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Original Article

Assessment of the supply chain of soursop (*Annona muricata* L.) fruit and leaves in Ibadan, Nigeria

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ABSTRACT

This study assessed the supply chain of soursop (*Annona muricata* L.) fruit and leaves in Ibadan, Oyo State, Nigeria, focusing on economic viability, local demand, and challenges faced by traders. Using a purposive sampling method, three major markets—Oje, Bode, and Ayeye—were selected based on their soursop trading activity, and 45 respondents were chosen through simple random sampling. Data were collected through semi-structured questionnaires, with tables employed as a descriptive tool to analyse results. Findings reveal that soursop trading is predominantly led by middle-aged women between 41 and 50 years old, with either a primary education or no formal education, possessing over 12 years of experience in the trade. Results showed that 73.3% of respondents were married. Soursop is mainly sourced from surrounding villages, with 62.2% of respondents relying on rural suppliers. Additionally, 100% of traders identified the fruit as the most profitable product, and 75.56% of traders were affiliated with trade associations that facilitated rural access and improved bargaining leverage. Key challenges include seasonal shortages and transportation constraints. The study recommends supporting soursop cultivation among individual farmers, along with improved market access and infrastructure enhancements to increase supply stability.

K E Y W O R D S : *Agricultural product, Challenges, Trade, Traditional medicine, Rural, Village*

INTRODUCTION

Soursop (*Annona muricata* L.), also known as graviola, is a tropical fruit native to the Americas but widely cultivated in Africa and Asia for its economic, nutritional, and medicinal value. The fruit has gained increasing attention due to its wide range of uses, particularly in the food and pharmaceutical industries. Its pulp is consumed fresh or processed into juice, smoothies, and desserts, while its leaves and other parts have been explored for potential health benefits, including anti-inflammatory and anticancer properties (Moghadamtousi *et al.*, 2015; Mutakin *et al.*, 2022).

Despite documented benefits of soursop, the supply chain and challenges faced by actors involved in its trade remain underexplored, particularly in regions like Ibadan, Oyo State, where its importance in local economies continues to grow (Osaigbovo *et al.*, 2023). Furthermore, the broader commercialization of soursop in Nigeria faces several challenges, including inefficient supply chains, poor post-harvest handling, and limited consumer

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awareness (Osaigbovo *et al.,* 2023). Although soursop holds export potential, local markets remain underdeveloped due to inadequate structures and pricing volatility.

By examining the roles of producers, traders, and consumers, this research aims to provide insights that can inform policies to enhance the trade of soursop as a valuable agricultural product. Also, it explores soursop's potential in the health and food sectors, which are witnessing growing demand for natural and organic products in urban markets like Ibadan. The findings will contribute to a better understanding of how to optimize the soursop value chain in Nigeria, particularly in areas where consumer interest in natural products is increasing (Asamoah *et al.,* 2023; Osaigbovo *et al.,* 2023).

This study therefore investigates the supply chain of soursop fruit and leaves in Ibadan, Oyo State, with a focus on understanding current trade practices and the socio-economic contributions to rural livelihoods. By examining the roles and challenges faced by key actors along the supply chain, this research aims to identify opportunities for enhancing market sustainability and promoting economic growth in the soursop trade.

MATERIALSS AND METHODS

Study Area

Ibadan, the capital city of Oyo State, Nigeria, has a population of 2,550,593 and an average population density of 828 persons per km² (National Population Commission, 2006). The city experiences a tropical climate with distinct wet and dry seasons. The mean minimum annual temperature is approximately 21°C (68.8°F), and the mean annual rainfall is around 1,205 mm, distributed over about 109 days, with two peak rainfall periods occurring in June and September (Egbinola & Amobichukwu, 2013).

Sampling Technique and Data Collection

This study utilised a purposive sampling technique to focus on markets significant to the soursop trade in Ibadan. Three major markets were selected: Oje Market in Ibadan North-East, known for its agricultural diversity; Ayeye Market in Ibadan North-West, recognised for its fresh produce; and Bode Market in Ibadan South-West, characterised by active trade in fruits and vegetables (Figure 1).

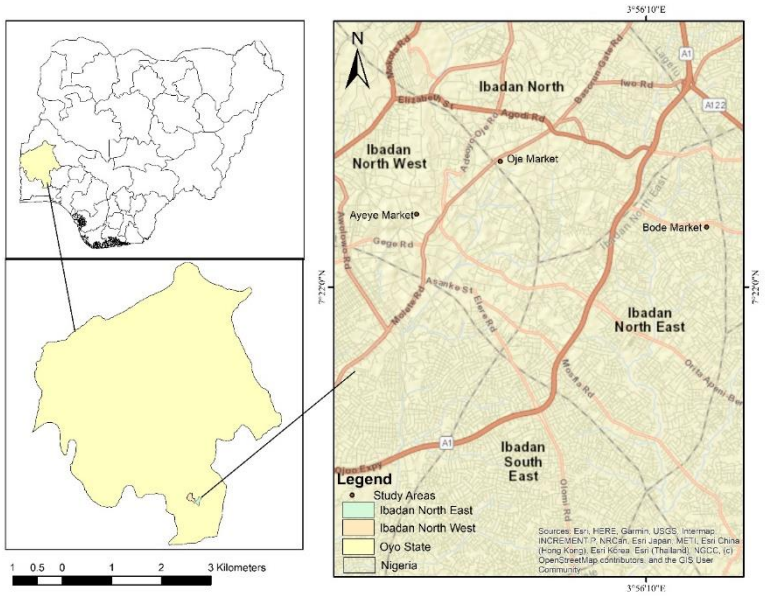

Figure 1: Map of Oyo State Showing the Regions where the Markets were Selected

From each market, 15 respondents were chosen, resulting in a total of 45 participants. This random selection aimed to capture a range of experiences and perspectives within the soursop trade. Data collection involved semi-structured questionnaires designed to gather quantitative information on marketing practices and demographic details of respondents.

The data were analysed using descriptive statistics to summarize the socio-economic characteristics of the respondents, their marketing practices, and the challenges they encounter.

RESULTS AND DISCUSSIONS

Socioeconomic Characteristics of Respondents

The trade of soursop is predominantly female-dominated, with 100% of the sampled respondents being women. This trend reflects traditional agricultural market dynamics, where women typically engage in the sale of perishable goods, such as fruits and vegetables. The active role of women in this trade aligns with studies showing that women play a critical part in the marketing and distribution of agricultural products in many developing countries (Raidimi, 2014).

As presented in Table 1, the age distribution of the traders indicates that most are between 41 and 50 years old, with a mean age of 44 years. This suggests that soursop trade is primarily conducted by middle-aged women, which is consistent with findings from studies on agricultural markets that highlight the importance of this age group in driving economic activity (Olawuyi *et al.,* 2021). In terms of marital status, 73.3% of the traders are married, while 17.8% are divorced, and 8.9% are widowed (Table 1). This reflects the role of soursop trade as a critical livelihood strategy for married women who frequently contribute significantly to household incomes. Oso *et al.* (2022) similarly found that married women significantly contribute to family welfare through small-scale business activities, particularly in rural economies.

Regarding education, 48.9% of the respondents completed primary school, 31.1% had no formal education, and 20% attained secondary education, with none having attended tertiary institutions (Table 1). These figures suggest that while formal education may not be essential for participation in soursop marketing, basic literacy could enhance interactions with consumers and suppliers, improving business outcomes. Research has shown that practical knowledge, combined with local market expertise, often supersedes formal education in rural agricultural markets (Olawuyi *et al.,* 2021). Moreover, the agricultural sector continues to attract individuals with varying levels of education, particularly in regions where small-scale farming and trading are primary sources of income (Udemezue, 2018). Years of experience in the trade of soursop revealed that 48.89% of the respondents had 11-15 years' experience, an average mean of 12 years.

Table 1: Distribution of Respondents according to Socioeconomic Characteristics

Socio economic variables	No. of Respondents (n=45)	%	Mode and Mean
Gender			
Female	45	100.00	Female
Total	45	100.00	
Age			
21-30	2	4.44	
31-40	9	20.00	44
41-50	28	62.22	years
51-60	5	11.11	
61 above	1	2.22	
Total	45	100.00	
Marital status			
Married	33	73.30	Married
Divorced	8	17.80	
Widow	4	8.90	
Total	45	100.00	
Education			
Primary	22	48.90	Primary
Secondary	9	20.00	
No formal Education	14	31.10	
Total	45	100.00	
Years of experience			
0-5	2	4.44	
6-10	11	24.44	12
11-15	22	48.89	years
16-20	7	15.56	
21 above	3	6.67	
Total	45	100.00	

Source: Field Survey, 2023

Supply Chain of Soursop

The supply chain of soursop products in Oje, Bode, and Ayeye markets operates in a structured manner, moving from producers to end consumers (Figure 2). Initially, producers, which include farmers and wild collectors, harvest soursop from their farms or natural habitats. These producers then sell their products to wholesalers, who serve as key intermediaries in the distribution process. The wholesalers purchase soursop in bulk from the producers and subsequently trade these products within the marketplace. At this stage, the wholesalers engage in direct sales to both retailers and end consumers. Retailers, who congregate in the markets, buy soursop from wholesalers as well as from other producers and fellow traders. They then sell the products to a diverse clientele,

encompassing a wide range of consumers from various socio-economic backgrounds. Figure 2 illustrates the supply channel of *Annona muricata* parts in these markets in Ibadan, Oyo State, highlighting the interconnected roles of producers, wholesalers, retailers, and consumers in the soursop supply chain.

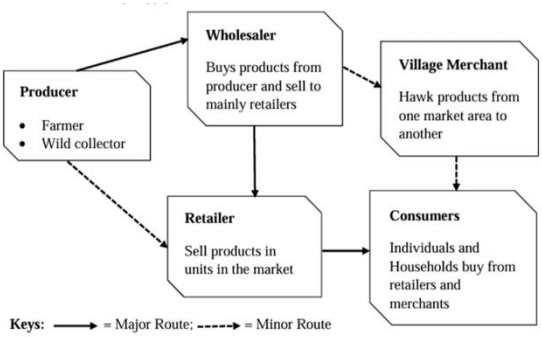

Figure 2: Supply Chain of Soursop Products in the Selected Markets

Sourcing of Soursop

The results presented in Table 2 indicate that a significant majority of respondents (62.2%) source their soursop products from surrounding villages, while 37.8% obtain their supply from local subsistence farmers who cultivate the fruit. This highlights the importance of rural sourcing, as soursop is predominantly grown in villages where land is available for cultivation. Village sourcing is crucial for ensuring product availability, as highlighted by Mahonya *et al*. (2019), who emphasise the central role of village-based production for many non-timber forest products and agricultural goods.

Seasonality greatly influences soursop availability, with 60% reporting increased supply during the rainy season, while 40% note availability during the dry season (Table 2). The seasonal fluctuations impact supply and market dynamics, as soursop has two major fruiting periods: early ripening (January to April) and mid-season ripening (June to August). This dual seasonality affects pricing, with prices typically lower during the rainy season when the fruit is abundant, while higher demand during the dry season drives up prices. Similar seasonal trends have been observed in other perishable agricultural products, where fluctuations in supply correspond to changes in price (Aiyeloja and Ajewole, 2024).

The results also reveal that 82.2% of the respondents travel to rural collectors to obtain their soursop supplies, while 17.8% receive deliveries directly from these collectors. This supports research by Falana *et al*. (2022), which highlights the importance of rural-urban linkages in the distribution of agricultural products. Moreover, 71.1% of the actors acquire their supplies on a weekly basis, reflecting a pattern seen in many small-scale agricultural markets where produce is sourced frequently to meet demand (Falana *et al*., 2022). A smaller group (28.9%) procures supplies every other day, reflecting operational flexibility based on customer needs.

Interestingly, all respondents (100%) concurred that the fruit is the most profitable part of the soursop plant. Prices for the fruit significantly exceed those of other parts of the plant, such as leaves. Small bundles of leaves can sell for as low as ₦250, while the price of a single fruit starts at ₦700, with larger fruits commanding prices between ₦1,200 and ₦2,000 depending on size. The profitability of the fruit aligns with findings from agricultural market studies that emphasize the higher market value of fruit over leaves and other by-products (Olawuyi *et al*., 2021).

Lastly, 75.56% of marketers are members of an association known as "Egbe Eleso/Egbe Elewe," while 24.44% do not belong to any organization. Membership in such associations offers several benefits, including enhanced access to rural suppliers and greater bargaining power. As Oso *et al*. (2022) suggest, collective membership in trade associations can significantly enhance the operational efficiency of agricultural traders by reducing barriers to sourcing products and improving access to markets.

Challenges in the Trade of Soursop Products

The findings presented in Table 3 highlight significant challenges faced by traders in sourcing and selling soursop within the selected markets. A majority of respondents (62.2%) disagreed, and 26.7% strongly disagreed with the notion that soursop plant parts are readily available. This scarcity can be attributed to several factors, including seasonal fluctuations and limited production capacity among local farmers, which is consistent with previous studies (Aiyeloja & Ajewole, 2024). Furthermore, 82.2% of respondents reported challenges in accessing soursop plants, with 13.3% strongly disagreeing that they had easy access. A significant number of traders noted that they often need to travel to rural village markets to procure soursop before selling it in urban areas, increasing their operational costs and time commitments.

Table 2: Sourcing of Soursop by the Actors

Variables	Frequency	Percentage	Mode
Sources of the plant part			
Villages	28	62.20	Villages
Cultivated	17	37.80	
Seasonal availability			
Rain	18	40.00	
Dry	27	60.00	Dry season
Frequency of supply			
Weekly	32	71.10	Weekly
Other days	13	28.90	
Point of collection			
I go to the collectors	37	82.20	Go to collectors
Collectors bring it to me	8	17.80	
Most profitable plant part			
Fruit	45	100.00	Fruit
Member of any association			
Yes	34	75.56	Yes
No	11	24.44	
Total	45	100.00	

Source: Field Survey, 2023

Soursop trade in Ibadan is typically small-scale, reflecting the limited quantities supplied by local producers. Producers typically offer between 5 and 12 fruits per transaction, compelling traders to purchase small amounts to avoid losses from unsold stock. This cautious trading strategy directly affects both inventory levels and profitability. Similar to findings in other agricultural product markets, pricing discrepancies were observed across different locations: traders at Oje market earned approximately ₦300 per fruit, compared to ₦200 at Bode market and ₦100 at Ayeye market. Such variations indicate how supply and accessibility influence profitability, a trend mirrored in studies on small-scale fruit marketing (Odoh *et al.*, 2021).

These findings align with earlier research, which notes that challenges in agricultural product sourcing often stem from limited access, low production capacity, and seasonal availability (Oso *et al.*, 2022). Addressing these obstacles would require infrastructure improvements, particularly in storage and transportation, to stabilize supply and reduce operational costs throughout the year. Moreover, enhancing cooperation between farmers and marketers, perhaps through organized associations, could increase production volumes and facilitate a more consistent supply of soursop in the market. Such measures could improve both inventory management and profitability, as seen in other sectors of agricultural marketing (Falana *et al.*, 2022).

Table 3: Challenges of Soursop Trade

Challenges of soursop trade		Strongly agree	Agree	Disagree	Strongly disagree	Total
Ease of Transportation	F	11	21	13	0	45
	%	24.4	46.7	28.9	0	100
The plant is readily available	F	1	4	28	12	45
	%	2.2	8.9	62.2	26.7	100
The trade of the plant is profitable	F	13	28	4	0	45
	%	28.9	62.2	8.9	0	100
Much patronization from people	F	11	17	15	2	45
	%	24.4	37.8	33.3	4.4	100
Easy accessibility to the plant	F	0	2	37	6	45
	%	0	4.4	82.2	13.3	100

Source: Field Survey, 2023 F= Frequency, %= Percentage

CONCLUSION AND RECOMMENDATIONS

This study highlights the economic role of soursop (A*nnona muricata*) in Ibadan markets, where it serves as a key income source, particularly for middle-aged women who predominantly source from rural areas. Findings indicate that seasonal shortages, low productivity, and transportation inefficiencies are major challenges that limit the consistent supply and profitability of soursop. To maximize its economic potential, this study recommends adopting sustainable agricultural practices to boost production and investing in local transportation infrastructure to ensure timely deliveries and reduce losses.

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Authors' Contributions

TVO and KPO managed data collection, interpretation of data, data analysis and writing of the manuscript. FDB supervised the research and reviewed the manuscript.

Ethical Statement

Not applicable.

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