UNIVERSITY OF CAPE COAST

INNOVATION AMONG SMALL-SCALE FIRMS IN SHEA BUTTER PRODUCTION IN THE NORTHERN REGION OF GHANA

KASSIM ALABANI

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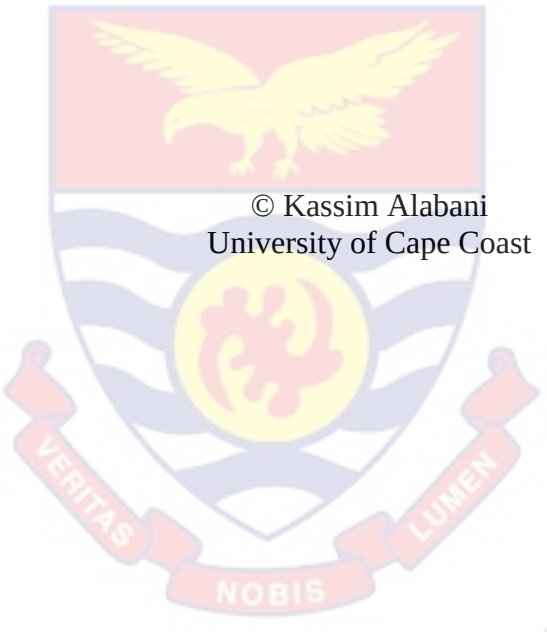

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INNOVATION AMONG SMALL-SCALE FIRMS IN SHEA BUTTER PRODUCTION IN THE NORTHERN REGION OF GHANA

BY

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Thesis submitted to the Department of Economic Studies, School of Economics, College of Humanities and Legal Studies, University of Cape Coast, in partial fulfillment of the requirements for the award of Master of Philosophy degree in Economics

JULY 2022

DECLARATION

Candidate's Declaration

I hereby declare that this thesis is the result of my own original research and that no part of it has been presented for another degree in this university or elsewhere.

Candidate's Signature …… Date……

Name: Kassim Alabani

Supervisors' Declaration

We hereby declare that the preparation and presentation of this thesis were supervised in accordance with the guidelines on supervision of thesis laid down by the University of Cape Coast.

Principal Supervisor's Signature …….. Date ……..

Name: Professor Mark Kojo Armah

Co-Supervisor's Signature ……Date ……..

Name: Dr. Francis Taale

ABSTRACT

This study delves into the innovative practices of shea butter production enterprises in Ghana's Northern Region. Its primary objectives are to investigate the impact of geographic location on innovation capacity, identify obstacles hindering innovation, assess the accessibility of innovation support services, and analyze the factors influencing access to these services. To achieve these aims, a cross-sectional research design was implemented, involving 181 small-scale shea butter producers. The findings reveal a strong correlation between proximity to urban centers and the likelihood of product and process innovation. Significant barriers to innovation include financial limitations, elevated input costs, and market access challenges. While many producers rely on internal support mechanisms, access to external innovation support services remains constrained. The logistic regression analysis revealed that factors such as social networks, access to finance, prior innovation experience, and gender were crucial for accessing ISS. The study concludes that financial limitations and geographic isolation impede innovation capacity among small-scale producers, highlighting the need for targeted interventions to improve financial access, enhance social networking, and foster collaborations among stakeholders.

KEY WORDS

Innovation

Small-scale firms

Shea butter production

Northern Region

Location

Barriers

Innovation support services

Access

Propensity to innovate

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DEDICATION

To my children

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LIST OF ACRONYMS

AIC	Akaike information criterion
ASBI	American Shea Butter Institute
BIC	Bayesian Information Criterion
FFA	Free Fatty Acid
FDI	Foreign Direct Investments
GEPC	Ghana Export Promotion Council
GRATIS	Ghana Regional Appropriate Technology Industrial Services
GLSS	Ghana living standard survey
GoG	Government of Ghana
GIP	Ghana Innovation Policy
GSA	Global Shea Alliance
GEPA	Ghana Export Promotion Authority
HCSB	Handcrafted Shea Butter
IITA	International Institute of Tropical Agriculture
ITTU	Intermediate Technology Transfer Unit
ISS	Several Innovation Support Services
IP	Intellectual Property
IPR	Intellectual Property Rights
MT	Megatonne
MoFA	Ministry of Food and Agriculture
MGL	Mansuki Ghana Limited
MSE	Micro and Small Enterprises
NBSSI	National Board for Small-Scale Industries
OECD	Organisation for Economic Cooperation and Development

PPP	Public-Private Partnership
R&D	Research and Development
SMEs	Small and Medium Enterprises
SWOT	Strengths Weakness Opportunities Threats
TECO	Technology Consultancy Centre
TIS	Technological Innovation Systems
TCP	Tree Crops Policy
UNDP	United Nations Development Programme
USAID	United States Agency for International Development
UNCTAD	United Nations Conference on Trade and Development

CHAPTER ONE

INTRODUCTION

Background Statement

Shea butter production has long been a vital economic activity across Africa, contributing significantly to local livelihoods and economies. Africa's savanna regions yield approximately 1.76 million tons of raw shea nuts annually (Elias & Saussey, 2013). However, only around 600,000 tons are harvested and processed for export, highlighting a substantial gap in the utilization of this resource. The shea tree (Vitellaria paradoxa) serves an imortant role in the livelihoods of communities, especially in West Africa, where its products are traditionally used for cooking oil, skincare, and haircare (Lovett, 2015). Historically, shea butter has been an important trade item, with its significance documented as far back as the fourteenth century (Lovett & Haq, 2000).

In Ghana's Northern Region, shea butter production is primarily a women-led industry, serving as a significant driver of women's economic empowerment (Mohammed, Boateng & Al-hassan, 2013). The small-scale nature of production often leads to a competitive landscape where firms rely on traditional methods to convert shea nuts into butter. However, the efficiency of these traditional processes varies significantly, with oil extraction rates ranging from 35% to 62%, influenced by the skills, tools, and physical strength of the producers (Mensah, 2004; Obeng, Adjaloo & Donkor, 2010). This situation underscores the urgent need for innovation to improve productivity and reduce the labour intensity associated with shea butter extraction.

Innovation within the shea butter sector has the potential to revolutionize production processes, minimize resource consumption (including water and firewood), and significantly elevate product quality. However, the adoption and diffusion of innovative practices among producers are uneven. Several factors, such as the geographical distribution of production facilities, availability of innovation support services, and technological challenges, play a significant role in shaping this situation. Many small-scale producers still depend on labor-intensive, traditional practices that consume considerable resources (Mensah, 2004).

Efforts to introduce small-scale mechanization, such as bridge presses to improve oil yields, have been initiated but are met with slow adoption rates. Producers face numerous challenges in accessing new technologies, including limited financial resources, inadequate training opportunities, and insufficient institutional support (Obibuzor et al., 2013; Obeng et al., 2010). Geographical location also plays a critical role, impacting producers' access to markets, resources, and innovation support services, which leads to disparities in production outcomes.

The Ghanaian government has acknowledged the economic significance of shea butter production, as evidenced by its inclusion in key national development strategies such as the Ghana Poverty Reduction Strategy (2003-2005) and the Food and Agricultural Sector Development Policy (FASDEP II) (2007). These policies focus on improving agricultural productivity, with particular attention to rural areas, where women are often the primary producers. Recent research, including studies by Sikpaam et al. (2019) and Mumin et al. (2023), has highlighted both the opportunities and

challenges in shea butter processing, revealing a complex interaction between local practices and broader economic policies.

Given the increasing demand for shea butter, particularly within the cosmetic and pharmaceutical sectors, it is essential to investigate the factors that facilitate or obstruct innovation among small-scale producers. This study seeks to investigate how producers' geographical locations impact their innovation efforts, identify obstacles to innovation, and evaluate access to innovation support services. Additionally, this work will examine the factors that influence producers' ability to access these services, with the goal of offering practical recommendations to boost innovation adoption and increase productivity within the industry.

Statement of the problem

Even though shea butter has enormous nutritional and economic potential on a local and international level, Ghana's small-scale shea butter producers have yet to reach their full potential. Despite the steady global growth in the shea butter market, many small-scale shea butter producers in Ghana face numerous challenges that hinder their ability to expand and innovate. Consequently, opportunities to fully capitalize on this valuable resource have been missed (Garba, 2015; Issahaku, Sarpong & Al-hassan, 2012).

For many rural households in Ghana's northern areas, nut processing is an essential livelihood activity that provides a major source of income, particularly for women (Elias & Saussey, 2013). However, small businesses' ability to increase production efficiency and product quality is hampered by a lack of current equipment, limited cash, and technological constraints. Rural

poverty and underdevelopment in the area have been made worse by these restrictions, which have prevented small-scale producers from accessing profitable foreign markets (Musah, Ibrahim & Adam, 2016).

The potential for shea butter to drive rural transformation and poverty reduction is well-documented (Abdullahi & Baba, 2020). However, without the ability to innovate, local businesses cannot fully capture the value of shea butter production. For example, According to Anafo (2016) "inadequate logistics and technology result in significant amounts of shea nuts going unprocessed each year, while processed shea butter often fetches lower prices due to poor packaging and lack of quality control". Additionally, the export of raw shea nuts, rather than processed butter, results in a significant loss of value that could have been retained within the local economy (Aikins, 2018).

While existing research on the shea butter industry in Ghana has provided valuable insights into various aspects of production, technology adoption, and the economic viability of shea butter enterprises, significant gaps remain in the understanding of innovation within this sub-sector. Previous studies have focused primarily on traditional versus improved shea butter processing technologies and their economic impacts, without fully exploring the underlying drivers of innovation, particularly among small-scale firms (Abdul-Mumeen, Beauty & Adam, 2019; Elias & Carney, 2007; Issahaku, Al-Hassan, & Sarpong, 2011). Issahaku et al. (2011), for instance, examined the allocative efficiency of traditional and modern shea butter processing techniques, but they did not evaluate how small producers innovate or adjust to shifting consumer needs or technical breakthroughs.

Other studies (Issahaku, Sarpong & Al-hassan, 2012; Mohammed, Boateng & Al-hassan, 2013; Anafo, 2016) have examined the profitability and socio-economic outcomes of improved processing methods for women engaged in shea butter production, these researchers largely overlook how innovation can drive sustainable growth and long-term competitiveness in the global shea butter market. The focus has predominantly been on the technical aspects of processing and production, rather than on the broader innovative practices—such as new product development, improved marketing strategies, or process optimization—that could help small-scale producers overcome barriers to market entry and improve their economic standing.

This study aims to bridge these research gaps by examining the factors influencing innovation among small-scale shea butter producers, with the goal of providing practical recommendations to bolster their productivity and economic contributions.

Objectives of the study

This study primarily aims to investigate the innovative challenges faced by small-scale shea butter producers in Ghana's Northern Region. Specifically, this work is designed to:

1. Examine the effects of shea butter producers' location on innovation.
2. Examine the barriers to innovation activities among shea butter producers.
3. Investigated shea butter producers' access to innovation support services.
4. Analysed the factors influencing access to innovation support services.

Hypotheses of the study

These hypotheses are proposed and tested:

H 0: The location of a shea butter producer has no significant effect on its propensity to innovate.

H 1: The location of a shea butter producer has a significant effect on its propensity to innovate.

H 0: There are no significant barriers to innovation activities among shea butter producers.

H 1: There are significant barriers to innovation activities among shea butter producers.

H 0: There are no significant factors influencing access to innovation support services among shea butter producers.

H 1: There are significant factors influencing access to innovation support services among shea butter producers.

Significance of the study

In a world where agricultural goods are increasingly processed through advanced technologies, the capacity of shea butter processors to innovate has proven vital to their competitiveness and sustainability. Innovation not only influences the efficiency of production processes but also enhances the quality and marketability of the final product. This study has provided empirical data on the innovative activities and capabilities of small-scale shea butter producers, offering insights into how these firms can better position themselves in both local and global markets.

The findings herein are crucial for policymakers and industry stakeholders, as they highlight the primary challenges confronting small

producers and offer actionable recommendations for public policy interventions aimed at fostering innovation in the shea sector. By identifying the drivers of innovation and the constraints to achieving it, the study contributes to the development of strategies that can enhance the productivity and profitability of small-scale firms, thereby promoting economic development in impoverished regions.

Furthermore, this work contributes to the existing knowledge in innovation economics by specifically focusing on small-scale enterprises in developing countries. By focusing on a sector with strong potential for poverty reduction and rural transformation, the study provides valuable insights that can inform broader discussions on innovation in agriculture and small business development in sub-Saharan Africa.

Delimitation

This study is confined to small-scale firms engaged in shea butter production within the Northern Region. It specifically focuses on examining the effects of geographic location on innovation, identifying barriers to innovation activities, investigating access to innovation support services, and analysing factors that influence this access.

This work relies on primary data collected through questionnaires administered to shea butter producers in the region. Logistic regression was employed for data analysis. However, the study does not extend to other regions of Ghana or other forms of agricultural production. It also excludes large-scale or industrial producers.

In addition, the study is confined to the viewpoints and experiences of those actively engaged in shea butter production, excluding input from

potential innovators or entrepreneurs outside the industry. The scope is restricted to the variables outlined in the research, without exploring additional factors that could influence innovation or access to support services beyond those captured in the questionnaire.

Limitations of the Study

Several limitations must be acknowledged in this work. First, the researcher used a cross-sectional design, which involved gathering data at one specific point in time. This approach inherently restricts the ability to draw causal connections between the variables studied. While a longitudinal study would offer a more comprehensive understanding of how innovation develops over time, the cross-sectional design facilitated the efficient gathering of data from a range of producers. As a result, although the findings offer only a snapshot of innovation practices, they still provide important insights into the current state of innovation in the industry.

Another limitation relates to the sample size and the degree to which the findings can be generalized. The study collected data from 181 small-scale shea butter producers, a sample that may not entirely reflect the broader population of producers across the region. Furthermore, the study's focus on the period from 2018 to 2020 may limit the applicability of its results to other timeframes or regions. Despite these limitations, the sample size was adequate to identify significant trends and patterns specific to the Northern Region, offering valuable insights that are relevant to local contexts, even though they may not be applicable to all shea butter producers nationwide.

The use of self-reported data through questionnaires introduced the potential for response bias. Respondents might have given socially desirable

answers or found it challenging to accurately recall their experiences with innovation practices and obstacles. To reduce this risk, the study utilized anonymous surveys, which aimed to encourage honest responses and minimize the influence of social desirability bias. Although some bias may still have been present, this approach improved the overall reliability of the data, leading to a more credible analysis of the factors influencing innovation among the participants.

Furthermore, the study's focus on specific barriers to innovation and access to innovation support services might overlook other influential factors, such as cultural, social, or economic conditions that could impact the innovation landscape for shea butter producers. Nevertheless, this concentrated approach facilitated a detailed examination of the key barriers directly relevant to the producers. The insights gained from this focused analysis provide a foundational understanding of the challenges faced, although future research could explore additional factors to create an effective analysis of the innovation eco-system.

The choice of theoretical frameworks to underpin the research objectives also presents limitations. By not utilizing other available theories, certain perspectives on innovation may remain unexplored. However, the selected frameworks—including Technological Innovation Systems Theory, Schumpeterian Innovation Theory, the Triple Helix Model of Innovation, and Incremental and Radical Innovation Theory—provided a robust basis for addressing the specific research objectives. While alternative theories might offer further insights, the chosen frameworks effectively captured the essence of the study’s goals.

Finally, the findings of the study may be influenced by local socio-economic and political factors that were not explicitly accounted for in the research design. Variations in government policies, market access, and community support systems could significantly affect innovation activities among shea butter producers. Nonetheless, the research incorporated qualitative feedback from respondents regarding their local contexts, which helped contextualize the findings. This qualitative aspect highlighted the importance of these local factors, even if they were not the primary focus of the analysis, suggesting avenues for future exploration in understanding the broader innovation landscape.

Organisation of the study

This study is organized into five chapters. Chapter One introduces the research by outlining the background, problem statement, objectives, hypotheses, significance, and scope, along with an overview of the thesis structure. Chapter Two reviews relevant literature, focusing on the shea butter processing sector in Ghana, innovation theories, and empirical studies, and concludes with the conceptual framework that guides the study. Chapter Three details the research methodology, including a profile of the study area, research design, data sources, sampling techniques, instruments, and ethical considerations. It also discusses data management and the econometric and empirical models used in the study. Chapter Four presents the findings and analysis, reporting on response rates, firm and manager characteristics, turnover from innovation, types of innovation, innovation activities, expenditures, barriers, access to innovation support services, and factors influencing access through logistic regression. Chapter Five concludes the

study, summarizing key findings, offering recommendations, and identifying areas for future research.

Chapter Summary

The beginning chapter highlights the importance of shea butter production as a significant economic activity in Africa, especially in the savanna regions, where it supports local livelihoods. According to USAID (2018) 'Although 1.76 million tons of raw shea nuts are produced annually, only 600,000 tons are harvested and processed for export, signaling a gap in the full utilization of this resource'.

The background explores how innovation is transforming shea butter production by reducing resource use and enhancing quality. However, the adoption of innovative practices among producers remains uneven, influenced by factors such as location, limited access to support services, and technological challenges. Producers often rely on labor-intensive methods, while mechanization efforts exist, they are slow to catch on due to financial limitations and lack of training. Geographical disparities also affect market access, resulting in uneven production outcomes. Despite government recognition of shea butter's economic importance, challenges persist, and additional studies needed to understand innovation drivers.

Global demand for shea butter is rising, but small businesses struggle due to limited access to technology, capital, and modern equipment. These constraints hinder their ability to improve efficiency and product quality, restricting market access and perpetuating rural poverty in the Northern Region. Although shea butter is vital to the economic well-being of many rural

households, especially women, the lack of innovation prevents them from fully realizing its economic potential.

While prior studies have explored traditional and improved processing methods, they often overlook broader innovation practices like product development and marketing strategies. This work intends to fill these gaps by examining factors that influence innovation, barriers and access to support services among small-scale.

The study is designed around four specific objectives. It will explore the effects of location on innovation, identify barriers to innovation, examine access to innovation support services, and analyses factors influencing this access. These objectives aim to provide insights into fostering innovation to enhance the competitiveness and sustainability of small-scale shea butter producers.

The study's significance lies in the role of innovation in enhancing competitiveness and sustainability in agricultural production, particularly shea butter. Innovation can improve production efficiency, quality, and marketability. This research provides empirical data on the innovation activities of small-scale shea butter producers and offers valuable insights for policymakers. It highlights the challenges faced by small producers and offers recommendations for public policies aimed at fostering innovation and promoting economic growth.

In a broader context, this study adds to the field of innovation economics, specifically focusing on small-scale enterprises in developing countries. By examining a sector with significant potential for poverty alleviation and rural transformation, it provides valuable insights into

agricultural innovation and small business development in sub-Saharan Africa. The findings are anticipated to inform policymakers in devising strategies to enhance the productivity and growth of small-scale shea butter producers, thereby advancing economic development in underserved and impoverished regions.

This study focuses on shea butter producers in the Northern Region of Ghana, examining the impact of location on innovation, identifying barriers to innovation, exploring access to support services, and analyzing the factors influencing such access. Using a cross-sectional research design, primary data is collected through questionnaires, with logistic regression applied for data analysis. The study is limited to small-scale producers in the Northern Region, excluding large-scale producers and those in other regions, providing a focused analysis of the selected demographic.

Lastly, the organization of the study is outlined. The first chapter introduces the study, indicating the background information, the statement of the problem, research objectives, hypotheses, and the study's significance. The next chapter reviews relevant literature, including innovation theories, empirical studies, and the conceptual framework. Chapter Three describes the research methodology, including design, data sources, sampling techniques, and variable operationalization. Chapter Four presents' findings and analysis, while Chapter Five concludes by summarizing the key findings and providing recommendations for enhancing innovation among small-scale producers. Areas for future research are also identified.

CHAPTER TWO

LITERATURE REVIEW

Introduction

With an emphasis on addressing the particular goals of the study, this chapter examines the relevant scientific literature on innovation among shea butter producers. It begins by contextualizing the shea butter processing sub-sector within Ghana's economy, emphasizing its role in rural income and employment.

The chapter further explores four key theories that underpin the research: the Triple Helix Model of Innovation, Technological Innovation Systems Theory, Schumpeterian Innovation Theory, and the Incremental and Radical Innovation Theory. In addition, the chapter reviews empirical literature related to innovation practices among shea butter producers, identifying gaps and contextualizing the research within the broader discourse on firm level innovation. The purpose of this synthesis is to lay a strong basis for the study that follows and to proffer some understanding of the elements driving innovation in the shea sector.

Overview of the Shea-butter processing Sub-Sector in Ghana

Shea butter is a fat that is made from the dried kernels of the Vitellaria paradoxa shea tree. “The so-called shea belt, which includes 21 nations, where the shea tree is found. These include Benin, Burkina Faso, Cameroon, Central African Republic, Chad, Ethiopia, Eritrea, Ghana, Guinea-Bissau, Ivory Coast, Mali, Niger, Nigeria, Senegal, Sierra Leone, South Sudan, Sudan, Togo, Uganda, the Democratic Republic of the Congo, Kenya, and Guinea” (Osei, 2011). The three countries that produce the most shea butter are Ghana,

Nigeria, and Uganda (Wardell, Tapsoba, Lovett, Zida, Rousseau, Gautier & Bama, 2021). The Global Shea Alliance (GSA) began a five-year program in 2014 with the goal of raising manufacturing standards for shea butter. Several of these projects were highlighted in the GSA's 2017 annual report.

In the north of Ghana, the majority of low-income households rely on agriculture and allied industries for their primary source of income, similar to other developing nations. Therefore, the agricultural sector continues to be the main source of support for the provision of food and employment (Osei, 2011).

The shea industry today provides 900,000 women with jobs and money (UNDP, 2007). According to UNDP (2007) Shea butter "is mostly utilized in the cosmetics sector to create products for the skin and hair (lip gloss, skin moisturizer creams and emulsions, and hair conditioners for dry and brittle hair)". Additionally, soap makers utilize it, though usually in modest quantities (5-7 percent of the recipe's oils) (Hatskevich, Jenicek, & Darkwah, 2011). The European Union sets the maximum allowable use of shea butter at approximately 28 percent, while some artisan soap makers use it in smaller quantities, typically around 25 percent. It is an effective emollient for individuals with dry skin, helping to alleviate tightness and itching, although there is no evidence to suggest that it serves as a cure (Hatskevich, Jenicek, & Darkwah, 2011; Laube, 2015).

The natural cosmetics production, packaging, trade, and service company Mansuki Ghana Limited (MGL) has created more than 20 lines of "value-added cosmetics" using Shea butter. The items are divided into three categories: "soap, lotion, and hair products". Products made with shea butter

include a variety of skincare and haircare items such as lotion, black shea butter soap (known as Alata samina in some regions), herbal shea butter hair treatment, and nourishing shea butter and coconut shampoo and conditioner. These shea butter products are beneficial for both skin and hair, providing nourishment. Rich in non-saponifiable compounds, essential fatty acids, vitamins E and D, phytosterols, provitamin A, and allantoin, shea butter serves as a powerful skin-nourishing ingredient (Wumpini, 2019). The structure of the shea industry can be seen in Figure 1.

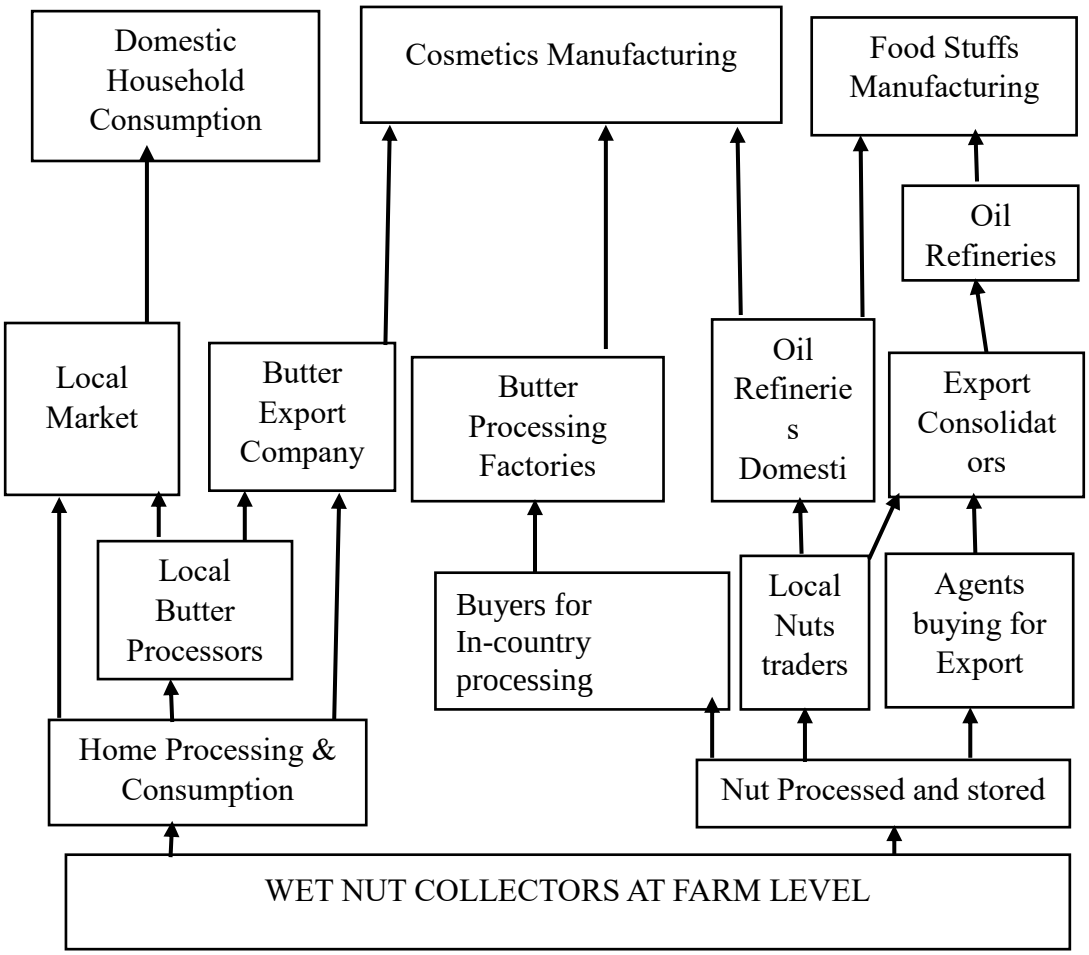

Figure 1: Structure of the shea industry
Source: Adapted from Kent and Bakaweri (2010).

Hatskevich et al. (2011) noted that records of overland exports, records of shea butter export volumes, and records of finished shea product exports

were inconsistently recorded prior to Lovett's (2005) export estimations. However, according to recent reports, shea butter exports climbed by 61.7 percent from 12,561.37 mt (US$19,010,304) in 2009 to 32,782.61 mt (US$24, 764,995) in 2010, which is still a high level annually (GEPA, 2014).

Significance of the Shea Industry

The shea industry plays a pivotal role in the economies of West Africa, with annual exports of handcrafted shea butter (HCSB) ranging from 5,000 to 10,000 metric tons (Lovett, 2015). The primary markets for this commodity include the Middle East, the United States, Europe, and Japan, particularly in the food and cosmetics sectors (Lovett, 2015). HCSB is celebrated for its high unsaponifiable content, low free fatty acid levels, and extended shelf life, making it an attractive ingredient in various products. However, challenges persist, including concerns related to health and safety, low earnings for producers, and inadequate traceability within the supply chain (Lovett, 2015).

For rural communities, the shea tree is more than just a source of income; it is integral to their way of life. Nearly every part of the shea tree is useful, with applications spanning from household uses to industrial purposes and medicinal benefits. The leaves can be used to create silage or serve as components in paint and alkaline production, while the edible pulp is valued for its pleasant taste and health benefits (Hatskevich et al., 2011).

In commercial uses, shea butter is primarily employed by the cosmetic, confectionery, and pharmaceutical industries. Additionally, the sap of the shea tree serves as a valuable raw material for the gum and rubber industries (Dogbevi, 2009).

Domestically, shea butter serves multiple purposes. It is used as an edible oil and in traditional remedies, as well as in hair and body creams. Its healing properties address various ailments such as stretch marks, skin conditions, burns and dryness. The vegetable fat content in shea butter promotes cell renewal and improves circulation. Additionally, it serves as a substitute for margarine and is often used in traditional mud-plastered homes, where byproducts from butter extraction are mixed with mud (Fobil, 2007; Dogbevi, 2009).

Shea butter's high content of vital fatty acids helps heal and protect damaged skin and hair. In addition to other minerals, it contains vitamins A, E, and F, all of which are critical for minimizing wrinkles and other aging symptoms. The butter also revitalizes and hydrates dull or dry skin, particularly during the harmattan season when skin is prone to cracking and drynessTraditional healers use shea butter to create ointments for fractures and dislocations, and it is also applied as a pomade during a baby's first bath to promote soft and smooth skin (Dogbevi, 2009).

The Global Shea Alliance reports that “approximately 90% of processed shea butter is utilized in the food industry”, with the remaining portion directed towards personal care products. Within the personal care sector, shea butter is widely used in applications such as treatments for damaged hair, wrinkle prevention creams, moisturizing lotions, sunburn remedies, stretch mark prevention, dry scalp treatments, and various infant skin care products, among others (Seghieri, 2019).

According to the Centre for the Promotion of Imports from Developing Countries, Netherlands Enterprise Agency (2018), shea butter is commonly

used in moisturizing body butters and creams in the European cosmetics market, valued for its emollient properties that soften and hydrate the skin. Globally, shea butter is traded as oil or nuts, with oil classified under "Harmonized System (HS) code 151590 and nuts under HS code 1207.92. However, there is no recorded trade activity for shea nuts."

Overall, the significance of the shea industry extends beyond economic metrics, impacting livelihoods and health within rural communities, while also contributing to global markets through its diverse applications.

Shea industry in Ghana: SWOT analysis

Ghana's shea butter industry's SWOT analysis reveals that much efforts need to be made to fully tap into the benefits of the sector. Table 1 presents a SWOT analysis of the shea industry as conducted by USAID in 2018.

Table 1: SWOT assessment of the handcrafted Shea industry in Ghana.

Strengths	Weaknesses
• Strong local shea production history • Current connections between local producers and consumers (like SFC) • Interest from group collectors in forming cooperatives • Rising global demand for handcrafted shea products in the US, Europe, and Asia. • GSA-endorsed guidelines ensuring high-quality processing (e.g., low FFA). • Transparent systems attracting impact investors. • Strong R&D support from regional and international networks like the GSA.	• Competing agricultural activities. • Limited processing skills within the local community. • Inadequate post-harvest handling and storage practices that degrade product quality. • Significant input demands on already limited energy and water resources. • High capital investment required for purchasing processing equipment and advanced technologies. • Insufficient infrastructure in rural production areas. • Low production volumes per processor due to an imbalance in the ratio of collectors to processors.

Table 1: Cont'd

Opportunities	Threats
• Growing interest from consumers in buying directly from producers to avoid middlemen • Rising national demand due to the high cost of imported ingredients • Lucrative niche markets for organic and fair-trade goods • Rising environmental awareness in communities, creating business opportunities as groups formalize. • Support for climate-smart agriculture and successful eco-friendly product commercialization in export markets. • Locally available energy-saving and water-recycling technologies • Increased usage of native tree foods in contemporary African cuisine	• Concerns about regional insecurity and pandemics • Food crop cultivation and urban expansion endangering shea tree populations. • Unpredictable production levels resulting from climate variability. • Increased vulnerability to pests and diseases. • Reintroduction of politically driven regulations affecting shea purchases, exports, and resource management. • Limited gender development potential because decision-making historically has been dominated by men • Sustained decline in global demand and value

Source: Adopted from USAID (2018)

Ghanaian SMEs

SMEs are categorized by a number of agencies in Ghana which includes the Ghana Statistical Service (GSS) and the Micro, Small, and Medium Enterprises (MSME) Development Agency (formally called NBSSI), using different criteria (Ackah & Vuvor, 2011). Businesses with fewer than nine (9) employees were classified as micro or tiny in the 1987 GSS industrial census, while those with ten (10) to twenty-nine (29) employees were classed as medium, and those with thirty (30) or more employees as big (Quartey, Turkson, Abor & Iddrisu, 2017).

In a similar vein, the Enterprise Development Agency defines Micro and Small Enterprises (MSE) based on two criteria: the "number of employees and the fixed asset value. Small businesses employ six to 29 people and have fixed assets worth no more than $100,000, excluding land and buildings. Microbusinesses are defined as those that employ no more than five (5) people

and have fixed assets worth no more than $10,000". As a result, companies employing at least twenty-nine (29) employees are categorized as SMEs.

According to empirical research by Aryeetey and Ofori (2011), based on a field survey of 133 businesses, SMEs can be classified into four groups: (i) microenterprises, which "employ fewer than six people"; (ii) very small enterprises, which "employ six to nine people"; (iii) small enterprises, which "employ ten to 29 people"; and (iv) medium-sized companies, which have "between 30 and 140 employees". The two most commonly used criteria for classifying SMEs are the number of employees and the total value of fixed assets.

The majority of developing countries use a definition that is based on fewer employees than advanced countries because of the nature of their industries. Although the exact number of SMEs in Ghana is unknown, Mensah (2004) noted that data from the Registrar General's office suggests that small and medium-sized businesses make up about 90% of registered businesses. Mensah (2004) suggests that this is partly due to the fact that many of these SMEs operate in the unregistered informal sector.

A common characteristic of SMEs in Ghana is their limited participation in both local and international capital markets, which is often cited as a key reason for their inadequate access to financing. This exclusion is largely due to the higher costs associated with financing smaller projects (Ackah & Vuvor, 2011). Additionally, SMEs in Ghana typically focus on serving the local market, with only a small number able to export their products internationally.

SMEs face significant challenges in exporting, primarily due to the high capital investment required and the limited knowledge, training, and awareness among some owners. Many of these SMEs depend on labor-intensive processes and lack access to advanced technology and innovation. Often family-run, these businesses typically have little distinction between the owner's personal finances and the business's financial operations (Ackah & Vuvor, 2011).

According to Mensah (2004), “SMEs in Ghana are predominantly owned by individuals who make all major decisions. These owners often have limited formal education, inadequate understanding of modern technology, and little familiarity with the credit market.” Furthermore, these businesses struggle with poor management skills, insufficient technical expertise, and highly unstable working capital (Mensah, 2004).

In Ghana, SMEs encompass a diverse array of businesses, such as grocery stores, provision shops, barbershops, restaurants, clothing and tailoring shops, furniture and carpentry workshops, and small-scale manufacturers producing items like fruit juices and sachet water (Ackah & Vuvor, 2011; Fatai, 2011). These businesses vary significantly in terms of productivity, entrepreneurial skills, profitability, innovation, capital assets, and growth potential, particularly within the informal sector (Seibel, 2020).

A number of empirical studies have highlighted the crucial role that SMEs play in driving the growth and development of national economies, particularly in developing countries. Ayyagari, Beck, and Demirguc-Kunt (2007) used enterprise-level data from 76 countries and discovered that, “on average, SMEs make up 55% of manufacturing jobs”. According to Ayyagari,

Beck, and Demirguc-Kunt (2007), “SMEs make up 98% of businesses, 50% to 80% of industrial employment, and 50% of manufacturing production in emerging nations”.

Small enterprises usually cover market gaps that are unattractive to large corporations, claims Seibel (2020). Effective industrialisation strategies depend on small enterprises' ability to sustain both domestic and inter-sectoral economic cycles.

The Concept of Innovation

Innovation is defined in various ways in the literature, with Joseph Schumpeter frequently recognized as one of the first economists to highlight its importance. Schumpeter's theory posits that economic development and innovation are interdependent, with the emergence of new and more economically viable combinations serving as a catalyst for growth (Swedberg, 2009). In the latter half of the 20th century, three key theories of technological change—induced innovation, the evolutionary approach, and the path-dependent model—further advanced the understanding of innovation theory.

The evolutionary and path dependency perspectives highlight how past decisions can restrict current innovation, while the induced innovation perspective examines how changes in relative prices shape technological development. Together, these approaches tackle essential concepts integral to contemporary innovation theories. For example, the evolutionary model includes the concept of "bounded rationality," indicating that decision-makers have limited capabilities to collect and analyze information. It also addresses the idea of "uncertainty" across multiple levels, such as technological, resource, competitive, supplier, consumer, and political factors.

This thesis argues that attitudes that typically favor minor, incremental adjustments to current products or processes over major, disruptive ones are caused by both constrained rationality and uncertainty. The route dependent model is based on the rising returns to adoption theory, which holds that an innovation has a higher chance of being accepted further the more users adopt it or the more established an institution is. The approach, which is aided by learning by doing and scale effects, typically leads to minor improvements and cost savings.

Dependence on established pathways can lead to the dominance of certain technologies, institutional resistance to change, and the "lock-in" of existing systems and technologies, ultimately preventing the adoption of potentially more advantageous innovations.

In the latter part of the 20th century, there was a significant shift in theoretical perspectives from the traditional linear model of innovation to a more complex approach that recognizes the interdependence and intricacies of the innovation process. This evolving "systems perspective" has been explored through various related frameworks, all emphasizing the importance of knowledge sharing among stakeholders. Additionally, these frameworks highlight the impact of future technological, market, and policy trends, as well as political and regulatory risks, and the institutional structures that shape both incentives and barriers. A key framework within this perspective is the Technological Innovation Systems (TIS) approach, which stresses the importance of understanding not only the structural components of the system—such as the broader conditions and involved entities—but also the

dynamic interactions and knowledge flows among these entities. Table 2 provides a list of definitions given to innovation by various scholars.

Table 2: Definition of innovation

Scholar	Definition
Joseph Schumpeter (2017)	Launching a new product or enhancing an existing one.
Boer and During (2001)	Implementing a new process within a specific industry.
Cuerva et. al., (2014)	Identifying a new market.
Rogers (1998)	Discovering new sources of raw materials.
Nohria and Gulati (1996)	Making other organizational changes.
Henderson and Lentz (1995)	Implementation of innovative ideas.
Orlay (1993)	Adoption of novel or greatly enhanced components to directly or indirectly increase the organization's value for its clients.
Knox (2002)	Innovation is the process of creating new products, services, solutions, and marketing strategies that provide added value and originality to companies, suppliers, and customers.
Jones-Evans, D., & Westhead, P. (1996).	The ability to identify new connections, view things from different angles, and create novel combinations from existing ideas.

Table 2: Cont'd

Davenport (1993)	Accomplish a task by utilizing an entirely radical approach.
Kenneth Simmonds (1986)	Innovations involve fresh concepts, including new products and services, novel applications of existing products, new markets for current products, or innovative marketing strategies.
Damanpour and Evan (1984)	The concept of broad utility is defined in different ways to address the specific needs and characteristics of a particular study.
Mohr (1969)	The level to which specific new changes are implemented in an organisation.
Howard and Sheth (1969)	Any new element introduced to the customer, regardless of whether it is entirely new to the business.

Source: Adopted from Ahmed and Shepherd (2010)

In their book "Innovation management: context, strategies, systems and processes" Ahmed and Shepherd (2010) identified 6 aspects of innovation. This is presented in Table 3.

Table 3: Aspects of Innovation by Ahmed and Shepherd (2010)

Aspect of innovation	Focus of definition
Creation (invention)	Use of resources (people, time and money) to invent or develop a new product, service, new way of doing things, new way of thinking about things.
Diffusion and learning	On acquiring, supporting or using a product, service or ideas.
Event	Discrete event, such as the development of a single product, service, idea or decision.
Change (incremental or radical)	Enacting of change. Some innovations are minor adjustments whilst other innovations are radical or discontinuous in nature.
Process (firm-level)	Innovation is not a single act, but a series of activities that are carried out by a firm to lead to the production of an outcome (namely, the innovation).
Regional, context and process level.	Act beyond the confines of an individual or firm. Focus on institutional frameworks, socio-political networks, and proximal factor endowments as important factors in the act of innovation.

Source: Adopted from Ahmed and Shepherd, 2010.

Innovation typology

Researchers have identified several types of innovation, with classifications varying based on their focus. Examples include innovations in sociocultural systems, ecosystems, business models, products, services, processes, organizations, and institutional arrangements. Furthermore, classifications can also differ according to the driving forces behind innovation, such as technology, markets, design, and user needs.

Ettlie, Bridges, and O'Keefe (1984) distinguished between administrative and technological innovations in the literature. Dewar and Dutton (1986), along with Popa, Preda, and Boldea (2010), further highlighted the difference between radical and incremental innovation. Technical innovations encompass the products, services, and technologies utilized in production processes. These innovations are closely linked to core business activities and focus on specific services or methods (Damanpour & Evan, 1984; Knight, 1967). Such creativity thrives in environments characterized by high professionalism, minimal formalization, and low centralization.

Organizational structure and administrative procedures are two key examples of administrative innovations. These innovations are more closely related to the management of operations than to the core functions of the organization (Damanpour and Evan, 1984; Knight, 1967). Factors such as low professionalism, high formalization, and high centralization tend to promote administrative innovation. On the other hand, product innovation involves the creation of new goods or services aimed at filling existing market gaps. These innovations benefit customers by providing new products or services that better meet their needs (Knight, 1967; Utterback & Abernathy, 1975). “Process

innovations" are brand-new components added to the various organisational-level processes. At various stages of an organisation's development, different processes and product innovations are used (Knight, 1967, Utterback & Abernathy, 1975).

Markides (1998) states, "The fundamental re-conceptualization of a firm is an example of a radical innovation." Innovation can be categorized into three levels: product innovation, which involves introducing new concepts or technologies; process innovation, which focuses on developing new methods for delivering goods and services; and a combination of both (Tushman & Nadler, 1986). "Incremental innovation" refers to improvements made to existing products, services, and processes (Leonard & Rayport, 1997). In contrast, "architectural innovation" (Henderson & Clark, 1990) entails modifying the overall structure of a product while keeping its individual components unchanged.

Henderson and Clark (1990) challenge the belief that successful product development depends solely on two types of knowledge: understanding the product's components and knowing how these components fit together into a cohesive structure. They emphasize the importance of distinguishing between the product as a complete system and its individual components. Architectural innovation, they argue, involves reconfiguring the existing system by combining these components in new ways to create a unified and functional whole.

Thompson (2004) offers an alternative classification of innovation, distinguishing between creative innovation and adoptive innovation. Creative innovation pertains to an organization's capability to introduce technological

advancements within its own system, often resulting in the development of new products or services. In contrast, adoptive innovation refers to the organization's ability to incorporate external ideas and adapt them to create changes in its management system or the interactions among its components. This adoptive approach typically emphasizes areas such as strategy and management, leading to the formulation of new strategies, corporate identities, or organizational structures.

Theoretical Review

This section presents an examination of the theoretical frameworks that underpin this study. By exploring relevant theories, including the Technological Innovation Systems (TIS) theory, the Triple Helix Model of Innovation, Schumpeterian Innovation Theory, and the Incremental and Radical Innovation Theory, this review aims to contextualize the research objectives and provide a solid foundation for understanding the dynamics of innovation in this sector. Each theory offers unique insights into how innovation occurs, the roles of various actors, and the contextual factors influencing the development and adoption of new practices.

Technological Innovation Systems Theory

Technological Innovation Systems (TIS) theory posits that innovations are not merely the result of individual creativity but emerge from complex interactions among various actors and organizations within a system. This perspective emphasizes that innovation is an ongoing process, shaped by continuous collaborations and exchanges rather than isolated events. The TIS framework is particularly relevant for understanding how small-scale shea butter producers can leverage their geographic location to foster innovation.

The literature surrounding TIS has identified critical processes necessary for the successful development and adoption of new technologies, especially those aimed at sustainability. For small-scale producers in the shea butter industry, shifting toward more resource-efficient and environmentally friendly practices is essential. According to Grin, Rotmans, and Schot (2010), achieving such a transition requires significant changes in current energy and resource utilization patterns. By applying TIS theory, this study can explore how the location of shea butter producers influences their ability to adopt and innovate sustainable practices.

Musiolik, Markard, and Hekkert (2012) highlight the importance of "supporting structures" in establishing legitimacy and stability for new technologies. In the context of producing shea butter, the geographic location of producers can play a pivotal role in creating such structures. Proximity to research institutions, markets, and other stakeholders can enhance collaborative opportunities, allowing producers to access knowledge and resources that facilitate innovation.

Furthermore, entrepreneurs within the shea butter sector often act as catalysts for change, driving the adoption of sustainable technologies and practices. As noted by Hall, Daneke, and Lenox (2010), these entrepreneurial actors can actively contribute to forming a supportive system that promotes innovation. They can initiate research collaborations and drive product development, thereby enhancing the overall sustainability and competitiveness of the industry.

By examining how geographic location affects the innovation capacities of small-scale shea butter producers, this study will utilize TIS

theory to identify the specific contextual factors that either facilitate or hinder innovative activities. This analysis will contribute to a deeper understanding of the role of location in shaping innovation processes within the shea butter sector, offering valuable insights for policymakers and industry stakeholders aiming to support sustainable development in this area.

Schumpeterian Innovation Theory

Schumpeterian Innovation Theory provides a valuable framework for understanding the barriers to innovation activities faced by shea butter producers. Austrian economist Joseph Schumpeter posited that innovation is a fundamental driver of economic change, intertwining market power, entrepreneurship, and innovation itself as key components of this transformation (Emami Langroodi, 2021). He highlighted the influence of market dynamics on capitalist structures, stating the concept of "creative destruction" in his 1942 work, "Capitalism, Socialism, and Democracy." This process, he argued, continuously revolutionizes the economic landscape by dismantling the old while simultaneously establishing the new (De Liso, 2022). The Schumpeterian innovation theory encompasses three essential principles: creative accumulation, creative destruction, and a critique of the notion of competitive market equilibrium, all of which underscore the importance of endogenous innovation and evolutionary change.

Innovations, according to Schumpeterian dynamics, are endogenous catalysts that facilitate significant expansion and success in the modern capitalist economy. By fostering various dynamic shifts, such as new technologies, knowledge, markets, and organizational structures, these innovations challenge traditional economic theories, including the Walrasian

general equilibrium model (De Liso, 2022). Endogenous forces primarily drive these transformations, while exogeneity arises mainly from uncertainties regarding the success or failure of new ventures (Emami Langroodi, 2021).

The core components of Schumpeter's innovation theory involve market dynamics, profit expectations, and long-term growth. He argued that entrepreneurship generates "creative destruction," where new inventions obsolete existing ideas, technologies, and practices. The critical question shifts from how capitalism manages established structures to how it evolves and dismantles them. Schumpeter believed that this creative destruction fosters continuous progress and enhances living standards for all (Ciborowski, 2023).

Challenging conventional wisdom, Schumpeter rejected the idea that perfect competition maximizes economic welfare. He contended that true competition arises from new products, technologies, and organizational forms, which fundamentally disrupt existing enterprises. This competition, he asserted, poses a greater threat than marginal changes at the edges of established firms, striking at their very foundations (Schumpeter & Swedberg, 2021). He argued that imperfect competition, akin to some degree of monopoly, is more beneficial for economic dynamism. Schumpeter illustrated this with the example of the Aluminum Company of America, which significantly increased production and reduced prices while maintaining its monopoly through relentless innovation.

While Schumpeter's views on the relationship between monopolies and innovation remain somewhat ambiguous, he stressed the need for mechanisms that protect innovations, such as patents and trade secrets. He underscored the vital role of the entrepreneur as the innovator and promoter, responsible for

initiating and disseminating technical advancements (Schumpeter, 2010). This entrepreneurial spirit, characterized by a drive to innovate, forms the bedrock of economic growth. Schumpeter encapsulated this ethos with the phrase "innovate or perish," emphasizing that profit serves as a reward for entrepreneurial risk-taking.

Additionally, Schumpeter noted that entrepreneurs do not constitute a fixed social class like property owners or laborers; rather, entrepreneurship is a dynamic role that can lead to varying social positions over time (Schumpeter, 2010). Unlike the Marxian capitalist, who accumulates wealth for its own sake, the Schumpeterian innovator focuses on innovation as a means to economic advancement. Ultimately, Schumpeter defined innovation as "the introduction of anything new—a new idea, method, or device," encapsulating the essence of entrepreneurship and its pivotal role in economic development. This theory underscores that barriers to innovation can stem from various sources, including market dynamics and resource constraints that limit the ability of small-scale producers to adopt new technologies and practices.

The Triple Helix Theory of Innovation

The Triple Helix model of innovation, proposed by Etzkowitz and De Mello (2004), represents a dynamic framework for understanding the interactions between government, industry, and academia in driving economic development and innovation. This model emerged in the 1960s, with Etzkowitz emphasizing the need for a balanced relationship among these three entities to facilitate successful economic progress. The concept of a "triangle" was initially introduced to analyze the complex relationships that govern innovation processes, indicating that effective collaboration among

government, academia, and industry is essential for fostering innovation and sustainable economic growth.

Etzkowitz and De Mello (2004) further developed this idea by examining how these triangular relationships operate in different contexts, particularly in Latin America. They highlighted that a lack of dynamic interactions among these vertices could hinder economic development. Sábato's analysis revealed that the absence of such "triangles" in Latin American countries impeded the effective exchange of research and technology, necessary for societal progress. He posited those productive interactions between the three vertices—government (G), the productive structure (E), and the science-technology infrastructure (I)—were vital for innovation (Etzkowitz & De Mello, 2004).

The Triple Helix model advocates for a continuous process of interaction among its three components. This model is described as a "spiral model of innovation," capturing the reciprocal linkages that occur at various stages of knowledge capitalization (Etzkowitz & Leydesdorff, 1997). According to this framework, the co-evolution of technologies and institutions is paramount, allowing for a system in which government policies can significantly influence the innovation capacities of industry and academia. This relationship can lead to mutual reinforcement, enhancing the overall effectiveness of the innovation ecosystem (Dosi & Nelson, 1994).

Leydesdorff (2012) elaborated on the empirical aspects of the Triple Helix model, framing it as a practical approach to learning and problem-solving. This perspective encourages the three actors—government, industry, and academia—to recognize and address problems collaboratively, sharing

experiences and knowledge in the process. The model does not restrict itself to the interaction of all three entities; it allows for focused studies on specific relationships, such as those between academia and industry (Leydesdorff, 2012).

Despite its strengths, the Triple Helix model has faced criticism over the years. Scholars such as Shinn (2002) have pointed out its theoretical ambiguities, questioning whether it can be accurately characterized as a well-defined analytical framework or merely an evocative metaphor. Others, like Saad (2004), have expressed skepticism regarding the contribution of institutions within the Triple Helix system to the development of national and regional innovation systems. Critics argue that while the model emphasizes trilateral relationships, it may overlook the distinct roles and dynamics that each actor plays in the innovation process.

Nevertheless, Etzkowitz and Dzisah (2008) acknowledged the complexity of the Triple Helix model, emphasizing that institutions can maintain their unique characteristics while also engaging with one another in collaborative roles. This hybrid nature allows universities to adopt entrepreneurial functions, fostering skills that enhance their capacity to interact effectively within the Triple Helix framework. However, the model's dynamic nature poses challenges, as high levels of commitment, knowledge, and trust among the three spheres are necessary for successful collaboration (Saad, 2004). Critics also warn that an overemphasis on business interests may compromise the universities' critical role in societal development (Saad, 2004).

The Triple Helix model of innovation presents a comprehensive framework for understanding the interconnected roles of government, industry, and academia in fostering innovation. By examining the dynamic interactions among these actors, the model offers valuable insights into the mechanisms that drive economic growth and innovation. Despite facing criticism, the Triple Helix model remains a vital tool for analyzing innovation ecosystems and understanding how collaborative relationships can lead to sustainable development in various sectors, including those such as shea butter production.

In the context of the shea butter industry, the government's role is crucial in establishing policies and providing resources that facilitate access to innovation support services. Effective governance can create an enabling environment for collaboration among producers, research institutions, and industry players. If barriers exist within these government policies—such as inadequate funding or lack of strategic support—producers may struggle to access the resources necessary for innovation. By utilizing the Triple Helix model, researchers can explore how government actions influence the availability and effectiveness of innovation support services.

Incremental and Radical Innovation Theory

The Incremental and Radical Innovation Theory posits that innovations can be categorized into two distinct types: incremental and radical. While numerous authors have discussed this theory under various terminologies, its core principles remain consistent across disciplines (Kaur, Naqshbandi & Jayasingam, 2014). Incremental innovation refers to gradual improvements made within an existing framework of processes, products, or services. In

contrast, radical innovation signifies a profound transformation, representing a shift in perspective and often characterized as "doing what we did not do before." The fundamental distinction lies in whether the innovation is perceived as a continuous modification of established methods or as a novel, groundbreaking change.

Dahlin and Behrens (2005) delineate three criteria for determining whether an innovation is radical: First, the innovation must be new, differing significantly from prior inventions. Second, it must be original, showcasing distinct characteristics that set it apart from recent innovations. Finally, the innovation must be utilized in a way that influences future developments. The first two criteria define the radical nature of the innovation, while the third criterion relates to its success and societal acceptance. Importantly, the timing of an innovation's introduction is crucial; a concept may be well-conceived but fail if societal, market, and cultural forces are not aligned appropriately. Historical examples, such as Apple's early 1990s launches of the QuickTake digital camera and the Newton personal digital assistant, illustrate this principle, as both met the first two criteria yet failed to achieve lasting impact due to timing issues.

Radical innovation is often described using terms like disruptive, competence-destroying, or breakthrough, emphasizing its capacity to fundamentally alter industries or markets. Despite the allure of radical innovation for its potential to create significant differentiation, successful implementations remain relatively rare, and many attempts ultimately fall short (Apple, 2018). The focus on radical innovation has been a prevalent

theme in innovation studies, particularly in design and management fields, where it is frequently associated with concepts such as "design thinking."

Understanding the factors influencing access to innovation support services requires a nuanced application of this theory. By examining how small-scale shea butter producers can navigate the landscape of incremental versus radical innovations, the study can identify barriers and enablers that affect their ability to access necessary support services. For instance, producers may find that incremental innovations, which align more closely with existing practices, are easier to adopt due to established networks and support mechanisms. Conversely, radical innovations may face significant challenges in access to resources, expertise, and institutional support, particularly if the surrounding environment is not conducive to disruptive change.

The Incremental and Radical Innovation Theory provides a valuable framework for analyzing how small-scale shea butter producers interact with innovation support services. By distinguishing between incremental and radical innovations, the study can explore the contextual factors that influence producers' ability to access and leverage these services effectively, ultimately informing strategies for enhancing innovation capacity within the sector.

Empirical Review

The empirical review section of this study aims to synthesize existing literature relevant to the specific objectives outlined for examining innovation among shea butter producers. Each objective addresses a critical aspect of innovation dynamics within the shea butter sector, highlighting the complex interplay between geographic factors, barriers to innovation, access to support

services, and the influencing factors that shape these interactions. By systematically reviewing empirical studies, this section seeks to identify key findings, methodologies, and theoretical frameworks that inform our understanding of innovation in this context.

The Effects of Shea Butter Producers' Location on Innovation

The location of shea butter producers significantly influences their ability to innovate. Adekambi et al. (2018) conducted a study titled Integrating Bottom-of-the-Pyramid Producers with High-Income Markets, focusing on female shea nut processors in Benin. The research examined the impact of institutional arrangements, such as payment systems and marketing support, on producers' sales to high-income markets. The study revealed that the location of producers, particularly those in remote areas, significantly influenced the effectiveness of these institutional arrangements. Producers located far from markets faced more challenges in accessing these innovations. One of the strengths of this study was its detailed empirical approach, which considered multiple variables affecting market integration. However, its focus on high-income market integration somewhat limited its broader applicability to local innovation dynamics. The study contributed to understanding how institutional support can mitigate location-based barriers to innovation.

Okolo and Osifo (2017) explored the Sources of Information and Finance for Women Shea Butter Producers in North Central Nigeria. Their research focused on how geographic isolation affected access to essential resources like finance and information, both of which are critical for fostering innovation. The study employed survey methods across rural areas to

understand these challenges. The findings highlighted those women in remote locations had limited access to these resources, which stunted their ability to innovate. This study's strength lies in its emphasis on resource access, an often-overlooked factor in the innovation process. However, it did not delve into the systemic drivers behind these barriers, leaving a gap in understanding the structural issues that exacerbate these challenges for rural producers.

In a study by Dagnogo et al. (2021) titled Socio-Economic Impact of Shea Butter Production in Northern Côte d'Ivoire, the researchers surveyed 1,200 producers to examine the economic and social effects of shea butter production, with a particular focus on how location influenced these outcomes. The study found that location had a profound impact on not just the economic success of producers but also their ability to innovate, especially in terms of organizational practices. While the research offered valuable insights into the socio-economic effects of shea butter production, it was limited in its exploration of technological innovation. The large sample size and regional focus were among the study's key strengths, offering robust conclusions about the influence of geographic location on production practices.

Kolawole and Usifo (2023) investigated the Physico-Chemical Characterization of Shea Butter from Western Nigeria, examining how the location of shea butter producers affected the quality of the product. Their findings showed that geographic location played a crucial role in determining the chemical quality of shea butter, which in turn impacted marketability and product development. While this study provided a technical evaluation of shea butter quality, it did not deeply engage with how producers could innovate based on these findings. Nevertheless, the study’s focus on location-driven

differences in product quality highlighted the need for innovation in both product development and market strategies to accommodate regional variations.

Another study is by Olusesi et al. (2022) focused on the marketing structures of shea butter in three different markets and explored how location affected the marketing practices and innovation among producers. The study employed a survey of 100 producers and marketers, revealing significant differences in marketing strategies across locations. Producers closer to urban centers had greater access to marketing opportunities, while those in remote areas faced significant challenges. This geographic disparity in market access underscores the importance of location in driving or hindering innovation. While the study effectively captured the relationship between location and market-driven innovation, it did not consider technological advancements that could improve production.

Based on geography (city size) and industry type, Pierre Therrien (2005) analyzes innovation performance and strategy using data from the Canadian Innovation Survey. Therrien concludes that while city size has no bearing on the anticipated likelihood of a firm releasing a novel product or method, it has an impact on the firm's innovation strategy. One key finding is that companies with headquarters in smaller locations are less likely than those with headquarters in major cities to be connected to a world-first breakthrough.

Innovation varies depending on a company's nature and societal return. The effect within innovative enterprises varies, as do the externalities of the place, therefore neither innovation nor the fraction of innovators can be

assessed (Tether, 2002). The socioeconomic climate of a place has a significant influence on the innovativeness of the businesses operating there (Kumar, 2014). Additionally, (Xu, Yang, Xin, Zhou & Zhu, 2019) examined a sample of Chinese listed companies between 2003 and 2015 and discovered that firm locations are strongly and favorably related to firm innovation.

The studies reviewed align with the Technological Innovation Systems (TIS) Theory, which focuses on the development, diffusion, and use of technologies within specific socio-technical systems. According to TIS, geographic factors such as location can significantly influence the performance of these systems by affecting access to resources, markets, and networks that support innovation. This is particularly evident in the studies on shea butter producers, where those in remote areas face substantial barriers in accessing the technological, financial, and informational resources necessary for innovation.

Despite the rich insights provided by the existing literature, several gaps remain. One notable gap is the limited focus on innovation. Most studies concentrate on management and operational efficiencies, but there is insufficient exploration of how producers can innovate to enhance production efficiency. Addressing these gaps will provide a more comprehensive understanding of how location influences innovation in the shea butter sector and offer practical recommendations for supporting small-scale producers in their innovation efforts.

Barriers to Innovation Activities Among Shea Butter Producers

Shea butter production plays a vital role in supporting the livelihoods of women and small-scale producers. However, despite its economic potential,

numerous barriers inhibit innovation in this sector, limiting opportunities for growth and competitiveness. Corchuelo Martínez-Azúa and Sama-Berrocal (2022) conducted a study titled Objectives of and Barriers to Innovation: How Do They Influence the Decision to Innovate? The research surveyed agribusinesses in Extremadura, Spain, to analyze how different objectives and barriers affect innovation activities. Using data from an ad hoc questionnaire targeting agri-food companies, the study found that uncertainty and lack of knowledge were significant barriers, reducing companies' willingness to innovate. In contrast, strategies focused on reducing costs and expanding markets fostered greater innovation and competitiveness. While this study provides valuable insights into how barriers influence innovation, it is primarily focused on Spain, limiting its applicability to shea butter producers in Ghana.

The 1980s saw the beginning of the academic interest in innovation barriers as several management researchers considered various organizational techniques a company could implement to speed up innovation, particularly product innovation. According to Millman (1982) the lack of product innovation in the UK industry was caused by misalignments and poor communication between the R&D and marketing divisions. As a result, the novel product would be more equipped to satisfy the market's constantly shifting needs. Farrands, Talalay & Tooze (2005) asserted that intra-firm "dislocations" had a negative impact on innovation. Similar to Millman (1982), he focused on functional misalignments. In a similar spirit, Myers (1984) asserted that the biggest impediment to innovation was the scarcity of funding for extremely hazardous undertakings.

Studies highlight a range of external, organizational, and attitudinal factors (Hueske & Guenther, 2015), as well as cost, knowledge, market, and institutional barriers, both internal and external (Oslo Manual, 2nd edition, OECD, 1997). Additionally, economic, entrepreneurial, and other factors are identified as key barriers (Bogotá Manual, Jaramillo, Lugones, & Salazar, 2001), underscoring the multifaceted nature of innovation challenges at the firm level (OECD, 2005).

Okolo and Osifo (2017) explored the Sources of Information and Finance for Women Shea Butter Producers in North Central Nigeria. Their findings revealed that producers in remote areas faced significant challenges in securing financial resources and obtaining the necessary information to drive their operations. The strength of this research lies in its focus on the critical role that access to finance and information plays in the management of small businesses. However, the study falls short in addressing how these challenges could affect the innovative capacity of businesses, leaving room for future research on this aspect.

The theoretical framework that best explains the barriers to innovation in the shea butter industry is Schumpeterian Innovation Theory. This theory emphasizes the role of entrepreneurship, creative destruction, and economic cycles in driving innovation. According to Schumpeter, innovation emerges from the activities of entrepreneurs who introduce new products, processes, or methods, thereby disrupting existing market structures. In the context of shea butter production, Schumpeterian Innovation Theory explains how barriers such as geographic isolation, lack of financial resources, and limited access to markets hinder the entrepreneurial efforts necessary to drive innovation.

Barriers to innovation have been reclassified into three categories: cost barriers, knowledge obstacles, and market barriers in order to be more consistent with other research and to streamline the process of data collecting and analysis. Cost constraints are what cause a company to struggle to finance its innovative projects. Access to knowledge about technology and skilled labor is restricted. Finally, market barriers illustrate how demand-driven pull technology is formed from the market structure (Coad, Segarra-Blasco, & Teruel, 2021).Table 4 contains the detailed classifications of barriers to innovation.

Table 4: Classifications of barriers to innovation

	Class of barrier	Specification
1.	Cost barriers	i. Insufficient internal funding ii. The absence of outside funding iii. Expensive innovations iv. Exorbitant production costs
2.	Market barriers	i. Market dominated by giants ii. Unpredictable demand iii. Barriers to accessing new markets
3.	Knowledge barriers	i. A lack of individuals who are qualified ii. The absence of modern technology iii. Barriers to finding business partners

Source: Adapted from Coad, Segarra-Blasco, & Teruel (2021)

Despite the valuable insights offered by the existing literature, several gaps remain. One significant gap is the lack of research on how innovation can help overcome the barriers faced by shea butter producers. While most studies focus on market-driven activities of shea butter producers, few explore how emerging innovations could address issues such as product quality or access to markets.

Shea Butter Producers' Access to Innovation Support Services

Access to innovation support services is crucial for enhancing productivity and market opportunities, particularly for shea butter producers.

Daniso et al. (2020) conducted a study titled "Assessment of Rural Households' Mobile Phone Usage Status for Rural Innovation Services in Gomma Woreda, Southwest Ethiopia". The research involved structured interviews, focus group discussions, and key informant interviews with 188 rural households to assess their mobile phone usage for accessing various innovation services. The study found that most households primarily used mobile phones for marketing services, while fewer utilized them for agricultural extension or financial services. Additionally, educated farmers made more effective use of mobile technology for innovation compared to their less educated counterparts. The strength of Daniso et al. (2020) study lies in its detailed analysis of how education impacts access to innovation services, but its focus on mobile phone usage limits the discussion of other innovation support mechanisms that are equally crucial for shea butter producers.

Adekambi et al. (2018), in their study titled "Integrating Bottom-of-the-Pyramid Producers with High-Income Markets: Designing Institutional Arrangements for West African Shea Nut Butter Producers", explored the effects of various institutional arrangements on shea butter producers in Benin. The research tested how payment on delivery, third-party control, and marketing competence affected the integration of female shea nut processors into high-income markets. The study found that institutional support, such as microcredits and information provision, was essential for integrating these producers into broader markets. However, geographic remoteness significantly diminished the effectiveness of these supports. The study's strength lies in identifying critical institutional interventions necessary for market access,

though it does not sufficiently address how such arrangements could support innovation among rural producers.

Dagnogo et al. (2021) examined the socio-economic impacts of shea butter production in northern Côte d'Ivoire. The study involved a survey of 1,200 producers and revealed that access to innovation support services, such as market and financial services, was largely determined by geographic location. Producers in remote areas had significantly less access to these services compared to those in more central locations. While the large sample size provides a comprehensive understanding of socio-economic factors influencing innovation, the study does not explore the role of technological or institutional support in sufficient detail.

Lastly, Olusesi et al. (2022) conducted a study titled Assessment of Shea Butter Marketing in Three Major Markets in Abeokuta, Nigeria, focusing on the marketing strategies of shea butter producers in three markets. The study involved 100 respondents and found that producers in urbanized regions had better access to innovation services, including marketing and financial support, while those in rural areas were significantly disadvantaged. This study highlights the geographic disparities in accessing innovation support services and their impact on market participation. However, it does not delve into other essential innovation supports such as technological assistance or institutional services.

The theoretical framework that best explains the barriers to accessing innovation support services among shea butter producers is The Triple Helix Theory of Innovation. This theory emphasizes the interaction between three key actors—universities, industry, and government—in fostering innovation.

According to the Triple Helix model, innovation occurs when universities generate knowledge, industries apply that knowledge to create products or services, and governments provide the policy frameworks and resources to support this process. In the context of shea butter production, this model helps explain how a lack of coordination between these three actors can hinder access to critical innovation support services, such as financial backing, technological development, and market access.

In the literature, service providers are referred to by a variety of names, including advisory services, extension organizations, brokers, bridge organizations, intermediates, and boundary organizations. These, however, do not adequately represent the variety of innovation support sources. The public or private character of these service providers may account for their variance.

Public organizations will need to focus more on policy analysis, quality control, and regulation as commercial innovation support providers proliferate. Nevertheless, colleges play a wide range of functions in systems that foster innovation. NGOs have become significant players as a result of the private sector's greater human and financial resources as well as more democratic political systems. NGOs either act as "service providers," providing clients with direct assistance, or "institution builders" (Alex, 2010).

Albert and Laberge (2007) lists a wide variety of institutions and organizations that offer services. He distinguishes them based on their position, purpose, reach, and intensity of intervention. He suggests the classifications below:

- Governmental organisations and institutions: departments, agencies, and ministries

- Parastatal organisations: these are a variety of businesses that offer both public and private services.
- Private businesses: profit-driven organisations, businesses, and firms that are focused on the market and fiercely competitive
- Civil society organisations, such as non-governmental organisations (NGOs) and neighborhood-based groups (CBOs).
- Informal service providers are mainly individuals who offer extremely small-scale services (such as local governments and neighbors). The provision of services is typically not these providers' primary function but rather more or less a byproduct.
- Donor organizations: There are many different kinds of donor organisations.

An important contribution was made by Allebone-Webb, Douthwaite, Hoffecker, Mathé & Triomphe (2016) by creating a general Innovation Support Service (ISS) typology. They accomplished this by compiling prior theories regarding what constitutes an ISS. Information on the typology of innovation support services may be found in Table 5.

Table 5: Innovation Support Service Typology

ISS types	Meaning
1. Transfer of knowledge and technology	Provision of knowledge and technologies for innovation. For instance, providing technical or scientific knowledge to businesspeople. Information transmission (website, leaflets), instruction, or demonstration are the main methods used to impart knowledge.
2. Consultancy and advice	Technical, legal, economic, environmental, social, and other types of advice are given during the innovation process based on company demands and the development of solutions.
3. Marketing and articulating demand	These services are connected to the assistance provided for more effective target audiences. There are many techniques that can be applied, including vision development, diagnostic, foresight, and improving the outlook of products. The service provider could assist stakeholders in comprehending and responding to market expectations.
4. Facilitation and brokerage of networking	The provision of services to support network organization or strengthening, to enhance ties between important actors, and to align services so that they can complement one another (the right service at the right time and place). All initiatives aiming at enhancing group and collective action are also included.
5. Increasing capacity	The provision of services designed to increase the capabilities of innovation players so that they are fully prepared to play their roles in the innovation process. It consists of both organizational and individual capacity building, such as strengthening leadership. The services are centered on the delivery of traditional training as well as process-based experiential learning. The supply of services in relation to the challenges business owners frequently face in defining their production goals, recognizing their needs, and clearly articulating their expectations to R&D suppliers is another component. Trainers, consultants, and facilitators employ a variety of techniques to identify their challenging situations, weigh potential remedies, and express their need for the provision of more focused services.
6. Access to resources	Tangible services that help the process are provided. Inputs (such as seeds and fertilizer), facilities and tools (such as technological platforms and labs), and money are examples of this (credit, subsidies etc.)
7. Institutional support for scaling mechanisms and niche innovation	Providing institutional support for out- and up-scaling the innovation process as well as for niche innovation (incubators, experimental infrastructures, etc.). Support for standards or funding mechanisms that make it easier for additional players to get involved in the innovation process or spread innovation is referred to here.

Source: Adopted from Allebone-Webb, Douthwaite, Hoffecker, Mathé & Triomphe (2016)

The European Union (EU) Community Innovation Survey categorizes innovation support services into standardized groups. These categories include:

i. Internal support within your enterprise or enterprise group

ii. Suppliers of equipment, materials, components, or software

iii. Private sector clients or customers

iv. Public sector clients or customers

v. Competitors or other enterprises in the same industry

vi. Consultants and commercial laboratories

vii. Universities or higher education institutions

viii. Government entities, public or private research institutes

ix. Conferences, trade fairs, and exhibitions

x. Scientific journals and trade or technical publications

xi. Professional and industry associations (OECD, 2005).

A company innovates by combining new types of information, which are not entirely novel in and of themselves. When a company decides to conduct R&D projects in order to create new knowledge, it must fork over cash, invest in sunk costs, and take on a lot of risk. The majority of the time, only large businesses produce new information through their research and development initiatives, but as Anthony, Johnson, Sinfield, and Altman (2008) noted, there are other ways to amass knowledge, including through practice, experience, and research.

Small businesses put new knowledge to use through practice, experience, and learning by doing. Existing knowledge is airborne and creates externalities that help regional businesses. This gives small businesses that

cannot invest in R&D the chance to obtain the knowledge they need to innovate (Coad, Segarra-Blasco, & Teruel, 2021).

Ghana has implemented a notable initiative to promote innovation and entrepreneurship. The government introduced the National Entrepreneurship and Innovation Programme (NEIP) as a flagship policy measure. This program aims to create a robust nationwide support system for startups and small businesses. NEIP focuses on providing essential services such as business development, startup incubation, and financial support to help emerging enterprises grow and thrive.

The National Entrepreneurship and Innovation Programme (NEIP) aligns with Ghana's long-term strategic vision of sustaining its middle-income status and fostering an industry-driven economy for sustainable development. Through the NEIP Business Support Program, approximately 45,000 businesses have received training and incubation support, distributed across three phases: 7,000 in Window 1, 12,000 in Window 2, and 26,000 in Window 3. The program has focused on key areas, including:

- Business Management
- Financial Management and Basic Bookkeeping
- Sales, Marketing, and Branding
- Business Plan Development
- Organizational Management
- Corporate Governance, among others (Government of Ghana-NEIP, 2020).

Despite the insights provided by the literature, there are notable gaps that require further research. One key gap is the limited exploration of how innovations, such as improved shea butter processing techniques, can enhance productivity and marketability. A synthesis of the findings across various studies reveals that geographic location plays a significant role in determining access to innovation support services for shea butter producers. Producers in urban or semi-urban areas are more likely to benefit from marketing, financial, and technical support, allowing them to innovate more effectively. In contrast, rural producers face significant barriers, including limited access to technology and institutional support. However, institutional interventions, such as microcredit schemes and information dissemination, can help mitigate some of these challenges, though their effectiveness is often reduced in remote regions.

Factors Influencing Access to Innovation Support Services Among Shea Butter Producers

Access to innovation support services is essential for the growth and competitiveness of shea butter producers, especially those in rural areas. A study by Olusesi et al. (2022) titled "Assessment of Shea Butter Marketing in Three Major Markets in Abeokuta" surveyed 100 respondents across three markets in Abeokuta, Nigeria, employing both close-ended and open-ended questions. The findings revealed that geographic location significantly impacts access to innovation support services, with producers in urban areas having better access to market and financial support compared to their rural counterparts. While the study effectively explores how marketing structures

vary by location, it does not investigate other forms of innovation support, such as technological or institutional aid, in depth.

A study by Dagnogo et al. (2021) highlights the role of geographic location in influencing access to innovation support services. Producers in remote areas do experience limited access to financial and market services. This study employed a large sample size and detailed socio-economic analysis offering valuable insights into the challenges faced by rural producers. However, the research does not adequately address how institutional support could help overcome these geographic barriers, leaving room for further investigation.

In their study titled “Producers in High-Income Markets”, Adekambi et al. (2018) tested various institutional arrangements to integrate female shea butter producers into high-income markets. The study found that institutional arrangements such as microcredits and marketing competence were crucial in helping geographically remote producers overcome barriers to innovation and market access. This research is particularly valuable for its insights into how institutional support can mitigate financial and geographic constraints. However, the study does not provide much detail on how innovation could further assist producers in overcoming these barriers.

The reviewed studies align with the Incremental and Radical Innovation Theory, emphasizing the importance of both gradual improvements and breakthrough innovations in advancing the industry. Although the existing literature offers valuable insights into the barriers to accessing innovation support services, several gaps remain. First, there is insufficient research on how technological innovations can assist producers in overcoming geographic

and financial challenges. Second, additional studies are required to evaluate the long-term effects of institutional support programs, such as microcredit schemes and training, on the innovation capabilities of shea butter producers.

Finally, there is limited focus on factors that influence a producer's access to innovation support services. A synthesis of the findings reveals that geographic location, financial constraints, and a lack of institutional support are the primary factors influencing access to innovation support services for shea butter producers. Producers in urban or semi-urban areas benefit from better access to these services, while rural producers face significant barriers. Institutional interventions, such as microcredits and training programs, can help bridge these gaps, but their effectiveness is often hindered by the remoteness of producers.

Conceptual framework

The conceptual framework outlined in this study provides a solid foundation for examining innovation among small-scale shea butter producers in the Northern Region of Ghana. It clearly identifies the key components and relationships that influence innovation in this context, enhancing our understanding of the underlying dynamics.

At the outset, the framework emphasizes Access to Innovation Support Services. This component is critical, as it highlights the availability and accessibility of essential resources that can catalyze innovation. Services such as Knowledge Transfer, Advisory Services, Marketing Support, Networking, Capacity Building, Resource Access, and Institutional Support are vital for small-scale firms aiming to enhance their innovative capabilities. By foregrounding these resources, the framework underscores the significance of

support systems in creating an enabling environment for innovation to flourish.

The framework further classifies Types of Innovation into four categories: Product Innovation, Process Innovation, Marketing Innovation, and Organizational Innovation. This categorization allows for a nuanced analysis of the diverse ways in which shea butter producers engage in innovative practices. By recognizing the multifaceted nature of innovation, the framework provides a structured lens through which to assess how these producers can implement changes that improve their competitiveness and operational efficiency.

Central to the framework is the focus on Innovation in Shea Butter Production, which situates the research within the specific context of the shea butter industry. This emphasis ensures that the investigation aligns with the unique characteristics and challenges faced by producers in this sector. By contextualizing innovation in this manner, the framework highlights the importance of addressing industry-specific factors that influence innovative activities.

The framework also identifies Barriers to Innovation, which encompass Adoption Barriers, Mindset Barriers, and Risk Barriers. These obstacles can impede the adoption and implementation of innovative practices among small-scale firms. Understanding these barriers is crucial for developing targeted strategies to mitigate their effects, thereby fostering a more conducive environment for innovation.

Additionally, the framework acknowledges the impact of Effects of Location on innovation. This section discusses how Regional Resources and Market

Access can significantly shape a firm's capacity to innovate and thrive. Recognizing the role of geographical context emphasizes the necessity of considering external factors that can either facilitate or hinder innovative efforts among shea butter producers. A diagramme illustrating this relationship is presented in Figure 3.

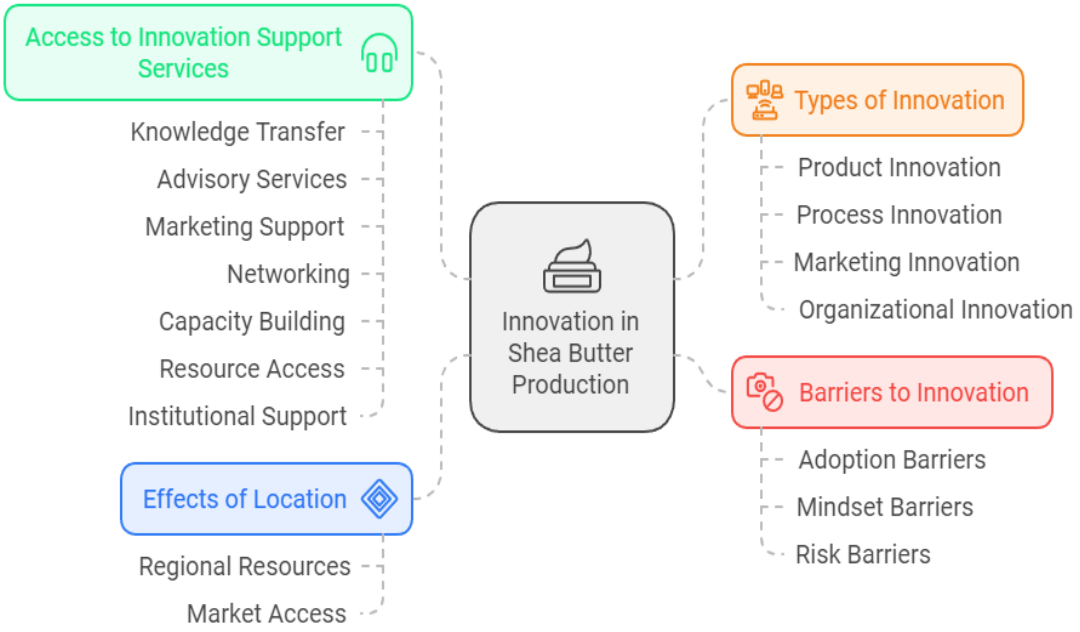

Figure 3: Conceptual framework
Source: Alabani (2022)

Chapter Summary

Chapter two presents a review of literature relevant to the innovation dynamics among shea butter producers in the Northern Region of Ghana. Apart from some conceptual reviews, the chapter has a theoretical review, an empirical review as well as a conceptual framework.

The theoretical framework underpinning this study includes four key theories: Technological Innovation Systems theory, Schumpeterian Innovation Theory, the Triple Helix Model of Innovation, and Incremental and Radical

Innovation Theory. Each theory provides a lens through which to understand the complexities of innovation processes in the shea butter sector.

The Technological Innovation Systems theory offers insights into the interactions among various actors in innovation systems, while Schumpeterian Innovation Theory emphasizes the role of entrepreneurship in driving economic change through innovation. The Triple Helix Model highlights the collaboration between academia, industry, and government in fostering innovation, and Incremental and Radical Innovation Theory underscores the importance of both gradual improvements and breakthrough innovations in enhancing competitiveness.

Chapter two lays a foundation for understanding the challenges and opportunities faced by shea butter producers in relation to innovation. By synthesizing theoretical insights and empirical findings, the chapter elucidates the critical factors that influence innovation activities, thereby informing the subsequent research phases and potential policy interventions.

CHAPTER THREE

RESEARCH METHODS

Introduction

This chapter details the research methodology adopted for the study, encompassing the research scope, profile of the study area, data sources, sample size, sampling techniques, model parameters, and ethical considerations. Data gathered through the field survey were analyzed using both descriptive and inferential statistical methods. The analysis techniques included cross-tabulations, pie charts, bar graphs, frequency distributions, percentages, mean values, and econometric modeling. Furthermore, this chapter provides an overview of the estimation methods, research variables, and their operational definitions.

Research Design

The study adopts a cross-sectional research design, ideal for investigating the present state of innovation among small-scale shea butter producers. This design enables data collection at a single point in time, allowing for the analysis of relationships between variables without requiring longitudinal data (Creswell, 2014). It facilitates the examination of various factors influencing innovation, such as geographical location, obstacles to innovation, and access to support services, offering a detailed overview of the current situation within the study area.

Sources of Data

Data for this study were collected through a field survey conducted among shea butter enterprises in the study area. Questionnaires were administered to the managers of these enterprises, who supplied key

information on different aspects of their operations, such as innovation practices, challenges to innovation, and availability of support services. This cross-sectional approach to data collection provides a thorough insight into the current state of shea butter production in the region.

Profile of the study area

The Northern Region of Ghana is the largest by land area, covering approximately 70,384 square kilometers. It shares borders with the Brong Ahafo and Volta regions to the south, the Upper East and Upper West regions to the north, the North East region to the east, and the Savannah region to the west. The terrain is predominantly low-lying, except for the Gambaga escarpment in the northwest and parts of the western corridor (Ghana Statistical Service, 2013).

In 2010, the Northern Region had a total population of 2,479,461, comprising more females (1,249,574) than males (1,229,887). Between 2000 and 2010, the region's population grew by 36.2%, making it the third fastest-growing region in Ghana, following the Central Region (38.1%) and the Greater Accra Region (38.0%) (Ghana Statistical Service, 2013).

The Northern region currently has sixteen (16) administrative districts. Table 6 shows the administrative districts in the Northern region.

Table 6: Districts in the Northern region

Name of District	District Capital
Tolon	Tolon
Tatale/Sanguli	Tatali
Sagnarigu Municipal	Sagnarigu
Savelugu Municipal	Savelugu
Mion District	Sang
Nanton District	Nanton
Gushiegu Municipal	Gushiegu
Karaga District	Karaga
Kpandai District	Kpandae
Nanumba North	Bimbilla
Nanumba South	Wulensi
Saboba	Saboba
Tamale Metropolitan	Tamale
Kumbungu	Kumbungu
Zabzugu	Zabzugu
Yendi Municipal	Yendi

Source: https://www.ghanadistricts.com/Home/Region/

Economy, industry and manufacturing

The majority of the population in the area is engaged in agriculture, cultivating crops such as yam, maize, millet, guinea corn, rice, groundnuts, beans, soybeans, and cowpeas. In Gushie, located within the Savelugu-Nanton District, there is a significant plantation of grafted mango trees managed by external growers. Additionally, shea tree plantations are found between Tamale and Savelugu, with another located in Kumbungu. In terms of the economically active population in the Northern region, Tamale has the highest percentage at 14.3%, while Chereponi has the lowest at 2.0%. Other districts fall within a range of 8% to 2%.

Tamale is the most urbanized district in the region and has the highest population density, suggesting that it may offer more economic opportunities than any other district. However, it also has the highest percentage of economically inactive residents at 25.5%, while Chereponi has the lowest at 1.8% (Ghana Statistical Service, 2013).

Population of the Study

The Global Shea Alliance listed 455 enterprises and cooperatives as shea processing businesses in Ghana. Out of this number, 332 operate within the sixteen (16) administrative districts of the Northern Region of Ghana. This study therefore targets the shea butter processing businesses that operate within the Northern Region of Ghana. Table 7 shows the number of firms listed in each district and number selected into the sample size.

Table 7: Number of small-scale shea butter producers

Name of District	District Capital	No. of firms
Tolon	Tolon	13
Tatale/Sanguli	Tatali	10
Sagnarigu Municipal	Sagnarigu	23
Savelugu Municipal	Savelugu	16
Mion District	Sang	19
Nanton District	Nanton	11
Gushiegu Municipal	Gushiegu	18
Karaga District	Karaga	17
Kpandai District	Kpandae	28
Nanumba North	Bimbilla	27
Nanumba South	Wulensi	21
Saboba	Saboba	20
Tamale Metropolitan	Tamale	44
Kumbungu	Kumbungu	19
Zabzugu	Zabzugu	13
Yendi Municipal	Yendi	33
Total		**332**

Source: Alabani (2021)

Sample Size and Sampling Techniques

Due to time and resource constraints, a sample has been selected since studying the entire population of small shea butter-producing businesses in the Northern region is virtually impossible. Samples can yield accurate information while requiring fewer resources, such as finance, time, and labor, making them more efficient than a full census (Afful Jr., 2010). However, it is crucial that the sample be representative of the population from which it is drawn (Singh & Masuku, 2014). To determine the sample size, the researcher employed the Taro Yamane formula at a 5% level of significance.

Yamnane (1967) formular:

$$n = \frac{N}{1+N(e)^2}$$

Where

n = sample size

N = Population of the study

e = level of significance/Error estimate at 5%

1 = Constant

Selecting a sample out of the total study population;

$$n = \frac{N}{1 + N(e)^2}$$

$$n = \frac{332}{1 + 332(0.05)^2}$$

$$n = \frac{332}{1 + 332(0.0025)}$$

$$n = 181.4207$$

Therefore, the sample size is 181.

Proportionate Sampling Technique

To ensure representativeness, a proportionate sampling technique was employed to distribute the sample across different districts. This approach guarantees that each district's sample size accurately reflects its share of the total population of shea butter firms. First, the number of firms in each district was divided by the total number of firms (332) to determine the proportion of firms in that district. This proportion was then multiplied by the total sample size (181) to calculate the number of firms to be sampled from each district. The resulting figures were rounded to the nearest whole number. By doing so, the researcher maintained the proportional distribution of firms across districts, ensuring that the sample accurately mirrors the population structure while allowing for efficient data collection. Table 8 shows the sample selection by districts.

Table 8: Sampling size

Name of District	District Capital	No. of firms	Sample Firms
Tolon	Tolon	13	7
Tatale/Sanguli	Tatali	10	5
Sagnarigu Municipal	Sagnarigu	23	13
Savelugu Municipal	Savelugu	16	9
Mion District	Sang	19	10
Nanton District	Nanton	11	6
Gushiegu Municipal	Gushiegu	18	10
Karaga District	Karaga	17	9
Kpandai District	Kpandae	28	15
Nanumba North	Bimbilla	27	15
Nanumba South	Wulensi	21	11
Saboba	Saboba	20	11
Tamale Metropolitan	Tamale	44	25
Kumbungu	Kumbungu	19	10
Zabzugu	Zabzugu	13	7
Yendi Municipal	Yendi	33	18
Total		332	181

Research Instrument

The data collection instrument for this study was a questionnaire specifically designed for managers to address key items related to the study's objectives. The researcher administered the questionnaire directly, allowing respondents to provide brief answers. It included a mix of open-ended and closed-ended questions. Open-ended questions enabled respondents to share detailed information, helping the researcher capture their genuine understanding and insights about the issues being studied. In contrast, closed-ended questions were included to facilitate easier comparison, rating, and statistical analysis of the responses. Before administration, the research supervisors reviewed and validated the questionnaire to ensure its relevance and accuracy.

Pilot-Testing of the Instrument

The questionnaire was initially pilot-tested with 25 small-scale shea butter producers in the Upper East region, outside the study area. Feedback from this pilot test led to adjustments that refined specific questions before the full-scale data collection commenced.

Data Organization and Management

To ensure data accuracy, consistency, and completeness, a systematic procedure was followed in organizing and managing the data collected during the fieldwork. After each interaction with a respondent, the researcher immediately reviewed the questionnaire to check for completeness and ensure that all questions were answered according to the instructions. During this process, particular attention was given to the consistency and correctness of responses, with a focus on verifying that ticking and markings were accurately

made in line with the questionnaire design. This initial review was crucial to identify and resolve any discrepancies or ambiguities before leaving the respondent, minimizing the risk of missing or incorrect data.

After the fieldwork, the researcher performed a secondary round of checks on all completed questionnaires. These checks involved reviewing the consistency of responses across all sections of the questionnaire, ensuring that skip patterns were followed correctly and that no questions were inadvertently left unanswered. This stage helped further enhance the reliability and validity of the data collected.

After verifying the data for completeness and consistency, it was systematically coded. This coding process involved assigning numerical or categorical values to qualitative and categorical variables, allowing the data to be suitable for quantitative analysis. Each questionnaire variable received a unique identifier, and the responses were encoded in a structured way to simplify data entry.

The coded data was entered into STATA software for further statistical analysis. STATA was selected because of its powerful data management capabilities, user-friendly interface, and comprehensive tools for econometric analysis. During the data entry process, periodic checks were performed to ensure accuracy, and random samples of the entered data were cross-referenced with the original questionnaires to identify and correct any potential entry errors.

In addition to this, all data files were securely stored in both physical and digital formats, with backups created to prevent any data loss. The data was organized in a structured format, with clear variable names and labels,

making it easily retrievable for subsequent analyses. By following these rigorous data organization and management procedures, the research ensured data quality, enabling reliable analysis.

Model Specification

The Probit Regression Model Specification

Linear Probability Model (LPM), Probit and Logit Models can be used to analyse binary choice models. Despite its potency in estimation, linear probability models have serious defect in that, the estimated probability values can fall outside the standard '0-1' range (Anafo, 2016; Cameron & Trivedi 2005). Hence probit and logit models are advantageous over LPM in that the probabilities are bound between 0 and 1. In addition, these models also fit the non-linear relationship between the probability and explanatory variables better.

Econometric Model

The Probit Regression Model is used when the dependent variable is binary (whether a firm has innovated or not). In this context, for each of your objectives, the binary dependent variable can represent innovation outcomes such as:

Y=1 if the shea butter producer has innovated.

Y=0 if no innovation has occurred.

For all models, the probit model assumes a latent variable Y^*, which is linked to observable factors. The binary outcome depends on whether Y^* crosses a certain threshold.

Model:

$$Y_i^* = \beta_0 + \beta_1 \text{Location}_i + \beta_2 X_i + \epsilon_i$$

$Y_i^* = \beta_0 + \beta_1 \text{SupportServices}_i + \beta_2 X_i + \epsilon_i$

Where: Y_i^* = latent variable for innovation activity.

Location_i = locationofthesheabutterproducer(urban/rural).

Barriers_i = factors that inhibit innovation.

Innovation Support Services_i = access to innovation support services

Factors_i = determinants of access to innovation support services

X_i = vector of control variables.

ε_i = error term.

The observed binary outcome Y_i is determined by:

$$Y_i = \begin{cases} 1 & if \quad Y_i^* > 0 \\ 0 & if \quad Y_i^* \leq 0 \end{cases}$$

Empirical model

The full estimation model can be expressed as follows:

$P(\text{Product Innovation} = 1 \mid Xi)$

$= \Phi(\beta 0 + \beta 1 Location_i + \beta 2 \text{AccessToMarketsi}_i$

$+ \beta 3 \text{InfrastructureQuality}_i + \beta 4 \text{AccessToTech}_i$

$+ \beta 5 \text{FirmSizei}_i + \beta 6 \text{ProducerEducation}_i + \epsilon_i)$

$P(\text{Process Innovation} = 1 \mid Xi) = \Phi(\beta 0 + \beta 1 Location_i +$

$\beta 2 \text{AccessToMarketsi}_i + \beta 3 \text{InfrastructureQuality}_i + \beta 4 \text{AccessToTech}_i +$

$\beta 5 \text{FirmSizei}_i + \beta 6 \text{ProducerEducation}_i + \epsilon_i)$ -------equation (1)

$P(\text{Process Product Combined} = 1 \mid Xi) = \Phi(\beta 0 + \beta 1 Location_i +$

$\beta 2 \text{AccessToMarketsi}_i + \beta 3 \text{InfrastructureQuality}_i + \beta 4 \text{AccessToTech}_i +$

$\beta 5 \text{FirmSizei}_i + \beta 6 \text{ProducerEducation}_i + \epsilon_i)$-------equation (2)

$$P(\text{Organisational Innovation} = 1 \mid \text{Xi}) = \Phi(\beta 0 + \beta 1 Location_i + \beta 2\text{AccessToMarketsi}_i + \beta 3\text{InfrastructureQuality}_i + \beta 4\text{AccessToTech}_i + \beta 5\text{FirmSizei}_i + \beta 6\text{ProducerEducation}_i + \epsilon_i)$$-------equation (3)

$$P(\text{Marketing Innovation} = 1 \mid \text{Xi}) = \Phi(\beta 0 + \beta 1 Location_i + \beta 2\text{AccessToMarketsi}_i + \beta 3\text{InfrastructureQuality}_i + \beta 4\text{AccessToTech}_i + \beta 5\text{FirmSizei}_i + \beta 6\text{ProducerEducation}_i + \epsilon_i)$$-------equation (4)

$$P(Factors_i = 1 \mid \text{Xi}) = \Phi(\beta 0 + \beta 1\text{FirmSize}_i + \beta 2\text{Location}_i + \beta 3\text{ProducerEducation}_i + \beta 4\text{SocialNetworks}_i + \beta 5\text{PreviousInnovations}_i + \beta 6\text{AccessToFinance}_i + Gender_i + \epsilon_i)$$-------equation (5)

Where:

$P(Innovation_i = 1 \mid \text{Xi})$ is the probability that a producer innovates, given the independent variables X_i.

$\Phi(\cdot)$ is the cumulative distribution function of the normal distribution.

$\beta_0, \beta_1, \ldots, \beta_6$ are the coefficients to be estimated.

ϵ_i is the error term.

From the total sample of 181 business owners, ten (10) business managers with the highest level of experience were purposively selected to rank the innovation barriers identified in the survey. The selection of these managers was based on their extensive knowledge and experience in managing shea butter production businesses, ensuring they could provide informed and accurate rankings. The data obtained from their rankings were then used to compute Kendall's coefficient of concordance to assess the level of agreement among the judges regarding the identified barriers to innovation.

The constraints were grouped into cost barriers, knowledge barriers and market barriers. Firm managers were asked to rank the identified

constraints numerically in order of most pressing to the least. The estimated ranked scores were used to calculate the Kendall's coefficient of concordance to obtain the degree of agreement in the ranking. The Kendall's Coefficient of Concordance (W) is calculated as:

$$W = \frac{12[\sum T^2 - \frac{\sum T^2}{n}]}{nm^2(n^2-1)}$$ -------equation (6)

Where T denotes sum of ranks for each barrier, m denotes number of rankers (firms), n denotes the number of barriers being ranked.

The coefficients of concordance (W) may be tested for significance in terms of the F-distribution. The F-ratio is given by:

$$\text{F-ratio} = \frac{[m-1)Wc}{(1-Wc)}$$ -------equation (7)

Wc is calculated using Kendall's coefficient of concordance. The decision rule states that if the calculated F-value is greater than the critical F-value, we will reject the null hypothesis (Ho); otherwise, we will fail to reject it.

Operationalization of variables

The dependent Variables

Innovation: According to the European Union's Community Innovation Survey 2012, innovation is defined as a new or significantly enhanced product, process, organizational structure, or marketing strategy. Specifically, product innovation refers to the market release of a new or significantly improved good or service, particularly in terms of its capabilities, user-friendliness, components, or sub-systems.

Product innovations—whether new or improved—must be novel for your business, even if they are not entirely new to your market. Your company,

along with other businesses or organizations, may have been the originators of certain product innovations. While downloadable software, music, and films are classified as products, a good typically refers to a tangible item such as a smartphone, furniture, or boxed software. In contrast, services like shopping, insurance, educational programs, plane travel, and consultancy are considered intangible. A "process innovation" refers to a novel or significantly enhanced production process, distribution strategy, or supporting activity.

While process innovations don't need to be unique to your market, they must be new to your company. These innovations can originate from your business or be developed by other companies or institutions.

An organizational innovation involves implementing a completely new organizational method that your company has not previously applied in its workplace structure, external interactions, or business processes, including knowledge management. This innovation should result from strategic decisions made by management.

A marketing innovation refers to a novel marketing idea or strategy that significantly deviates from your company's existing marketing methods and has never been used before. It requires substantial changes to aspects such as product placement, pricing, packaging, or advertising.

Explanatory variables

Firm level variances can be linked to variations in an organization's capacity for innovation. Therefore, it is suggested that enterprise level features are a function of innovation in this context.

Location of a firm: Firms are either located in urban or rural settings. A rural setting has a population of fewer than 5,000 people, while an urban

setting has a population of 5,000 or more (GSS, 2013). The internal variables, or the capacities and procedures within a company for developing and commercializing innovation, are almost entirely the focus of traditional thinking about the concept of innovation. Unquestionably crucial as they are, the outside environment for creativity is at least as significant. Additionally, the best environment for invention differs significantly between disciplines (Carlino, 2001).

Access to Innovation Support Services: Enterprise support services can be sourced from a variety of providers, such as:

- Internal resources within your enterprise or corporate group
- Suppliers offering equipment, materials, components, or software
- Private sector clients or customers
- Public sector clients or organizations
- Industry competitors or other businesses operating in your sector
- Consultants and commercial laboratories
- Universities or other academic institutions
- Government bodies or both public and private research organizations
- Events like conferences, trade fairs, and exhibitions
- Scientific publications and technical or trade journals
- Professional bodies and industry associations

An enterprise can either have access to innovation support (1) or no access (0).

Training and development: This is indicated by how many training sessions an employee participates in annually. To use a competent workforce to respond to market demands and maintain innovation, regular skill development and training are crucial.

Location

In the context of this study, location refers to the geographical setting in which shea butter producers operate and its influence on access to resources, markets, and support services. The spatial position of a business can significantly impacts its propensity to innovate, as proximity to urban centers often enhances access to necessary infrastructure and market opportunities (Romero, 2014).

Access to Markets

Access to markets involves the ability of shea butter producers to reach and sell their products to consumers locally and internationally. It plays a critical role in determining the profitability and scalability of small-scale firms. Firms with better market access are more likely to adopt innovations to meet demand (Romero & Jayme Jr., 2012).

Infrastructure Quality

Infrastructure quality refers to the availability and condition of essential facilities such as roads, electricity, and water, which support business operations. Poor infrastructure can inhibit the adoption of innovative practices due to increased operational costs and inefficiencies (Rothaermel & Thursby, 2005).

Access to Technology

Access to technology is the extent to which firms can obtain and utilize modern technological tools and equipment in their production processes. This access is essential for enhancing efficiency, productivity, and innovation in shea butter production (Ruttan, 1997).

Firm Size

Firm size refers to the scale of a business in terms of production capacity, workforce, and financial resources. Larger firms often have more resources to invest in research, development, and innovation activities compared to smaller firms (Saad, 2004).

Producer Education

Producer education refers to the knowledge and skills possessed by shea butter producers, which can influence their ability to adopt and implement innovations. Higher levels of education and technical training are associated with a greater likelihood of engaging in innovative activities (Saad & Zawdie, 2005).

Financial Constraints

Financial constraints represent the limitations that shea butter producers face in securing the funds necessary for business operations, innovation, and expansion. These constraints can hinder the adoption of new technologies and processes (Sabatier, Craig-Kennard & Mangematin, 2012).

Lack of Skills

Lack of skills refers to the absence of necessary technical expertise and competencies among shea butter producers, which can limit their capacity to innovate and improve production processes. Skill shortages create a barrier to effective innovation adoption (Romero, 2014).

Marketing Problems

Marketing problems refer to the challenges shea butter producers face in promoting their products to potential buyers. These challenges can include inadequate marketing strategies, limited market information, and competition,

which can impede business growth and innovation (Romero & Jayme Jr., 2012).

High Input Cost

High input cost relates to the expenses associated with acquiring raw materials, equipment, and labor. Shea butter producers often struggle with rising costs of production inputs, which can deter innovation and reduce profitability (Sarpong & Akaribo, 2021).

Social Networks

Social networks refer to the relationships and interactions between producers, suppliers, and other stakeholders within the industry. Strong social networks can facilitate knowledge sharing and access to resources, thereby fostering innovation (Saad, 2004).

Previous Innovations

Previous innovations refer to the history of adopting and integrating new technologies or processes within the firm. Firms with a track record of innovation are often more likely to continue innovating as they build on past successes (Romero & Jayme Jr., 2012).

Access to Finance

Access to finance is the ability of shea butter producers to obtain the necessary funding for their business activities. Easy access to finance supports innovation by enabling investment in new technologies and processes (Rothaermel & Thursby, 2005). Table 9 contains the details on the variables under consideration.

Table 9: Summary of dependent and independent variables in the logit model

Dependent Variables			
Variable Name	**Description**	**Data Type**	**Values / Labels**
Product Innovation	Whether the firm introduced a product innovation	Binary	1 = Yes, 0 = No
Process Innovation	Whether the firm introduced a process innovation	Binary	1 = Yes, 0 = No
Process Product Combined	Whether the firm introduced both product and process innovations	Binary	1 = Yes, 0 = No
Organisational Innovation	Whether the firm introduced organizational innovation	Binary	1 = Yes, 0 = No
Marketing Innovation	Whether the firm introduced marketing innovation	Binary	1 = Yes, 0 = No
Barriers	Whether the firm encountered barriers to innovation	Binary	1 = Yes, 0 = No
Access to support	Whether the firm accessed external support for innovation	Binary	1 = Yes, 0 = No
Factors	Presence of influential factors for innovation	Binary	1 = Yes, 0 = No
Independent Variables			
Variable Name	**Description**	**Data Type**	**Values / Labels**
Location	Location of the firm	Categorical	1 = Urban, 0 = Rural
Access to markets	Firm's access to markets	Categorical	1 = High, 2 = Medium, 3 = Low
Infrastructure Quality	Quality of the infrastructure the firm has access to	Categorical	1 = High, 2 = Medium, 3 = Low
Access to technology	Access to technology and technological resources	Categorical	1 = High, 2 = Medium, 3 = Low
Firm Size	Size of the firm (number of employees)	Continuous	Numeric values representing number of employees
Producer Education	Education level of the producer or key decision maker	Categorical	1 = High school, 2 = College, 3 = Graduate
Financial Constraints	Whether the firm faces financial constraints	Binary	1 = Yes, 0 = No

Table 9: Cont'd

Lack of skills	Whether the firm faces a lack of skilled workers	Binary	1 = Yes, 0 = No
Marketing Problems	Whether the firm has issues marketing its products	Binary	1 = Yes, 0 = No
High input cost	Whether the firm faces high input costs	Binary	1 = Yes, 0 = No
Social Networks	Access to social networks and business connections	Binary	1 = Yes, 0 = No
Previous Innovations	Whether the firm had previous innovations	Binary	1 = Yes, 0 = No
Access to finance	Whether the firm has access to finance	Binary	1 = Yes, 0 = No

Ethical Consideration

In this study, informed consent was obtained from all participants before data collection began, following the guidelines outlined by Silverman and Ollendick (2005) and Anafo (2016). The researcher ensured that each participant was fully informed about the study's objectives and how their data would be used. Participants were given clear explanation of the research purpose and assured that their participation was entirely voluntary.

To address potential ethical concerns, such as hesitation to participate or the withholding of critical information, the researcher provided participants with detailed information about the study's nature and goals. Informed consent documents explicitly stated that participants were free to accept or withdraw from the study at any point without any consequences, ensuring that no pressure was placed on them to commit. This approach ensured that participants were fully aware of their rights and the voluntary nature of their involvement in the research.

Chapter Summary

Chapter three outlines the research methodology, covering aspects such as the research design, scope, study area profile, data sources, sample size, sampling techniques, model parameters, and ethical considerations. The collected data was analyzed through both descriptive and inferential statistical methods, including cross-tabulations, bar charts, frequency distributions, and econometric modeling.

The study employs a cross-sectional research design, which is ideal for assessing the present level of innovation among small-scale shea butter producers. This design enables data collection at a specific point in time, making it possible to analyze the relationships between variables such as location, innovation barriers, and access to support services. Data was collected through a field survey focused on shea butter enterprises.

The study focuses on shea processing businesses located in the Northern Region of Ghana, where 332 enterprises were identified out of a total of 455 across the country. A sample size of 181 was determined using the Taro Yamane formula (Yamane, 1967), ensuring representativeness through proportionate sampling from various districts. The primary data collection tool was a questionnaire, administered directly by the researcher. It comprised both open-ended and closed-ended questions, which were validated by research supervisors for relevance and accuracy. A pilot test was conducted with 25 producers (outside the study area) to refine the instrument prior to the full-scale data collection.

Ensuring data accuracy was a key focus, achieved through meticulous organization and management processes. After each questionnaire was

completed, it underwent a review for completeness, followed by additional checks for consistency and correctness. The coded data was then entered into STATA software for statistical analysis, ensuring high standards of data quality and reliability. To analyze the binary decision of innovation (whether a firm has innovated or not), the Probit Regression Model was applied. This model included various independent variables, such as location, barriers, and access to support services. Empirical models were specified for different types of innovation, outlining the relationships between independent and dependent variables.

Finally, ethical considerations were a key focus, stressing the importance of obtaining informed consent from participants and ensuring their voluntary involvement. Participants were thoroughly informed about their rights and were free to withdraw from the study at any point, in accordance with established ethical research practices.

CHAPTER FOUR

RESULTS AND DISCUSSION

Introduction

This chapter outlines the findings from the data collected and interprets the results in relation to the research objectives. Its main purpose is to analyze the factors affecting innovation among small-scale shea butter producers in the Northern Region of Ghana. The analysis is structured around the four key objectives of the study: examining the impact of location on innovation activities, identifying the barriers these producers face in innovating, exploring their access to innovation support services, and analyzing the factors that influence their access to these services.

This chapter presents a comprehensive analysis of the descriptive statistics and the outcomes of the econometric models applied in the study. Each section provides a thorough discussion, comparing the study's findings with existing literature and theoretical frameworks on innovation. The analysis highlights the specific challenges encountered by small-scale shea butter producers, while also examining broader trends in innovation within the shea butter industry. The chapter concludes by discussing the implications of these findings, setting the stage for practical policy recommendations aimed at fostering innovation in the shea butter sector in the subsequent chapter.

Response Rate

A total of 181 questionnaires were distributed to small-scale shea butter producers throughout the Northern Region of Ghana, all of which were successfully returned, resulting in a 100% response rate. As noted by Holtom, Baruch, Aguinis, and Ballinger (2022), a high response rate improves data

reliability and minimizes non-response bias, ensuring that the findings accurately reflect the target population. This complete response rate provides a strong basis for the validity of the analysis that follows, reinforcing the robustness of the study's conclusions.

Characteristics of the firm

This section categorizes the data based on the distinct characteristics of the variables under consideration. Table 10 provides details on the type of business, nationality of the owner, geographical area of operation, firm size, and the age of the firm.

Table 10: Firm characteristics

Variables	Categories	Number of firms	Percent (%)
Owner Nationality	Ghanaian	176	97.24
	Foreign	2	1.1
	Dual-Citizen	3	1.66
Type of Business	Sole Proprietorship	110	60.77
	Family business	54	29.83
	Co-operative society	17	9.39
Geography	Geolocal/Regional	181	100
	Geonational/Ghana	163	90.06
	Geoworldwide/International	35	19.34
Firm Size	1 to 5 employees	86	47.5
	6 to 10 employees	79	43.6
	11 - 15 employees	12	6.6
	16 employees	4	2.2
Firm Age	1 - 10 years	79	43.63
	11 - 20 years	68	37.55
	21 - 30 years	25	13.79
	31 - 40 years	8	4.41
	41 + years	1	0.55

Source: Alabani (2021)

Type of Businesses

In line with the classification of businesses by the Ghana Statistical Service in the 2003 industrial survey, this study categorizes enterprises based

on ownership. According to the data in Table 10, the majority of the firms surveyed, 60.77%, operate as sole proprietorships. Private limited liability companies account for 28.73% of the businesses, while cooperatives make up 7.73%. Public limited liability companies represent only 1.1%, and 1.6% of businesses fall under other categories, primarily involving ownership by non-profit religious organizations. Thus, sole proprietorships are the dominant business type in the shea butter industry.

Owner Nationality

The nationality of the owners of the enterprises under study was also examined. As shown in Table 10, a substantial majority, 97.21% (176 firms), are Ghanaian-owned. Only two firms are foreign-owned, and 3 (1.60%) are owned by individuals with dual citizenship. These results underscore the predominance of Ghanaian ownership within the shea butter industry.

Geography

The geographical scope of the enterprises' operations was another area of focus. Table 10 reveals that all 181 firms (100%) conduct their operations within their local area or region, with product sales confined largely to their region of physical presence. Additionally, 90.06% of the firms also operate on a national level, selling their products in other regions of Ghana. However, only 19% (35 firms) have expanded their reach to international markets, indicating that the majority of these businesses do not engage in cross-border trade and are limited to the domestic market.

Firm Age

Firm age was categorized using five class intervals, each spanning ten years. Table 10 shows that the largest portion of firms, 43.63%, fall within the

1-10 year age range. The next most common age group is 11-20 years, representing 37.55% of the firms. Firms aged 21-30 years account for 13.79%, while 4.41% of businesses have been operational for 31-40 years. A very small proportion, just 0.55%, of firms have been in operation for over 41 years. The average age of the firms in the sample is 14.12 years, with a standard deviation of 7.324. The oldest firm in the survey is 41 years old, while the youngest is only two years old, indicating that a significant number of firms in the sample are relatively young and could be considered start-ups.

Firm Size

Regarding firm size, based on the number of employees, the data in Table 10 indicates that 47.5% of firms employ between 1 and 5 workers. Firms with 6 to 10 employees make up 43.6% of the sample, while 6.6% employ 11 to 15 workers. Only 2.2% of firms have 16 employees. These statistics show that most of the businesses in the shea sector are small, with the majority employing fewer than 10 workers.

Socio-economic characteristics of the Manager

Data in this part has been categorised into certain distinct characteristics. This includes data on the manager's gender, age, marital status, nationality, level of education and medium of skills acquisition. It also includes information on whether the manager has received training abroad, as well as their experience, measured by the number of years they have worked in the shea industry.

Gender

Females dominate the shea sector in the Northern region. Table 11 indicates that 72% of respondent firms had female managers and only 28% of

respondent firms had a male manager. The shea sector can therefore be labelled as women dominated.

Age

Ages of managers were categorised into five (5) classes. Table 11 shows that mangers of firms who had aged between 51-60 years were the majority; consisting of 39%. Those between 31-40 years (19%), 21-30 years (8%), 41-50 years (14%) and 61 years and above were 16%. The youngest manager had age 23 and the oldest manager has aged 69. The mean age of a manager was 48.580 with a standard deviation of 12.025.

Nationality

As much as 97% of the managers of respondent firms were Ghanaians and only 2% did not identify as Ghanaians. Table 11 displays this data.

Table 11: Characteristics of the firm manager

Variables	Categories	Number of people	Percent (%)
Gender	MALE	0	28.25
	FEMALE	27	71.75
Age	21 - 30 years	6	8.83
	31 - 40 years	6	19.88
	41 - 50 years	7	14.89
	51 - 60 years	2	39.78
	61+ years	0	16.56
Nationality	Ghanaian	77	97.79
	Other		2.21
Level of Education	University	7	25.97
	Polytechnic	4	51.93

Table 11: Cont'd

	Training College		3.87
	Technical/Vocational	1	11.6
	Secondary/Commercial		2.21
	J.H.S		1.1
	Primary		1.66
	Non		1.66
Medium of skills acquisition	Formal	2	12.15
	Informal		3.87
	Both	52	83.98
Received training abroad	Yes		4.97
	No	72	95.03
Experience in the Shea industry	0 - 5 years	4	29.82
	6 - 11 years	5	52.49
	12+ years	2	17.66

Source: Alabani (2021)

Levels of education

The educational backgrounds of the managers were analysed. Data displayed in Table 11 highlights the educational qualifications of managers from the respondent firms. A significant proportion, 51%, of the managers had completed polytechnic education, while 25% had university degrees. Additionally, 11% had technical or vocational training, 2% had secondary or commercial school education, 3% had attended training colleges, 1% had Junior High School (JHS) education, another 1% had only primary education, and 1% had no formal education.

Medium of skills Acquisition

An impressive 83% of managers from the respondent firms gained their skills through a combination of formal and informal training. Only 3% received solely informal training, while 12% obtained their skills through

formal training alone. Data on the methods of skills acquisition is presented in Table 11.

Training abroad

Table 11 indicates that a vast majority, 95%, of managers from the respondent firms had not participated in any training abroad, highlighting a lack of international exposure in their professional development. In contrast, only 4% of the managers had the opportunity to receive training outside the country. This disparity suggests that while most managers have developed their skills locally, a small proportion have gained insights and knowledge from international training programs, which could potentially enhance their management capabilities and bring diverse perspectives to their firms. The limited access to overseas training may reflect challenges such as financial constraints, limited opportunities, or the focus on local training resources.

Experience

To assess experience in the shea industry, the number of years worked was categorized into three distinct groups. The first group includes individuals with 0–5 years of experience, representing 29% of the respondents, suggesting a significant proportion of relatively new entrants to the industry. The second group, with 6–11 years of experience, accounts for the majority at 52%, indicating that most managers have gained moderate industry exposure. The third group comprises those with 12 or more years of experience, making up 17%, highlighting a smaller segment of highly experienced professionals. This distribution, presented in Table 11, provides insights into the varying levels of expertise within the industry, reflecting a blend of fresh perspectives and

seasoned knowledge among managers. This diversity in experience levels could influence innovation and decision-making dynamics within the sector.

Turnover from innovated products and services

Between 2018 and 2020, the distribution of respondent firms based on the share of their total turnover derived from innovated products and services reveals varying levels of contribution. Approximately 11.60% of firms reported that their share ranged from 0% to less than 1%, indicating minimal financial returns from innovation. A further 10.50% of firms generated between 1% and less than 5% of their turnover from these products and services, reflecting modest contributions.

The majority, 70.17%, fell within the range of 5% to less than 10%, highlighting a significant reliance on innovated offerings as a notable revenue source. Meanwhile, 3.31% of firms achieved a higher turnover contribution, ranging from 10% to less than 25%, and 2.21% reported an even greater share of 25% and above, showcasing the potential for innovation to drive substantial financial success for some firms.

Additionally, 2.21% of firms were unable to determine the turnover attributable to their innovated products and services, indicating a lack of tracking mechanisms or awareness. These figures, illustrated in Figure 4, underline the varying impact of innovation on the financial performance of firms and the importance of effective innovation management and measurement strategies.

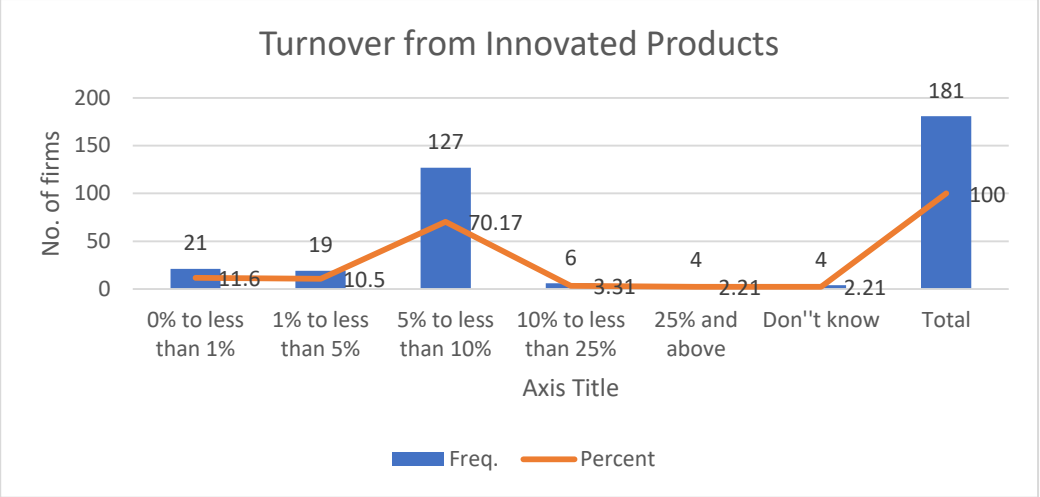

Figure 4: Turnover from Innovated Products
Source: Alabani (2021)

Types of Innovation

Table 12 offers an overview of the different types of innovation activities carried out by small-scale shea butter firms. The innovations are categorized into four main areas: product innovation, process innovation, organizational innovation, and marketing innovation. These classifications illustrate the degree to which these firms have implemented new or substantially enhanced products, methods, or operational practices. This framework aligns with the guidelines established by the European Union Community Innovation Survey (2012), providing a standardized approach to understanding innovation within the sector.

Product Innovation

The data reveals that 55.0% of firms reported introducing new or significantly improved goods, indicating a notable degree of product innovation within the shea butter industry. However, only 17.0% of these firms introduced products that were entirely new to the market, while 18.0% adopted innovations that were novel to their own operations. This suggests that while a majority of firms are engaged in product innovation, a smaller

proportion are driving market-level advancements by launching entirely new products.

Process Innovation

Approximately 16.0% of firms reported adopting new or significantly improved manufacturing methods, reflecting a modest level of process innovation within the sector. In contrast, a larger proportion, 42.0%, implemented new logistics, delivery, or distribution methods, indicating a strong emphasis on enhancing supply chain efficiency. However, only 9.0% of firms introduced new or improved supporting activities, such as upgraded maintenance systems or operational processes, suggesting limited attention to optimizing internal business operations.

Organizational Innovation

In the realm of organizational innovation, 56.0% of firms reported adopting new business practices for organizing procedures, including supply chain management, business reengineering, and quality management. This constitutes the highest reported category of innovation, underscoring a strong emphasis on optimizing operational management and efficiency. Furthermore, 18.0% of firms introduced innovative methods for structuring work responsibilities and decision-making, highlighting some level of advancement in human resource management. However, only 5.0% of firms implemented new approaches to managing external relations, such as forming strategic alliances or outsourcing, indicating a relatively low priority given to external organizational restructuring.

Marketing Innovation

In terms of marketing innovation, 28.0% of firms had made significant changes to the aesthetic design or packaging of their products, indicating a notable effort to improve product presentation. However, innovations in other marketing areas were less common. Only 5.0% of firms introduced new promotional techniques, product placement methods, or pricing strategies, such as variable pricing or discount systems. This suggests that while there is some focus on improving the product's physical appeal, marketing innovations related to promotion, sales channels, and pricing strategies remain underutilized.

Table 12 demonstrates that innovation in the shea butter sector is primarily concentrated in product and organizational innovations, with over half of the firms' reporting improvements in goods and business practices. Process and marketing innovations, particularly in areas such as supporting activities and promotional techniques, are less widespread. This suggests that while many firms are advancing in the development of products and operational management, there is room for growth in process optimization and marketing strategies.

Table 12: Product Innovation

Variable	No. of Firms	Percentage (%)
Goods Innovation: New or significantly improved goods	99	55.0
New to Market Innovation	31	17.0
New to Firm Innovation	32	18.0
Process Innovation: New, novel or substantially enhanced techniques for manufacturing or producing goods and services	29	16.0
New, novel or significantly improved logistics, delivery or distribution methods for your inputs, goods or services	76	42.0
New, novel or significantly improved supporting activities for your processes, such as maintenance systems or operations for purchasing, accounting, or computing	16	9.0
Organisational Innovation:		
Innovative business practices for structuring processes, such as supply chain management, business reengineering, knowledge management, lean production, and quality management.	101	56.0
Novel or new approaches to structuring work responsibilities and decision-making processes, including the initial implementation of systems for employee roles, teamwork, decentralization, departmental integration or separation, and education or training programs.	32	18.0
Novel or new methods of organising external relations with other firms or public institutions (i.e. first use of alliances, partnerships, outsourcing or sub-contracting, etc.)	9	5.0
Marketing Innovation: Major modifications to the visual design or packaging of a product or service, excluding changes that affect its functionality or user experience, which are classified as product innovations.	51	28.0

Table 10, continued

Novel or new media or techniques for product promotion (i.e. the first time use of a new advertising media, a new brand image, introduction of loyalty cards, etc.)	9	5.0
Novel or new methods for product placement or sales channels (i.e. first time use of franchising or distribution licenses, direct selling, exclusive retailing, new concepts for product presentation, etc.)	9	5.0
Innovative pricing strategies for goods or services, such as the initial implementation of demand-based pricing or discount systems.	8	4.0

Source: Alabani (2021). Note: Multiple responses

Innovation Expenditure

No matter how minute innovation activities may appear to be, it comes with some cost to the firm. Figure 7 shows the various innovation expenditure items among small Shea butter production firms. Even though R & D is mostly look at in literature as an activity exclusively done by big firms, the results of this works shows something different.

There is R&D occurring in its micro form "micro research and development" among even the smallest firms identified. Some amount of resources; however little is devoted to some form of research and development activities. Apart from staff training (which takes up to 28% of the expenditure pie) and product marketing (which takes 19% of the pie) the next biggest spending goes to micro R&D which takes up to 17% of the innovation expenditure pie. Other innovation expenditure items include product design (13%), knowledge transfer (11%), external R&D (3%) and other unclassified spending (3%). The results is captured in Figure 5.

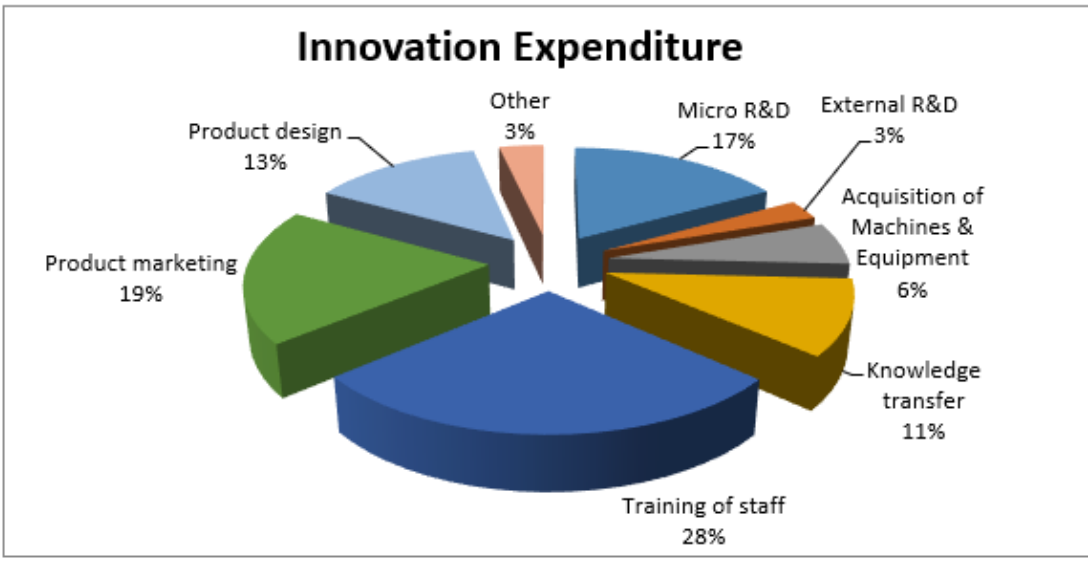

Figure 5: Innovation Expenditure
Source: Alabani (2021)

Objectives of Innovation

Table 14 gives an overview of the primary objectives driving innovation among small-scale shea butter producers. The table lists the various motivations behind the innovation activities and the percentage of firms that selected each objective, highlighting the strategic priorities within the sector.

The most common objective for innovation is the desire to extend the product range, with an overwhelming 98% of firms indicating this as a goal. This suggests that nearly all the firms see diversification and the development of new or improved products as critical to their growth and competitiveness. Extending the product range may help firms adapt to changing market demands, attract new customers, or maintain relevance in a dynamic market environment.

A significant proportion of firms (60%) aim to maintain their market share through innovation. This reflects the importance of sustaining competitive advantage in the shea butter industry, where firms may need to continually innovate to prevent losing ground to competitors. Firms are likely

innovating to keep up with customer preferences or to fend off market challenges, such as increased competition.

Another key objective is finding and capturing new markets, which was selected by 56% of the firms. This indicates that more than half of the firms are focused on expanding beyond their existing customer base. This strategic priority aligns well with the high percentage of firms aiming to extend their product range, as developing new products could open up opportunities in untapped or underserved markets, both domestically and internationally.

Cost reduction is a driver for innovation for 52% of firms, highlighting the significant focus on improving efficiency and profitability. By innovating in ways that reduce production or operational costs, firms can increase their margins, making them more competitive, especially in a price-sensitive market like shea butter production.

A sizable minority of firms also target improving working conditions (34%) and improving product quality (29%) through innovation. These objectives point to an awareness of the importance of employee well-being and product excellence. Enhancing working conditions could help retain skilled labor and increase productivity, while improving product quality is likely a response to market pressures for higher standards, especially if firms aim to compete in higher-end or export markets.

Interestingly, only 30% of firms prioritize increasing market share, which suggests that, while firms are focused on maintaining their existing market position, fewer are actively pursuing aggressive expansion in terms of market dominance. This could reflect the challenges faced by small-scale

producers in competing with larger firms or the difficulty of scaling operations.

Replacing phased-out products is the least common objective, with only 7% of firms indicating this as a goal. This suggests that most firms are more concerned with innovating to create new products or improve existing ones, rather than responding to the need to replace obsolete products.

Data as shown in Table 14 shows that the dominant objectives for innovation among small-scale shea butter producers are to extend their product range (98%) and maintain their market share (60%), reflecting a focus on diversification and sustaining competitiveness. Cost reduction (52%) and market expansion (56%) are also significant drivers. Meanwhile, improving working conditions and product quality are important for a subset of firms. However, increasing market share and replacing phased-out products are less prominent objectives, indicating a more cautious approach to expansion and product replacement. These insights underscore the firms' efforts to balance growth, operational efficiency, and product innovation.

Table 14: Objectives of Innovation

Objective of Innovation	No. of selection (N=181)	Percentage (%)
Cost reduction	95	52
Replacing phased-out products	12	7
Maintaining firm's market share	109	60
Extending product range	178	98
Increasing firm's market share	55	30
Finding and capturing new markets	102	56
Improving product quality	53	29
Improving working conditions	62	34

Source: Alabani (2021). Note: Multiple responses

Nature of Innovation

Data was gathered to explore the different types of innovations within firms, with a focus on understanding whether these innovations were new to the Ghanaian market or simply new to the firms themselves. The goal was to determine the scope of innovation and its impact on both the firm and the broader market. The findings revealed that more than 80% of the innovative activities identified were classified as new only to the innovating firms, indicating that most firms were introducing changes or improvements that were not previously implemented within their operations. In contrast, less than 20% of the innovations were classified as new to the Ghanaian market, suggesting that only a small proportion of the firms were introducing truly market-leading innovations. Figure 6 presents a bar graph that visually represents the distribution of innovation types among the firms surveyed. This data highlights the predominance of incremental, firm-specific innovations over market-wide innovations, offering insight into the innovation dynamics within the shea butter industry.

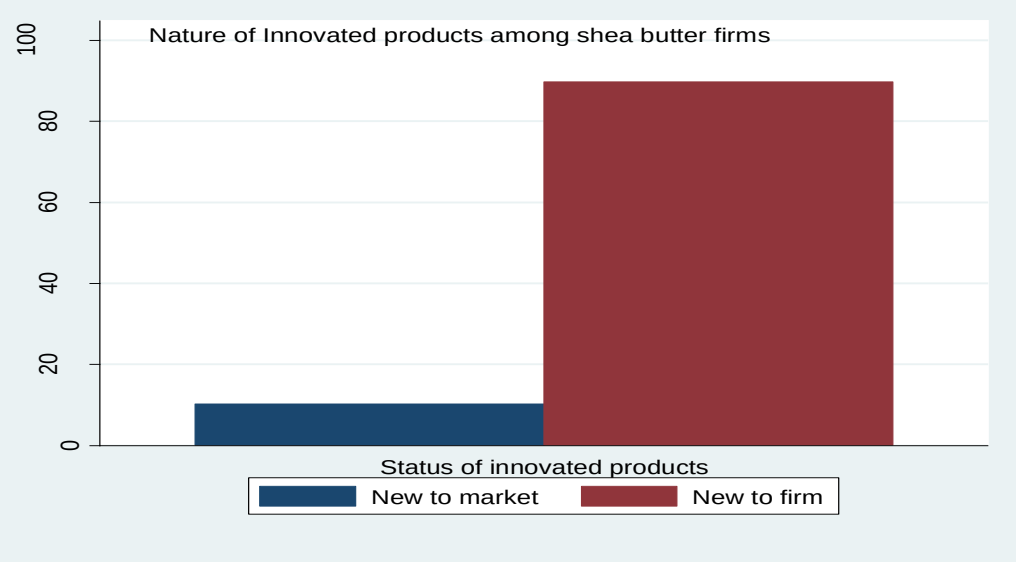

Figure 6: Nature of innovation
Source: Alabani (2021)

Empirical findings and discussion of results

Regression Results

The results of a logistic regression analysis of factors that affect product innovation, process innovation, marketing innovation, organisational innovation and product & process combined innovation among shea butter firms are presented in Tables 15, 16, 17, 18, 19 and 22.

Product Innovation

The logistic regression results presented in Table 15 aim to identify the key factors influencing product innovation among small-scale shea butter producers. The table provides coefficients, odds ratios, standard errors, and p-values for each explanatory variable. The dependent variable in this analysis is whether a firm engages in product innovation, with a mean dependent variable of 0.537, indicating that 53.7% of the firms in the sample were involved in product innovation activities.

Access to Technology

Access to technology emerges as one of the most important predictors of product innovation. The coefficient for this variable is 1.28, corresponding to an odds ratio of 1.2803, which implies that firms with improved access to technology are 28% more likely to engage in product innovation. This result is statistically significant, with a p-value of 0.003, indicating a strong relationship between technological resources and innovation within the shea butter sector. The data underscores the pivotal role that technological infrastructure and tools play in enabling firms to develop new or enhanced products. This suggests that firms with better access to technology have a significant advantage in driving innovation, highlighting the need for further

investment in technological capabilities to foster product development and competitiveness within the industry.

Location

The location of a firm is another crucial factor influencing product innovation. With a coefficient of 2.917 and an odds ratio of 2.9166, the data suggests that firms in specific geographical areas are nearly three times more likely to engage in product innovation than those located in less advantageous regions. The p-value of 0.009 further supports the statistical significance of this result. This highlights the intuitive idea that a firm's location can significantly impact its access to essential resources, markets, and other factors that support innovation, such as proximity to suppliers, customers, and knowledge networks. As a result, firms in favorable locations are better positioned to leverage these advantages, which in turn boosts their ability to innovate and remain competitive in the market.

Infrastructure Quality and Access to Markets

The variables of infrastructure quality and access to markets exhibit negative coefficients (-1.052 and -1.264, respectively), with odds ratios slightly above 1 (1.052 and 1.264). However, their high p-values (0.664 and 0.522) indicate that these factors are not statistically significant in explaining product innovation within this sample. This suggests that, despite being widely recognized as important in the broader economic literature, infrastructure quality and access to markets do not have a significant direct impact on product innovation in this particular context. The negative coefficients imply that, if anything, better infrastructure and market access might slightly decrease the likelihood of innovation, although this effect is not statistically

robust. One possible explanation for this is that other factors, such as technology and location, may have a more immediate and influential role in driving innovation in the shea butter industry. This could suggest that in this specific setting, firms may be more reliant on technological resources or geographical advantages rather than infrastructure or market access to stimulate innovation.

Producer Education

The education level of producers appears to positively influence product innovation, with a coefficient of 3.455 and an odds ratio of 3.4553. This indicates that producers with higher levels of education are more than three times as likely to participate in product innovation. However, this result is not statistically significant (p-value of 0.122). While education may be important in understanding and adopting innovative practices, this finding indicates that it might not be a decisive factor in this context, possibly due to limited variation in education levels among the producers.

Gender

The variable gender also has a positive coefficient (5.756) and odds ratio (5.7564), suggesting that gender may play a role in influencing innovation. However, like education, this result is not statistically significant (p-value of 0.128), indicating that gender differences do not have a meaningful impact on product innovation in this study.

Firm Size

The size of the firm, as measured by the number of employees, has a negative coefficient of -1.004 and an odds ratio of 1.0037, indicating that larger firms are marginally less likely to engage in product innovation.

However, this result is not statistically significant, with a p-value of 0.932, suggesting that the effect of firm size on innovation is minimal in this context. This could imply that within the small-scale shea butter industry, firm size does not significantly influence a firm's ability to innovate. It is possible that smaller firms may be more agile and adaptable, enabling them to innovate more readily, while larger firms might face more organizational inertia or resource allocation challenges that hinder their innovation activities.

Table 15: Logistic regression results: Product innovation only

Variable	Coefficient	Odds Ratio	Standard Error	P>z
Infrastructure Quality	-1.052	1.052439	0.1238942	0.664
Access to Markets	-1.264	1.264009	0.4625721	0.522
Access to Technology	1.28	1.280288**	0.694494	0.003
Producer Education	3.455	3.455338	2.774178	0.122
Gender	5.756	5.756355	6.618293	0.128
Firm size	-1.004	1.003681	0.0433216	0.932
Location	2.917	2.916637**	1.193844	0.009
_cons	23.788	23.78793	346.2819	0.828
Mean dependent var	0.537	SD dependent var	0.573	
Pseudo r-squared	0.138	Number of obs	181	
Chi-square	34.582	Prob > chi2	0.002	
Akaike crit. (AIC)	246.067	Bayesian crit. (BIC)	294.044	

Source: Alabani (2021)
Note: ** indicates significance at 5% and * indicates significance at 10%.

Overall Model Fit

The model's overall fit is reflected by a pseudo R-squared value of 0.138, which indicates that 13.8% of the variation in product innovation is accounted for by the variables included in the model. Additionally, the chi-square statistic of 34.582, which is significant at the 0.002 level, confirms that the model is statistically significant overall. However, the relatively modest pseudo R-squared suggests that there may be other unmeasured factors influencing product innovation, which are not captured by this model. This

implies that while the model explains some of the variation in innovation, additional variables or considerations might also play a crucial role in determining product innovation outcomes.

Hypothesis Testing

An analysis of the logistic regression results reveals that the coefficient for the location variable is 2.917, with an odds ratio of 2.9166. The p-value of 0.009, which is well below the typical significance threshold of 0.05, provides compelling evidence to reject the null hypothesis (H_0). This rejection suggests that location has a significant influence on the likelihood of shea butter producers engaging in product innovation.

The results indicate that the geographic location of a shea butter producer is a key factor influencing their likelihood to innovate. Producers based in urban areas or regions rich in resources are more likely to engage in product innovation, emphasizing the significant role that location plays within the shea butter industry.

Process Innovation

The logistic regression results presented in Table 16 focus on process innovation only. The analysis examines several variables, including firm size, location, access to markets, producer education, access to technology, and gender, revealing insights into their respective impacts on the likelihood of a firm implementing an innovative process.

Table 16: Logistic regression results: Process innovation only

Variable	Coefficient.	Odds Ratio	Std. Err.	P>z
Firm size	-1.008	1.008314	0.0438959	0.849
Location	3.364	3.364446**	1.245515	0.001
Access to markets	2.281	2.28109*	1.050948	0.073
Producer Education	0.813	0.8132609	0.3842029	0.662
Access to technology	0.217	0.2170942*	0.1963393	0.091
Gender	-0.604	0.6040436	0.584081	0.602
_cons	0.312	0.3124502	0.6426768	0.572
Mean dependent var	0.378	SD dependent var	0.35	
Pseudo r-squared	0.202	Number of obs	181	
Chi-square	25.548	Prob > chi2	0.008	
Akaike crit. (AIC)	248.127	Bayesian crit. (BIC)	286.509	

Source: Alabani (2021)

Location

The location variable has a coefficient of 3.364, indicating a strong positive relationship with process innovation. The odds ratio of 3.364 implies that producers in certain locations are more than three times as likely to engage in process innovation compared to those in less advantageous areas. Additionally, the p-value of 0.001 confirms the statistical significance of this result, providing solid evidence that location is a critical factor in promoting process innovation.

Access to markets

The variable access to markets also exhibits a noteworthy effect, with a coefficient of 2.281 and an odds ratio of 2.2811. Although the p-value of 0.073 does not meet the conventional threshold for statistical significance (0.05), it is relatively close, indicating that improved access to markets may enhance the likelihood of firms adopting innovative processes.

Firm size

The variable 'firm size' shows a coefficient of -1.008 with an odds ratio of 1.0083, which suggests a negligible influence on process innovation. The high p-value of 0.849 indicates that firm size does not significantly influence the propensity to innovate processes. Similarly, other variables, including producer education and gender, exhibit coefficients and p-values that imply no significant effects on process innovation, with p-values of 0.662 and 0.602, respectively.

Overall Model Fit

The logistic regression model yields a pseudo-R-squared value of 0.202, suggesting that around 20.2% of the variation in process innovation is explained by the independent variables in the model. The model as a whole is statistically significant, as evidenced by the chi-square statistic of 25.548 and a p-value of 0.008.

Hypothesis Testing

The odds ratio for location is 3.364446, which means that producers in certain locations are more than three times as likely to engage in process innovation compared to those in less favorable areas. This result is statistically significant, as demonstrated by the p-value of 0.001, which is well below the conventional threshold of 0.05. Given the p-value is less than 0.05, we reject the null hypothesis (H_0) that location does not significantly affect a producer's likelihood of engaging in process innovation. This strongly supports the conclusion that location plays a crucial role in influencing process innovation within the shea butter industry, highlighting its importance as a key factor in driving innovation.

Organisational Innovation

The logistic regression analysis presented in Table 17 focuses on organizational innovation only.

Location

The coefficient for location is 0.46, with an odds ratio of 0.4598506, indicating a notable positive effect on organizational innovation. The p-value of 0.044, which is below the standard threshold of 0.05, further supports this finding. This suggests that producers in specific locations are more inclined to adopt innovative organizational practices.

Table 17: Logistic regression analysis: Organisational innovation only

Variable	Coefficient.	Odds Ratio	Std. Err.	P>z
Firm size	-1.063	1.063043	0.0592002	0.272
Location	0.46	0.4598506*	0.1773145	0.044
Access to markets	0.134	0.1343686**	0.0896258	0.003
Infrastructure quality	-0.71	0.7095963	0.3337361	0.466
Producer Education	-1.537	1.536987	0.6054885	0.275
Gender	3.801	3.801362*	2.227471	0.023
_cons	0.841	0.8414526	3.027766	0.962
	Mean dependent var	0.771	SD dependent var	0.731
	Pseudo r-squared	0.157	Number of obs	175
	Chi-square	37.036	Prob > chi2	0.001
	Akaike crit. (AIC)	222.518	Bayesian crit. (BIC)	260.495

Source: Alabani (2021) Note: ** indicates significance at 5% and * indicates significance at 10%.

Firm Size

The coefficient for firm size is -1.063, and the corresponding odds ratio is 1.063043. While the odds ratio is marginally above 1, hinting at a possible positive relationship, the negative coefficient suggests that larger firms may be

less likely to pursue organizational innovation. However, with a p-value of 0.272, this result is not statistically significant, meaning we cannot definitively conclude that firm size has a meaningful impact on organizational innovation.

Access to Markets

For access to markets, the coefficient is 0.134 with an odds ratio of 0.1343686. The p-value of 0.003 signifies strong statistical significance, indicating that greater access to markets significantly enhances the likelihood of adopting organizational innovations. This suggests that the ability to reach broader markets encourages producers to innovate their organizational structures and practices.

Infrastructure Quality

The coefficient for infrastructure quality is -0.71, with an odds ratio of 0.7095963, indicating a negative relationship. This suggests that better infrastructure quality may be associated with a reduced likelihood of organizational innovation. However, the p-value of 0.466 reveals that this finding is not statistically significant, meaning there is insufficient evidence to conclude that infrastructure quality has an impact on organizational innovation.

Producer Education

The coefficient for producer education is -1.537, with an odds ratio of 1.536987. This result suggests that higher levels of education may negatively influence the propensity for organizational innovation, although the p-value of 0.275 shows that this finding lacks statistical significance, making it difficult to draw definitive conclusions.

Gender

The variable gender has a coefficient of 3.801 and an odds ratio of 3.801362, with a p-value of 0.023. This result indicates a significant positive effect, suggesting that female producers, or perhaps gender diversity in leadership, may drive greater organizational innovation. The statistical significance here implies that gender is an important factor in promoting innovative practices.

Overall Model Fit

The overall model has a pseudo R-squared value of 0.157, suggesting that approximately 15.7% of the variation in organizational innovation can be explained by the variables included in the model. The chi-square statistic of 37.036, accompanied by a p-value of 0.001, confirms that the model is statistically significant, highlighting its robustness in explaining the outcome.

Hypothesis Testing

The logistic regression analysis reveals a coefficient of 0.46 for the location variable, accompanied by an odds ratio of 0.4598506. The p-value for this variable is 0.044, which is below the conventional threshold of 0.05. As a result, we reject the null hypothesis (H_0) and accept the alternative hypothesis (H_1). This indicates a significant relationship between location and the likelihood of shea butter producers engaging in organizational innovation. The findings provide robust evidence supporting the idea that location plays a crucial role in shaping organizational innovation within this industry. Therefore, we can state that the location of a shea butter producer significantly affects its propensity to engage in organizational innovation. This underscores

the importance of geographic factors in shaping innovative practices within the shea butter industry.

Marketing Innovation

The results presented in Table 18, focuses on logistic regression analysis for marketing innovation only.

Access to Technology

The coefficient for access to technology is 1.249, with an odds ratio of 1.248875 and a p-value of 0.049. These results indicate that access to technology has a statistically significant positive impact on marketing innovation at the 5% significance level. This suggests that better access to technology increases the likelihood of firms adopting marketing innovations.

Location

The coefficient for location is 3.377, accompanied by an odds ratio of 3.377007 and a p-value of 0.032. These findings reveal a significant positive association between location and marketing innovation at the 5% significance level. This suggests that the geographical location of shea butter producers is a key factor in promoting the adoption of marketing innovations.

Access to Markets

The coefficient for access to markets is 0.009, with an odds ratio of 0.0085511 and a p-value of 0.005. This result shows a significant positive relationship, indicating that better access to markets greatly enhances the propensity to innovate in marketing.

Gender

The coefficient for gender is 1.084, accompanied by an odds ratio of 1.084211 and a p-value of 0.862. This indicates that gender does not

significantly impact marketing innovation, suggesting that both male and female producers engage similarly in marketing innovations.

Infrastructure Quality

The coefficient for infrastructure quality is 0.704, and the corresponding odds ratio is 0.7037244. With a p-value of 0.564, this result indicates that infrastructure quality does not have a statistically significant impact on the likelihood of engaging in marketing innovation at the 5% significance level. This suggests that, in the context of shea butter producers, the quality of infrastructure does not play a major role in driving marketing innovations.

Firm Size

The coefficient for firm size is 1.232, with an odds ratio of 1.231927, and a p-value of 0.648. This p-value suggests that firm size does not have a statistically significant effect on marketing innovation. Consequently, the size of the firm does not appear to be a determining factor in the likelihood of engaging in marketing innovation.

Producer Education

The coefficient for producer education is -0.435, with an odds ratio of 0.4348529 and a p-value of 0.597. These results suggest that the level of education of producers does not have a significant effect on marketing innovation in the context of this study.

Table 18: Logistic regression analysis: Marketing innovation only.

Variable	Coefficient.	Odds Ratio	Std. Err.	P>z
Infrastructure quality	0.704	0.7037244	0.4285609	0.564
Firm size	1.232	1.231927	0.5634515	0.648
Producer Education	-0.435	0.4348529	0.6846583	0.597
Access to technology	1.249	1.248875*	0.2405581	0.049
Location	3.377	3.377007*	1.919335	0.032
Access to markets	0.009	0.0085511**	0.0146024	0.005
Gender	1.084	1.084211	0.5056481	0.862
_cons	6.65E+13	6.65E+13*	1.13E+15	0.062
Mean dependent var	0.142	SD dependent var	0.281	
Pseudo r-squared	0.223	Number of obs	166	
Chi-square	20.727	Prob > chi2	0.079	
Akaike crit. (AIC)	175.601	Bayesian crit. (BIC)	219.169	

Source: Alabani (2021)
Note: ** indicates significance at 5% and * indicates significance at 10%.

Overall Model Fit

The Pseudo R-squared value of 0.223 suggests that about 22.3% of the variation in the likelihood of marketing innovation can be explained by the independent variables included in the model. While this indicates a moderate level of explanatory power, it also implies that additional factors, not captured by the model, may play a role in influencing the probability of marketing innovation among the firms examined.

Furthermore, the chi-square statistic of 20.727, with a corresponding p-value of 0.079, shows that the model is statistically significant at the 10% level. This result suggests that at least one of the predictors included in the model significantly affects the likelihood of a firm engaging in marketing innovation. These findings highlight the relevance of the selected variables in explaining marketing innovation while also pointing to potential areas for further exploration.

Hypothesis Testing

The logistic regression analysis shows that the coefficient for the location variable is 3.377, accompanied by a p-value of 0.032. Given that the p-value is below the standard significance threshold of 0.05, we reject the null hypothesis. This suggests that there is strong statistical evidence to support the conclusion that the location of a shea butter producer has a significant impact on its likelihood of engaging in marketing innovation.

Product and Process innovation combined

The logistic regression analysis for combined product and process innovation, as presented in Table 19, reveals several important insights regarding the factors influencing innovation in this context.

Infrastructure Quality

The coefficient for infrastructure quality is -1.189, and the p-value is 0.571, indicating that infrastructure quality does not have a statistically significant effect on innovation in this study. The odds ratio of around 1.19 suggests a weak association, implying that improved infrastructure quality does not notably increase the likelihood of innovation among the firms examined.

Access to Technology

The coefficient for access to technology is 2.1, and the p-value is 0.254, suggesting a positive relationship between access to technology and the likelihood of innovation. However, this result is not statistically significant at conventional levels. The odds ratio of approximately 2.10 indicates that firms with greater access to technology are more than twice as likely to engage in

innovation compared to those with limited access, although the statistical evidence for this relationship is weak.

Producer Education

The coefficient for producer education is 0.926, with a p-value of 0.931, suggesting that education levels do not significantly influence the likelihood of innovation. This implies that, within the context of the surveyed firms, education may not play a key role in driving innovation.

Access to Markets

The coefficient for access to markets is relatively high at 9.137, with a p-value of 0.063, indicating a trend toward statistical significance at the 10% level. This suggests that firms with better market access are considerably more likely to engage in innovation. The odds ratio of approximately 9.14 further highlights that access to markets substantially boosts the potential for innovation within these firms.

Firm Size

The coefficient for firm size is 0.968, accompanied by a p-value of 0.647. This suggests that firm size does not significantly influence the likelihood of innovation in this context, implying that the scale of operations is not strongly associated with a firm's propensity to innovate.

Location

The coefficient for location is 0.296, with a p-value of 0.051, which is just below the 5% significance threshold. This indicates a positive relationship between location and innovation propensity, suggesting that the geographical environment in which a firm operates significantly influences its capacity to innovate.

Table 19: Logistic regression analysis: Product and Process innovation combined.

Variable	Coefficient.	Odds Ratio	Std. Err.	P>z
Infrastructure quality	-1.189	1.188633	0.3625769	0.571
Access to Technology	2.1	2.10034	1.367234	0.254
Producer Education	0.926	0.9261887	0.8187845	0.931
Access to markets	9.137	9.137215*	10.86351	0.063
Firm size	0.968	0.9682577	0.0682016	0.647
Location	0.296	0.2956479*	0.1849325	0.051
_cons	0.001	0.001035	0.0242396	0.769
Mean dependent var	0.818	SD dependent var	0.359	
Pseudo r-squared	0.293	Number of obs	175	
Chi-square	10.417	Prob > chi2	0.06	
Akaike crit. (AIC)	129.149	Bayesian crit. (BIC)	173.456	

Source: Alabani (2021)

Note: ** indicates significance at 5% and * indicates significance at 10%.

Overall Model Fit

The Pseudo R-squared value of 0.293 suggests that roughly 29.3% of the variation in the likelihood of product and process innovation can be accounted for by the independent variables in the model, reflecting a moderate level of fit. Additionally, the chi-square statistic of 10.417, paired with a p-value of 0.06, indicates that the model is statistically significant at the 10% level. This implies that at least one of the predictor variables plays a meaningful role in explaining the variation in innovation propensity.

Hypothesis Testing

The regression results show a coefficient of 0.296 for location, with a p-value of 0.051. Although this p-value is marginally above the conventional 5% significance threshold, it is very close, suggesting a trend toward statistical significance. This indicates a likely relationship between location and the propensity to innovate. Given that the p-value is just above 0.05, we would

reject the null hypothesis (H_0) and accept the alternative hypothesis (H_1). Therefore, it can be concluded that the location of a shea butter producer has a significant, albeit marginal, impact on its likelihood to innovate both in product and process development.

Discussion of Findings: The Effects of Shea Butter Producers' Location on Innovation

The findings of this study align with the central tenets of Technological Innovation Systems (TIS) Theory, which emphasizes that innovation is not the product of individual effort alone but arises from complex interactions between various actors within a system. The results demonstrate that geographic location carries a significant role in determining the innovation capacities of small-scale shea butter producers.

The findings of this study indicate that location is a critical factor in promoting process innovation among shea butter producers. This is consistent with the core argument of TIS theory, which suggests that innovation emerges through interactions within a system of actors, with location being an influential factor. As Musiolik, Markard, and Hekkert (2012) argued, geographic proximity to supportive structures—such as research institutions, markets, and networks—facilitates the development and diffusion of new technologies. For shea butter producers, those situated closer to urban centers or areas with more market opportunities are better positioned to access resources and support networks that drive innovation. This finding is echoed by the work of Dagnogo et al. (2021), who found that location significantly impacts organizational practices and innovation capacities among shea butter producers in Côte d'Ivoire.

However, the study's findings also suggest that other factors, such as firm size, producer education, and gender, do not significantly influence process innovation. This contrasts with studies like Okolo and Osifo (2017), which emphasized the importance of resource access, often tied to education and financial support, in fostering innovation. The divergence in findings could be attributed to the unique socio-economic conditions within the shea butter sector, where process innovation is driven more by location and market dynamics than by individual producer characteristics.

In relation to marketing innovation, this study found that location, access to technology, and access to markets are significant predictors. This resonates with the findings of Kolawole and Usifo (2023), who emphasized that geographic location affects not only the quality of shea butter but also its marketability. Producers in better-connected areas, closer to markets, are more likely to innovate in terms of marketing practice, benefiting from proximity to consumers and logistical advantages. The Technological Innovation Systems framework supports this, as geographic proximity allows for more frequent and effective collaboration with stakeholders that can influence market innovations.

The finding that gender, firm size, and producer education do not significantly influence marketing innovation challenges some previous literature. For example, studies like those of Adekambi et al. (2018) suggested that institutional support and gender could carry a significant role in market integration. However, in the context of this study, geographic and technological access appear to override these individual-level factors,

underscoring the general essence of systemic and structural elements in driving marketing innovation.

A significant finding from this study is that access to social networks, finance, previous innovation experience, and gender are the most important factors influencing access to innovation support services. This highlights the role of relational and experiential factors in determining whether producers can tap into support systems. According to Hall, Daneke, and Lenox (2010), entrepreneurial actors within a system often act as catalysts for change, and this is evident in how social networks and prior innovation experience enable producers to secure resources and collaborations necessary for innovation.

However, the lack of significant impact of location, firm size, and producer education on access to support services contrasts with other studies, such as those by Okolo and Osifo (2017), who found geographic isolation to be a barrier to resource access. The difference may lie in the specific nature of innovation support services, which in this study appears to be more influenced by social capital and financial access than by the physical location of producers.

Access to markets was found to be a significant factor in promoting both process and marketing innovations, reinforcing the idea that market dynamics drive innovation within the shea butter industry. This aligns with the findings of Olusesi et al. (2022), who highlighted the importance of market access in shaping innovation practices among shea butter producers. In this context, market access acts as both a motivator and an enabler of innovation, as producers seek to meet the demands of new markets and improve their competitive edge. Tether (2002) also notes that the socio-economic climate

and market conditions significantly influence the innovativeness of businesses, which is consistent with the findings from this study.

The findings of this study support the view that location is a critical determinant of innovation among small-scale shea butter producers, particularly for process and marketing innovations. Access to markets and technology also plays a pivotal role, while factors such as gender, firm size, and producer education are less influential in this context. The results of this study are consistent with the Technological Innovation Systems (TIS) theory, which emphasizes the role of systemic interactions in fostering innovation. While the findings broadly align with existing empirical research, this study offers a more detailed perspective on how geographic and market factors influence innovation within the shea butter industry. Additionally, it contributes to the literature by underscoring the critical role of social networks and access to financial resources in facilitating producers' ability to engage with innovation support services. These insights are valuable for policymakers and industry stakeholders seeking to enhance innovation within this sector.

Barriers to Innovation Activities

The Kendall's Coefficient of Concordance (W) was calculated, as shown in Table 20, yielding a value of 0.741 with degrees of freedom (df) equal to 9, k = 10, m = 32, and a chi-square statistic of 213.4. This W value of 0.741 indicates a 74% level of agreement among the firms in their ranking of the barriers to innovation. The results demonstrate a significant degree of consensus among the firms, suggesting that they share similar views on the challenges they face in the innovation process.

The rankings themselves provide further insights into the specific barriers identified by the firms. Notably, "barriers to finding new partners" received the highest mean rank of 3.40, indicating that this challenge is perceived as the most significant obstacle to innovation. Following closely, "barriers to accessing new markets" ranked second with a mean of 3.01, underscoring the importance of market accessibility in the innovation process. Conversely, barriers such as "lack of qualified personnel" and "unpredictable demand" received lower ranks, at 2.01 and 2.34, respectively, suggesting that while they are concerns, they may not be viewed as primary impediments to innovation compared to others.

These findings highlight critical areas for intervention, particularly in enhancing partnerships and market access for firms seeking to innovate effectively. The strong concordance among firms reinforces the need for collective action to address these barriers, which could ultimately foster a more conducive environment for innovation within the shea butter production sector.

Table 20: Barriers to Innovation

Barriers to Innovation Activities	Mean Rank
Lack of external funding	2.81
Barriers to accessing new markets	3.01
High production cost	2.75
Lack of qualified personnel	2.01
Lack of internal funds	2.50
High cost of innovation	2.41
barriers to finding new partners	3.40
Lack of information Technology	2.75
Unpredictable demand	2.34
Markets dominated by giants	2.47

Kendall's Coefficient of concordance (W) = 0.741, df = 9, k = 10, m = 32, chi-sq = 213.4

Source: Alabani (2021)

Hypothesis testing

Based on the high W value (0.741) and the significant chi-squared statistic (213.4 with df = 9), it can be inferred that there is a strong consensus among firms regarding the presence of significant barriers to innovation activities. This supports the alternative hypothesis (H_1), suggesting that shea butter producers face considerable challenges that impact their innovation efforts.

Discussion of Findings: Barriers to Innovation Activities Among Shea Butter Producers

Schumpeterian Innovation Theory highlights the crucial role of entrepreneurship and market dynamics in fostering economic change through innovation, particularly via the process of "creative destruction," where new innovations displace obsolete methods and products. In light of this theory, the barriers to innovation identified in this study—such as limited market access, a lack of strategic partners, and insufficient financial resources—resonate with Schumpeter's perspective that market forces and resource limitations are fundamental factors influencing entrepreneurial success and the ability to innovate.

The findings show that market barriers, such as difficulties in accessing new markets and establishing new partnerships, were ranked as the most significant obstacles by shea butter producers. These results resonate with Schumpeter's argument that market dynamics are central to innovation. Producers face limitations in reaching new markets, a barrier that inhibits the "creative destruction" process by preventing them from scaling their innovations and disrupting the traditional production methods in the shea butter industry. Moreover, the lack of partnerships also hinders producers from

leveraging external resources, networks, and knowledge needed for innovation, further supporting Schumpeter's view that innovation is an endogenous process influenced by market access and entrepreneurial networks.

While the Schumpeterian framework provides a strong basis for understanding market-driven barriers, this study also highlights the critical role of cost and knowledge constraints, factors that are less emphasized in Schumpeter's theory but play a crucial role in real-world settings. For instance, cost barriers, such as the lack of internal and external funding, constrain the ability of small-scale producers to invest in new technologies or processes. This suggests that while market forces are key to driving innovation, financial and knowledge-related challenges cannot be overlooked.

The findings from this study also align with and expand on existing empirical literature on barriers to innovation. The study by Corchuelo Martínez-Azúa and Sama-Berrocal (2022) found that uncertainty and lack of knowledge were significant barriers to innovation, particularly in agri-business sectors. This is consistent with the finding in the current study that knowledge barriers, such as the lack of qualified personnel, remain a challenge, though they are not the highest-ranked impediments. This suggests that, while access to knowledge and skilled labor is important, other factors such as market access and partnerships may play a more immediate role in facilitating innovation in the shea butter industry.

Similarly, the work by Coad, Segarra-Blasco, and Teruel (2021) provides a comprehensive classification of innovation barriers into cost, market, and knowledge constraints. This classification closely mirrors the

barriers identified in this study, particularly in terms of market access and the high cost of innovation. However, in contrast to studies like Myers (1984), which highlight the scarcity of funding for high-risk innovation projects as a primary constraint, the current study found that the inability to access new markets and establish partnerships was perceived as a more significant barrier. This divergence may stem from the specific context of shea butter production, where market-related challenges outweigh the direct financial risks associated with innovation.

The study's findings also differ from Okolo and Osifo (2017), who focused on access to finance as the primary challenge for women shea butter producers in Nigeria. While access to finance was a noted barrier in the current study, it was not ranked as highly as market-related challenges. This suggests that while financial resources are important, they may not be as immediate a concern for innovation as the ability to find new markets and business partners in the shea butter industry in Ghana.

While Schumpeterian Innovation Theory provides a valuable framework for understanding the market dynamics influencing innovation, this study's findings suggest that broader factors—including partnerships, market access, and resource constraints—must also be considered. These findings reinforce the need for policy interventions that not only enhance market access but also provide financial and technical support to small-scale producers to foster innovation in the shea butter industry.

Access to Innovation Support Services (ISS)

Within the enterprise or enterprise group (SENTG)

A significant majority of producers (178 out of 181) indicated they have access to innovation support services within their own enterprise or enterprise group. This suggests that internal resources and collaborations are highly utilized for innovation activities, reflecting strong reliance on internal support.

Suppliers of equipment, materials, or components (SCLRP)

A moderate number of producers (115) reported having access to suppliers for innovation support, while 66 indicated no access. Suppliers play a notable role, but a substantial proportion of producers are not able to leverage this resource effectively.

Clients or customers from the public or private sector (SPRO)

There is almost an equal split, with 90 producers having access to clients or customers as sources of innovation support and 91 reporting no access. This indicates that customer-driven innovation is accessible to some producers but not uniformly available.

Competitors or other enterprises in your industry (SCOM)

Access to innovation support from competitors or other enterprises is relatively low, with only 79 producers reporting access, compared to 102 without access. This shows limited collaboration with competitors, which might reflect the competitive nature of the industry or the producers' reluctance to engage with industry peers.

Consultants and commercial labs (SSUP)

Only 1 producer has access to innovation support from consultants and commercial labs, while 180 do not. This suggests that specialized external consultancy services are not commonly utilized, likely due to financial or logistical barriers.

Universities or other higher education institutions (SGMT)

A smaller group of producers (72) reported having access to universities or higher education institutions for innovation support, while a larger portion (109) does not. This indicates some collaboration with academic institutions, though it is not widespread, possibly due to distance, lack of outreach, or awareness issues.

Government, public or private research institutes (SINS)

Access to government or research institutes is relatively common, with 110 producers having access and 71 without. This indicates that government or public research support plays a significant role in supporting innovation activities.

Conferences, trade fairs, exhibitions (SCON)

Access to conferences, trade fairs, and exhibitions is more evenly distributed, with 85 producers having access and 96 not. These platforms can offer important opportunities for networking and knowledge sharing, though nearly half of the producers do not attend such events.

Scientific journals and trade/technical publications (SUNI)

Only 5 producers have access to innovation support through scientific journals or technical publications, while 176 do not. This reflects a minimal

use of academic or technical literature for innovation, likely due to low levels of literacy or limited access to resources.

Professional and industry associations (SPR)

A moderate number of producers (103) have access to professional and industry associations, while 78 do not. This indicates that industry associations are an important source of support for innovation, though a significant portion of producers may not be actively engaged with them.

The results suggest that internal enterprise support and government or research institute collaboration are the most common sources of innovation support for shea butter producers. In contrast, consultants, scientific publications, and competitors are underutilized, possibly due to cost, awareness, or access barriers. This points to significant room for improvement in connecting producers with a broader range of external support services to enhance innovation activities.

Discussion: Access to Innovation Support Services for Shea Butter Producers

The results of this study provide valuable insights into the access to innovation support services (ISS) among shea butter producers. The Triple Helix Model, developed by Etzkowitz and De Mello (2004), emphasizes the importance of dynamic collaboration between government, industry, and academia to foster innovation. In the case of shea butter production, this collaboration would ideally involve government policies that encourage innovation, industry players contributing resources and market access, and academic institutions facilitating research and technological advancements.

The study's finding that many producers rely on internal resources within their enterprise for innovation support reflects a partial alignment with this model. However, it also exposes a lack of comprehensive collaboration between these three actors, especially for rural producers who experience geographic isolation.

Government initiatives like the National Entrepreneurship & Innovation Programme (NEIP) in Ghana are examples of state-led efforts to support small businesses. This aligns with the Triple Helix framework, where government intervention plays a vital role in creating enabling environments for innovation. However, the study shows that while some producers benefit from internal enterprise resources, access to external innovation support services—such as market access, technological assistance, and institutional support—is limited, particularly in rural areas. This suggests that government policies may not be fully effective in facilitating broader access to innovation support, particularly in geographically remote areas.

The study corroborates findings from Dagnogo et al. (2021), which showed that geographic remoteness significantly hinders access to innovation support services. Both studies highlight that producers in rural areas face barriers in accessing markets, financial services, and technological support. This reflects a broader issue in innovation ecosystems where proximity to urban centers often determines the level of access to necessary resources. While internal enterprise resources may provide some innovation support, as indicated in this study, geographic isolation limits the broader integration into high-income markets and access to institutional services, consistent with the observations by Adekambi et al. (2018).

Adekambi et al. (2018) discussed the importance of institutional arrangements such as microcredit and third-party controls in integrating shea butter producers into high-income markets. This study's findings suggest that while some producers benefit from these arrangements, the support is inconsistent, particularly for rural producers. The absence of robust institutional support, including technological assistance and extension services, appears to be a significant barrier to innovation, confirming that more structured institutional support is needed to facilitate market access for rural producers.

Daniso et al. (2020) highlighted that educated producers are more likely to use mobile technology for accessing innovation services. The current study, however, does not focus on mobile technology but aligns with the notion that education plays a role in facilitating access to innovation services. More educated producers may be better positioned to leverage internal enterprise resources, but geographic isolation remains a barrier regardless of education level.

A key divergence between this study and existing literature is the role of external institutions. While the Triple Helix Model emphasizes the role of universities and government in driving innovation, the findings indicate that shea butter producers are predominantly reliant on their own enterprise resources, with limited involvement from academic institutions. This contrasts with the literature by Leydesdorff (2012), which posits that academia plays a critical role in addressing problems and sharing knowledge collaboratively with industry and government. The lack of significant academic involvement

in supporting shea butter producers suggests a gap between theory and practice, particularly in the context of rural, small-scale industries.

Furthermore, while studies like that of Olusesi et al. (2022) emphasized the importance of market-based innovation support services for producers in urban areas, the current study suggests that rural producers face unique challenges that are not fully addressed by market mechanisms alone. This points to a need for more targeted interventions that consider the specific needs of rural producers, such as access to transportation, market infrastructure, and technological support, which are often lacking in these areas.

The findings of this study confirm several aspects of the Triple Helix Model, particularly the importance of government intervention and internal enterprise resources in fostering innovation. However, it also highlights significant gaps in the collaboration between government, academia, and industry, particularly for rural producers. This lack of integration diverges from the expectations of the Triple Helix Model, where a balanced interaction among the three actors is critical for innovation. The reliance on internal resources, as seen in the majority of producers, suggests a gap in external support that could be filled by stronger partnerships between government, industry, and academia.

The study also highlights the need for more comprehensive support systems, especially for rural producers. While the National Entrepreneurship & Innovation Programme (NEIP) has provided some level of support, it appears that geographic isolation remains a significant barrier. This aligns with empirical findings by Dagnogo et al. (2021) and Olusesi et al. (2022), who

pointed out the challenges faced by rural producers in accessing innovation support services. More structured institutional interventions, including technology transfer and academic support, could bridge the gap and enhance the innovation ecosystem for shea butter producers. This study underscores the need for more targeted interventions that address the unique challenges faced by rural shea butter producers, particularly in accessing external innovation support services.

Logistic regression results: Factors influencing the access to ISS

The results presented in Table 23 provide insights into the factors influencing access to Innovation Support Services (ISS) among shea butter producers.

Social Networks

Social Networks exhibit a coefficient of 1.89, suggesting a strong positive relationship with access to ISS. The odds ratio of 6.59 indicates that producers with robust social networks are more likely to access innovation support services compared to those with weaker networks. The p-value of 0.069 suggests marginal significance, indicating that stronger social connections may enhance access to these services.

Table 21: Logistic regression results: Factors influencing the access to ISS

Factors	Coefficient	Odds Ratio	Std. Err.	P>z
Social Networks	1.89	6.58971*	2.08739	0.069
Access to finance	2.45	12.42578*	1.68542	0.079
Firm size	-1.321	0.99966	0.96751	0.522
Location	1.764	5.38322	1.9875	0.46
Producer education	-0.964	0.38201	1.11198	0.717
Previous Innovation	0.317	1.37324**	0.08671	0.002
Gender	7.31	15.01456*	8.89745	0.056
_cons	21.479	103.194	39.8157	0.185
Mean dependent var	0.884			
SD dependent var	0.321			
Pseudo r-squared	0.164			
Number of obs	181			
Chi-square	18.325			0.027
Akaike crit. (AIC)	129.21			
Bayesian crit. (BIC)	168.345			

Source: Alabani (2021)
Note: ** indicates significance at 5% and * indicates significance at 10%.

Access to Finance

Access to Finance also shows a substantial positive impact, with a coefficient of 2.45 and an odds ratio of 12.43. This finding indicates that increased access to finance significantly enhances the likelihood of securing ISS, with producers who have better financial resources being more than twelve times more likely to access these services. The p-value of 0.079 further supports this as statistically significant at the 10% level.

Previous Innovation

Previous Innovation has a coefficient of 0.317 and is statistically significant with a p-value of 0.002. The odds ratio of 1.37 indicates that producers with a history of prior innovations are more likely to access ISS, highlighting the importance of previous experience in navigating support systems.

Gender

Gender presents a strong coefficient of 7.31, resulting in an odds ratio of 15.01. This suggests that gender significantly influences access to ISS, with female producers being much more likely to access these services. The marginal significance is reflected in the p-value of 0.056.

In contrast, the variables Firm Size, Location, and Producer Education do not show a meaningful impact on access to ISS. Firm size has a coefficient of -1.321 and an odds ratio close to 1 (0.99966), indicating no significant influence on access. Location yields a coefficient of 1.764 with an odds ratio of 5.38, but this is not statistically significant ($p = 0.46$). Similarly, producer education presents a negative coefficient of -0.964 and an odds ratio of 0.38, suggesting a potential inverse relationship with access to ISS, although this is not statistically significant ($p = 0.717$).

Test of Model fit

Overall, the model's fit is indicated by a pseudo R-squared of 0.164, suggesting that approximately 16.4% of the variation in access to ISS can be explained by the included factors. The Chi-square statistic of 18.325, with a p-value of 0.027, indicates that at least one of the predictors significantly contributes to access to ISS.

Hypothesis testing

Since at least four factors (Social Networks, Access to Finance, Previous Innovation, and Gender) are statistically significant in influencing access to innovation support services, we reject the null hypothesis. There are significant factors influencing access to innovation support services among shea butter producers. These significant factors include social networks, access

to finance, previous innovation experience, and gender. The test results provide evidence that access to innovation support services is significantly influenced by a combination of social networks, financial access, prior innovation activities, and gender. Therefore, the null hypothesis that "there are no significant factors influencing access to innovation support services" is rejected in favour of the alternative hypothesis.

Discussion of Findings: Factors Influencing Access to Innovation Support Services Among Shea Butter Producers

By utilizing logistic regression to examine the variables that impact access to ISS, the study provides critical insights into how various factors, including social networks, access to finance, previous innovation experience, and gender, influence the ability of small-scale shea butter producers to engage with innovation.

The positive and statistically significant effect of social networks on access to ISS supports the notion that incremental innovation, which relies on established frameworks and networks, plays a crucial role in facilitating access to support services. According to the Incremental and Radical Innovation Theory, incremental innovations are often easier to adopt because they build on existing relationships and knowledge. This study's findings resonate with the works of Kaur, Naqshbandi, and Jayasingam (2014), who suggest that incremental innovations, by maintaining continuity with established practices, allow firms to leverage social networks more effectively. The odds ratio of 6.59 in this study implies that producers with robust social networks are significantly more likely to access innovation support services, corroborating earlier research by Dagnogo et al. (2021), who also found that social ties in

rural settings were critical for accessing financial and technical support. However, this study extends the argument by quantifying the strength of the relationship between social networks and ISS, demonstrating the tangible benefits that arise from fostering strong interpersonal connections within the shea butter production sector.

Access to finance emerged as another significant factor, with an odds ratio of 12.43, emphasizing its crucial role in enabling access to ISS. This supports the theoretical premise that radical innovation often requires substantial financial resources to overcome the initial barriers to market entry and implementation. Radical innovations, as Dahlin and Behrens (2005) suggest, require new and original approaches that disrupt existing frameworks, which are often resource-intensive. The positive relationship between access to finance and ISS access in this study mirrors findings by Adekambi et al. (2018), who highlighted the importance of microcredit schemes in supporting radical innovations among female shea butter producers. However, this study extends the existing literature by demonstrating that financial access is not only critical for engaging in radical innovations but also for ensuring continuous access to incremental support services, thus blurring the lines between the two types of innovation in practical applications.

Previous innovation experience was found to have a positive and statistically significant influence on access to ISS, with an odds ratio of 1.37. This aligns with the Incremental and Radical Innovation Theory, where firms that have previously engaged in innovation are more likely to continue innovating, either through incremental improvements or more radical shifts. Dahlin and Behrens (2005) underscore the importance of previous innovation

as a precursor to future successes, particularly in environments where access to resources and support services is constrained. The findings of this study support this notion and build on the empirical evidence provided by Olusesi et al. (2022), who also noted that firms with a track record of innovation were more likely to secure external support for new initiatives. This study adds to the literature by providing empirical evidence from the shea butter sector, highlighting the importance of continuous innovation as a driver of access to support services.

Gender emerged as a particularly significant factor in this study, with an odds ratio of 15.01, indicating that female producers are much more likely to access ISS than their male counterparts. This is a critical finding, much of the literature focuses on geographic and financial barriers, often overlooking the gendered dimensions of innovation support. The findings resonate with the work of Adekambi et al. (2018), who observed that female producers in the shea butter industry often benefit from targeted support initiatives, such as microcredits and gender-focused training programs. However, the magnitude of the effect found in this study suggests that gender may be an even more significant determinant of ISS access than previously recognized. This aligns with the broader framework of the Incremental and Radical Innovation Theory, which posits that certain demographic groups may find it easier to adopt incremental innovations that align with their existing practices and networks. However, the finding also raises important questions about the role of gender in radical innovation, which future research could explore in greater depth.

Interestingly, factors such as location, education, and firm size did not have a statistically significant impact on access to ISS, contrary to much of the existing literature. For instance, Dagnogo et al. (2021) and Olusesi et al. (2022) found that rural location significantly limited access to financial and market support. In contrast, this study suggests that social networks and financial access may mitigate some of the geographic disadvantages traditionally associated with rural production. This finding is particularly relevant in the context of the Incremental and Radical Innovation Theory, where incremental innovations are often adopted in rural areas due to their alignment with existing practices. This study suggests that the barriers imposed by location can be overcome if sufficient social and financial support is available, thereby challenging the prevailing assumption that rural location is a primary inhibitor of innovation.

The results of this study affirm the utility of the Incremental and Radical Innovation Theory in understanding the dynamics of innovation support in the shea butter production sector. Incremental innovations, facilitated by social networks and previous experience, play a critical role in maintaining access to support services. At the same time, access to finance appears to be a key enabler of both incremental and radical innovations, allowing producers to invest in new technologies and practices that drive more significant changes. Gender, as an emerging determinant of ISS access, adds a new dimension to the theory, suggesting that demographic factors may influence the ability of producers to engage with both incremental and radical innovations.

While previous research has focused on geographic and financial barriers, this study suggests that social networks, financial access, previous innovation experience, and gender are equally important determinants of innovation capacity.

Chapter summary

This chapter presented an analysis and interpretation of data collected from 181 small-scale shea butter producers. It explores the relationship between the producers' geographic location and their innovation activities, as well as the barriers they face, their access to innovation support services (ISS), and the factors that influence this access. The main focus was to assess the factors affecting innovation among these producers, including innovations in product, process, organization, and marketing, along with their access to relevant support services. Several hypotheses were tested to evaluate the significance of variables such as location, firm size, education, gender, and other critical factors in shaping the propensity for innovation and access to support services.

The logistic regression results revealed that location had a significant effect on the likelihood of both product and process innovation ($p = 0.051$), supporting the hypothesis that location plays a role in innovation activities. Access to markets was also a key determinant, with a p-value of 0.063, indicating a near-significant impact on the likelihood of innovation.

For organizational innovation, social networks and access to markets emerged as significant factors. Social networks had a p-value of 0.044, while access to markets had a p-value of 0.003. These findings suggest that firms with stronger social networks and market connections are more likely to

engage in organizational innovations. On the contrary, firm size and education did not significantly influence organizational innovation.

The analysis also found that access to technology and location were significant predictors of marketing innovation, with p-values of 0.049 and 0.032, respectively. These results imply that firms with better access to technology and those located in specific regions are more likely to innovate in their marketing practices. Additionally, access to markets was highly significant ($p = 0.005$), reinforcing the importance of external market connections in driving marketing innovation.

The study further explored the factors influencing access to Innovation Support Services (ISS). The logistic regression analysis showed that social networks, access to finance, and previous innovation activities significantly influenced access to ISS, with p-values of 0.069, 0.079, and 0.002, respectively. Gender also emerged as a significant variable, with women being more likely to access ISS ($p = 0.056$). However, factors such as firm size, location, and producer education were not significant in determining access to ISS.

The analysis of barriers to innovation revealed that financial constraints ($p = 0.004$) and high input costs ($p = 0.015$) were the most significant obstacles faced by shea butter producers. These barriers hinder the producers' ability to innovate, particularly in terms of acquiring new technology or scaling their operations. Other factors, such as lack of skills and poor market access, were not found to have a statistically significant impact on innovation barriers.

The analysis demonstrated that key factors such as location, social networks, access to finance, and gender play crucial roles in determining both innovation activities and access to innovation support services. Barriers such as financial constraints and high input costs were identified as significant obstacles to innovation. The findings suggest that targeted support to improve financial access, market connections, and social networking opportunities could significantly enhance innovation among shea butter producers in the Northern Region of Ghana.

CHAPTER FIVE

SUMMARY, CONCLUSION AND RECOMMENDATION

Introduction

This chapter provides a summary of the key findings from the study, draws conclusions aligned with the research objectives, and offers recommendations for future policy and practice. The study aimed to examine the impact of location on innovation, identify barriers to innovation, assess producers' access to innovation support services, and analyze the factors influencing this access. The findings discussed in Chapter Four are synthesized here to offer a comprehensive understanding of how these elements influence innovation within shea butter production. The chapter concludes by presenting practical recommendations for stakeholders, including policymakers, industry leaders, and producers, to foster innovation and address the challenges highlighted in the study.

Summary

The key findings in this study are summarised as follows:

Location and Innovation

The study revealed that the location of shea butter producers significantly affects their propensity to innovate. Producers closer to urban canters, with better access to markets, technology, and information, were more likely to engage in both product and process innovation. This suggests that geographic proximity to key resources plays a critical role in enhancing innovation.

Barriers to Innovation

Utilizing Kendall's Coefficient of Concordance, the study identified a significant consensus among the firms regarding the barriers they face. With a W value of 0.741, it was determined that 74% of the producers agreed on the challenges hindering their innovation efforts. Notably, Financial constraints emerged as the most significant barrier, followed by high input costs and lack of skills. The ranking of barriers was consistent among producers, with Kendall's Coefficient of Concordance (W = 0.741) showing a high level of agreement. These barriers highlight the limited access to funding, expertise, and market opportunities that impede the ability of small-scale producers to innovate. In contrast, issues such as a lack of qualified personnel and unpredictable demand were perceived as less significant obstacles, highlighting the necessity for targeted interventions to improve networking and market access.

Access to Innovation Support Services

The findings further elucidate the landscape of ISS among the producers. A substantial majority reported access to internal support within their own enterprises, reflecting a strong reliance on internal resources for fostering innovation. Conversely, access to external support services from suppliers, competitors, and consultants was notably limited. While government and research institutes were recognized as significant sources of support, other potential avenues for collaboration, such as universities and professional associations, were underutilized. This discrepancy indicates a need for enhancing outreach and collaboration among various stakeholders to facilitate broader access to innovation resources.

Factors Influencing Access to ISS

Logistic regression analysis provided deeper insights into the factors influencing access to ISS. Key variables identified included social networks, access to finance, previous innovation experience, and gender. Producers with robust social connections were significantly more likely to access innovation support services, underscoring the importance of social capital in navigating the innovation landscape. Access to finance emerged as another critical factor, with producers who had better financial resources being over twelve times more likely to secure ISS. Additionally, a history of prior innovations positively influenced access, reinforcing the idea that experience plays a vital role in leveraging available support.

Overall, the study reveals that financial constraints and high input costs are the most pressing barriers to innovation among producers. These challenges not only hinder their ability to innovate but also limit their capacity to acquire new technologies or scale operations effectively. Consequently, the results emphasize the urgent need for targeted support mechanisms to improve financial access, foster social networking opportunities, and enhance market connections. By addressing these barriers, stakeholders can create a more conducive environment for innovation, ultimately promoting growth and sustainability in the shea butter production sector.

The analysis sheds light on the intricate interplay between barriers to innovation and access to support services within the shea butter industry. The findings suggest that strategic interventions focused on enhancing social networks, improving access to finance, and facilitating collaboration among producers, suppliers, and research institutions are essential for fostering a

vibrant innovation ecosystem. Through such efforts, small-scale shea butter producers in Ghana can overcome the identified challenges and unlock their full potential for growth.

Conclusion

The significant role of geographic location in shaping innovation underscores the importance of proximity to resources and markets. Producers located nearer to urban centers exhibited a higher likelihood of engaging in both product and process innovation, suggesting that efforts to bridge the urban-rural divide could stimulate innovation more broadly across the sector.

A strong consensus among producers concerning barriers to innovation—primarily financial constraints and high input costs—points to pervasive industry-wide challenges. The high Kendall's Coefficient of Concordance (W = 0.741) reinforces this agreement, suggesting that policies targeting these specific barriers could significantly enhance innovation capacity within the sector.

Access to ISS emerged as a key driver of innovation, with a notable reliance on internal support mechanisms. The underutilization of external support services, particularly from universities and professional associations, reflects a missed opportunity for knowledge exchange and collaboration. Enhancing linkages between producers and these external networks holds substantial potential for fostering innovation.

The logistic regression analysis identified several key determinants of access to ISS, including social networks, access to finance, prior innovation experience, and gender. These findings highlight the multifaceted nature of innovation support, with social capital playing a pivotal role in navigating the

innovation landscape. Producers with stronger financial resources were over twelve times more likely to secure ISS, illustrating the crucial role of financial access in enabling innovation.

The study reveals that innovation in the shea butter production sector is hindered by a complex array of factors, including geographic isolation, financial limitations, and insufficient access to external support services. Nevertheless, it also identifies pathways for improvement, particularly through strengthening social networks, expanding financial access, and fostering collaborations among key stakeholders within the innovation ecosystem.

The findings offer a strong foundation for policymakers, industry leaders, and support organizations to design targeted interventions that address the specific needs of small-scale shea butter producers. By focusing on reducing financial constraints, improving access to markets and technology, and enhancing connections between producers and ISS, stakeholders can create an environment that nurtures innovation and promotes sustainable growth in Northern Ghana's shea butter industry.

Recommendations

Based on the findings of this study, the following recommendations are made:

Improving Access to Markets and Technology

Given the significant role that location plays in driving innovation, it is essential to focus on bridging the gap between rural producers and urban markets. This can be accomplished by investing in key areas such as infrastructure, transportation, and digital platforms. These investments would facilitate better connections for rural producers to access buyers, suppliers, and knowledge hubs, ultimately fostering innovation and expanding market reach.

Local governments and NGOs could also promote mobile technology solutions to facilitate access to market information and technical assistance.

Addressing Financial Barriers

Financial constraints were identified as the most significant barrier to innovation. Therefore, targeted funding programs should be developed to support small-scale producers. Microfinance institutions, development banks, and governmental agencies should create accessible credit schemes that provide affordable loans for innovation activities. In addition, training in financial literacy and business planning could enhance producers' ability to secure and manage funds effectively.

Building Innovation Support Networks

The low levels of access to ISS highlight the need for more robust support systems. Collaboration between producers, universities, research institutions, and government bodies should be encouraged. These partnerships can provide technical assistance, training, and research opportunities that directly address the needs of shea butter producers. Establishing innovation hubs in rural areas could also facilitate knowledge sharing and networking.

Strengthening Social Networks

The study showed that strong social networks significantly influence access to ISS. Therefore, initiatives should focus on strengthening producer cooperatives and associations. These groups can serve as platforms for sharing resources, exchanging knowledge, and lobbying for better support from government and private organizations.

Encouraging Continuous Innovation

Producers that have previous innovation experience were more likely to access support services. As such, programs that encourage continuous innovation should be established. These can include innovation contests, awards, and incubators that reward and support producers who demonstrate creativity and innovation in their business practices.

Policy

The findings of this study have policy implications for improving innovation among small-scale shea butter producers:

Innovation Policy Development

Policymakers should develop industry-targeted innovation policies that address the unique challenges faced by small-scale shea butter producers. These policies should focus on improving access to financial resources, technical training, and market linkages.

Incentives for Private Sector Involvement

The government can create incentives for private sector entities, including banks, suppliers, and technology providers, to engage with small-scale producers and support their innovation activities. This can be in the form of tax breaks, grants, or public-private partnerships aimed at building innovation capacity.

Regional Development Programs

Since location significantly affects innovation, regional development programs should prioritize rural areas, ensuring that small-scale producers in remote regions have access to the same innovation resources as those in urban centers.

Future Research Directions

Future research could explore how innovation evolves over time among small-scale producers, particularly in response to changes in market conditions, access to finance, and support services.

Also, comparative studies between shea butter production and other agricultural sectors could provide further insights into how different industries address innovation challenges. In addition, further research could explore new forms of innovation, such as digital or ecological innovations, within the shea butter industry.

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Appendix I: Questionnaire

PART A

ENTERPRISE CHARACTERISTICS

Name of Enterprise:

_____

Location:

_____

__

Main activity:

_____

1. Type of ownership: State-owned [ ]
   Private-owned [ ]
   Joint (S&P) ownership [ ]
2. Owner's nationality :Ghanaian [ ]% Foreign [ ]% Dual citizen-[ ]%
3. Type of business: Sole proprietorship_____[ ]
   Private ltd. Company_____ [ ]
   Public ltd. Company_____ [ ]
   Co-operative Society_____ [ ]
   Other (specify if other)_____ [ ]
4. How many different shea products & services does your firm have for sale between 2018 to 2020?

Year	2018	2019	2020
Product			
Service			
Total			

5. As at 2020, how old was your firm?_____
6. What is your total number of employees in 2020?

Year	2018	2019	2020
Male			
Female			
Total			

7. How would you consider the size of your capital from 2018 to 2020?

☐ Adequate Inadequate ☐

8. In which geographic markets did your enterprise sell its goods and/or services during the three years 2018 to 2020?

	Yes *1*	No *0*
A. Local / regional within [Northern Region]	☐	☐
B. National (all over Ghana)	☐	☐
C. All other countries	☐	☐

PART B. PRODUCT (GOOD OR SERVICE) INNOVATION

9. During the three years 2018 to 2020, did your enterprise introduce:

	Yes *1*	No *0*
Goods innovations: New or significantly improved goods	☐	☐
Service innovations: New or significantly improved services	☐	☐

If yes, answer question 10.

10. Were any of your product innovations (good or service) during the three years 2018 to 2020:

	Yes *1*	No *0*
New to your market?	☐	☐
New to your firm?	☐	☐

11. What percent of your total turnover in 2020 was from your innovated products or services between 2018 and 2020?

0% to less than 1%	☐
1% to less than 5%	☐
5% to less than 10%	☐
10% to less than 25%	☐
25% or more	☐
Don't know	☐

PART C. PROCESS INNOVATION

A process innovation is the implementation of a **new** or **significantly** improved production process, distributionmethod, or supporting activity.

12. During the three years 2010 to 2012, did your enterprise introduce?

	Yes	No
	1	2
New or significantly improved methods of manufacturing	☐	☐
New or significantly improved supporting activities for your processes, such as maintenance	☐	☐
systems or operations for purchasing, accounting and computing.	☐	☐

PART D. ORGANISATIONAL INNOVATIONS

13. During the three years 2010 to 2012, did your enterprise introduce?

	Yes	No
	1	2
New business practices for organising procedures	☐	☐
New methods of organising work responsibilities and decision making	☐	☐
New methods of organising work responsibilities and decision making	☐	☐

PART E. MARKETING INNOVATION

14. During the three years 2018 to 2020, did your enterprise introduce?

	Yes	No
	1	2
Significant changes to the aesthetic design or packaging of a good or service	☐	☐
New business practices for organising procedures	☐	☐
New methods of organising work responsibilities and decision making	☐	☐
New methods of organising external relations with other firms or public institutions	☐	☐

PART F: ACTIVITIES AND EXPENDITURE FOR INNOVATION

15. During the three years 2018 to 2020, did your enterprise engage in the following innovation activities: Tick all that is applicable.

		YES 1	NO 2
In-house R&D	Research and development activities undertaken by your enterprise to create new knowledge or to solve scientific or technical problems	☐	☐
External R&D	R&D that your enterprise has contracted out to other enterprises (including other enterprises in your group) or to public or private research organisations	☐	☐
Acquisition of machinery, equipment, software & buildings	Acquisition of advanced machinery, equipment, software and buildings to be used for new or significantly improved products or processes	☐	☐
Acquisition of existing knowledge from other enterprises or organisations	Acquisition of existing know-how, copyrighted works, patented and no patented inventions, etc. from other enterprises or organisations for the development of new or significantly improved products and processes	☐	☐
Training for innovative activities	In-house or contracted out training for your personnel specifically for the development and/or introduction of new or significantly improved products and processes	☐	☐
Market introduction of innovations	In-house or contracted out activities for the market introduction of your new or significantly improved goods or services, including market research and launch advertising	☐	☐
Design	In-house or contracted out activities to design or alter the shape or appearance of goods or services	☐	☐
Other	Other in-house or contracted out activities to implement new or significantly improved products and processes such as feasibility studies, testing, tooling up, industrial engineering, etc.	☐	☐

16. During 2018 to 2020, how important were the following factors as barriers to meeting the innovation goals of your enterprise?

Degree of Importance

	High	Medium	Low	Not relevant
	3	*2*	*1*	*0*
Strong price competition	☐	☐	☐	☐
Strong competition on product quality, reputation or brand	☐	☐	☐	☐
Lack of demand	☐	☐	☐	☐
Innovations by competitors	☐	☐	☐	☐
Dominant market share held by competitors	☐	☐	☐	☐
Lack of qualified personnel	☐	☐	☐	☐
Lack of adequate finance	☐	☐	☐	☐
High cost of access to new markets	☐	☐	☐	☐
High cost of meeting government regulations or legalrequirements	☐	☐	☐	☐

17. Did your enterprise has access to any form of innovation support services between 2018 to 2020?

Yes [ ] No [ ]

18. If yes for Q19, which source or sources did you get the support?

Degree of importance

Tick 'not used' if no information was obtained from a source.

Source	High	Medium	Low	Not used
	3	*2*	*1*	*0*
A.Within your enterprise or enterprise group	☐	☐	☐	☐
B.Suppliers of equipment, materials, components, or software	☐	☐	☐	☐
C.Clients or customers from the private sector	☐	☐	☐	☐
D.Clients or customers from the public sector*	☐	☐	☐	☐
E. Competitors or other enterprises in your industry	☐	☐	☐	☐
D.Consultants and commercial labs	☐	☐	☐	☐
E.Universities or other higher education institutions	☐	☐	☐	☐
F.Government, public or private research institutes	☐	☐	☐	☐
G.Conferences, trade fairs, exhibitions	☐	☐	☐	☐
H.Scientific journals and trade/technical publications	☐	☐	☐	☐
I.Professional and industry associations	☐	☐	☐	☐

19. Which of the following factors do influence your firm's ability to gain or receive support for innovation activities? Tick all that is applicable.

Age_____[ ]
Size_____[ ]
Belongingness to a group_____[ ]
Educational level of the Manager____[ ]
Location of the enterprise_____[ ]
Employment opportunities_____[ ]
Turnover from sales_____[ ]
Other (specify)_____[ ]

20. How would you mark Ghana's approriability regime? (the legal systems and polices protecting innovations and inventions).

Functioning [ ]

Not Functioning []

Part G: Characteristics of the managers

21. Sex: Male [ ] Female [ ]

22. Age: [ ]

23. Marital Status: 1.Single [ ] 2. Married [ ] 3. Divorced [ ] 4. Separated [ ]

5. Cohabiting [ ] 6. Widowed [ ] 7. Other, specify [ ]

24. Nationality: 1. Ghanaian [ ] 2. Non-Ghanaian 3. Other, Specify [ ]

25. What is the highest level of schooling attained?

i. University	[ ]
ii. Polytechnic	[ ]
iii. Training college	[ ]
iv. Technical/vocational	[ ]
v. Secondary/commercial	[ ]
vi. J.H.S	[ ]
vii. Primary	[ ]
viii. Non	[ ]

26. How did you acquire your skills? i. Formal (schooling) [ ] ii. Informal (apprenticeship) [ ] iii. Both [ ]

27. How long were you trained? i. Formal (schooling)…… ii. Informal (apprenticeship)……..

28. Have you ever received any training abroad? Yes [ ] No [ ]

29. Have you ever received any training foreigner in Ghana? Yes [ ] No [ ]

30. For how long have you been working in the Shea industry?.....

Remarks *(if any)*

_____

_____

_____

_____

_____

_____

end