VALUE CHAIN ADDITION OF PARKIA BIGLOBOSA IN BENIN CITY, EDO STATE, NIGERIA

BY

Prosper Erunse OSAGHAEDE
AGR2004406

DEPARTMENT OF FOREST RESOURCES AND WILDLIFE MANAGEMENT
FACULTY OF AGRICULTURE
UNIVERSITY OF BENIN
BENIN CITY

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A PROJECT SUBMITTED TO THE DEPARTMENT OF FOREST RESOURCES AND WILDLIFE MANAGEMENT, FACULTY IF AGRICULTURE, UNIVERSITY OF BENIN, BENIN CITY. IN PARTIAL FULFILMENT OF THE REQUIREMENT FOR THE AWARD OF BACHELOR OF FOREST RESOURCES AND WILDLIFE MANAGEMENT DEGREE HONOUR

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CERTIFICATION

This is to certify that Prosper Erunse OSAGHAEDE with Matriculation Number AGR2004406 of the Department of Forest Resources and Wildlife Management, Faculty of Agriculture, University of Benin City, carried out this research work.

Dr. (Mrs.) N. Osadolor	**Dr. (Mrs.) N. Osadolor**
Project Supervisor	**Head of Department**
Date	**Date**

DEDICATION

This work is dedicated to God Almighty for the strength and grace to carry it out up until its completion, for this I say very big thank you

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ABSTRACT

This study examined the value chain addition of *Parkia biglobosa* (African locust bean) in Benin City, Edo State, Nigeria, with emphasis on its processing, packaging, transportation, profitability, and contribution to livelihoods. A total of 120 respondents, comprising traders and processors, were randomly and purposively selected from eight major markets across two Local Government Areas (Oredo and Egor) namely Ekiosa, Oba, Agbado, New Benin, Uwelu, Uselu, Oliha, and Ogida. Primary data were obtained through structured questionnaires and interviews, while secondary data were sourced from relevant literature. Data analysis employed descriptive statistics, gross margin analysis, and simple cost and return methods. Findings revealed that 97.5% of respondents were female, with the majority (75%) having at least secondary education and over 13 years of experience in the trade. The most preferred product was the fermented locust bean (iru), processed using traditional methods. Gross margin analysis indicated that processed products were significantly more profitable than raw seeds, yielding a net return of ₦3,004.11 per kg compared to ₦786.79 per kg from raw seeds. This translates to a profit margin of 52.3% for processed products and 47.7% for raw seeds, underscoring the economic advantage of value addition. However, the study identified major challenges such as inadequate transportation (mean = 3.22), high market levies (3.51), poor access to ready markets (3.11), and limited awareness of value-added opportunities (3.41). Despite these constraints, *Parkia biglobosa* remains a vital source of livelihood and nutrition, particularly due to its rich vitamin A content, which supports eye health and general wellbeing. The study concludes that improving processing efficiency, adopting modern packaging techniques, and strengthening distribution channels will significantly enhance the profitability and competitiveness of *Parkia biglobosa*. It recommends entrepreneurial investment in branding, cooperative marketing, and value-added innovations such as powdered iru or ready-to-use condiments, which will boost income generation and promote the wider use of this indigenous, health-enhancing product

CHAPTER ONE

INTRODUCTION

1.1 Background of study

Non-Timber Forest Products (NTFPs) constitute an important component of forest resources, providing food, medicine, raw materials, and income to millions of people in Africa and beyond (FAO, 2010). Among the wide range of NTFPs, *Parkia biglobosa*, commonly known as the African locust bean, is of particular socio-economic importance in West Africa (Akinmoladun, 2018). The tree belongs to the family Fabaceae and has been utilized for centuries across sub-Saharan Africa for both nutritional and commercial purposes (Orwa *et al.*, 2009). Its seeds are widely processed into a fermented condiment called "iru" or "dawadawa," which serves as a popular seasoning in Nigerian cuisine and a major source of livelihood in local markets (Omafuvbe *et al.*, 2004).

While the seeds are the most prominent product, processed into the popular condiment *iru* (dawadawa), which generates substantial income through local and regional trade, other parts of the species also possess important uses. The pods are rich in sweet pulp consumed directly or fermented into drinks, contributing to local nutrition and small-scale commerce. The flowers provide nectar for honey production, indirectly supporting apiculture, while the bark and roots are widely used in traditional medicine, treating ailments such as hypertension, fever, and infections (Gernah *et al*., 2007; Akinmoladun, 2018). The leaves are utilized as fodder for livestock, strengthening the role of *Parkia biglobosa* in integrated agroforestry systems.

From an economic standpoint, the value addition potential of the species remains underexploited. For instance, while raw seeds fetch an average of ₦800–₦1,200 per kilogram in local markets, processed *iru* can command between ₦3,500–₦5,000 per kilogram depending on packaging and preservation methods (Olaoye *et al*., 2017). Similarly, honey derived from *Parkia biglobosa* flowers contributes approximately 12–15% of smallholder beekeepers' income in parts of Nigeria (FAO, 2019). Medicinal extracts from the bark and roots, though largely traded informally, are valued at over ₦5 billion annually within the traditional medicine sector (Yakubu *et al*., 2020). Yet, despite this broad spectrum of uses, inadequate value addition through modern packaging, standardization, and large-scale processing continues to limit its economic returns.

Unlike many other NTFPs, *Parkia biglobosa* has a particularly well-developed system of value addition. The seeds undergo extensive processing that not only improves taste and shelf life but also enhances their economic value in markets (Odunfa, 1981). In Nigeria, especially in urban centers such as Benin City, Importantly, the species is predominantly sold in its processed forms such as fermented condiments, pastes, or powders rather than in raw seed form, as processing significantly increases both consumer acceptance and market value (Omafuvbe *et al.*, 2004).

The economic value of *Parkia biglobosa* lies not only in the raw seeds but more importantly in the series of activities that add value to the product through processing, packaging, and transportation (Ayinde, 2015). Processing transforms the seeds into forms that increase shelf life, improve quality, and enhance consumer appeal (Odunfa, 1981). Packaging plays a critical role in ensuring hygiene, preservation, and marketability, while transportation provides the essential link between producers, processors, and consumers by making the product accessible in both rural and urban centers (Ayanwale *et al.*, 2017).

Despite the importance of *Parkia biglobosa*, inadequate processing technologies, poor packaging methods, and inefficient transportation systems have limited the full economic potential of this species (Adedokun, 2020). Traditional processing often involves tedious and time-consuming methods, while packaging is frequently substandard, leading to contamination and reduced shelf stability (Oladipo and Jadesimi, 2012). Transportation challenges, such as poor road networks and high logistics costs, also reduce profitability and restrict market expansion (Babalola, 2012).

The processing of *Parkia biglobosa* seeds is a labor-intensive but value-enhancing activity that transforms the otherwise hard, bitter seeds into highly desirable condiments. The seeds are first extracted from the pods, washed thoroughly to remove adhering pulp, and then boiled in large pots for several hours to soften the hard testa. After boiling, the softened seeds are dehulled manually, usually by pounding lightly in mortars or by hand rubbing in water, until the seed coats are completely removed. The clean cotyledons are then boiled again briefly and transferred into fermentation containers, often calabashes, earthen pots, or baskets lined with leaves.

During fermentation, which typically lasts two to four days depending on ambient temperature, the seeds undergo microbial action that produces a strong characteristic aroma and develops the dark-brown color associated with *iru* or *dawadawa*. This stage is crucial as it improves both flavor and digestibility. After fermentation, the seeds may be mashed into a paste, formed into small balls, or packed into leaves for sale in rural markets. In urban centers, further processing takes place where the fermented product is dried, ground into powder, and packaged in plastic sachets or containers, thereby increasing shelf-life, hygiene, and consumer appeal.

This progression from raw seeds to fermented, dried, and packaged products reflects the chain of value addition that multiplies the economic worth of *Parkia biglobosa*. While raw seeds have

limited direct consumption, the processed forms are in high demand as a staple seasoning across Nigeria and West Africa, commanding several times the price of the unprocessed product (Odunfa, 1985; Campbell-Platt, 1980)

Therefore, examining the value chain addition of *Parkia biglobosa* in Benin City is essential to identify the contributions of processing, packaging, and transportation in enhancing the economic value of this species. Such an analysis will provide insights into how improvements in these stages can increase income generation, promote food security, and sustain local trade (Oyekale, 2014).

The seeds are the primary economic product. In their raw form they are often sold directly in rural markets, usually in bowls or small containers at prices ranging from ₦1,500 to ₦2,000 per paint bucket depending on seasonality (Akinmoladun, 2018). Demand for raw seeds is limited since they require processing before consumption. In contrast, when fermented into *iru* or *dawadawa*, the value rises substantially. The market price for fermented seeds may reach ₦6,000 to ₦8,000 per paint bucket equivalent, representing a three to four fold increase over raw seeds (Odunfa, 1985). Powdered and packaged *dawadawa* in sachets, especially in urban centers, fetch even higher margins due to improved shelf life and consumer convenience.

The bark is harvested and sold cheaply in rural markets at about ₦100 to ₦200 per bundle, mainly for medicinal purposes. When processed into boiled extracts or powdered remedies, it becomes more commercially valuable, selling for ₦500 to ₦1,000 depending on packaging and distribution channels (Gbile, 1984).

The wood is soft and not durable, so in its raw form it is mainly used as fuelwood and in low-grade carpentry, making only a modest economic contribution. Processing the wood into charcoal, however, is far more profitable. Charcoal derived from *Parkia biglobosa* is in high demand in urban centers both for domestic cooking and small-scale industries. A bag of charcoal may sell for ₦4,000 to ₦5,000, offering considerably higher returns compared to selling the wood directly (Ajayi, 2013).

Altogether, *Parkia biglobosa* makes a substantial contribution to rural and urban economies in Nigeria. In raw form its products are often restricted to subsistence uses with relatively low commercial value. Processing, however, significantly increases profitability by raising market prices, creating employment for processors, transporters, and traders, and providing accessible nutrition and medicine to consumers. It has been reported that processing *Parkia biglobosa* seeds alone accounts for more than 60 percent of household income for women traders in northern Nigeria, highlighting the central role of the species in poverty alleviation and food security (Ladipo, 1995). Although some of this findings are outdated, they still remain relevant in this project research in evaluating the value chain addition over the years.

1.2 Statement of problem

Despite the recognized importance of *Parkia biglobosa* in Nigeria's food system, its economic value remains underutilized due to major challenges in transportation, packaging, and processing. The majority of the seeds, nearly 75%, are still sold in loosely packaged forms such as old polyethylene bags, bowls, or sacks that do not meet modern market standards (Akinmoladun, 2018). This poor packaging reduces the shelf-life of the product by about 35%, making it unattractive for supermarkets and export markets. Consequently, while properly packaged and

branded locust bean products can sell for between ₦2,500–₦3,000 per kilogram in urban centers, the same quantity sold in traditional loose packaging rarely exceeds ₦800–₦1,000, reflecting a 200% difference in market value.

Transportation also poses a critical challenge. More than 60% of *Parkia biglobosa* products in Benin City markets are transported from surrounding rural areas using non-refrigerated open trucks or buses (Olaoye *et al*., 2017). This results in contamination, spillage, and product deterioration, which accounts for an estimated post-harvest loss of 20–25%. In financial terms, traders lose between ₦10,000 and ₦15,000 weekly due to spoilage, depending on the scale of their operations.

Processing remains another bottleneck in unlocking the full value chain potential of the species. Traditional fermentation methods, which still dominate in over 80% of households and small-scale processors, are time-consuming (taking up to 3–5 days) and produce inconsistent quality (Odunfa, 1985). In contrast, improved mechanized or semi-mechanized processing can cut fermentation time by nearly 50% and yield products that are cleaner and more uniform, yet adoption remains very low due to high equipment costs and limited awareness. As a result, the added value that should elevate *Parkia biglobosa* to the level of commercial condiments like bouillon cubes or imported protein supplements is not being realized.

Altogether, the absence of standardized packaging, modern processing, and efficient transportation systems limits the competitiveness of *Parkia biglobosa*. Consequently, the gap between the potential and realized value of *Parkia biglobosa* reflects a broader problem, the absence of structured value addition and standardization, which not only limits local income generation but also weakens Nigeria's position in the growing regional and global NTFP market.

1.3 Objectives of the study

To examine the value chain addition of *Parkia biglobosa* in Benin City and the socio-economic contributions to livelihood while the specific objectives are to:

1. identify the value added product obtained from *Parkia biglobosa*
2. estimate the costs of value addition activities such as transportation, processing, and packaging, and evaluate their profit margins.
3. compare the profitability of the value added *Parkia biglobosa* with fresh products.
4. highlight the challenges faced in the value chain such as inadequate processing technologies, weak market linkages, and lack of standard packaging.

1.4 Justification of the study

This study is needed due to the arising increase in the economic and nutritional importance of *Parkia biglobosa* in Nigeria, particularly in urban centers such as Benin City. Despite its wide use, the species' economic contribution remains far below its potential because of low value addition across processing, packaging, and transportation stages. Studies show that processed *Parkia biglobosa* seeds (locally known as dawadawa) command over 70% higher market prices compared to raw seeds, yet in many cases the quality of processing remains inconsistent, leading to lower consumer preference and reduced profitability (Akinmoladun, 2018). Packaging is another critical challenge, as more than 65% of products in local markets are still sold in non-standard containers such as polyethylene bags or reused plastic, which limits shelf life, market competitiveness, and potential for export (FAO, 2019).

Transportation equally poses a major bottleneck. In Nigeria, post-harvest losses of *Parkia biglobosa* products are estimated at 20–30% annually, with poor road networks and high

logistics costs accounting for a substantial portion of this loss (Ibrahim *et al*., 2020). For example, transportation costs can amount to ₦150–₦200 per kilogram, representing nearly 25% of the final retail price, thereby reducing producer and trader margins.

This study will provide insights into the economic implications of current processing, packaging, and transportation practices, highlight gaps, and suggest practical strategies to enhance value addition. The findings will be valuable not only for traders and processors in Benin City but also for policymakers, extension services, and investors seeking to maximize the socio-economic potential of *Parkia biglobosa*

1.5 Scope of the study

This study is restricted to Benin City, Edo State, Nigeria. It focu,ses on activities of value addition of *Parkia biglobosa* within the city, particularly among traders, processors, and marketers who are directly involved in the handling and distribution of its products. The geographical scope does not extend to other parts of Nigeria, as the research is designed to reflect the situation in Benin City markets alone.

CHAPTER TWO

LITERATURE REVIEW

2.1 Concept of non-timber forest products (NTFPs)

Non-timber forest products (NTFPs) refer to biological materials other than timber that are harvested from natural forests, agroforestry systems, and plantations (FAO, 1990). These include fruits, seeds, nuts, leaves, roots, bark, resins, and medicinal plants. NTFPs contribute significantly to food security, healthcare, and income generation in many developing countries (Shackleton *et al*., 2007). In Nigeria, they play an important role in sustaining rural livelihoods and supporting urban markets.

2.2 Parkia biglobosa (African Locust Bean)

Parkia biglobosa, commonly known as the African locust bean or néré, is a perennial, deciduous tree in the family Fabaceae, subfamily Mimosoideae (Odetola *et al*., 2012). It is native to West Africa, with a distribution from Senegal to Sudan and Uganda (Osawaru & Odin, 2012). The species has been utilized for centuries, particularly for its seeds which are fermented to produce condiments such as iru or dawadawa, rich in protein and essential nutrients (Akinola & Oladele, 2018). Historically, the use of fermented locust beans in West Africa has been documented since the 14th century, highlighting its long-standing role in local diets and traditional medicine (Olawoye *et al*., 2015). Beyond human consumption, *Parkia. biglobosa* contributes to agroforestry systems by enhancing soil fertility through nitrogen fixation, providing shade, and serving as fodder for livestock (Akinmoladun *et al*., 2016).

2.3 Review of Related Literature

Several studies have investigated the value chains of *Parkia biglobosa*, focusing on aspects such as processing methods, profitability, and stakeholder participation across different regions of Nigeria. For instance, Kabir and Rukayat (2024) conducted a study in Sokoto Metropolis, Nigeria, analyzing the socio-economic characteristics of processors, cost–benefit analysis, and strategies for enhancing the value chain. They reported that the locust bean processing industry is largely dominated by elderly women with limited formal education and large household sizes. Their findings revealed that value addition through improved packaging and branding significantly increased gross margins from ₦873.2 to ₦4,780. However, the study was confined to Sokoto Metropolis and did not examine the urban dynamics of southern markets such as Benin City.

Similarly, Adedigba *et al*. (2024) assessed profit-sharing among actors involved in the collection and marketing of *Parkia biglobosa* in Oyo State. Their results showed that marketing activities contributed the highest share to the value chain (43.02%), followed by processing (23.40%). Collectors realized an average gross margin of ₦25,848.89, which reflects the profitability of raw locust bean marketing. Nonetheless, their study paid limited attention to how value addition processes such as fermentation, preservation, and improved market packaging affect profitability in urban centers.

Other empirical studies have reinforced the significance of *Parkia biglobosa* as a major non-timber forest product (NTFP) in Nigeria. Akinmoladun (2018) highlighted its multifunctional uses, ranging from seeds processed into fermented condiments (“iru” or “ogiri okpei”) to pulp, bark, and leaves used for food, medicine, and livestock feed. Yet, despite these uses, the value

chain remains weak due to challenges such as high transportation costs, poor preservation techniques, and lack of standardized packaging (FAO, 2019).

While these studies provide valuable insights into the economic relevance of *Parkia biglobosa*, most have concentrated on rural production areas or generalized analyses of the value chain. Little attention has been given to urban contexts where demand patterns, consumer preferences, and processing technologies may differ significantly. Benin City, being a major urban hub in southern Nigeria, presents unique dynamics in terms of market demand, women-led processing enterprises, and the potential for modern value addition.

In contrast to earlier works, the present research investigates the value chain of *Parkia biglobosa* specifically within Benin City. It examines not only the traditional processing and marketing of seeds but also explores the utilization of other tree parts including pulp, bark, and leaves that are often overlooked in value chain analyses. Furthermore, it situates the study within the urban socio-economic context, addressing issues such as access to modern processing equipment, branding, and consumer-driven market expansion.

By filling these research gaps, the study contributes to a more comprehensive understanding of *Parkia biglobosa* value chain addition in an urban setting. The findings are expected to provide empirical evidence that can guide policymakers, development agencies, and local entrepreneurs in enhancing the economic significance of this species in Benin City and beyond.

2.4 Concept of Value Chain Addition

Value chain addition refers to the set of activities that improve the value of a product or service as it moves along the stages of production, transformation, and distribution until it reaches the

final consumer. Unlike primary production, which often yields low market prices, value chain addition emphasizes the transformation and enhancement of products through processes such as processing, packaging, preservation, branding, storage, and distribution (FAO, 2018).

In economic terms, value chain addition highlights the incremental improvements at each stage of the product's journey, ensuring that every actor within the chain contributes to increasing its worth and competitiveness (Kaplinsky & Morris, 2001). For instance, a raw product at its source may have limited demand and a relatively low price, but once subjected to activities that enhance its utility, quality, or presentation, its market value rises significantly.

The importance of value chain addition lies in its ability to expand market opportunities, generate higher income for stakeholders, and strengthen the overall economy. It also supports employment creation, fosters innovation, encourages sustainability, and enables products to compete more effectively in both local and international markets (World Bank, 2011).

In summary, value chain addition is not limited to physical transformation but also includes the strategic improvements and services that collectively increase the product's appeal, profitability, and accessibility along the value chain

2.4.1 Concept of Value Chain Addition of *Parkia biglobosa* in Benin City

The value chain addition of *Parkia biglobosa* in Benin City reflects the progressive enhancement of the species' economic potential through processing, packaging, branding, preservation, and distribution of its various parts. While the seeds are the most prominent component, often processed into the popular fermented condiment "iru" or "dawadawa," the pods, pulp, leaves, and bark also contribute to local economies when subjected to proper value-adding processes.

In its raw form, *Parkia. biglobosa* seeds are sold at relatively low prices, averaging between ₦1,500–₦2,000 per kilogram in urban Benin markets (Ezekiel *et al*., 2021). However, after undergoing boiling, dehulling, and fermentation, the same volume of seeds processed into "iru" can fetch up to ₦5,000–₦6,500, representing a value addition of over 200%. Similarly, the sweet yellow pulp surrounding the seeds, often discarded in rural areas, when dried and packaged, has an urban retail price of about ₦1,200 per 250 g pack, creating new niche markets for confectionery and beverage industries.

The leaves and bark, commonly used in herbal medicine, also show potential for value chain addition. For instance, powdered leaf products packaged in sachets of 100 g retail between ₦800–₦1,000 in herbal stores in Benin City, a significant improvement compared to raw leaves sold at local markets for less than ₦200 per bundle. When standardized and branded, these products could further penetrate both local and regional pharmaceutical markets.

Despite these opportunities, the value chain addition of *Parkia. biglobosa* in Benin City remains underdeveloped. Poor storage and preservation facilities reduce product quality, packaging is often rudimentary and unattractive, and distribution systems are fragmented. In Benin City specifically, the market remains dominated by informal processors and traders, limiting opportunities for large-scale commercialization.

Therefore, effective strategies in value chain addition particularly modernized processing technologies, improved packaging and branding, and efficient distribution networks are critical to unlocking the full socio-economic potential of *Parkia biglobosa* in Benin City and positioning it as a competitive non-timber forest product in Nigeria

2.5 Importance of *Parkia biglobosa*

Parkia biglobosa, commonly known as the African locust bean tree, is one of the most socially, economically, and ecologically valuable non-timber forest products (NTFPs) in Nigeria. Its significance spans across nutrition, medicine, economy, culture, and the environment, making it a multipurpose species of national and regional importance.

Nutritionally, the seeds are widely consumed in the form of fermented condiments locally known as “iru” or “dawadawa.” These condiments are rich in protein, providing up to 40%, alongside essential fats, vitamins, and minerals that contribute to dietary diversity and food security. The yellow pulp surrounding the seeds is also valued for its high carbohydrate and vitamin C content, making it an important source of energy and micronutrients, particularly for children and rural households.

Medicinally, various parts of the tree serve significant roles in traditional healthcare. The leaves are applied in managing malaria, hypertension, and wound healing, while the bark and roots are used in the treatment of diarrhoea, toothache, and infections. These medicinal applications not only support household health needs but also supply raw materials for local herbal practices and small-scale pharmaceutical preparations.

Economically, *Parkia. biglobosa* provides substantial livelihood opportunities. In Benin City markets, for instance, a bag of processed locust bean condiment sells for nearly three times the cost of raw seeds, highlighting the impact of value addition. Women, in particular, dominate the “iru” processing trade, making the species vital for rural household incomes and gender empowerment.

Culturally, the locust bean tree occupies a central place in the diet and traditions of many Nigerian ethnic groups. The consumption of “iru” forms part of long-standing culinary heritage, while the tree itself is often preserved in farmlands and homesteads as a legacy species, passed down through generations as a marker of family and community identity.

Environmentally, *Parkia. biglobosa* contributes to soil fertility through nitrogen fixation and the addition of organic matter, thereby supporting sustainable agriculture. Its wide canopy provides shade for humans and livestock, while the roots reduce erosion and enhance soil stability in farming systems. In agroforestry landscapes, the tree strengthens resilience against land degradation and contributes to ecosystem balance.

Parkia biglobosa is not only a food tree but a multipurpose species that delivers nutritional, medicinal, economic, cultural, and ecological benefits. Its importance underlines the need for sustainable management and value chain development to unlock its full potential in Nigeria.

2.6 Challenges Facing Value Chain Addition of *Parkia biglobosa* in Benin City

The process of value chain addition for *Parkia biglobosa* in Benin City is constrained by several challenges that limit its full economic potential. A major obstacle lies in the limited access to modern processing technologies, which forces many producers and processors to rely on traditional, labor-intensive methods of fermentation, dehulling, and oil extraction. These methods reduce efficiency, increase post-harvest losses, and limit the quality and shelf life of the products.

Another challenge is the inconsistent supply of raw materials, as seasonal availability of seeds and fruits affects production continuity. Farmers often experience fluctuations in yields due to

climatic variations, land-use changes, and unsustainable harvesting practices, which in turn disrupt value addition processes.

The lack of adequate storage and preservation facilities also contributes significantly to post-harvest losses. Without appropriate drying, packaging, and storage systems, products like fermented seeds and pulp deteriorate quickly, reducing their marketability and profitability.

Additionally, there is a limited level of awareness and training among local farmers and processors on improved value addition practices. Most of the stakeholders lack access to extension services, capacity-building initiatives, and technical support that could enhance product quality and competitiveness in wider markets.

Market-related constraints such as poor infrastructure, limited access to finance, and weak market linkages further hinder the growth of the value chain. Many small-scale producers are unable to obtain credit facilities needed to invest in improved technologies or expand production, while poor road networks make it difficult to transport products efficiently from rural collection points to urban markets.

Lastly, issues of policy neglect and weak institutional support remain significant. Non-Timber Forest Products (NTFPs) like Parkia biglobosa often receive little recognition in agricultural and forestry policies, thereby limiting the incentives, research, and investments needed to strengthen their value chain addition

2.7 Theoretical Framework

The theoretical framework guiding this study is anchored on two interrelated theories: the Value Chain Theory (Kaplinsky & Morris, 2001) and the Sustainable Livelihoods Framework

(Chambers & Conway, 1992). These theories provide a structured lens through which the economic, social, and environmental relevance of *Parkia biglobosa* can be examined within the context of value addition in Benin City.

The Value Chain Theory emphasizes the importance of analyzing all stages involved in transforming a raw material into a final product, highlighting the roles of actors, processes, and linkages in creating and enhancing value. Applying this theory to *Parkia biglobosa* allows the study to trace how different stages of value addition ranging from seed collection, processing into condiments, utilization of pulp, bark, pods, and leaves, to final marketing contribute to increased product worth, employment opportunities, and income generation. It also provides a framework for identifying bottlenecks and inefficiencies that limit the full optimization of the species' potential in the local economy.

Complementing this is the Sustainable Livelihoods Framework, which posits that people draw on various assets natural, human, social, physical, and financial to sustain their livelihoods. Within this framework, *Parkia biglobosa* is positioned as a vital natural capital that rural and urban households utilize for food, medicine, income, and cultural continuity. The framework helps explain how value addition activities not only enhance incomes but also strengthen resilience, particularly for women and low-income groups who dominate locust bean processing and trading.

By integrating these theories, the study adopts a holistic perspective. The Value Chain Theory explains the economic pathways of transformation and wealth creation, while the Sustainable Livelihoods Framework situates these processes within broader socio-ecological systems of survival, equity, and sustainability. Together, they provide the conceptual grounding for

analyzing how *Parkia biglobosa* value addition contributes to both individual livelihoods and community development in Benin City.

CHAPTER THREE

MATERIALS AND METHODS

3.1 Description of the study area

The study was carried out in Benin City, the capital of Edo State, located in the South-South geopolitical zone of Nigeria. Benin City lies approximately between latitude 6°20' 21.066N and longitude 5°37'2.8092"E (LatLong.net, 2025), with an estimated population of over 1.7 million people according to the National Population Commission (NPC, 2006) and projections reaching above 2.5 million in 2023. The city is a major urban center known for its historical significance, cultural heritage, and as a hub of economic and commercial activities in southern Nigeria.

The climate of Benin City is characterized by a humid tropical environment, with a distinct wet season (April–October) and a dry season (November–March). Average annual rainfall ranges between 2,000 mm and 2,500 mm, while temperatures range from 24°C to 34°C. These favorable agro-ecological conditions support the growth of diverse forest and agricultural resources, including *Parkia biglobosa*, which is commonly found in both cultivated and semi-wild forms within the region.

Economically, Benin City is dominated by small- to medium-scale trading, agro-processing, and service-based activities. Rural-urban linkages are strong, with surrounding communities supplying agricultural and forest products such as locust bean, cassava, oil palm, and vegetables to city markets. The use of *Parkia biglobosa* seeds for food condiments, as well as other parts of the tree for medicinal, nutritional, and commercial purposes, makes it an important Non-Timber Forest Product (NTFP) within the local economy.

The selection of Benin City as the study area is significant because it represents a melting pot where traditional knowledge of forest products intersects with increasing urban demand and modern market structures.

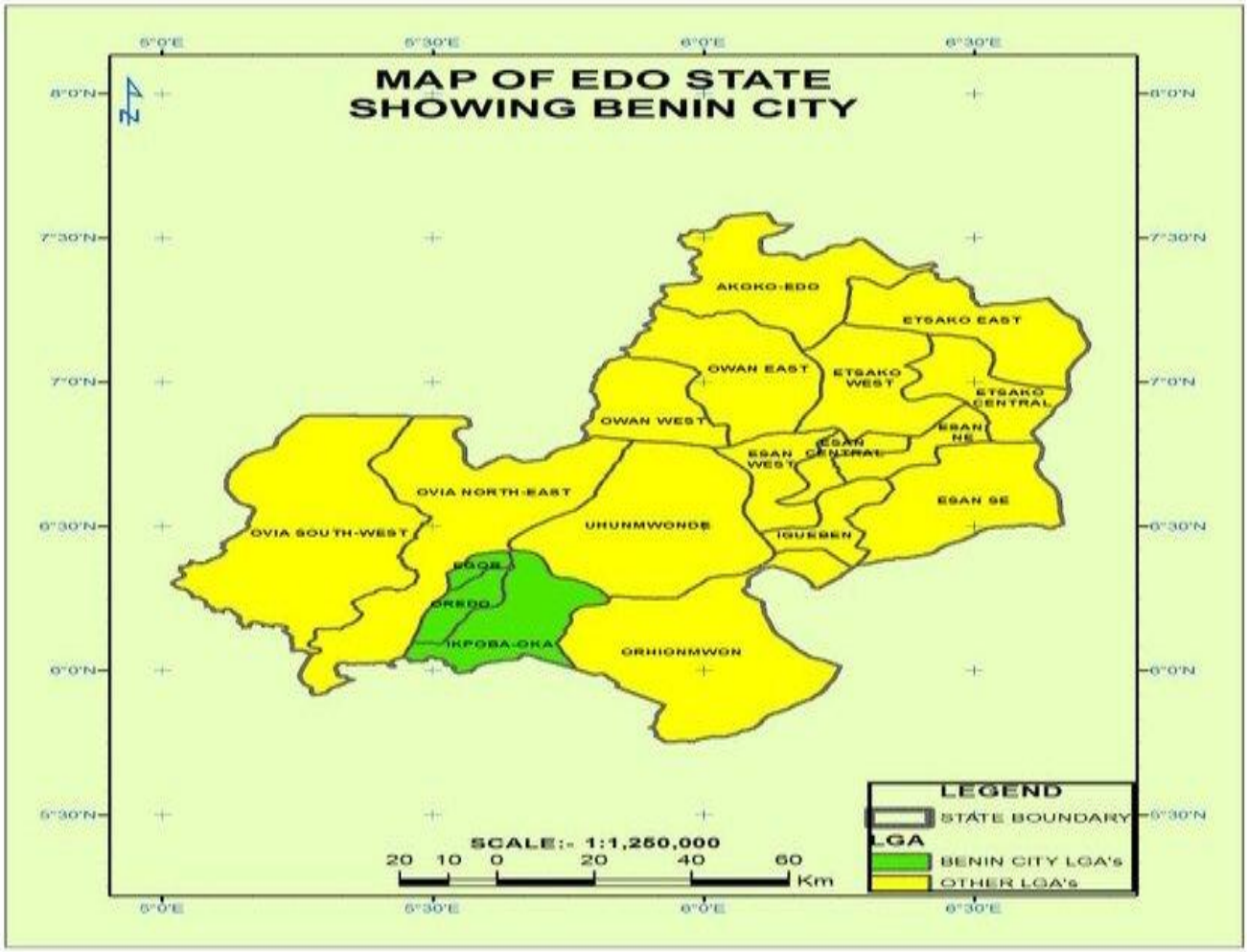

Figure 1: Map of study area

3.2 Sample size and sampling techniques

The sample size for this study was determined to adequately capture the perspectives of key stakeholders involved in the value chain addition of *Parkia biglobosa* in Benin City. The study population comprised processors and traders of locust bean products within selected markets and communities in the study area.

A sample size of 120 respondents was chosen to ensure representativeness and reliability of findings, with participants distributed proportionately across the identified groups

Benin City is administratively divided into four Local Government Areas (LGAs), namely Oredo, Egor, Ikpoba-Okha**,** and Ovia North-East. For the purpose of this study, a 50% sample intensity was applied to ensure both manageability and representativeness of the research population. Based on this criterion, two LGAs Oredo and Egor were purposively selected out of the four.

A total of eight major markets were purposively selected from the two chosen Local Government Areas (Oredo and Egor) for effective data collection. These markets include Ekiosa, Oba, Agbado, New Benin, Uwelu, Uselu, Oliha, and Ogida, representing key commercial centers where *Parkia biglobosa* products are actively processed and traded.

The choice of these LGAs was informed by their high concentration of processors and traders of *Parkia biglobosa* products, as well as their strategic role in the commercial activities of Benin City. Within these LGAs, respondents were selected to represent different nodes of the value chain, focusing primarily on processors and traders. A combination of purposive and random sampling techniques was employed: purposive to target the relevant groups, and random to ensure fairness and minimize selection bias within each group.

TABLE 1: LGA, MARKETS AND THEIR COORDINATES

LGA	MARKET	COORDINATES
OREDO	EKIOSA	Latitude: 6°19′24″ N Longitude: 5°38′11″ E
	OBA	Latitude: 6°20′5″ N Longitude: 5°37′11″ E
	AGBADO	Latitude 6°33′48″ N Longitude 5.6201° E.
	NEW BENIN	Latitude: 6°20′56″ N Longitude: 5°37′55″ E
EGOR	UWELU	Latitude 6°37′68″ N Longitude 5.5914° E.
	USELU	Latitude: 6°24′32.6″ N Longitude: 5°36′51.3″ E
	OLIHA	Latitude: 6°20′44″ N Longitude: 5°36′33″ E
	OGIDA	Latitude 6°35′914″ N Longitude 5°60′49″ E

3.2.1 Population of the study

The population of this study comprises individuals actively involved in the value chain of *Parkia biglobosa* within Benin City. Specifically, it includes processors, traders, and distributors who handle the transformation and marketing of locust bean products across the four Local Government Areas of the city: Oredo, Egor, Ikpoba-Okha, and Ovia North-East. These groups represent the core actors responsible for adding value to *Parkia biglobosa* through processing, packaging, and distribution to meet consumer demand. For the purpose of this research, the population provides a comprehensive base from which samples were drawn, ensuring that the findings reflect the dynamics of value chain addition in Benin City.

3.3 Data collection

The study employed the use of both primary and secondary sources of data. Primary data were obtained through the administration of structured questionnaires and interviews conducted with selected respondents across the sampled Local Government Areas in Benin City. The questionnaires were designed to capture information on the activities, challenges, and opportunities within the value chain addition of *Parkia biglobosa*. Interviews were also conducted with key stakeholders such as processors, traders, and distributors to gain deeper insights into their experiences and practices.

Secondary data were sourced from relevant literature, journal articles, institutional reports, and previous studies related to Non-Timber Forest Products (NTFPs), value chain addition, and the utilization of *Parkia biglobosa*. These sources provided background information and supported the primary data in analyzing the subject matter

3.4 Measurement of variables

The questionnaire for this study was structured to obtain both quantitative and qualitative information directly relevant to the research objectives. It was divided into four main sections:

Section A: Socio-economic characteristics of respondents.

This section focused on gathering background information on respondents such as age, gender, educational level, household size, years of experience in *Parkia biglobosa*-related activities, and primary occupation.

Section B: Production and processing activities.

This part examined the availability and utilization of *Parkia biglobosa*, covering volumes of raw materials obtained, methods of harvesting different parts of the tree, types of processing undertaken, cost of inputs, equipment used, and labour requirements.

Section C: Marketing and distribution.

This section explored the marketing dimension of the value chain. Questions covered modes of transportation, packaging methods, market outlets (local and regional), pricing patterns, and challenges encountered in marketing *Parkia biglobosa* products.

Section D: Perceptions and constraints.

This section assessed respondents' opinions on value chain addition of *Parkia biglobosa*. A 5-point Likert scale (Strongly Disagree, Disagree, Neutral, Agree, Strongly Agree) was employed to capture their views on profitability, sustainability, and the major constraints limiting the full exploitation of the species.

3.5 Data analysis

The data collected from the field survey were subjected to both descriptive and inferential statistical analyses. Descriptive statistics such as frequencies, percentages, means, and standard deviations were used to summarize the socio-economic characteristics of respondents, as well as their activities in production, processing, marketing, and distribution of *Parkia biglobosa* products.

The Likert scale responses were analyzed using weighted averages to determine the perceptions and constraints faced by respondents in the value chain addition process. Cross-tabulations were also employed to examine the relationship between socio-economic factors and participation in different stages of the value chain.

In addition, Simple Cost and Return Analysis was applied to estimate the profitability of *Parkia biglobosa* value chain addition activities. The following formulas were used:

The gross margin (GM) was computed as the difference between total revenue (TR) and total variable cost (TVC):

GM = TR – TVC

Simple cost and return analysis was used to evaluate the economic performance of processing *Parkia biglobosa*. Net returns (NR) were calculated by subtracting total costs (TC) from total revenue (TR):

NR = TR – TC

Total Cost (TC): TC=TFC+TVC

This analysis provided insight into the relative profitability of the NTFPs by accounting for both variable and fixed costs involved in processing, and marketing. All analyses were conducted using Statistical Package for Social Sciences (SPSS) version 25 and Microsoft Excel for data entry and computation.

Plates 1: Data collection at New Benin market

Plates 2: Data collection at Uwelu market

Plates 3: Data collection at oba market

Plates 4: Data collection at Uselu market

Plates 5: Image of packaged locust beans (Iru)

Plates 6: Image of different forms and packages locust beans (Iru)

CHAPTER FOUR

RESULTS AND DISCUSSION

4.1 Results

4.1.1 Socio-Economic Characteristics of respondents

The result shows most respondents (40.8%) were aged 41–50 years, with an average age of 47.28 years, showing that middle-aged individuals dominate the *Parkia biglobosa* trade. The sector is largely female-driven, with 97.5% women participants, and 75% of them possess secondary education. On average, respondents have 13.73 years of experience, indicating a skilled and well-established group engaged in processing and marketing activities.

Table 2: Socio-Economic Characteristics of respondents

Age in years	Freq.	%	Mean	Std. Dev.
<= 30.00	4	3.3		
31.00 - 40.00	31	25.8		
41.00 - 50.00	49	40.8	47.28	10.01
51.00+	36	30		
Name of local government				
Oredo	60	50.0		
Egor	60	50.0		
Market/Area				
Agbado	11	9.2		
Ekiosa	17	14.2		
New Benin	25	20.8		
Oba Market	15	12.5		
Ogida	12	10.0		
Oliha	15	12.5		
Uselu	25	20.8		
Gender				
Male	3	2.5		
Female	117	97.5		
Level of education				
No formal education	8	6.7		
Primary	12	10		
Secondary	90	75		
Tertiary	10	8.3		
Main occupation				
Supplier	5	4.2		
Supplier, Trader	2	1.7		
Trader	113	94.2		
Years of experience in processing/marketing Parkia biglobosa				
<= 5.00	30	25.0		
6.00 - 10.00	27	22.5		
11.00 - 15.00	29	24.2	13.73	11.00
16.00+	34	28.3		

4.1.2 Value added products of *Parkia biglobosa*

Most respondents (80.8%) preferred processing and selling fermented *Parkia biglobosa*(iru/ogiri). Nearly all (95.8%) sourced their produce from local markets and sold them in nylon packaging, which remains the dominant method (59.2%). Processing is entirely traditional, with an average cost of ₦1,300.71 per kilogram

Table 3: Value added products of *Parkia biglobosa*

Most preferred *Parkia biglobosa* product to sell or process	**Freq.**	%
Raw seeds	6	5.0
Fermented locust bean (*iru/ogiri*)	97	80.8
Powdered locust bean	9	7.5
Dried locust bean (Dawadawa)	8	6.7
How do you obtain your produce?		
Own farm	5	4.2
Local market	115	95.8
Forest collection	5	4.2
How do you sell your products?		
Cups	2	1.7
Bowls	3	2.5
Paint bucket		
Nylon	115	95.8
Processing method used		
Traditional/manual	6	100
Semi-mechanized	0	0
Mechanized	0	0
Packaging methods		
Nylon bags	71	59.2
Plastic containers	16	13.3
Leaf wrapping	22	18.3
Non response	11	9.2
Mean cost of processing 1 kg of raw product (₦)	1300.71	39.2

Source: Field Survey, 2025.

4.1.3 Marketing and Distribution channels of *Parkia biglobosa*

Most traders (65.8%) sell *Parkia biglobosa* in local markets, with vehicles (68.3%) serving as the main means of transportation. Fermented locust beans are the most preferred product form, accounting for 70% of total sales. However, high spoilage rates (46.7%) and costly transportation (17.5%) remain the major marketing challenges limiting profitability.

Table 4: Marketing and Distribution channels of *Parkia biglobosa*

Marketing and distribution	Freq.	%
Major market outlet		
Local markets	79	65.8
Urban markets	32	26.7
Retail shops	7	5.8
Wholesalers	2	1.7
Means of transportation		
Head load	2	1.7
Bicycle		
Motorbike	5	4.2
Vehicle	82	68.3
No transportation	31	25.8
Products form sells more		
Raw seeds	4	3.3
Fermented locust beans	84	70
Dried locust bean (Dawadawa)	8	6.7
Powdered locust bean	6	5
Non response	18	15
Main marketing challenges		
Price fluctuations	3	2.5
Poor road networks	7	5.8
Limited customer base	14	11.7
High transportation costs	21	17.5
High spoilage rate	56	46.7
No complaints	19	15.8

Source: Field Survey, 2025.

4.2 Discussion

4.2.1 Gross Margin Analayis of raw and processed products of *Parkia biglobosa*

The gross margin analysis shows that the processed product, fermented *Parkia biglobosa* (commonly known as *iru* or *dawadawa*) is significantly more profitable than the raw seeds. For every ₦1 invested, processors earned ₦1.10 in net return compared to ₦0.91 from raw seed sales. Similarly, the profit margin for processed products (52.3%) exceeds that of raw seeds (47.7%).

This result aligns with the general principle of agro-value chain economics, which posits that value addition through processing enhances income, employment, and market competitiveness (Kaplinsky & Morris, 2001; FAO, 2020). In this case, transformation from raw seeds to fermented, packaged, and market-ready *iru* introduces both functional and price value driven by increased utility, convenience, and urban consumer demand (Akinwale *et al*., 2018; Odebode, 2019).

The cost composition highlights the dominant role of labour, transportation, and storage costs in determining profitability. For raw seed traders, transport and labour represent 29.3% and 23.3% of total variable costs, respectively. Among processors, storage (33.6%) and labour (23.9%) were the most significant, followed by energy/fuel (9.7%), market levies (9.7%), and transportation (9.7%).

These findings correspond with those of Odebode and Adetunji (2017) and Yusuf *et al*. (2022), who reported that labour and transport are the largest cost components in *Parkia biglobosa* processing across southwestern Nigeria. Labour intensity arises from the manual procedures of boiling, dehulling, fermenting, and drying, while transportation costs reflect challenges in logistics and market access due to poor rural infrastructure (Oluwatusin & Shittu, 2021).

Although processing incurs higher absolute costs (₦2,736.82 per kg compared to ₦863.85), the much higher total revenue (₦5,740.93) offsets these expenses. Consequently, processing adds ₦2,217.32 more in net profit per kilogram, demonstrating the clear financial advantage of engaging in downstream value addition.

The observed increase in profitability corroborates earlier studies emphasizing that value addition substantially improves returns in the African locust bean chain (Akinyele *et al*., 2016; Afolabi, 2020). Processed products command premium prices in urban markets due to improved shelf life, packaging, and consumer convenience. Similar findings were reported by Jolaoso *et al*. (2019) in Oyo and Ekiti States, where processed *iru* producers earned over 45% higher net margins than seed collectors.

Moreover, this pattern reflects the upgrading mechanism in value chain theory, where actors move from primary production to processing and marketing, thereby capturing greater value (Gereffi, Humphrey, & Sturgeon, 2005). In Benin City, women dominate this upgrading process, transforming raw seeds into processed condiments, often in micro-scale home-based enterprises. Such entrepreneurial transitions contribute to household income diversification and women's empowerment, consistent with findings by Yusuf *et al*. (2022) in Kwara State and Odebode (2019) in Oyo State.

When compared to other non-timber forest products, *Parkia biglobosa* exhibits similar value-chain dynamics. For example, Adetola and Arowolo (2020) found that *Irvingia gabonensis* (bush mango) processors in Ondo State achieved a gross margin of ₦2,850 per kg versus ₦780 for raw fruit traders. Similarly, *Vitellaria paradoxa* (shea butter) processors in Kwara State reported margins nearly three times higher than collectors (Yusuf *et al*., 2022). These parallels reinforce

that value addition is the most effective strategy for improving livelihoods and rural industrialization in NTFP economies (FAO, 2020).

The profitability gap between raw and processed products reveals the importance of strengthening local value addition through policy support, cooperative formation, and technology adoption. Establishing community-level processing clusters, improving access to energy-efficient equipment, and facilitating microcredit for women processors would reduce key cost drivers and raise profitability.

4.2.2 Comparative analysis of raw and processed products per 1kg of *Parkia biglobosa*

Processing *Parkia biglobosa* increases total cost by over 200%, from ₦863.85 for raw seeds to ₦2,736.82 for processed products. However, revenue also rises by about 247%, from ₦1,650.64 to ₦5,740.93. As a result, net returns grow significantly from ₦786.79 to ₦3,004.11, showing that value addition through processing greatly enhances profitability.

Table 5: Comparative analysis of raw and processed products per 1kg of *Parkia biglobosa*

Item	RAW			PROCESSED		
	Quantity	Price/unit[1 KG]	Total cost	Quantity	Price/unit [[1 KG]	Total cost
Variables						

Raw seed purchase	185.48	185.48	185.48	185.48
Transportation		251.85		251.85
Storage (rent)		105.15		869.58
Labour		200.53		617.11
Firewood/Kerosene/Gas				251.77
Packaging materials				160.48
Market levies/tickets		115.84		250.55
TVC		**858.85**		**2586.82**
Fixed Cost				
Processing/storage materials		500.00		1500.00
Depreciation (10%)		5.00		150.00
TFC				
Total Cost (TC)		**863.85**		**2736.82**
Revenue		1650.64		5740.93
TR		**1650.64**		**5740.93**
Gross Margin (GM)		**791.79**		**3154.11**
NR		**786.79**		**3004.11**

Source: Field Survey, 2025.

4.2.3 Constraints in value addition of *Parkia biglobosa*

The major constraints affecting *Parkia biglobosa* value addition are high market levies and taxes (mean = 3.51) and limited awareness of value-added products (mean = 3.41). Inadequate transportation (3.22) and lack of storage facilities (3.20) also significantly hinder profitability and efficiency. Conversely, the high cost of processing equipment (1.29) and insufficient capital (1.71) were rated as less severe challenges.

Table 6: Constraints in value addition of *Parkia biglobosa*

Constraints	Mean	Std. Dev.
Inadequate transportation	3.22	0.99
High cost of processing equipment	1.29	0.46

Inadequate processing facilities	2.16	1.32
Lack of storage facilities	3.20	0.94
Insufficient capital/credit facilities	1.71	0.93
High market levies/taxes	3.51	1.33
Limited awareness of value-added products	3.41	1.16
Unstable prices of products	1.80	0.90
Poor access to ready market	3.11	1.04
High risks in processing and marketing	3.14	1.09

Source: Field Survey, 2025.

Mean ≥ 3.0 = Serious constraints

CHAPTER FIVE

CONCLUSION AND RECOMMENDATION

5.1 Conclusion

The study shows that *Parkia biglobosa* is already a locally important commodity and that downstream value addition primarily processing into fermented iru substantially improves incomes and marketability. Processed products dominate the trade in Benin City, are far more profitable than raw seeds, and attract urban demand. However, value capture is constrained by mainly manual processing methods, weak packaging practices, inadequate storage and transport, and limited market awareness. Key cost drivers are labour and storage, while major bottlenecks reported by respondents include poor road networks, lack of storage, high market levies, and limited awareness of value added product opportunities. In short, processing pays, but scale, standards, and logistics are holding the chain back from delivering consistent higher returns and broader market access.

Given the growing awareness of the nutritional and health benefits of indigenous condiments, particularly the positive impact of *Parkia biglobosa* on eye health, investment in its production and value-added processing presents a highly promising and profitable opportunity. The increasing demand for locally sourced, health-enhancing food products positions *Parkia biglobosa* as both an economically viable enterprise and a means of promoting public wellbeing.

5.2 Recommendation

Based on my findings from the study, the following recommendations were made:

1. More efforts be focused on improving the processing, packaging, and transportation of *Parkia biglobosa* to enhance product quality and market value.

2. Stakeholders such as local entrepreneurs, traders, and processors should be encouraged to adopt modern techniques through skill development programs and access to affordable processing equipment. Providing microcredit and cooperative financing options can help small-scale entrepreneurs expand production and improve profitability.
3. Additionally, greater awareness should be created on the nutritional and health benefits of *Parkia biglobosa*, especially its richness in vitamin A and its role in promoting good eyesight. Entrepreneurs can also increase profitability by investing in attractive branding, hygienic packaging, and value-added products such as powdered *iru* or ready-to-use seasoning blends.
4. Strengthening distribution networks and forming cooperative groups can further reduce transportation costs and improve access to urban markets, ensuring higher income and long-term business sustainability.

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QUESTIONNAIRE

DEPARTMENT OF FOREST RESOURCES AND WILDLIFE MANAGEMENT
FACULTY OF AGRICULTURE, UNIVERSITY OF BENIN, BENIN CITY

QUESTIONNAIRE ON THE VALUE CHAIN ADDITION OF *PARKIA BIGLOBOSA* IN BENIN CITY, EDO STATE, NIGERIA

Good day! My name is OSAGHAEDE ERUNSE PROSPER, a final-year student of Forest Resources And Wildlife Management, University Of Benin, Benin City. This questionnaire is designed to collect information on the processing, packaging, marketing, and economic aspects of *Parkia biglobosa* (Locust beans) in Benin City. Your experience is valuable. All information provided will be treated confidentially and used only for academic purposes.

Section A: Socio-economic Information

1. Age: _____ years
2. Name of local government: Oredo [ ] Egor [ ] Ikpoba-Okha [ ] ovia north east [ ]
3. Market/Area: ……
4. Gender: Male [ ] Female [ ]
5. Level of education: No formal education [ ] Primary [ ] Secondary [ ] Tertiary [ ]
6. Main occupation: _____
7. Years of Experience in processing/marketing *Parkia biglobosa*: _____

Section B: Processing and packaging of *Parkia biglobosa*

8. Which of these *Parkia biglobosa* products do you sell/engage in?
   Raw seeds [ ], Fermented locust bean (*iru/ogiri*) [ ], Powdered locust bean [ ], Dried [ ]
   Others (specify) _____
9. How do you obtain your produce? Own farm [ ], Local market [ ], Forest collection [ ],
   Others (specify) _____
10. What is your most preferred *Parkia biglobosa* product to sell or process? Raw seeds [ ], Fermented [ ], Powdered [ ], Dried [ ]
11. How do you sell your products? Cups [ ] Bowls [ ] Paint bucket [ ] Nylon [ ]Plastic containers [ ] Others (specify) _____
12. Packaging methods: Nylon bags [ ] Plastic containers [ ] Leaf wrapping [ ] Others (specify) _____
13. Which forms of *Parkia biglobosa* do you process? Fermented locust bean (*iru/dawadawa*) [ ] Dried locust bean [ ] Powdered form [ ]
    Others (specify) _____
14. Processing method used: Traditional/manual [ ] Semi-mechanized [ ] Mechanized [ ]
15. How much does it cost to process 1 kg of raw product? (₦) _____
    Note: Leave question 13,14 and 15 blank if you do not process

Section C: Marketing and distribution

16. What is your major market outlet? Local markets [ ] Urban markets [ ] Retail shops [ ] Wholesalers [ ] Others (specify) _____

17. Means of transportation: Head load [ ] Motorbike [ ] Vehicle [ ] Others (specify) _____
18. Which product form sells more? Raw seeds [ ] Processed (fermented/dried or powdered) [ ] Both equally [ ]
19. Main marketing challenges: Price fluctuations [ ] Poor road networks [ ] Limited customer base [ ] High transportation costs [ ] Others (specify) _____
20. Do you label or brand your products? Yes [ ] No [ ]
21. What is the approximate cost of packaging per 1 kg unit? (₦) _____

Section D: Cost And Returns

MARKETING ZONE

Product purchase (Specify the product(s) you deal with) : _____

Price per kg (₦)	Quantity gotten after packaging	Total cost (₦)

	Monthly cost (₦)	Yearly cost (₦)
Market levies/ticket		
Storage(rent)		
Transportation		

Packaging materials **Quantity** **Total cost**

Specify: _____ _____ _____

Storage materials: **Quantity** **Total cost**

Specify: _____ _____ _____

PROCESSING ZONE (NOTE: LEAVE BLANK IF YOU DO NOT PROCESS)

Raw seeds purchase Price per kg Total cost

_____ _____

Processing materials

1. _____ Cost(₦)_____
2. _____ Cost(₦)_____
3. _____ Cost(₦)_____

Total cost of processing (₦)_____

Section D: Economic Returns and Profitability

22. Income from Value Added Product

Value addition product	Quantity recovered (per 1kg)	Unit price(per 1kg)	Quantity sold(per 1kg)	Total income
Raw seeds				

23. Estimated net profit per week from raw products(₦): _____
24. Which processing method adds the most value to your product?
    _____
25. Estimated total revenue per week from processed products(₦): _____
26. Estimated net profit per week(₦): _____
27. Suggestions to improve value addition, packaging, or marketing:
    _____

Note: Leave question 22, 23 and 24 blank if you do not process

Section E: Constraints

Please tick appropriately.

S/N	Constraints	SD	D	N	A	SA
1.	Inadequate transportation	[ ]	[ ]	[ ]	[ ]	[ ]
2.	High cost of processing equipment	[ ]	[ ]	[ ]	[ ]	[ ]
3.	Inadequate processing facilities	[ ]	[ ]	[ ]	[ ]	[ ]
4.	Lack of storage facilities	[ ]	[ ]	[ ]	[ ]	[ ]
5.	Insufficient capital/credit facilities	[ ]	[ ]	[ ]	[ ]	[ ]
6.	High market levies/taxes	[ ]	[ ]	[ ]	[ ]	[ ]
7.	Limited awareness of valued-added products	[ ]	[ ]	[ ]	[ ]	[ ]
8.	Unstable prices of products	[ ]	[ ]	[ ]	[ ]	[ ]
9.	Poor access to ready market	[ ]	[ ]	[ ]	[ ]	[ ]
10.	High risks in processing and marketing	[ ]	[ ]	[ ]	[ ]	[ ]

Others(Specify) _____

FOOTNOTE INSTRUCTIONS: STRONGLY DISAGREE (SD), DISAGREE (D), NEUTRAL (N), AGREE (A), STRONGLY AGREE (SA)