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Profitability and Market Structure of Fresh Milk Marketing in Borno State, Nigeria

By

Shuaib Jibrin[1]*, Ibrahim Mustapha Sulumbe[2], and Mohammed Abba[3]

[1]Department of Agricultural Economics and Extension, Borno State University, Maiduguri, Borno State, Nigeria
[2]Department of Agricultural Economics, University of Maiduguri, Borno State, Nigeria
[3]Department of Animal Science, Borno State University, Maiduguri, Borno State, Nigeria

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Abstract

Understanding the profitability and market structure of fresh milk marketing is critical for formulating effective interventions to improve livelihoods and market efficiency in northern Nigeria. This study estimated the profitability of fresh milk marketing and determined the market structure for fresh milk marketers in Borno State, Nigeria. Primary data were collected from 302 purposively sampled fresh milk marketers across Biu, Maiduguri Municipal Council (MMC), and Monguno Local Government Areas using structured questionnaires. Gross margin analysis was used to assess profitability, while the Gini coefficient, Lorenz curve, price determination mechanisms, supply chain analysis, and cooperative membership data were used to characterize market structure. The gross margin of fresh milk marketing was ₦1,039.06 per unit period, derived from total revenue of ₦2,806 and total variable cost of ₦1,766.94, yielding a market efficiency ratio of 37%. Transportation (27.6% of total variable cost) was the dominant cost item. Income distribution analysis yielded an estimated Gini coefficient in the range of 0.45–0.60, indicative of an oligopolistic market structure. Haggling and negotiation dominated price determination (75.50% of marketers), and only 32.78% of marketers belonged to milk marketing cooperatives. These findings point to a profitable but structurally imperfect market, with significant income inequality and limited marketer bargaining power. Policy interventions should focus on reducing transport costs, strengthening cooperative institutions, and improving infrastructure to enhance market competitiveness.

Keywords: *Profitability, Gross margin, Market structure, Gini coefficient, Fresh milk marketing, Borno State*

1. INTRODUCTION

Fresh milk marketing in Nigeria constitutes a vital component of the rural economy, particularly in the pastoral communities of the North-East where the Fulani, Shuwa Arab, and Hausa peoples are engaged in livestock rearing and dairy product trade. In Borno State, the fresh milk marketing system is characterized by inadequate market infrastructure, inefficient distribution channels, limited access to credit, and the compounding effects of insurgency-related insecurity (Jibrin et al., 2025). These structural deficiencies are likely to affect both the profitability of marketing enterprises and the efficiency with which markets allocate resources among participants.

Market structure and market performance are two interconnected dimensions of marketing systems analysis. Market structure relates to the organizational features of a market, including buyer and seller concentration, entry conditions, and the extent of product differentiation (Bain, 1959; Olukosi & Isitor, 2005). Market performance encompasses the outcomes produced by the interaction of buyers and sellers, including profitability, income distribution, and price formation efficiency (Adekanye, 1998). Marketing structure and performance are important in milk marketing because they determine the degree of competition, the distribution of marketing margins, and the returns accruing to different market participants.

Although several studies have examined milk marketing in other parts of sub-Saharan Africa, there is a paucity of empirical evidence specifically addressing the profitability and market structure of fresh milk marketing in post-conflict Borno State. The present paper addresses this gap by

*Corresponding Author: **Shuaib Jibrin.**

estimating the profitability of fresh milk marketing enterprises and characterizing the market structure through income distribution analysis, price determination mechanisms, supply chain configuration, and cooperative membership data. These objectives correspond to objectives (iii) and (iv) of the broader study of the structure and performance of fresh milk marketing in Borno State.

2. LITERATURE REVIEW

2.1 Profitability of Milk Marketing

The profitability of milk marketing varies substantially across marketing channels and geographies in sub-Saharan Africa. Jamal (2017), in Degarbour Wureda, Ethiopia, found that total gross marketing margins (TGMM) ranged from 0% in direct producer-to-consumer channels (Channels I and II) to 33.33% in more complex intermediated channels (Channel VII). Gross profit was highest in Channel IV at 25.95 Birr per litre. Yocab (2016) found that camel milk traders in Addis Ababa achieved total gross margins of 31.7% of average purchase price, though this margin was not transferred to producers, whose share of retail price declined from 76% in 1983/84 to 55% in 2015.

Solomon (2014) documented that village collectors in Addis Ababa's Kera market received relatively large shares of total gross marketing margin (69.5%, 63.4%, and 61.6% for milk supplied from Yabelo, Negelle, and Dubluk markets, respectively). Mediza (2016) reported TGMM of 25%, with total gross marketing margin for rural assemblers at 21% and for retailers at 8%. Rehima (2015) found gross marketing margins of 43.08% for camel milk retailers in southern Kenya. Muhammed (2017) in Bangladesh documented that collector middlemen incurred average marketing costs of Tk 3.39 per litre, with a gross margin of Tk 3 per litre, while Gola middlemen had higher marketing costs (Tk 12.29/litre) and a net margin of Tk 6 per litre.

2.2 Market Structure of Milk Marketing

Market structure in milk marketing systems across Africa is widely characterized as oligopolistic or oligopsonistic. Gizachew (2015) found that the camel milk market in Nairobi was highly concentrated, with a Gini coefficient of 0.70696, while the Kisumu market had a coefficient of 0.5555. A Gini coefficient above 0.4 is considered indicative of oligopolistic tendencies. Badelu (2015) documented CR4 values of 63.8%–93.45% across sampled milk markets in Kenya, confirming that most markets were characterized by strong oligopoly.

Farah (2017) found concentration ratios of 59%, 63%, and 87% in Hodale, Ubale, and Agasur kebele markets in Ethiopia's Degarbour Wureda, demonstrating oligopsonistic market conditions at the local level where milk collectors set prices. At the Degabour town level, however, a CR4 of 13% indicated a more competitive market driven by price forces. Jamal (2017) confirmed that dry season conditions further concentrate market power in favour of buyers as available supply declines.

The dominance of haggling and negotiation in price setting is a consistent finding across similar studies. Olukosi and Isitor (2005) observed that market structure directly shapes the degree of competition and efficiency of price formation. In systems with high buyer concentration, price-setting power is effectively transferred to a small number of actors who can exploit information asymmetries and the perishable nature of milk to impose low farmgate prices (Oxfam, 2018).

3. MATERIALS AND METHODS

3.1 Study Area and Sampling

The study was conducted in Borno State, located in Nigeria's North-East between latitudes 10°02'N and 13°04'N and longitudes 11°04'E and 14°04'E. Three Local Government Areas were purposively selected for their high milk marketing activity: Biu, Maiduguri Municipal Council (MMC), and Monguno. Cluster sampling was used to select 302 fresh milk marketers distributed across the three senatorial zones of the state.

3.2 Data Collection

Primary data were collected using structured questionnaires administered by trained enumerators covering cost and revenue information, price determination mechanisms, supply chain characteristics, cooperative membership, and household income. Secondary data were obtained from government publications, journals, and research reports.

3.3 Analytical Techniques

3.3.1 Gross Margin Analysis

Profitability was assessed using the gross margin equation:

$GM = GR - TVC$ …… (Equation 1)

Where:

GM = Gross Margin (₦)

GR = Gross Revenue (₦)

TVC = Total Variable Cost (₦)

Market efficiency was estimated as:

$\text{Market Efficiency (\%)} = (TVC / GR) \times 100$ …… (Equation 2)

3.3.2 Gini Coefficient

The Gini coefficient was used to compute the inequality in income distribution among milk marketers as a proxy for market concentration (Sulumbe et al., 2012). The formula is:

$GC = 1 - \Sigma xy$ …… (Equation 3)

Where:

GC = Gini Coefficient

x = Cumulative percentage of milk marketers

y = Cumulative percentage of marketers' income

A coefficient of 0 indicates perfect equality; a coefficient of 1 indicates perfect inequality. Values above 0.5 indicate significant inequality (oligopolistic tendency), while 0.2–0.35 indicates equitable distribution (Sulumbe et al., 2012; Gizachew, 2015). The Lorenz curve was constructed to visually represent income distribution.

Descriptive statistics (frequencies, percentages) were additionally used to characterize price determination

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mechanisms, supply chain structure, and cooperative membership.

4. RESULTS AND DISCUSSION

4.1 Profitability of Fresh Milk Marketing in Borno State

Table 1 presents the profitability analysis of fresh milk marketing based on aggregated cost and revenue data from the 302 sampled marketers.

Table 1: Profitability Analysis of Fresh Milk Marketing in Borno State

Item	Total Quantity (Litres)	Average Price/Cost (₦)
Fresh Whole Milk (Madara)	1,106	1,148
Skimmed Milk (Nono)	3,477	658
Yoghurt (Kindirmo)	8,451	1,000
Total Revenue (GR)		₦2,806
Marketing Cost Variables		Cost (₦)
Transportation		487.16
Processing		310.06
Labour		295.32
Packaging		287.63
Communication		181.40
Refrigeration		151.29
Market Fee		54.09
Total Variable Cost (TVC)		₦1,766.94
Gross Margin (GR – TVC)		₦1,039.06
Market Efficiency (%)		37%
Market Efficiency (%)		37%

Source: Field Survey, 2025.

The gross margin of fresh milk marketing in Borno State was ₦1,039.06 per unit period, derived from total revenue of ₦2,806 and total variable cost of ₦1,766.94, representing a market efficiency ratio of 37%. This confirms that fresh milk marketing is a profitable enterprise, generating positive returns above variable costs.

Transportation emerged as the single largest cost item at ₦487.16, accounting for 27.6% of total variable cost. This finding resonates with Barker and Hofman (2016), who identified distance to market as a critical determinant of profitability in pastoral milk marketing systems, and with Musenwa (2016), who demonstrated that poor road networks impose disproportionately high transport costs on dairy marketers in remote areas. In Borno State, where insecurity compounds infrastructure deficits, transportation costs are particularly elevated, constraining profit margins for smallholder marketers.

Processing costs (₦310.06; 17.5% of TVC) ranked second, reflecting the dominant role of yoghurt (Kindirmo) marketing in the product mix: 44.70% of marketers engage in Kindirmo, requiring fermentation, packaging, and handling steps that add to operational costs. Labour (₦295.32; 16.7%) and packaging (₦287.63; 16.3%) followed closely, together accounting for over one-third of TVC. This cost structure is consistent with Jamal (2017), who documented labour, transport, and container/packaging expenses as dominant cost items for milk collectors and middlemen in Ethiopia.

The market efficiency ratio of 37% indicates that a substantial portion of revenue (63%) is consumed by marketing costs. This is somewhat below the gross marketing margin of 43.08% reported by Rehima (2015) for camel milk retailers in southern Kenya but consistent with the range of 25%–33.33% documented by Mediza (2016) and Jamal (2017). The relatively lower efficiency ratio in Borno State reflects the additional operational burdens imposed by the post-conflict environment, including security-related transport detours, informal levies, and limited market infrastructure.

The commercial dominance of Kindirmo (8,451 litres at ₦1,000/litre) reflects the value-addition logic prevalent in sub-Saharan African dairy markets: processing fresh milk into yoghurt extends shelf life, reduces spoilage losses, and expands market reach beyond the immediate production zone (Wolday, 2014; Kubkomawa & Kenneth, 2019). Fresh whole milk (Madara), despite commanding the highest unit price (₦1,148/litre), generated the lowest volume (1,106 litres), constrained by perishability and the non-refrigerated transport conditions characteristic of the study area. This product-price-volume pattern underscores the economic logic of Kindirmo production as a profitability strategy for marketers with limited cold chain access (Muhammed, 2017).

4.2 Market Structure of Fresh Milk Marketing in Borno State

4.2.1 Price Determination Mechanisms

Table 2 presents data on price determination methods among fresh milk marketers.

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Table 2: Price Determination Mechanisms Among Fresh Milk Marketers in Borno State (n=302)

Price Determination Method	Frequency	Percent (%)	Cumulative (%)
Haggling/Negotiation	228	75.50	75.50
Market Forces (Supply & Demand)	38	12.58	88.08
Fixed by Market Association	36	11.92	100.00
Total	302	100.00	

Source: Field Survey, 2025.

The dominant price determination mechanism among fresh milk marketers in Borno State is haggling and negotiation (75.50%), with only 12.58% reporting reliance on market forces and 11.92% on prices fixed by market associations (Table 2). The prevalence of bilateral bargaining rather than impersonal competitive price formation is a hallmark of imperfectly competitive markets (Olukosi & Isitor, 2005; Adekanye, 1998).

This finding closely mirrors results from comparable dairy marketing studies in sub-Saharan Africa. Jamal (2017), in the Hodale, Obole, Ogasur, and Degabour markets of Somalia, found that at the kebele level, prices were effectively set by the few milk collectors who dominated buying activities, demonstrating how buyer concentration creates price-setting power. Farah (2017) similarly showed that Kebele milk collectors in Degarbour Wureda, Ethiopia, being few in number but controlling the bulk of camel milk purchasing, effectively dictated prices at the local market stage, reducing competitive pressures for producers and smaller marketers.

The small proportion of marketers relying on fixed association prices (11.92%) reflects the weak institutionalization of milk marketing associations in Borno State. As discussed further in Section 4.2.4, only 32.78% of marketers belong to any association or cooperative, limiting the collective price-setting capacity of marketers relative to buyers.

4.2.2 Supply Chain Structure and Marketing Channels

Tables 3, 4, and 5 present data on milk supply sources, supplier types, and buyer categories, respectively, providing a comprehensive picture of the marketing chain structure.

Table 3: Sources of Milk Supply for Fresh Milk Marketers in Borno State (n=302)

Supply Source	Frequency	Percent (%)	Cumulative (%)
Local Community within Borno State	263	87.09	87.09
Outside Borno State	38	12.58	99.67
Neighbouring Countries	1	0.33	100.00
Total	302	100.00	

Source: Field Survey, 2025.

Table 4: Supplier Types for Fresh Milk Marketers in Borno State (n=302)

Supplier Type	Frequency	Percent (%)	Cumulative (%)
Local Producers	196	64.90	64.90
Middlemen	87	28.81	93.71
Aggregators	19	6.29	100.00
Total	302	100.00	

Source: Field Survey, 2025.

Table 5: Buyer Categories for Fresh Milk from Marketers in Borno State (n=302)

Buyer Category	Frequency	Percent (%)	Cumulative (%)
Consumers (Direct)	191	63.25	63.25
Processors	54	17.88	81.13
Retail Marketers	29	9.60	90.73
Other Marketers	28	9.27	100.00
Total	302	100.00	

Source: Field Survey, 2025.

The overwhelming majority of milk supply (87.09%) originates from within Borno State, with 64.90% of marketers sourcing directly from local producers and 28.81% through middlemen (Tables 3 and 4). This near-total dependence on localized supply underscores the vulnerability of the marketing system to local shocks, including drought, disease outbreaks, and security disruptions. Jaleta and Herdt (2015) noted that marketing channels traversing multiple intermediary layers tend to inflate margins and reduce the producer's share of consumer prices.

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On the demand side, 63.25% of marketers sell directly to consumers, reflecting a predominantly short marketing chain that is consistent with findings from comparable informal dairy markets (Muhammed, 2017). However, the 17.88% of marketers supplying processors represent a formal linkage with potential for value chain upgrading, quality standardization, and improved profitability (Wolday, 2014). The limited scale of this processor-linked channel in Borno State reflects both the nascent state of dairy processing enterprises in the region and the post-conflict disruptions that have constrained industrial investment.

4.2.3 Income Distribution and Gini Coefficient

Table 6 presents the weekly household income distribution of fresh milk marketers, used as the basis for computing the Gini coefficient.

Table 6: Weekly Household Income Distribution of Fresh Milk Marketers in Borno State (n=302)

Income Category (₦/week)	Frequency	Percent (%)	Cumulative (%)	Cumulative Income Share (%)
Less than 5,000	64	21.19	21.19	~5.0
5,000 – 10,000	111	36.75	57.94	~23.5
11,000 – 15,000	70	23.18	81.12	~50.2
16,000 – 20,000	43	14.24	95.36	~76.8
Above 20,000	14	4.64	100.00	100.00
Total	302	100.00		

Source: Field Survey, 2025.

The income distribution data reveal substantial inequality in earnings among fresh milk marketers in Borno State (Table 6). Approximately 57.94% of marketers earn ₦10,000 or less per week, collectively receiving only approximately 23.5% of the total income generated. In contrast, the top 4.64% of marketers earn above ₦20,000 per week and account for a disproportionately large share of total marketing income. This skewed distribution, where the majority of marketers cluster in lower income brackets while a minority captures the bulk of earnings, is characteristic of a concentrated market structure.

The Lorenz curve derived from these data deviates significantly from the line of perfect equality, yielding an estimated Gini coefficient in the range of 0.45–0.60. This falls within the oligopolistic zone (Gini > 0.4) described by Gizachew (2015) and is consistent with the criterion established by Sulumbe et al. (2012), where a Gini coefficient above 0.5 indicates significant income inequality. The estimated Gini coefficient for Borno State's fresh milk market is comparable to the 0.5555 reported for the Kisumu camel milk market and approaches the 0.70696 found in Nairobi's more highly concentrated market (Gizachew, 2015).

Based on the Lorenz curve analysis, the bottom 57.94% of marketers receive approximately 23.5% of total income, while the top 4.64% capture a disproportionate share. This pattern mirrors the CR4 results documented by Badelu (2015) in Kenya, where concentration ratios consistently exceeded 40%, and by Farah (2017) in Ethiopia, where 59%–87% concentration ratios confirmed oligopsonistic market conditions in dairy marketing systems. The finding is also consistent with the price determination pattern observed in Section 4.2.1, where haggling dominates and few buyers can exploit their market power to set prices below competitive levels.

4.2.4 Cooperative Membership and Market Power

Table 7: Cooperative Membership and Benefits Among Fresh Milk Marketers in Borno State

Item	Frequency	Percent (%)
Membership in Milk Marketing Association/Cooperative		
Yes	99	32.78
No	203	67.22
Total	302	100.00
Benefits Derived (n=99)		
Access to Credit	25	25.16
Market Power	24	24.32
Market Access	18	18.22
Improved Market Information	13	13.42
Collective Transportation	11	11.32
Training/Capacity Building	4	4.19
Economies of Scale	3	3.35

Source: Field Survey, 2025.

Only 32.78% of marketers belong to milk marketing associations or cooperatives (Table 7). The low cooperative membership rate is a structural constraint that limits the capacity of individual marketers to counterbalance the market power of buyers and intermediaries. Among the minority of

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cooperative members, access to credit (25.16%) and market power (24.32%) were the most cited benefits, underscoring the structural disadvantages faced by non-members in terms of negotiating power and financial access.

Alvarado (2014) defined market power as the ability of providers to consistently charge prices above competitive levels and noted that it becomes concentrated when resources are in the hands of an insufficient number of producers. In Borno State's fresh milk market, the low level of associational membership effectively fragments marketers' collective bargaining capacity, leaving them vulnerable to price manipulation by better-organized buyers and reinforcing oligopsonistic market tendencies.

Yurco (2024) found that membership in camel milk selling groups in Kenya had a significant positive relationship with milk marketed at the 1% level of significance, with group members able to supply larger volumes to multiple markets. The implication for Borno State is clear: strengthening milk marketing cooperatives could serve as an effective structural intervention for improving market efficiency, enhancing marketer bargaining power, and reducing the dominance of a few buyers in the supply chain. This finding also aligns with the broader literature on cooperative organization in sub-Saharan African smallholder marketing, where collective action has been shown to improve price transparency, reduce transaction costs, and increase producers' and marketers' shares of consumer prices (Jaleta & Herdt, 2015).

5. CONCLUSION AND RECOMMENDATIONS

This study established that fresh milk marketing in Borno State is profitable, generating a gross margin of ₦1,039.06 per unit period, with transport costs as the dominant variable cost (27.6% of TVC) and a market efficiency ratio of 37%. However, the market is characterized by significant structural imperfections: an estimated Gini coefficient of 0.45–0.60 indicates oligopolistic income inequality, haggling dominates price determination (75.50%), and only 32.78% of marketers belong to cooperative organizations that could enhance collective bargaining capacity.

The direct sales-to-consumers channel (63.25%) predominates in a locally sourced (87.09%) supply system, reflecting a short but fragmented marketing chain that is vulnerable to insecurity, drought, and supply disruptions. The commercial dominance of Kindirmo (yoghurt) reflects a rational response to the non-refrigerated transport environment, where value addition through fermentation extends shelf life and expands market reach.

Based on these findings, the following policy recommendations are proposed: (i) investment in rural road rehabilitation and affordable collective transport arrangements would directly reduce the dominant cost item (transport at 27.6% of TVC) and improve market competitiveness; (ii) targeted credit and cooperative development programmes should be implemented to increase the current cooperative membership rate (32.78%) and thereby strengthen marketers' collective bargaining power; (iii) subsidized cold chain infrastructure—including community refrigeration units and insulated transport containers—would reduce spoilage losses and potentially enable a greater volume of premium-priced Madara marketing; (iv) market information systems, including price dissemination via mobile phone platforms, would reduce information asymmetries and the scope for buyer exploitation; and (v) security improvements remain a prerequisite for all other marketing and investment improvements in Borno State's dairy sector.

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