



Comparative Assessment of Profitability of Gum Arabic in Pre and Post Insurgency Periods in Northeastern Nigeria

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ABSTRACT

The study evaluated the effects of gum Arabic marketing on the income status of the marketers in North-Eastern Nigeria. Objectives of the study is to describe the socioeconomic characteristics of gum Arabic farmers; estimate the cost and return and identify the constraints associated with gum Arabic marketing in pre and post insurgency periods Data were collected through the use of structured questionnaire administered on 44 respondents in Borno, Yobe, and Gombe states of Nigeria. Multi-stage sampling technique was adopted for the study. Data were analyzed using both descriptive and inferential statistics. The results indicated that male respondents exclusively dominated gum Arabic production in the study areas, making up (100%) of the respondents with (64years) as (mean) age and (28years) as mean farming experience, largely dominated by older individuals and married men. Despite the substantial increase in production costs farmers realized very high revenue ₦308627.57 far exceeding pre insurgency earnings. Market Margin ₦244259.67 indicates that farming remained highly profitable. However, (100%) of the respondents agreed inadequate capital (100%) is the major constraints preventing production expansion, followed by insecurity (88.04%). The study concluded that the gum Arabic marketing system in Northeastern Nigeria is a highly resilient yet distressed value chain significantly reshaped by over a decade of insurgency. The insurgency has successfully shifted the trade from a low-risk market into a high-risk, high-cost environment characterized by restricted mobility and institutionalized barriers to entry. The findings suggest that development of Secure "Agricultural Transit Corridors.

Keyword: Insurgency, Northeast, Constraints, Costs and Returns

INTRODUCTION

Gum Arabic, a natural gum derived from the sap of acacia trees, is predominantly used in food, pharmaceutical, and cosmetic industries due to its emulsifying and stabilizing properties. In Nigeria, it is mainly sourced from the northeast region, where acacia species are abundant. Its production and trade represent a critical component of the local economy for communities reliant on its harvesting (Awoyemi *et al.*, 2020). Gum Arabic provides a valuable source of income for many smallholders or wandering labourers. Tens of thousands of people worldwide living in regions of semi-arid lands depend on the collection of gums, resins and latexes as a

means of cash income (Chikamai, 2001; Adindu *et al.*, 2019). Before the rise of insurgency in northeast Nigeria, the gum Arabic market flourished due to favorable climatic conditions and established trade routes. The sector provided livelihood for thousands of households, contributing significantly to the local economies. Farmers harvested gum Arabic and sold it in both local and international markets, with strong demand from industries in Europe and North America (Audu, 2019). However, Akinbi *et al.* (2015) argued that insurgency especially since 2009 has constituted a major security threat to the nation and have made Northern Nigeria,

particularly the Northeast, which is the epicenter of insurgency activities, the most dangerous region in the country. Majorly affected states include, Borno, Yobe, and Adamawa all from northeastern Nigeria. Boko Haram violence heated up in 2014 with about 7,711 deaths occurring in 2014, with a number of cities in Borno, Yobe and Adamawa states taken over by the group (Assessment, Capacity Project (ACAPS, 2014a).

In Borno state alone, Boko Haram insurgents controlled between 40 – 70% of the state (ACAPS, 2014b). In Nigeria the main actors along the marketing of gum Arabic industry in Nigerian are the gum collectors who collect gum from the wild naturally occurring trees from different *Acacia* species. However, even the cultivated gum Arabic from government owned plantations or private holdings are also tapped. The other important groups of actors are the buying agents, the wholesalers and the exporters. The buying agents/dealers are generally native people who knew the farmers and have the knowhow of sorting gum according to species type and quality.

Therefore, they carryout post-harvest cleaning, sorting and grading of gum. Accordingly, they buy gum on behalf of wholesalers on commission basis. Then the wholesalers' role is to sell the gum to the local processor and exporters who are based in big towns. The wholesalers are businessmen who have enough financial power to finance the buying of gum. Wholesalers are responsible for cleaning, sorting, grading and packaging to the required standards and weights (United Nation Conference of Trade and Development (UNCTAD, 2018). They maintain close contacts with local processors, exporters and their agents. The third groups of actors are the exporters who are the international businessmen who have the capacity to maintain the supply of gum Arabic to foreign companies in Asia and Lebanon (United Nation Conference of Trade and Development (UNCTAD, 2018).

The objective of the study is to describe the socioeconomic characteristics of gum Arabic collectors in pre and post insurgency period; estimate the cost and return associated with

gum Arabic among collectors in pre and post insurgency periods and identify the constraints associated with gum Arabic marketing in pre and post insurgency periods.

MATERIALS AND METHODS

The Study Area

The study was conducted in Borno, Gombe, and Yobe States. Borno State is the second-largest state in Nigeria, uniquely bordering the Niger, Chad, and Cameroon republics. It is centered at latitude 11° 30'N and longitude 13° 00'E (Figure 1). The projected population is 6.65 million (Xplorer, 2025), predominantly Kanuri and Shuwa Arab. The ecology of the state features a transition from Sahel savanna in the north to Sudan savanna in the south, while the climate is semi-arid with a short rainy season (June–September) and a peak hot period in May (average 34°C). Borno State is a major regional trade hub for livestock, fish, and gum arabic (Ishaku *et al.*, 2020).

Gombe State is located between latitudes 10° 15' N and 10° 19' N and longitudes 11° 6' E and 11° 13' E, (Figure 2) with an estimated projected population of 3.97 million. (Xplorer, 2025). It is situated in the West Sudan savanna. Major tree species include *Acacia* species, *Adansonia digitata* and *Azadirachta indica*. Temperatures range from 14°C to 38°C, with the hottest period between February and April. The state is ethnically diverse with Fulani, Tangale, and Tera groups. The major economic activity is agriculture (sorghum, maize, groundnuts, and livestock herding) (Ishaku *et al.*, 2020).

Yobe State is located at latitude 12° 00'N and longitude 11° 30'E (Figure 3), sharing an international border with the Republic of Niger. Projected population is 3.98 million (Xplorer, 2025). Major tribes include Kanuri, Fulani, and Karai-karai. Predominant ecological zones ranged from Sudan to Sahel vegetation, consisting of grasslands and hardy shrubs. It experiences a long dry season (7 months) and low annual rainfall (180 mm–240 mm). with temperatures ranging from 35°C and 40°C The State is known for the Potiskum cattle market and significant deposits of gypsum and kaolin (Ishaku *et al.*, 2020).

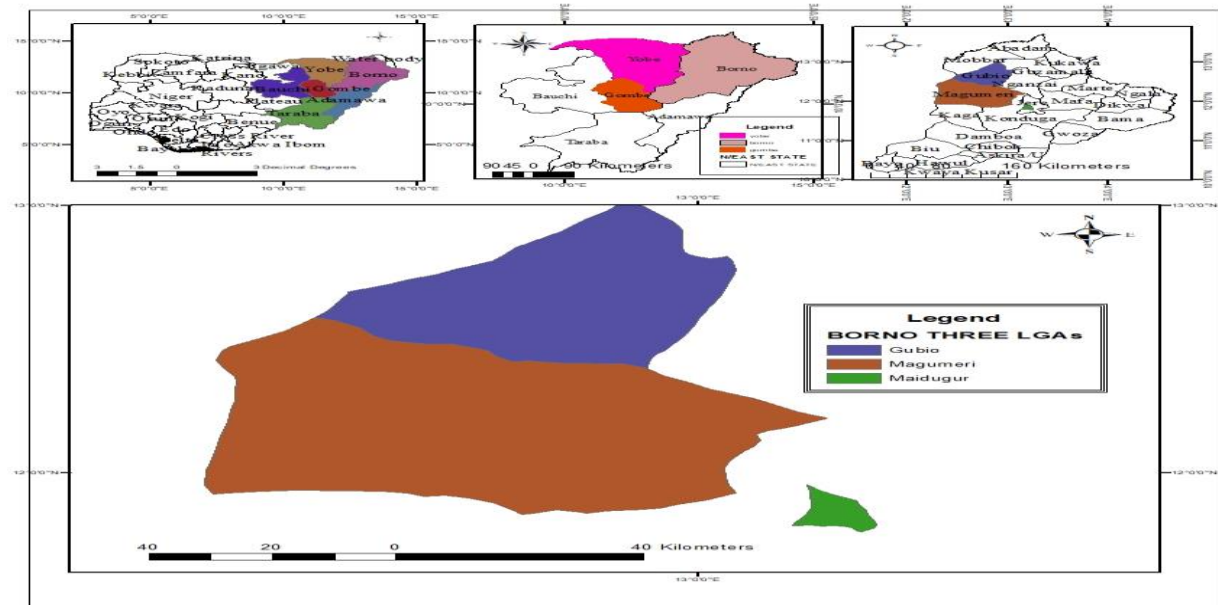


Figure 1: Map of Borno State Showing the Sampled Locations
Source: (Ishaku et al., 2020).

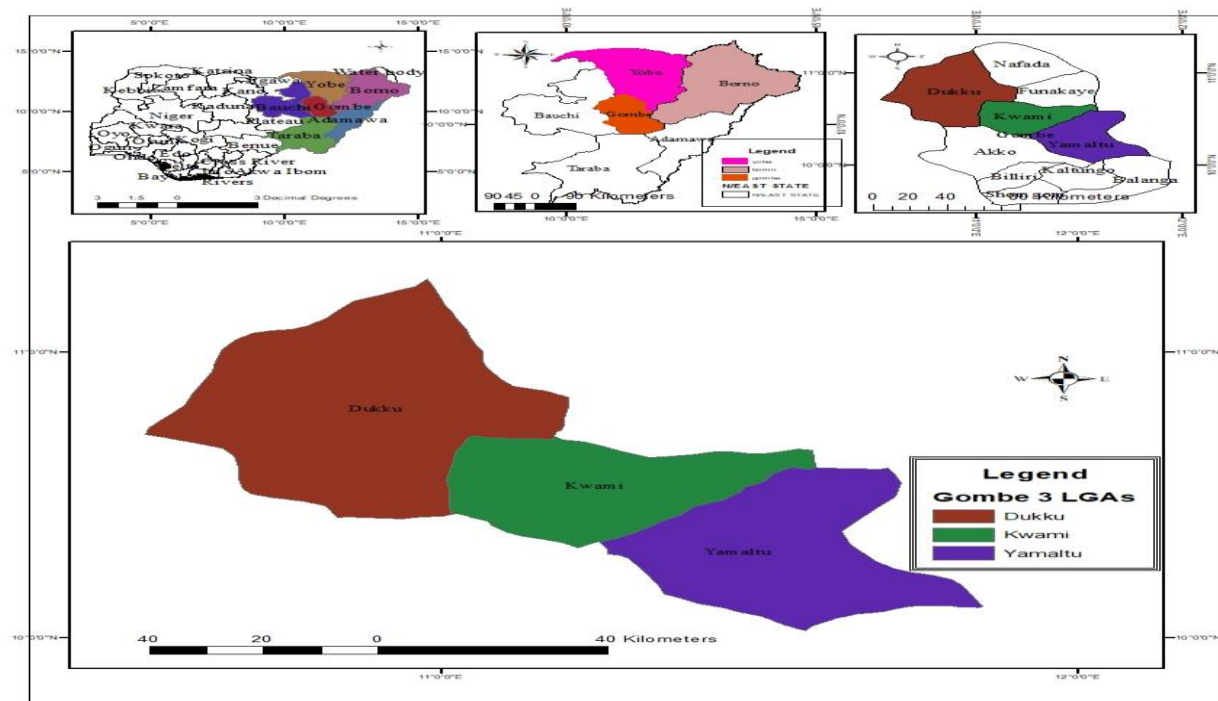


Figure 2: Map of Gombe State Showing the study locations
Source: (Ishaku et al., 2020)

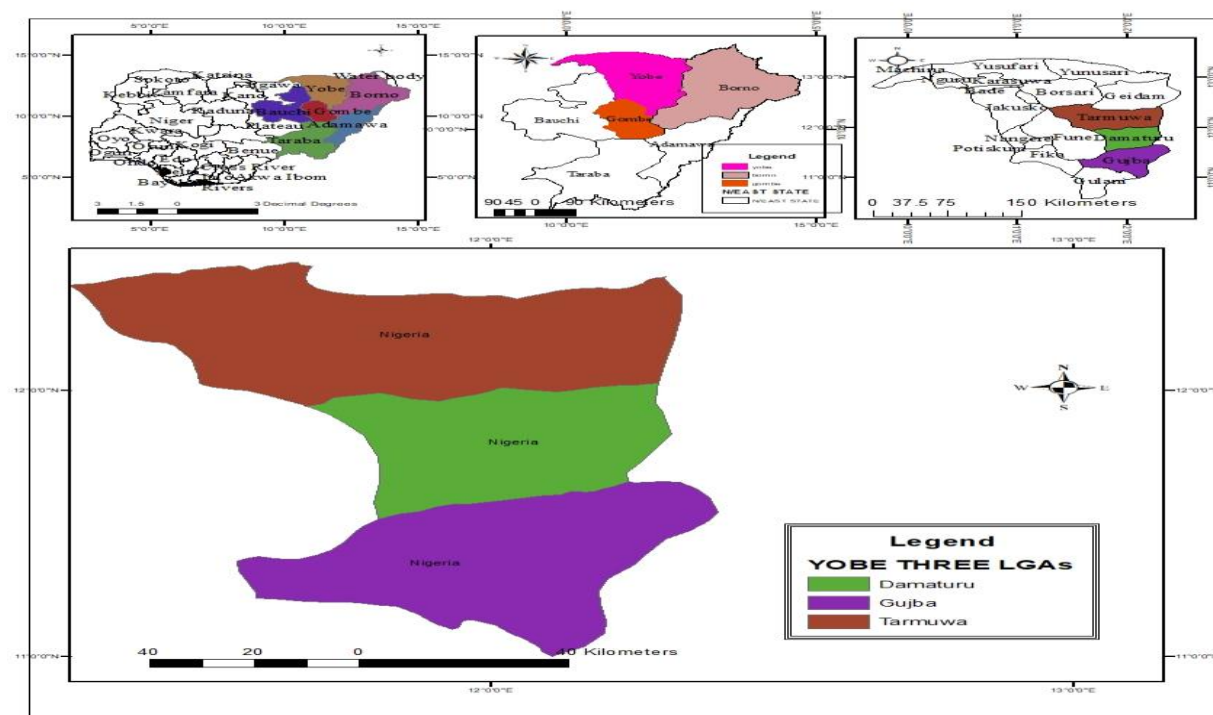


Figure 3: Map of Yobe State Showing the Selected Local Government Areas

Source: (Ishaku et al., 2020).

Sampling Techniques and Sample Size

Multi-stage sampling technique was adopted for the study. According to UNCTAD (2018), Borno, Yobe, and Gombe states are the principal producers of gum Arabic, hosting the highest number of gum Arabic trading marketplaces in Nigeria. These states make up the center of the Gum Arabic production belt in Nigeria. Borno, Gombe, and Yobe States were therefore purposefully selected in the first stage of the multi-stage sampling technique because of the high density of *Acacia* species as confirmed UNCTAD (2018). In the second and third stages, three Local Government Areas and one community within each Local Government Area were selected using a purposive sampling technique. This selection was based on the security risks and significance number of gum Arabic farmers and producers. In the fourth stage, a simple random sampling technique was employed to select the sample sizes of 24, 6, and 19 respondents in proportion to the total populations of Borno, Gombe, and Yobe States, respectively. A total of 49 questionnaire was produced and

administered in the study, out of which only 44 questionnaire were correctly filled, returned and used for data analysis.

Data Collection

Data for this study were obtained from primary source collected through the structured questionnaire administered to the randomly selected respondents in the study area. Data were collected on relevant parameters such as socio-economic characteristics, cost and return and constraints activities among the respondents.

Data Analysis

The data collected were analyzed using descriptive statistics, five-point Likert scale and inferential statistics. Descriptive statistics such as means, standard deviation, frequency and percentage were used to analyze the socio-economic characteristics of the respondents in the study. The responses to various answers by the respondents were scored using a five-point Likert scale categorized as follows: Very Serious (VS) = 5; Serious (S) = 4; Moderately Serious (MS) = 3; Least Serious (LS) = 2; Not Serious (NS) = 1. (Adindu, 2019).

RESULTS AND DISCUSSION

Socio-Economic Characteristics of Respondents in Northeast Nigeria

Table 1, and 2, revealed the average (mean) age of the respondents 64 years and a standard deviation of 5.14. This indicates that, gum Arabic is largely dominated by older individuals. This suggests a potential generational gap in participation, raising concerns about succession planning and long-term sustainability of gum Arabic farming. According to FAO (2017), aging farming population stance challenges to agricultural innovation and adaption of modern techniques, potentially limiting productivity. Male farmers exclusively dominated gum Arabic production in the study areas, making up 100% of the respondents. This indicates that women participation might be constrained by socio-cultural factors. This pattern strongly suggests the presence of cultural, religious, or socio-economic barriers limiting women's participation in gum production and marketing activities. Similar gender exclusion has been widely reported in natural resource-based livelihood across many parts of sub-Saharan Africa, where norms often restrict women's involvement in activities that require mobility, land ownership, or physical exertion (Agarwal, 2018; Ibrahim and Olaleye, 2020). Since gum farming is labor-intensive and often conducted in remote woodland areas, women may face constraints related to safety, land tenure, and cultural restrictions on forest access. This aligns with findings from rural livelihood studies in northern Nigeria, where literacy rates among agricultural producers remain below national averages (National Bureau of statistic (NBS, 2021).

Similarly, the average mean farming experience of 28 years (ranging from 20 to 36 years), further confirms the depth of knowledge and traditional expertise among the farmers. Extensive experience may contribute to efficient resource management, as supported by Feder (1985), who argue that experience in farming is positively correlated with productivity, especially in regions with limited access to modern inputs. However, majority had no formal education as low literacy has implication for adoption of improved production practices, access to market information, and engagement in formal contract arrangements. Nevertheless, the presence of substantial minority (38.64%) with some level of education implies potential for targeted capacity building interventions to enhance production efficiency and market integration (Ajeigbe, 2019). More so, all farmers were married men reflecting the household structure common in agrarian setting, where marital status often correlates with access to land, labor and social networks. Moreover, about 86.36%, were registered members of a gum Arabic association (NAGAPPEN). Farmers associations have been shown to play critical roles in improving bargaining power and fostering collective action in tree crop value chains (Fakayode, 2017). However, Gum Arabic farming and marketing were primarily self-managed, with 43% of Farmers handling their own output and sales. This suggests a high level of individual control over marketing decision but may also implies limited access to more organized or lucrative supply chains. Individualized marketing can expose farmers to price volatility and exploitation by intermediaries, a challenge widely documented in (NTFP) economies

(Shackleton and Pandey, 2014). However, the average mean household size was 10 members (SD = 2.300841), with a minimum of 6 and maximum of 15 people, is considerably large. This is consistent with the findings in rural sub-saharan Africa, where extended family structures often persist (World Bank, 2020).

Large household sizes can serve as source of family labor, which is vital in smallholder agriculture, especially where mechanization is limited. However, they also represent greater dependency ratios, which may strain household resources, particularly during periods of economic stress or conflict. Moreover, the average mean farm sizes were 3.64 ha, in the study area which ranged from a minimum of 1.8 hectares to a maximum of 11 hectares and a standard deviation of 2.037372. This implies that gum arabic farming in the area is mostly in the hands of small-scale holders and may be due to lack of available farm land and/or fund to establish large scale of gum arabic farms. This aligns with trends in sub-sahara Africa, where majority of farms are under 2 hectares (Lowder *et al.*, 2016). Limited access to land may stem from traditional land tenure systems, population pressure, or insecurity, particularly in post conflict regions. Moreover, restricted land access can hinder economies of scale and limit income potential.

Furthermore, average annual income was ₦2,476,136 (approximately USD 3,200 at 2024 rates) with earnings ranging from ₦1,000,000 to ₦4,000,000 (Table 1), demonstrates the potentials of gum Arabic farming as a viable income source. This is especially significant during the agricultural off-season, offering an important diversification strategy for rural livelihoods. This supports earlier findings by Barbier, (2000), which emphasized the value of non-

timber forest products (NTFPs) in supporting household incomes and enhancing resilience. Before the insurgency, farmers faced no difficulties with market entry or exit, as indicated 100%. However, this situation changed drastically after the insurgency, with 81.82% of respondents reporting difficulties, signifying severe disruption of supply chains, mobility constraints, and increase market risk. Conflict and insecurity have been widely recognized as major determinants that reduced market participation, particularly for cash crops and forest products (FAO, 2017; Idowu and Ayoola, 2022). This disruption likely contributed to reduced production volumes, increased transaction costs, and a shift in marketing channels. Despite these challenges, a significant proportion of respondents agreed that gum Arabic production contributed positively to their household economy. About 70.45 and 72.73%, in pre and post insurgency periods acknowledged that gum Arabic income helped them cover household expenditures and settle debts. This finding reinforces the role of gum Arabic as a resilience crop, providing cash income during periods of livelihood stress consistent with evidence showing that NTFPs often act as safety nets for rural households facing shocks (Angelsen, 2014; Babiker, 2020). But, in terms of production, Grade I (*Acacia Senegal*) gum Arabic was the most common type produced. This grade accounted for 84.09% of production during the pre-insurgency period and 79.55% during the post-insurgency period. This trend aligns with existing literature, which identified *Acacia Senegal* as preferred species due to its superior quality, higher market demand, and better resin yields (Ali, 2019). The less common grades, Grade II (*Acacia Seyel*) and Grade III (*combretum nitricans*) indicate

their use as supplementary rather than production.
primary species in commercial gum

Table 1: Summary Statistics of Socio- Economic Characteristics of Gum Arabic Farmers in Northeast Nigeria

Variable	Mean	Standard dev	Minimum	Maximum
Age	64	5.135171	57	80
Farm size	3.64	2.037372	1.8	11
Household size	10	2.300841	6	15
Experience	28	4.194782	20	36
Annual income	2476136	812510.4	1000000	4000000

Source: Field Survey (2025)

Table 2: Socio - Economic Characteristics of Farmers in the Study Area

Variable	Frequency	Percentage (%)
Male	44	100
Female	00	00
Education		
Arabic	27	61.36
Primary	6	13.64
Post primary	11	25
Marital Status		
Married	44	100
Membership of Cooperative Society		
Yes	44	100
Use of Gum Arabic in Household Expenditure		
Yes	31	70.45
No	13	29.55
Debt Services		
Yes	32	72.73
No	12	27.27

Source: Field Survey (2025)

Pre and Post Insurgency Cost and Return Analysis for Farmers in the Study Area

Tables 3 and 4 depict the total variable cost of ₦19,528.60, representing 88.93% of the total cost. This heavy reliance on variable inputs is consistent with labour intensive agricultural systems where activities such as harvesting, storage handling and transportation dominate operational expenses (Adeoye *et al.*, 2021). However, costs like bagging 23.96%, transportation 19.58%, picking and storage 11.38% each, constitute the most significant cost components. This aligns with the literature identifying packaging and transportation as major cost drivers in agricultural value chains, especially in less mechanized

systems (Afolayan and Oni, 2019). Transportation costs in particular, often reflect both infrastructural quality and the availability of efficient logistics (Jones, 2020). Tax 2.27% and loading/unloading 2.58% were among the minor cost components. Moreover, the total fixed costs ₦2430.50 (11.07%) comprised depreciation on tools such scales 8.48%, head pans 1.94% and measures/mudus 0.65%. such tools are essential for products handling and standardization, and their low depreciation cost indicates a modest level of capital investment, typical of smallholder production systems (Akinyoade and Uche, 2018). However, a positive was observed as marketing margin (mm), calculated the

difference between total revenue and TVC. This further confirms that under stable conditions, farmers were able to cover both variable and fixed costs while realizing acceptable returns.

However, in post insurgency period, the production system experienced a pronounced cost increase across key components. TVC rose significantly ₦56658.60, representing 88.02% of the total production cost, suggesting that production remained highly dependent on labour and activity-based costs even under crisis conditions. This is consistent with findings that insecurity increases labour demand due to disruptions in workflow, restricted movement and reduced efficiency (Oluwatayo and Ojo 2022). Major contributors' variable cost includes picking 23.30%, loading/offloading 19.52% and sorting 15.69%. The elevated shares imply that insurgency intensified labour requirement, possibly due to reduced mechanization, the need for additional security related handling, or delays during harvest and post-harvest processes. Conflict environments typically exacerbate

transaction costs and force farmers into more labour-intensive practices (World Bank, 2020). Moreover, fixed costs increase 11.98%, slightly higher than in pre insurgency period. Depreciation on head pans, scales and mudus, indicates continued dependence on basic tools despite disruption, highlighting a lack of capital upgrades during the crisis a common in conflict zones where investment risks are high (UNDP, 2019). Despite the substantial increase in production costs, farmers realized very high revenue ₦308627.57, far exceeding pre insurgency earnings. Market Margin ₦244259.67 and Net Farm Income ₦46,886.13 (table 3), indicates that farming remained highly profitable. This aligns with research showing that agricultural prices often rise sharply in conflict regions due to supply shortages, market fragmentation and increased consumer demand relative to available supply (Raleigh, 2021). However, farmers who manage to continue production during crisis often benefit from elevated market prices, compensating for higher costs (Okoli and Iortyer, 2014).

Table 3: Farmers Average Costs and Return per Hectare in Pre- Insurgency Period

Cost Items	Amount in Naira	Percentage of Total cost (%)
Tax	500.00	2.27
Sorting	2300.00	10.47
Bagging	5262.30	23.96
loading and off loading	566.30	2.58
Picking	2500.00	11.38
Parking	1600.00	7.28
Storage	2500.00	11.38
Transportation	4300.00	19.58
TVC	19528.60	88.93
Depreciation on fixed cost items		
Head pan	425.00	1.94
Scale	1862.30	8.48
Measures and Mudus	143.20	0.65
TFC	2430.50	11.07
TC	21959.10	100.00
TR	71275.73	
MM (TR-TVC)	49316.63	
NFI (GM – TFC)	46886.13	

Source: Field Survey (2025)

Key: TVC = Total Variable Cost, TFC = Total Fixed Cost, TC = Total Cost, TR = Total Revenue, MM = Marketing Margin and NFI = Net Farm Income.

Table 4: Farmers Average Costs and Return per Hectare in Post- Insurgency Period

Cost Items	Amount in Naira	Percentage of Total Cost (%)
Tax	2500.00	3.88
Sorting	10100.00	15.69
Bagging	5262.30	8.18
loading and off loading	12566.30	19.52
Picking	15000.00	23.30
Parking	6300.00	9.79
Storage	2500.00	3.88
Transportation	2430.00	3.78
TVC	56658.60	88.02
Depreciation on fixed cost items		
Head pan	4523.40	7.03
Scale	2530.40	3.93
Measures and Mudus	655.50	1.02
TFC	7709.30	11.98
TC	64367.90	100.00
TR	308627.57	
MM (TR-TVC)	244,259.67	
NFI (GM – TFC)	236,550.37	

Source: Field Survey (2025)

Key: TVC = Total Variable Cost, TFC = Total Fixed Cost, TC = Total Cost, TR = Total Revenue, MM = Marketing Margin and NFI = Net Farm Income.

Constraints Faced by Gum Arabic Farmers in Pre and Post Insurgency Periods

Table 5 revealed that unanimous agreement (100%) of the respondents agreed inadequate capital is the major constraints preventing production expansion, limits farmers ability to invest in modern, improve technologies and withstand market shocks. This aligns with research frequently cites lack of access to formal credit and poor saving capacity as primary reasons (Funteh, 2013; Awotide, 2012). Also, (88.04%) of the respondents identified insecurity due to conflict related directly disrupts farming activities by limiting access to farms, destroying assets, displacing labor and discouraging long term investment. Similar, studies from conflict zones consistently report insecurity as a major factor reducing agricultural productivity and market access (Alubankudi, 2021; Collier, 2007). This constraint has a profound impact on all other aspects of value chain. Furthermore, high

labor costs (78.95%), and land tenure system (74.64%) represent a critical institutional and socioeconomic obstacles. Problem of land tenure system can create disincentives for farmers to make long term investments, due to fear of losing their land or its benefits. This reflects the studies (Deininger, 2006) that, inadequate security of land rights is a well-documented institutional constrain on agricultural development. In addition, a significant number of farmers recognized inadequate modern farm inputs (71.77%), poor marketing outlets (69.38%), and inadequate storage facilities (67.94%). These highlight weaknesses in the structural and institutional support for the gum Arabic value chain. However, high level of dissatisfaction with government policies (77.51%), indicates a major institutional failure. Policy dissatisfaction is often linked to poorly implemented subsidy schemes, ineffective agricultural extension services, or policies that fail to stabilize commodity prices (Coulter and Shephert, 2004).

Table 5: Marketing Constraints of Gum Arabic Farmers in the Study Area

Constraints	Frequency	Percentage (%)
Inadequate capital	44	100.00
Problem of pest and diseases	8	17.22
High cost of transportation	18	41.63
High cost of labor	39	78.95
Poor marketing outlet	29	69.38
High cost of chemicals	3	5.26
Inadequate farm input	30	71.77
Land tenure system	33	74.64
Poor storage facility	28	67.94
Insecurity	40	88.04
Government policies	38	77.51

Source: Field Survey (2025)

CONCLUSION

The study concluded that the gum Arabic marketing system in Northeastern Nigeria is a highly resilient yet distressed value chain, significantly reshaped by over a decade of insurgency. While the socio-economic profile of the respondents primarily elderly (64years) experienced males (100%) remain largely consistent. The insurgency has successfully shifted the trade from a low-risk, fluid market into a high-risk, high-cost environment characterized by restricted mobility and institutionalized barriers to entry. Findings on costs and returns (244259.67 and 308627.57) pre and post insurgency respectively, indicated a paradoxical economic landscape: while total variable costs for farmers have escalated by over 190%, the industry's profitability has not collapsed. Instead, the market has developed a "risk-premium" pricing structure, where significantly higher marketing margins are used to offset the volatility of the security landscape.

RECOMMENDATIONS

These findings suggest the following recommendations:

- i. Strategic Youth Engagement and Succession Planning Given that the mean age of farmers is 64 years, there

is a high risk of "generational exit" from the industry. The government and NGOs should implement youth-targeted empowerment programs in the Grade I zones (Gubio, Magumeri, Damaturu) to modernize gum Arabic farming. This includes providing start-up capital and training in modern tapping techniques to ensure the long-term sustainability of the sector.

- ii. Development of Secure "Agricultural Transit Corridors" To address the 87% surge in storage costs and the high transport risks identified, the security apparatus (Military and Police) should collaborate with the Gum Arabic Association of Nigeria (GAAN) to establish secure trade corridors. Reducing the time goods are held in storage due to insecurity will lower variable costs, improve market flow, and enhance the "just-in-time" efficiency that existed pre-insurgency.
- iii. Establishment of Decentralized Processing and Storage Hubs Since the post-insurgency period has forced actors to hold inventory for longer periods; the Ministry of Agriculture should facilitate the construction of modern, climate-controlled warehouses in Grade I and II LGAs. This will

minimize post-harvest losses and quality degradation (maintaining Grade I Hard Gum standards) while actors wait for safe windows to transport goods to urban centers like Maiduguri.

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