



VALUE CHAIN ANALYSIS OF CRAYFISH MARKETING IN ORON BUSINESS CLUSTER OF AKWA IBOM STATE, NIGERIA

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ABSTRACT

The study assessed value chain analysis of crayfish marketing in Oron business cluster of Akwa Ibom State, Nigeria. The specific objectives were to; analyze and compare the cost structure, revenue profile and returns across value chain actors in crayfish marketing; and assess the distribution of values and benefits in the crayfish value chain. Multi-stage sampling technique was used to draw samples of 129 fishers, 66 Processors, 60 Primary wholesalers and 96 retailers. Primary data were collected using structured questionnaire and analyzed using Budgetary Analysis, Analysis of Variance (ANOVA), Student-Newman-Keuls (SNK) test and Bar charts. The results showed that value addition across the chain is overwhelmingly concentrated at the primary capture stage, where fishers incur a unit cost of ₦2,586.33 per kilogram, accounting for 85.4% of the total value added along the entire marketing corridor. Primary wholesalers achieve an extraordinarily high Return on Investment of 266.00% and a Benefit-Cost Ratio (BCR) of 13.35. The Analysis of Variance (ANOVA) and Student-Newman-Keuls (SNK) test results showed that disparities in returns across value chain actors are statistically significant. The calculated F-values for net profit ($F = 8529.96$, $p < 0.0001$) and Return on Investment ($F = 63,664.50$, $p < 0.0001$) demonstrate clear structural differences across all nodes. Primary fishers contribute the vast majority of direct value addition along the entire chain, absorbing 85.4% of total unit costs, processors account for 9.0% of total value addition through sun-drying and smoking—functions, primary wholesalers account for merely 3.0% of direct value addition costs, yet they capture the single largest share of net benefits along the chain at 34.73% while retailers account for the remaining 2.6% of value addition while capturing 24.42% of total chain benefits. The study concludes that crayfish marketing in the study area is highly profitable across all actor nodes, but it suffers from severe structural inequities in value addition and economic benefit capture. Hence, the study recommends that fishers and processors should be encouraged to form strong marketing cooperatives. Collective bargaining and joint storage facilities would enable primary producers to bypass exploitative intermediary pricing, improving their net returns and balancing market leverage against primary wholesalers.

Keywords: Business, Cluster, Marketing, Value, Chain, Analysis

INTRODUCTION

Crayfish—predominantly the dried, smoked form of small shrimps and prawns—occupies a central position in the culinary practices and food security landscape of Nigeria (Chen *et al.*, 2024). Prized for its rich flavor profile, distinct aroma, and extended shelf life under ambient tropical conditions, crayfish serves as a staple condiment and a crucial source of animal protein across millions of households. Unlike live or fresh seafood consumption trends observed in European or North American markets, the Nigerian seafood sub-sector relies almost exclusively on sun-drying and smoking techniques (Ambali *et al.*, 2025). This traditional post-harvest processing preserves the commodity and facilitates its distribution from coastal harvesting nodes to inland urban consumer markets. Because aquatic animals such as fish, shrimps, crabs, and lobsters are universally acceptable across diverse ethnic, cultural, and religious demographics, crayfish enjoys uninterrupted consumer demand throughout the nation.

The macroeconomic pressures affecting animal protein supply in West Africa have further reinforced the strategic importance of seafood. Escalating retail prices for conventional domestic



livestock including beef, mutton, goat meat, and commercially farmed poultry have strained household food budgets, driving lower- and middle-income consumers toward more affordable marine alternatives like dried fish and crayfish (Siddhnath, Sharma & Singh, 2024). From a nutritional perspective, crayfish is exceptionally nutrient-dense. It serves as a concentrated source of high-quality, easily digestible protein containing all nine essential amino acids required for human growth and tissue maintenance. Additionally, it supplies crucial micronutrients, including B-complex vitamins, fat-soluble vitamins (A, D, E, and K), and vital minerals such as calcium, phosphorus, iron, zinc, magnesium, and sodium (Adegbusi *et al.*, 2024). The presence of beneficial fatty acids, particularly omega-3 fatty acids, links regular crayfish consumption to improved visual acuity and cognitive health, making it an essential component of maternal and child nutrition in resource-constrained communities.

In coastal states such as Akwa Ibom, crayfish production, processing, and trade form the backbone of the rural–urban food network (Essien, 2023). This trade links small-scale fishers in riverine communities to intermediary processors, bulk aggregators, and retail networks that supply major consuming markets. At the heart of this regional network is the Oron business cluster, situated along the lower Cross River Basin. Comprising five coastal Local Government Areas (Oron, Udu, Uyo, Uruakpe, and Okoko), the Oron cluster functions as the primary marine aggregation, processing, and transshipment node in Southeastern Nigeria. Crayfish represents the second largest fishery in the marine and estuarine capture fisheries of the lower Cross River Basin (Enyenihi *et al.*, 2026). Consequently, the name "Oron" has become virtually synonymous with high-volume crayfish trading, serving as the origin point from which tons of dried seafood are distributed across Akwa Ibom State and exported to major urban hubs throughout the country.

Despite the coastal fishery sector's vital role in sustaining regional food security and generating rural livelihoods, systemic inefficiencies continue to undermine the performance of the crayfish value chain in Akwa Ibom State. Crayfish in Nigeria is harvested almost entirely from natural estuarine and marine capture fisheries rather than controlled aquaculture operations. This ecological reliance creates spatial and seasonal supply imbalances. Production is geographically concentrated along coastal corridors like Oron, while inland agricultural and urban zones face localized scarcity and sharp retail price spikes during off-peak seasons. Navigating these spatial disequilibrium dynamics requires an efficient, well-coordinated marketing chain. However, structural bottlenecks across harvesting, wholesaling, and retailing nodes often erode net returns and disrupt steady product flows. A fundamental challenge within the crayfish value chain is the unequal distribution of operational costs, financial risks, and market power among chain participants (Herlambang, 2025). Smallholder retailers who form the critical bridge between landing sites and final consumers face severe operating capital constraints, limited access to formal bank credit, and high wholesale procurement costs. Procurement of raw bulk crayfish accounts for majority of a retailer's variable budget, leaving micro-traders vulnerable to price inflation and wholesale price leverage at primary landing beaches. Furthermore, downstream actors bear the weight of non-tariff operational costs, including excessive daily municipal levies, high stall rents, transport inefficiencies, and substantial post-harvest storage losses caused by insect infestation and moisture absorption.

Empirical literature on agricultural economics in Southern Nigeria has historically focused on primary production dynamics (Okon *et al.*, 2018), artisanal fishing catches, or raw processing practices, leaving midstream wholesaling and downstream retailing relatively under-researched. Existing studies frequently fail to disaggregate cost components or quantify functional profit margins across marketing actors. Without precise empirical data on node-level gross margins, cost drivers, seasonal price transmission, and trader constraints in key commercial hubs like Oron, development organizations and government agencies cannot reliably design targeted interventions. Policy assumptions regarding bulk-purchasing advantages, communal storage facilities, or informal credit systems remain largely unverified. Therefore, a detailed value chain analysis of crayfish marketing in the Oron business cluster is urgently needed to provide empirical evidence for policy formulation, micro-credit restructuring, and market infrastructure development. Hence, the study addressed the following objectives; analyze and compare the cost structure, revenue profile and returns across value chain actors in crayfish marketing; and assess the distribution of values and benefits in the crayfish value chain.



METHODOLOGY

Study Area

The Oron business cluster is comprised of five Local Government Areas (LGAs) in Akwa Ibom State, namely; Oron, Udung-Uko, Mbo, Urue-Offong/Oruko, and Okobo. The area is located within the Coordinates of 5°3'N and 7°56'E. It is inhabited by the people of Oro, the third largest ethnic group in the state. Its political and economic headquarters is Oron town which is the third largest city in Akwa Ibom state after Uyo and Eket. Lying on the Cross River, the predominant occupation is fishing and farming. Oron is found in the flood plain of South Eastern Nigeria, with the land mainly intersected by numerous streams and tributaries flowing into Cross River. Crayfish is the second largest fishery in the marine/estuarine fisheries in the lower Cross River Basin. Crayfish is used as seasoning in most food prepared in Nigeria. Crayfish marketing seems to be synonymous with “Oron” from where it is exported to other parts of Akwa Ibom state and other states of the federation.

Sampling Technique

Multistage sampling technique was used to sample the respondents for the study. At the first stage, out of the five (5) Local Government Areas in the study area, three (3) Local Government Areas were selected using a simple random sampling technique. At stage two, snowball sampling technique was used to obtain 129 fishers, 66 processors, 60 primary wholesalers, and 96 retailers in the study area.

Analytical Technique

Objective 1: To analyze and compare the cost and returns across value chain actors in crayfish marketing; budgetary analysis was used to determine the costs and returns

Net Income = Total revenue – Total Cost -----Equation 1

Where

Total Cost = Total Variable Cost + Total Fixed Cost -----Equation 2

Total Revenue = $P_y \times Y$

P_y = Price of crayfish

Y = Total quantity of crayfish

For fixed cost inputs, the straight-line depreciation technique was adopted to estimate annual costs. Profitability measure such as Returns to Capital or Investment (ROI) was estimated.

Straight-line depreciation technique = $\frac{\text{Cost} - \text{Salvage value}}{\text{Useful life}}$ ----- Equation 3

Returns on Investment = $\frac{\text{Net Return}}{\text{Total Cost}}$ ----- Equation 4

Analysis of Variance, (ANOVA) was used to test the hypothesis that there was no significant difference in the returns to the actors in the crayfish value chain.

Objective 2: To assess the distribution of values and benefits in the crayfish value chain. Descriptive statistics such as frequency count, percentages and bar charts were used.

RESULTS AND DISCUSSION

Cost and Returns across Value Chain Actors

The empirical results presented in Tables 1 and 2 offer a comprehensive evaluation of the cost structure, revenue profile, value addition, and returns across the key operational nodes in the crayfish value chain within the Oron business cluster of Akwa Ibom State. The data reveals a pronounced asymmetry in how costs, value additions, and economic benefits are distributed among fishers, processors, primary wholesalers, and retailers. Value addition across the chain is overwhelmingly concentrated at the primary capture stage, where fishers incur a unit cost of ₦2,586.33 per kilogram, accounting for 85.4% of the total value added along the entire marketing corridor. This heavy cost burden stems from substantial operational expenditures per trip—totaling ₦59,486.00 for an average yield of 23 kg—which are driven by high expenses for fuel, boat maintenance, and gear procurement. These findings directly align with the work of Enyenihi *et al.* (2026), who observed that primary fishers in coastal communities face massive start-up and operational capital requirements, placing them under greater financial risk than any other actor group along the chain.

Moving down the value chain, the physical processing node contributes 9.0% (₦272.55/kg) of total value addition through traditional sun-drying and smoking techniques. As noted by Ambali *et al.*

(2025) and Siddhnath *et al.* (2024), post-harvest drying and smoking are critical for extending product shelf life under ambient tropical conditions and facilitating trade between coastal landing sites and inland urban markets. However, despite performing this essential preservation role, processors capture a disproportionately small share of overall value chain benefits. In contrast, value addition drops significantly at the trading nodes to 3.0% (₦90.02/kg) for primary wholesalers and 2.6% (₦79.73/kg) for retailers. Despite contributing minimal physical transformation costs, these downstream intermediaries leverage market positioning, capital access, and spatial distribution networks to command substantial price markups.

Table 1: Distribution of Value, Benefits and Returns to the Different Actors along the Crayfish Value Chain within the Study Area (Based on 1kg of Crayfish).

Stage	Item	Monetary Component
Capture (Fishers)	Catch per fishing trip (kg)	23
	Cost per fishing trip (N)	59,486.00
	Unit cost (value added) per kg (N)	2,586.33
	Percentage of value added	85.4
	First sale price (by Fishers)	3,650.43
	Profit (benefits) per kg	1,064.00
	Percentage of benefits	28.23
	Benefit/cost ratio	1.411
	Returns on Investment	41%
Processing (Processors)	Processing cost (value added) per kg	272.55
	Percentage of value added	9.0
	Second sale price (by Processors)	4,398.98
	Profit (benefits) per kg	476.00
	Percentage of benefits	12.63
	Benefit/cost ratio	1.74
Primary Wholesale	Returns on Investment	35%
	Primary Wholesaler cost (value added) per kg	90.02
	Percentage of value added	3.0
	Third sale price (by Primary wholesaler)	5,798.00
	Profit (benefits) per kg	1,309.00
	Percentage of benefits	34.73
Retailers	Benefit/cost ratio	13.35
	Returns on Investment	266%
	Retailers cost (value added) per kg	79.73
	Percentage of value added	2.6
	Final sale price (by Retailers to consumers)	6,801.73
	Profit (benefits) per kg	920.50
Final Consumer	Percentage of benefits	24.42
	Benefit/cost ratio	11.43
	Returns on Investment	66%

Field survey, 2025

The distribution of net profits and Return on Investment (ROI) further highlights structural imbalances in reward distribution relative to cost commitments. Primary wholesalers emerge as the most economically dominant actors along the value chain, securing the highest absolute net profit of ₦1,309.00 per kilogram, which accounts for 34.73% of total chain benefits. Furthermore, primary wholesalers achieve an extraordinarily high Return on Investment of 266.00% and a Benefit-Cost Ratio



(BCR) of 13.35. This remarkable financial performance aligns with the broader value chain efficiency literature by Herlambang (2025), which notes that midstream aggregators in small-scale fisheries often capture high economic rents by exploiting spatial price arbitrage between isolated landing sites and major commercial centers. While primary wholesalers report high transport costs as a major constraint (Agom, 2026; Enyenihi *et al.*, 2026), their low variable cost per unit handled enables them to maximize profit margins efficiently.

In comparison, fishers generate the second-highest absolute net profit at ₦1,064.00 per kilogram (28.23% of total benefits), yet their Return on Investment stands at a modest 41.00% with a Benefit-Cost Ratio of 1.411. The high initial operating outlay required for marine capture limits their capital efficiency despite their high revenue per trip. Meanwhile, retailers achieve a net profit of ₦920.50 per kilogram (24.42% of total benefits), an ROI of 66.00%, and a BCR of 11.43. The retail node benefits from high final consumer demand, with retail prices reaching ₦6,801.73 per kilogram. As discussed by Adegbusi *et al.* (2024) and Chen *et al.* (2024), dried crayfish is an indispensable culinary condiment and a vital source of animal protein, micronutrients, and omega-3 fatty acids in Nigerian households. This steady household reliance sustains retail price resilience even amidst broader macroeconomic pressures and food inflation (Siddhnath *et al.*, 2024). Nevertheless, as observed by Esheya (2023), retailer gross margins remain constrained by operational overheads such as shop rent, municipal market levies, and transport expenses.

The processing actor group represents the most vulnerable segment within the Oron crayfish cluster. Processors realize the lowest net profit at ₦476.00 per kilogram (12.63% of total benefits), an ROI of 35.00%, and a BCR of 1.74. Their low profitability is largely attributable to reliance on labor-intensive, inefficient processing technologies, high fuelwood costs, and product perishability during humid weather. Enyenihi *et al.* (2026) similarly identified the short shelf-life of processed seafood as the single most severe constraint facing coastal processors, which limits their bargaining power when negotiating selling prices with primary wholesalers.

The Analysis of Variance (ANOVA) and Student-Newman-Keuls (SNK) test results in Table 2 confirmed that the observed disparities in returns across value chain actors are statistically significant. The calculated F-values for net profit ($F = 8529.96$, $p < 0.0001$) and Return on Investment ($F = 63,664.50$, $p < 0.0001$) demonstrate clear structural differences across all nodes. In both metrics, the SNK mean separation places primary wholesalers in the highest distinct statistical group (a), followed sequentially by fishers (b), retailers (c), and processors (d). These statistical distinctions corroborate the empirical findings of Agom and Okon (2024) regarding socio-economic input-output dynamics in regional fisheries, confirming that financial returns are heavily mediated by operational scales and capital intensity.

Overall, the empirical evidence demonstrates that while crayfish trading in the Oron cluster is profitable across all stages, value and profit capture are highly inequitable. Primary producers (fishers) carry the highest operational costs, while processors bear severe shelf-life risks for the lowest relative gain. Conversely, midstream primary wholesalers capture disproportionately high economic returns relative to their direct cost additions. To create a more balanced value chain, targeted policy interventions are required, including the introduction of modern solar-hybrid drying technologies for processors, micro-credit access for fishers to reduce operating cost pressures, and improved market infrastructure to streamline distribution channels. \

Table 2: Comparison of net profit and returns on investment of the crayfish value chain actors.

Value Actor	Net Profit (₦)	Returns on Investment (%)
Processors	476.00 ^d	35.00 ^d
Retailers	920.50 ^c	66.00 ^c
Fishers	1,064.00 ^b	41.00 ^b
Primary Wholesalers	1,309.00 ^a	266.00 ^a
F-Value	8529.96	63,664.50
P > F	< 0.0001S	< 0.0001S

Means followed by the same superscripts/letters in the same column are not significantly different at $P \leq 0.05$ by Student-Newman-Keuls (SNK); S= significant

Source: Computed from field data, 2025

Distribution of Values and Benefits in the Crayfish Value chain

The empirical findings presented in Figure 1 provide a clear visual breakdown of the structural distribution of value addition and economic benefits accrued per kilogram of crayfish across the four major actor nodes in the Oron business cluster. A rigorous examination of the data reveals a stark misalignment between the physical and financial resources expended at each node and the corresponding net profits captured. Primary fishers contribute the vast majority of direct value addition along the entire chain, absorbing 85.4% of total unit costs. This reflects the high capital intensity of marine capture fisheries, driven by high trip expenditures for fuel, gear maintenance, labor, and vessel upkeep. Despite absorbing the overwhelming burden of operating expenses and operational risks, fishers capture only 28.23% of total chain benefits. This cost-benefit disparity directly echoes the empirical findings of Enyenihi *et al.* (2026), who demonstrated that primary fishers in coastal South-East Nigeria bear the highest start-up capital demands and financial vulnerabilities, yet face structural constraints that limit their ability to capture proportional economic gains.

The post-harvest processing node similarly reflects a structural disadvantage within the value chain layout shown in Figure 1. Processors account for 9.0% of total value addition through sun-drying and smoking—functions that are indispensable for product preservation and marketability in tropical environments (Ambali *et al.*, 2025; Siddhnath *et al.*, 2024). However, processors secure the smallest share of financial benefits at just 12.63%. This outcome is strongly supported by the constraint analysis of Enyenihi *et al.* (2026), who identified short product shelf-life, perishability risks, and reliance on traditional processing equipment as severe handicaps for coastal processors. These technical bottlenecks weaken processors' bargaining power when negotiating sale prices with bulk buyers, leaving them vulnerable to price squeeze by midstream intermediaries.

In contrast, the downstream distribution nodes—comprising primary wholesalers and retailers—exhibited an inverted pattern, where low direct value-added contributions yield substantial profit captures. Primary wholesalers account for merely 3.0% of direct value addition costs, yet they capture the single largest share of net benefits along the chain at 34.73%. As Herlambang (2025) noted in evaluations of small-scale fishery value chains, midstream aggregators often leverage spatial price arbitrage, superior market access, and capital liquidity to extract high economic rents relative to their physical processing investments. Even though wholesalers incur significant transport expenses to move dried seafood from coastal landing sites to urban centers (Enyenihi *et al.*, 2026), their bulk transaction volumes allow them to maintain large operating margins.

Finally, retailers account for the remaining 2.6% of value addition while capturing 24.42% of total chain benefits. The retail node benefits directly from steady consumer demand for dried crayfish, which serves as an essential, nutrient-dense culinary staple across Nigerian households (Adegbusi *et al.*, 2024; Chen *et al.*, 2024). High retail prices (reaching ₦6,801.73/kg) are sustained by consumer preferences and broader macroeconomic shifts where households increasingly rely on dried seafood as an accessible alternative to high-priced livestock proteins (Siddhnath *et al.*, 2024). Nevertheless, retailers' net margins continue to be constrained by non-tariff operational costs such as market levies

(Ghodsí & Stehrer, 2022), stall rents, and post-harvest storage losses, as previously documented by Esheya (2023).

Taken together, Figure 1 illustrates structural inequities in the Oron crayfish cluster, demonstrating that market power and financial returns favor midstream trade aggregators over upstream primary producers and processors. These findings highlight the need for targeted policies aimed at reducing capital burdens on fishers, introducing improved drying technologies for processors, and modernizing market infrastructure to foster a more equitable value chain.

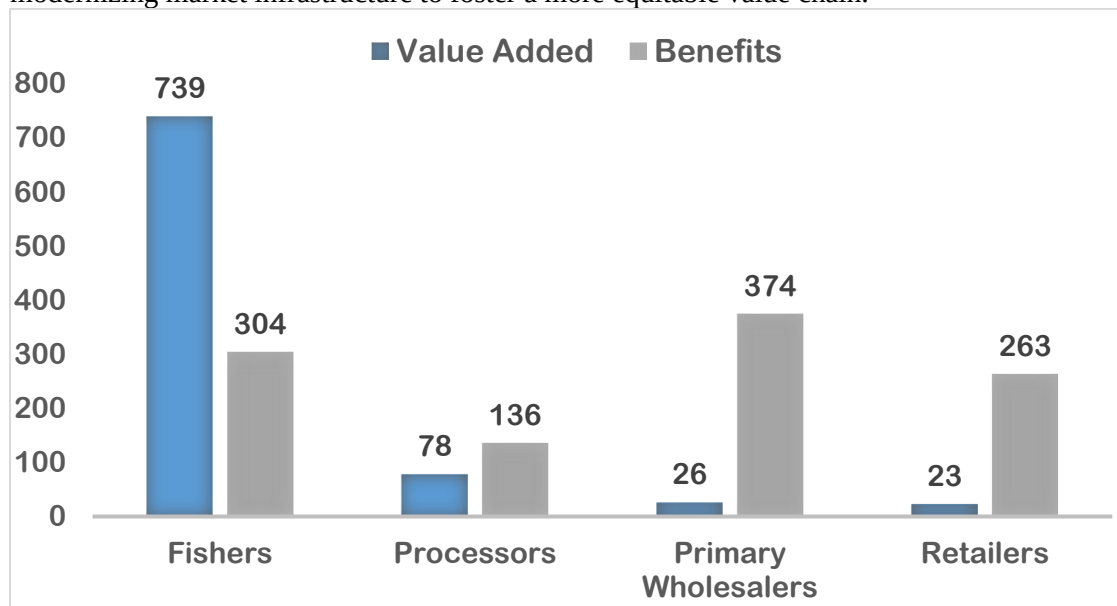


Figure 1: Distribution of values and benefits in the crayfish value chain
Source: Field survey, 2025.

CONCLUSION AND RECOMMENDATIONS

The study concludes that crayfish marketing in the Oron business cluster of Akwa Ibom State is highly profitable across all actor nodes, but it suffers from severe structural inequities in value addition and economic benefit capture. Fishers shoulder the overwhelming majority of direct operational expenses, while processors absorb high post-harvest perishability risks for the lowest profit margins and lowest ROI. Conversely, midstream primary wholesalers capture disproportionately high returns relative to their minor inputs cost, exploiting spatial market power and bulk distribution channels. Statistically significant differences ($p < 0.01$) confirm that economic rewards along the chain favor downstream trading aggregators over primary producers and processors.

The following recommendations are suggested based on the findings of the study;

1. Fishers and processors should be encouraged to form strong marketing cooperatives. Collective bargaining and joint storage facilities would enable primary producers to bypass exploitative intermediary pricing, improving their net returns and balancing market leverage against primary wholesalers.
2. Development organizations and research institutes should promote and subsidize modern, energy-efficient post-harvest technologies, such as solar-hybrid drying kilns. This will extend product shelf life, reduce reliance on costly fuelwood, strengthen processors' bargaining power, and improve their profit margins.
3. Government intervention agencies and financial institutions should establish specialized micro-credit programs and input subsidy schemes (e.g., for outboard engines, fuel, and fishing gear) to alleviate the high operational cost burden (₦59,486.00 per trip) and financial risks borne by primary fishers.



4. Local government authorities in the Oron cluster and urban market hubs should harmonize non-tariff charges (such as daily market levies and stall rents) and construct modern, pest-proof storage facilities. This will reduce operating overheads and post-harvest storage losses for micro-retailers, helping stabilize retail prices for final consumers.

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