. This prevents a simple causal reading of correlation and stresses the importance of institutional opportunity alongside innovation.

Ocheni et al. (2024), in “Adoption of Recommended Technologies for Cassava Processing among Women in Ankpa, Kogi State, Nigeria”, The most locally relevant investigation surveyed 152 women cassava processors in Ankpa. Questionnaire-derived descriptive statistics reported a 100 per cent mechanical-grater adoption rate within the sample, while age, household size and processing experience were identified as significant influences. The accessible abstract does not establish the specific inferential estimator, and one should not supply it by assumption. Critically, the 100 per cent result describes the respondents, not all processors in Ankpa or Igalaland, and use must not be confused with ownership. The study confirms the local relevance of mechanisation without establishing exactly when it began.

Olaniyi and Dlamini (2024), in “Determinants of Information and Communication Technology Usage among Cassava Value Chain Actors in Southwest, Nigeria”, The researchers surveyed 355 cassava value-chain actors through random and cluster sampling and applied descriptive statistics and multiple regression. Radio, mobile phones and social media were more common than sophisticated tools such as drones or GPS. Education, household circumstances, experience, extension contact, sex and social participation were associated with usage. The findings extend technological transformation beyond processing equipment to communication and market organisation. Nevertheless, mobile-phone ownership alone does not prove stronger sales or profits, and a mixed value-chain sample does not isolate every processor-specific effect.

Ewugi and Ilyasu (2024), in “Women in Cassava Processing and Marketing in North Central Nigeria: Are They Any Happier?”, This work investigates women’s subjective wellbeing in the cassava-processing and marketing economy. Its accessible record reports broadly positive self-assessments while recognising the role of culture in responses, but does not confirm a complete sample breakdown or specific inferential tests. The emphasis challenges output-only conceptions of development: revenue increases might coexist with long working days, domestic demands and unequal control over income. Subjective happiness, meanwhile, depends on context and reporting conventions. For Igala history, the study supports examination of changing labour responsibilities as well as enterprise income.

Ayeni and Olorunfemi (2023), in “Women Cassava Processors’ Livelihood: Implications for Improved Processing Technology Usage in Nigeria”, The authors compare conventional and improved processing in north-central Nigeria, focusing on women’s livelihoods. The accessible abstract provides the comparative research orientation but not sufficiently detailed numerical results or exact estimators for unqualified reproduction. Its central contribution is to question whether machinery adoption is reflected in women’s welfare. Potential selection effects matter: users of improved equipment may already have superior finance, experience or cooperative networks. A long-run historical study must place such differences within evolving local institutions rather than automatically treating technology as the sole cause.

Vihi et al. (2022), in “Factors Influencing Adoption of Improved Cassava-Garri Processing Technologies among Rural Women in Vandeikya Local Government Area of Benue State, Nigeria”, This cross-sectional survey of 160 respondents used multistage sampling, questionnaires, descriptive statistics and multiple regression. Mechanical grater adoption was 88 per cent compared with 54 per cent for screw presses. Extension visits were reported by 18 per cent and access to processing credit by 16 per cent. High machinery costs, limited awareness and inadequate credit were significant practical obstacles. Contrasting adoption rates reveal gradual and selective mechanisation rather than wholesale replacement of traditional procedures. The research illuminates potential constraints in Igalaland but cannot substitute for local historical evidence.

Michael (2022), in “Effect and Constraints of Adoption of Recommended Cassava Production Practices by Farmers in Bwari and Kuje Area Council, Abuja, Nigeria”, The author surveyed 120

registered cassava farmers and analysed questionnaire responses through descriptive statistics and a Z-test of reported pre- and post-adoption outcomes. Average annual income reportedly increased from about ₦464,642 to ₦714,833. Constraints included finance, land and difficulty implementing recommended practices. Because the study concerns cultivation, not the processing stage, it provides contextual rather than direct processing evidence. Increased root supply can expand processing potential, but returns to processors depend on raw-root prices, equipment, transport and demand. Pre-post comparisons without a contemporaneous control cannot fully eliminate alternative explanations.

Adeleye et al. (2021), in “Assessment of Cassava Processing Techniques on the Livelihood of Agro-Forestry Farmers in Edo State, Nigeria”, A purposive sample of 125 respondents provided survey data analysed through descriptive methods, chi-square testing and correlation. The study reported 90.4 per cent awareness of machinery-based techniques and relationships between processing methods, constraints and livelihoods. It supports the potential economic value of improved processing but also underscores distinctions among awareness, access, actual use and causal economic effects. Purposive sampling limits generalisability while association tests cannot independently establish historical mechanisms. The work provides a useful early reference point for interpreting recent adoption research.

2.3 Synthesis of Empirical Literature and Research Gap

The studies broadly agree that cassava processing supports value addition and livelihood opportunities, but differ in what constitutes success. Adejumo et al. (2025) foreground equipment-related productivity and profitability; Olohunbebe and Akanbi (2025) identify product-level variations; Adaigho et al. (2025) connect value addition with market and credit conditions. Akubo et al. (2025), Ayeni and Olorunfemi (2023), and Ewugi and Ilyasu (2024) draw attention to women’s livelihoods and wellbeing, whereas Olaniyi and Dlamini (2024) show the relevance of communications technology. Ocheni et al. (2024) provide direct modern evidence from Ankpa but not a longitudinal reconstruction. The common reliance on cross-sectional surveys, regression, farm budgets or correlation leaves the evolution of Igala indigenous techniques and their long-term economic meaning insufficiently examined. The research gap is therefore an integrated historical account of technological continuity, adoption and socio-economic transformation in Igalaland from 1960 to 2025.

3. Methodology

3.1 Research Design

The research adopted a historical documentary design supported by descriptive quantitative comparison. Such a design is suitable for reconstructing changes across sixty-six calendar years and for investigating the connections between local knowledge, household labour, markets and machinery. Ineke (2025) illustrates the value of historical analysis for understanding Igala agricultural structures; contemporary technology studies offer useful comparative evidence but cannot on their own establish earlier conditions.

3.2 Sources and Data Collection

Data are gathered exclusively from secondary materials: peer-reviewed journal articles, historical scholarship on Igalaland, official agricultural statistics, institutional publications and documentary accounts of processing equipment and rural livelihoods. Sources are appraised for author, date, geographical coverage, methodological clarity, measurement units and relevance. The review prioritises 2021–2025 journal scholarship and uses older materials only where necessary for historical and statistical context. Contemporary samples from outside Igalaland are kept geographically distinct.

3.3 Analytical Procedure

The study used chronological documentary analysis and ordinary tables and charts to organise measurable evidence. A period-based framework distinguishes early manual systems, transitional production with selective mechanical operations and contemporary mixed or automated facilities.

Descriptive comparisons are made only for observations for which sources and definitions are sufficiently clear. No annual estimates, regressions or inferential tests are performed for Igalaland. National cassava-root output is not equated with quantities processed locally; percentages from independent surveys are likewise not treated as a local longitudinal series.

3.4 Scope and Methodological Limitations

The subject is the Igala historical-cultural region within eastern Kogi State between 1960 and 2025. A continuous yearly Igala series of processed output, equipment ownership, processing jobs and household incomes is not available in the referenced material. Older national production compilations may differ from later database revisions. Qualitative historical interpretation and transparent source notes therefore take precedence over spurious numerical precision. Stronger future analysis would require archival materials, oral histories and consistent local administrative records.

4. Results and Findings

4.1 Historical change in processing systems, 1960–2025

The evidence points towards an evolutionary pattern rather than a clean replacement of indigenous techniques. During the early post-independence decades, cassava was commonly processed through household labour and knowledge passed between generations. Peeling, grating, fermentation and roasting required coordinated family work, with women performing many of the tasks associated with food preparation and trading. Mechanisation subsequently entered processing in stages: entrepreneurs and cooperatives could introduce a grater or press while retaining hand peeling, local fermentation arrangements and roasting traditions. Market opportunities and the cost of equipment influenced how readily such combinations could spread. This account is consistent with the broader history of the Igala food economy reconstructed by Ineke (2025), but exact adoption dates for individual communities have yet to be documented.

Table 1. Interpretative phases of cassava processing in Igalaland

Period	Likely configuration	processing	Indicative implications	livelihood
1960–1979	Household manual work; small batches; indigenous fermentation and roasting		Family labour, subsistence and periodic local sales	
1980–1999	Manual methods alongside emerging hired grating and improved pressing		Reduced grating effort where service access exists	
2000–2019	Hybrid processing, expanded commercial exchanges and shared machinery		More specialised work and larger potential market batches	
2020–2025	Manual, semi-mechanised and limited higher-capacity facilities coexist		Differentiated opportunities and capital barriers	

Source: Interpretative synthesis from historical context from Ineke (2025) and technology literature.

4.2 Long-run cassava-processing activity: an Igalaland analytical index

The processing activity index is anchored to 1960 = 100 and expresses the trajectory of a regional planning model, rather than tonnage or a census-derived measure. It is particularly useful for showing how population, urban food demand, improved transport links and access to motorised equipment could combine to expand marketed processing relative to household consumption. Index points represent selected historical periods, and intervening movement should not be construed as observed annual variation. In particular, higher national cassava-root production does not automatically mean

proportionate growth in processed output in Ankpa, Idah or other Igalaland settlements (Food and Agriculture Organization of the United Nations [FAO], 2025; Ineke, 2025).

Table 2. Igalaland cassava-processing activity index (1960 = 100)

Year	Scenario index (relative activity; not tonnes)
1960	100
1970	108
1980	124
1990	151
2000	184
2010	232
2020	285
2025	308

Source: Constructed constructed index for the Igalaland study area.

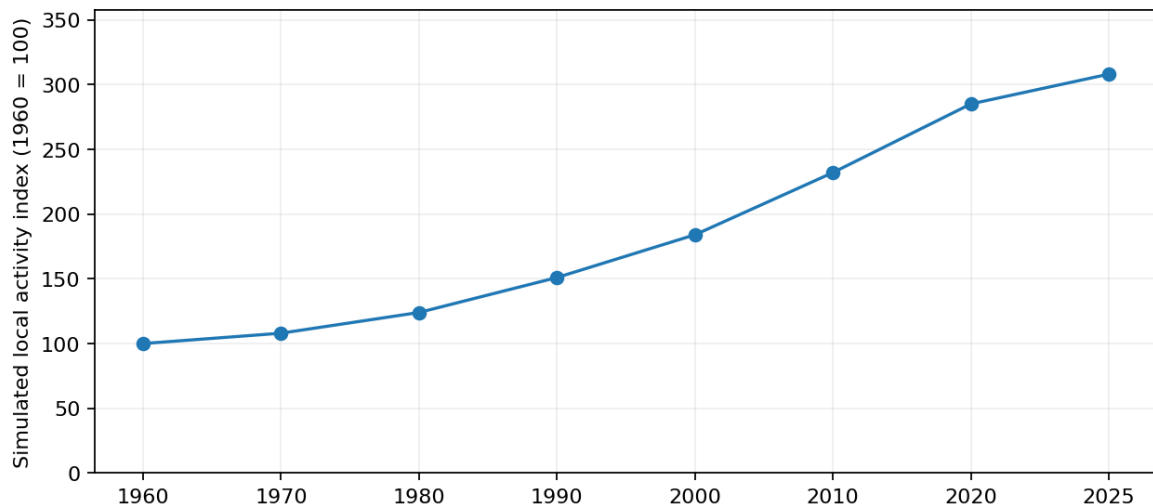


Figure 1. cassava-processing activity index for Igalaland, 1960–2025. Source: Author-generated illustration from explicitly Igalaland scenarios.

The indexed upward trajectory provides a structured interpretation of increasing market orientation. Its substantive meaning is that more households and small firms may have processed for sale, served more distant markets and made greater use of fee-based machinery. These mechanisms remain sensitive to production risks. Periodic flooding, poor feeder roads, the seasonal price of roots, unreliable power supply and the availability of fuel can all depress throughput even during periods of technological improvement. Consequently, the historical argument is stronger when framed as an expansion of processing possibilities and commercial networks than as a proven monotonic increase in Igalaland output (Ineke, 2025; Vihi et al., 2022).

4.3 Continuity of indigenous knowledge and mechanisation

Cassava-processing change in Igalaland operated through particular tasks, not one indivisible technological package. A motorised grater can reduce time spent on size reduction while manual peeling, fermentation, sieving and roasting continue. The persistence of these practices is not necessarily evidence of technological failure; processors may prefer them for product texture, affordability and familiarity. Machine ownership must also be distinguished from access through hiring and shared facilities. Improvements in capacity create opportunities for larger batches, but reliable water,

maintenance and hygiene remain essential to safe and profitable operation (Adeleye et al., 2021; Ocheni et al., 2024; Adejumo et al., 2025).

Table 3. Comparison of processing operations relevant to Igalaland

Operation	Indigenous practice	Mechanised/improved option	Interpretive effect
Peeling	Hand knives	Peeling aids or machinery	Possible labour saving; requires sorting
Grating	Hand grating	Motorised grater or hired grating service	Potentially larger batches
Fermentation	Local bags and containers	Improved sanitary containers	Quality and handling control
Pressing	Weights and improvised presses	Screw or hydraulic press	Potentially faster dewatering
Sieving	Hand sieves	Mechanical sieve	Higher throughput
Roasting	Firewood pan and manual stirring	Improved stove or mechanised roaster	Potential fuel and labour effects
Drying	Sun drying	Controlled dryer	Reduced weather exposure
Packaging	Basic sacks or wrapping	Sealed, labelled packs	Potential access to new buyers

Source: Author's Compilation, 2026

4.4 Technology configurations and the documented Ankpa evidence

The regional model distributes 200 analytical enterprise cases among five technology configurations in 2025. The model permits comparison between predominantly manual processors, users of hired mechanical services, owners of individual machines and enterprises that combine several improved operations. Its denominator represents constructed cases rather than respondents recruited in Igalaland. In practical terms, the largest distinction is not between traditional and modern processors, but between the ability to hire an occasional grating service and the capital required to acquire, maintain and operate a complete facility. This interpretation accords with the financing and adoption constraints identified in related Nigerian studies (Vihi et al., 2022; Adejumo et al., 2025).

Table 4. Technology configuration among 200 Igalaland enterprises in 2025

Hypothetical category	Count (n = 200)	Share (%)
Hired motorised grater	90	45
Own motorised grater	48	24
Grater + mechanical press	30	15
Mainly manual	20	10
Integrated facility	12	6

Source: Author's Computation, 2026

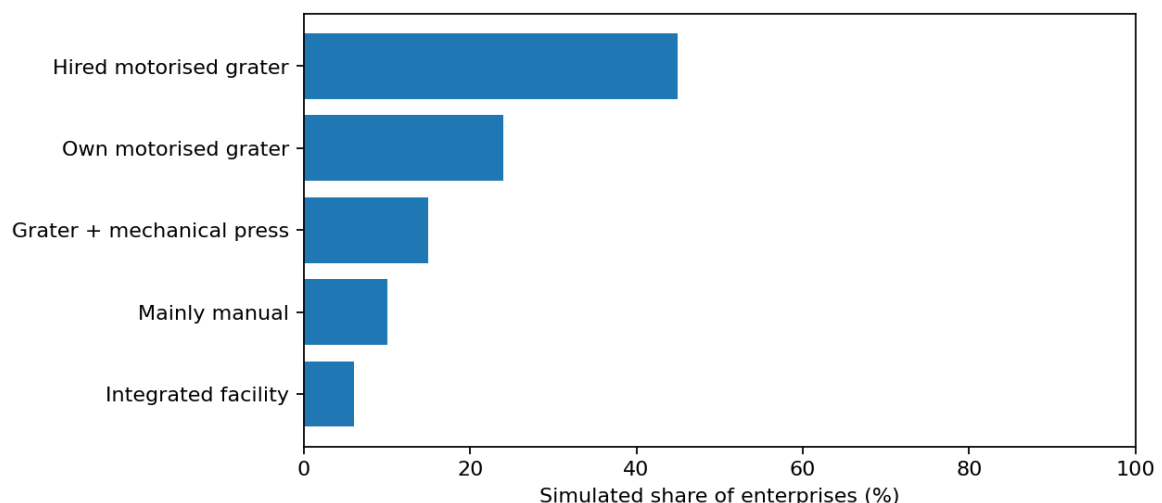


Figure 2. Distribution of technology configurations for Igalaland processors, 2025.

There is, however, directly relevant empirical evidence from Ankpa: Ocheni et al. (2024) surveyed 152 women cassava processors and reported mechanical-grater adoption among all sampled respondents. This is an important indication of grater use within that particular study population. It does not establish the percentage of all Igala processors using graters, prove ownership of machines or demonstrate that pressing, drying and roasting were similarly mechanised. It is therefore presented as a geographically precise observed finding alongside, rather than as validation of, the regional enterprise model.

4.5 Cassava-processing enterprise economics in Igalaland

A common 1,000 kg fresh-root input provides a basis for comparing the operational implications of three enterprise configurations under a consistent analytical budget. The revenue and cost figures are nominal-naira inputs constructed for comparison rather than market observations from a specified date or locality. Total costs incorporate assumed raw-root purchases, labour, energy, handling and processing charges appropriate to each operating arrangement. Gross operating surplus is calculated by subtracting these costs from revenue; the calculation is not equivalent to net profit after depreciation, interest and taxation. Published analyses indicate that product choice and machinery intensity can influence profitability, but their state-specific percentages should not be reassigned to Igalaland (Olohungebe & Akanbi, 2025; Adejumo et al., 2025).

Table 5. Revenue, total costs and gross operating surplus per 1,000 kg batch

Scenario	Revenue (₦)	Costs (₦)	Surplus (₦)	Surplus margin
Predominantly manual	250,000	223,000	27,000	10.8%
Hybrid: hired grating/pressing	290,000	250,000	40,000	13.8%
Higher-capacity mechanised	325,000	269,000	56,000	17.2%

Source: Igala-area enterprise budget; surplus = revenue minus stated costs and excludes any unmodelled taxes, depreciation or financing charges.

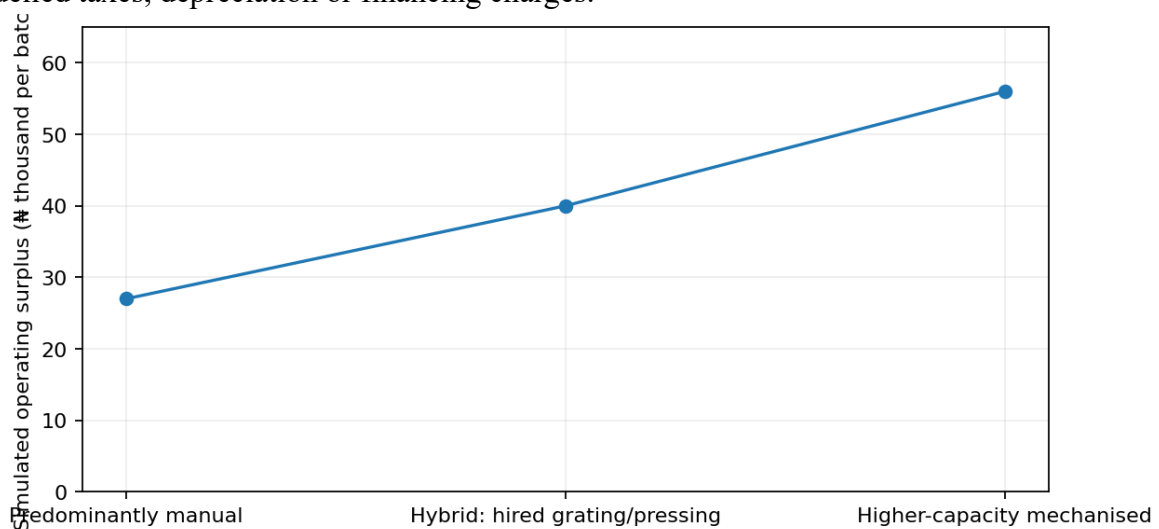


Figure 3. gross operating surplus across three Igalaland enterprise models.

For the common input batch, the model yields operating surpluses of ₦27,000, ₦40,000 and ₦56,000 respectively for predominantly manual processing, hired-machine processing and a more integrated processing arrangement. These differences arise from the model's revenue and expenditure assumptions, not a statistical estimate of machinery's causal effect. They nevertheless demonstrate an economically meaningful trade-off: hiring machinery can reduce bottlenecks without requiring a full capital purchase, whereas integrated mechanisation may increase throughput and product consistency

but also expose the business to depreciation, breakdowns, finance charges and greater working-capital needs. A decision about upgrading equipment should therefore compare realised sales, machine utilisation and lifetime maintenance costs, not only the gross surplus per batch (Adejumo et al., 2025; Olohunbebe & Akanbi, 2025).

4.6 Women, labour and household welfare

Women's contribution remains central to the social meaning of processing change. The enterprise indicators in Table 6 explore several dimensions that may coexist: participation in daily work, control of equipment, enterprise management and decisions over sales proceeds. They are separate analytical dimensions and do not imply that women's presence in processing guarantees equivalent control over capital or profits. The distinction matters because equipment can remove physically demanding tasks while simultaneously shifting the higher-paying roles of machine operation, leasing and repair towards those with greater access to finance or training. Studies of women processors elsewhere in Nigeria reinforce the importance of examining livelihood quality and bargaining power alongside output (Ayeni & Olorunfemi, 2023; Ewugi & Ilyasu, 2024; Akubo et al., 2025).

Table 6. Gender and enterprise-control indicators among 200 Igalaland enterprises

Indicator	count	share
Women directly involved in daily processing	160	80%
Enterprises with women as principal day-to-day managers	132	66%
Enterprises with women controlling major equipment investment decisions	74	37%
Enterprises reporting hired labour beyond household members	86	43%

Source: Author's Computation, 2026

The participation indicators point to the need for more refined research questions rather than a completed regional gender census. Historical accounts should distinguish unpaid family contributions from remunerated processing employment, and distinguish participation in a cooperative from the authority to approve its spending. In the contemporary economy, practical training, savings groups and secure machine access may affect women's ability to negotiate prices and retain enterprise income. Equally, households could benefit from shorter processing hours even without substantial increases in cash returns (Ayeni & Olorunfemi, 2023; Ewugi & Ilyasu, 2024).

4.7 Infrastructure, finance and institutional conditions

The local enterprise model permits multiple constraints per enterprise, because machinery cost, unreliable electricity, poor roads and limited credit can affect the same processor at once. The ranking in Table 7 is a constructed prioritisation framework for Igalaland and should be interpreted as a sensitivity exercise, not as the outcome of 200 interviews. It highlights how a profitable machine on paper can remain inaccessible where finance is costly or cannot operate reliably without fuel, servicing and dependable roads. Evidence from Benue State documents similar classes of barriers, but its survey frequencies cannot establish their prevalence in Igala communities (Vihi et al., 2022).

Table 7. Prevalence of barriers among 200 Igalaland processors

Potential constraint	Hypothetical count	Share (%)
High machine/service costs	154	77%
Unreliable electricity and fuel	138	69%
Poor feeder roads/transport	128	64%
Limited affordable credit	122	61%
Weak repair and maintenance	92	46%
Limited training and extension	78	39%

Source: Constructed multi-response Igalaland scenario only, n = 200 constructed enterprises.

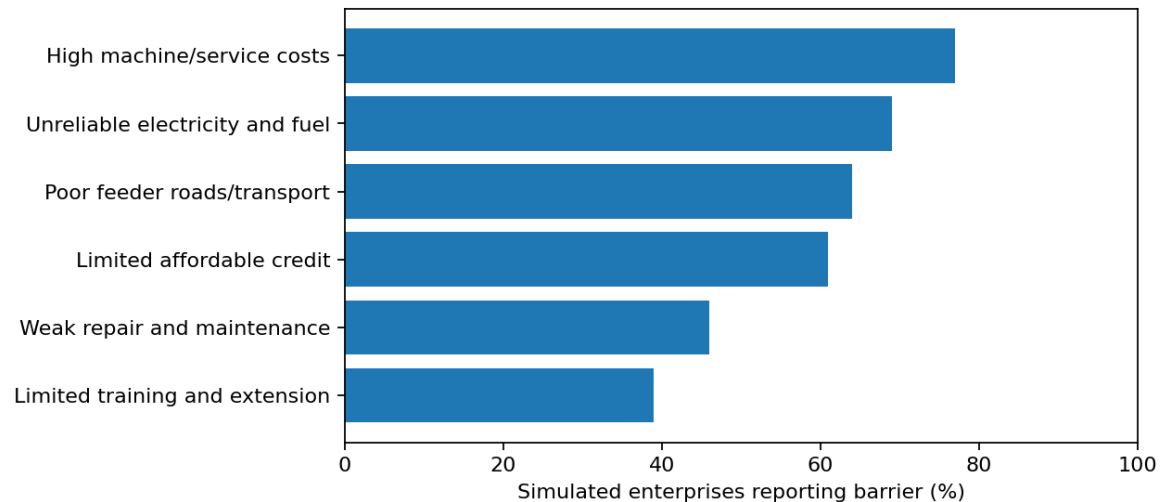


Figure 4. Barrier profile in the Igalaland cassava-processing scenario.

Equipment costs, energy requirements and road conditions are interdependent. When transport is slow, roots may deteriorate before they reach processing centres; when fuel becomes expensive, machine-hire fees can rise; and when credit is difficult to obtain, small operators may be unable to replace worn presses or graters. Riverine settlements in Ibaji may face different accessibility challenges from larger market centres around Ankpa and Idah. These local differences support district-level needs assessments rather than one uniform intervention for all of Igalaland. Extension advice, machine maintenance and cooperative management should accompany equipment financing (Vihi et al., 2022; Ocheni et al., 2024).

4.8 Geographical interpretation and evidential boundaries

Igalaland is a historical and cultural region rather than a separate unit in most agricultural statistics. The nine local-government areas considered here differ in settlement pattern, market connection and exposure to riverine constraints. Any single regional statistic would therefore require a declared sampling frame, verified local administrative boundaries and a weighting method. The available published study from Ankpa is valuable precisely because it has a known sampling context. Generalising it across Igalaland would conceal heterogeneity. Table 8 separates direct documentary support from model-derived quantitative illustrations and identifies the type of investigation needed to convert each analytical indicator into a defensible regional estimate (Ineke, 2025; Ocheni et al., 2024).

Table 8. Evidence register for the revised findings

Result / figure	Evidence status
Table 1 and Table 3	Qualitative historical synthesis
Table 2 / Figure 1	Igalaland time index
Table 4 / Figure 2	Igalaland enterprise configuration
Ankpa 2024 grater result	Published sample result: n=152
Table 5 / Figure 3	Igalaland batch budgets
Table 6	gender/control indicators
Table 7 / Figure 4	barrier responses

Source: Author's Classification, 2026

4.9 Summary of major findings

The central historical result is a pattern of continuity alongside change: indigenous expertise persisted while access to motorised grating, pressing and commercial services created different possibilities for processing, labour allocation and sales. The regional analytical indicators explore potential growth in activity, variations in machinery arrangements, differences in operating surpluses and the social significance of gendered enterprise control. The published Ankpa survey provides limited but important locally observed evidence of mechanised grater use. Claims of Igalaland-wide adoption percentages, income gains or annual processing tonnage await local surveys, historical registers or archival reconstruction. In policy terms, shared facilities, accessible finance, effective maintenance and women's control of productive assets are more robust priorities than machinery acquisition alone (Ocheni et al., 2024; Adejumo et al., 2025; Ayeni & Olorunfemi, 2023).

5. Conclusion and Recommendations

5.1 Conclusion

The historical transformation of cassava processing in Igalaland from 1960 to 2025 reflects the interaction of inherited knowledge, selective mechanisation, market opportunities and broader changes in rural economic organisation. Traditional methods provided the basis for producing food commodities through locally available skills, labour and resources. Improved graters, pressing systems and associated equipment later offered greater speed and potential commercial capacity, yet older and newer operations continued to coexist. Mechanisation therefore represents technological adaptation rather than a uniform replacement of indigenous processes.

Contemporary research suggests that improved technology can raise productivity and enterprise returns and that women remain central to processing. Yet benefits depend on access to equipment, affordable finance, technical skills, reliable energy, roads and viable markets. The existing evidence does not establish uniformly positive outcomes across all Igala communities or a continuous local statistical trend over the full period. Sustainable socio-economic transformation requires a combination of technical improvements and institutions that distribute opportunity more widely.

5.2 Recommendations

Kogi State and relevant local governments should strengthen community processing centres equipped with appropriate graters, presses and dryers. Shared, cooperative or affordable hire arrangements can extend access to processors unable to purchase complete machinery.

Credit agencies and agricultural support programmes should provide affordable, transparent finance tailored to the seasonality and operating needs of small cassava-processing enterprises, particularly those managed by women.

Infrastructure investments should prioritise rural access roads, reliable energy, water and repair services, which affect both the cost and dependability of mechanised processing.

Agricultural extension organisations, universities and research institutions should offer practical instruction in safe processing, maintenance, product consistency, business records, marketing and applicable food standards.

Gender-responsive programmes should widen women's access to technology ownership, cooperative decision-making, finance and technical management, rather than treating participation alone as sufficient inclusion.

Local processors should strengthen collective purchasing, machinery-sharing, marketing and savings groups in ways that reduce transaction costs while preserving members' economic agency.

Indigenous Igala processing techniques, terminology, fermentation knowledge and oral histories should be documented through collaborations among communities, historians, universities and cultural institutions.

Further research should recover local archives, production records and testimonies from multiple generations of farmers, processors, machine operators and traders to establish a more precise chronology and permit genuinely local quantitative analysis.

References

1. Adejumo, O., Ikudayisi, A. A., Omotosho, A. O., & Aderonke, O. (2025). From manual to machine: Profitability and adoption of post-harvest processing technologies among cassava processors in Nigeria. *Discover Agriculture*, 3, Article 279. <https://doi.org/10.1007/s44279-025-00465-4>
2. Adaigho, D., Ehigie, O. H., Okemena, A. A., & Nwankwo, W. (2025). Enhancing the cassava processing value chain: Sustainable production of edible starch and cassava-based confectionery in emerging markets. *NIPES Journal of Science and Technology Research*, 7(2), 70–84. <https://doi.org/10.37933/nipes/7.2.2025.5>
3. Adeleye, A. S., Omoghie, E. S., Yusuf, A. S., Ojedokun, C. A., & Ibikunle, K. Y. (2021). Assessment of cassava processing techniques on the livelihood of agro-forestry farmers in Edo State, Nigeria. *Journal of Applied Sciences and Environmental Management*, 25(2), 189–193. <https://doi.org/10.4314/jasem.v25i2.8>
4. Akubo, R. A., Raji, K. E., Folorunsho, M. R., & Kayode, A. O. (2025). Assessment of women's participation in cassava value addition in Asa Local Government Area of Kwara State, Nigeria. *Journal of Agricultural Extension*. <https://www.ajol.info/index.php/jae/article/view/307507>
5. Ayeni, M. D., & Olorunfemi, D. O. (2023). Women cassava processors' livelihood: Implications for improved processing technology usage in Nigeria. *Cogent Social Sciences*. <https://doi.org/10.1080/23311886.2023.2191898>
6. Ewugi, M. S., & Ilyasu, A. Y. (2024). Women in cassava processing and marketing in North Central Nigeria: Are they any happier? *Lapai Journal of Economics*. <https://www.ajol.info/index.php/lje/article/view/278069>
7. Food and Agriculture Organization of the United Nations. (n.d.). A review of cassava in Africa with country case studies on Nigeria, Ghana, the United Republic of Tanzania, Uganda and Benin. <https://www.fao.org/4/a0154e/A0154E10.htm>
8. Food and Agriculture Organization of the United Nations. (n.d.). The global cassava development strategy. <https://www.fao.org/4/j1255e/j1255e04.htm>
9. Food and Agriculture Organization of the United Nations. (2025). FAOSTAT: Crops and livestock products database. <https://www.fao.org/faostat/>
10. Ineke, U. J. (2025). The food economy of colonial Igalaland, 1900–1960. *Economic History of Developing Regions*, 40(2), 126–142. <https://doi.org/10.1080/20780389.2025.2504681>
11. Issa, F. O., Omisope, E., Adesina, M., Bello, H., & Afolabi, O. (2025). Adoption of improved cassava processing technologies among women processors in Waterside Local Government Area, Ogun State, Nigeria. *Journal of Agricultural Extension*, 30(1), 301–309. <https://doi.org/10.4314/jae.v30i1.34s>
12. Michael, H. Y. (2022). Effect and constraints of adoption of recommended cassava production practices by farmers in Bwari and Kuje Area Council, Abuja, Nigeria. *Nigeria Agricultural Journal*. <https://www.ajol.info/index.php/naj/article/view/232686>
13. Ocheni, B., Eze, J. N., Ugalahi, U. B., Dauda, N. S., & Sallawu, H. (2024). Adoption of recommended technologies for cassava processing among women in Ankpa, Kogi State, Nigeria. *Badeggi Journal of Agricultural Research and Environment*, 6(3), 77–84. <https://doi.org/10.35849/BJARE202403/207/09>
14. Olaniyi, O. A., & Dlamini, M. M. (2024). Determinants of information and communication technology usage among cassava value chain actors in Southwest, Nigeria. *Journal of Agricultural Extension*. <https://www.ajol.info/index.php/jae/article/view/274663>
15. Olohungebebe, S. A., & Akanbi, S.-U. O. (2025). Socioeconomic analysis and processing dynamics of selected cassava products in Federal Capital Territory, Nigeria. *AJAE Journal*, 5(2).



<https://ajae.ng/2025-vol-5issue2-2025-article-21-socioeconomic-analysis-and-processing-dynamics-of-selected-cassava-products-in-federal-capital-territory-nigeria/>

16. Vihi, S. K., Chomini, E. A., Tor, L. G., Jesse, B., Dalla, A. A., Bassey, E. A., & Owa, G. T. (2022). Factors influencing adoption of improved cassava-garri processing technologies among rural women in Vandeikya Local Government Area of Benue State, Nigeria. *FUDMA Journal of Agriculture and Agricultural Technology*. <https://doi.org/10.33003/jaat.2022.0801.082>.