

UNIVERSITY FOR DEVELOPMENT STUDIES

FACULTY OF BUSINESS AND LAW

**MOBILE PHONE ADOPTION FOR SUPPLY CHAIN MANAGEMENT
PROCESSES: A CASE STUDY OF RURAL SHEA PROCESSORS IN NORTHERN
GHANA**

BY

NANPUAN BABA MATTHEW

(UDS/MCM/0034/18)

UNIVERSITY FOR DEVELOPMENT STUDIES



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**THESIS SUBMITTED TO THE DEPARTMENT OF PROCUREMENT AND
MARKETING, SCHOOL OF BUSINESS AND LAW, UNIVERSITY FOR
DEVELOPMENT STUDIES, IN PARTIAL FULFILMENT OF THE
REQUIREMENTS FOR THE AWARD OF MASTER OF COMMERCE DEGREE
IN PROCUREMENT AND SUPPLY CHAIN MANAGEMENT**

MAY, 2021



DECLARATION

I declare that this work is the result of my own research and has not been presented by anyone for any academic award in this or any other university. All references used in the work have been fully acknowledged. I am duly accountable for any shortcomings.

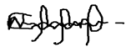
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CERTIFICATION

I hereby certify that this thesis was supervised in accordance with the procedures laid down by the University



08/08/2021

Dr. Br. Clement Nangpiire

Date



ABSTRACT

Over the years, mobile phones have been used extensively for information delivery and trainings in areas of agriculture, health, education as well as trade in the areas of commerce (e-commerce), leading to its wide expansion, most especially in developing countries. Most rural people who do not have access to formal education are marginalized in using the mobile phone to assess information and related services. The researcher employed mixed methods approach for the study. The first two objectives of this study were to assess mobile phone ownership among Shea processors and explore the potentials of Shea processors in accessing the flows in a supply chain using the mobile phone. Using the tools of observation, interviews and advocacy/ participatory worldwide research paradigm, the study found that-Majority of Shea processors own mobile phones. Also there exist a huge potential of Shea processors in assessing digital services via mobile phones. Even as more Shea processors would wish to do voice communication, only 27.6% of them can self-make calls compared to 72.4% who cannot self-make calls and thus had to rely on literate people to search phone contact and make calls for them. There is a crave for MoMo transactions by Shea processors as some Shea processors are registered for MoMo though, do not have mobile phones. Illiteracy among Shea processors is still a key challenge to accessing digital services as majority of Shea Processors had no formal education and thus could be marginalized in accessing complex digital services via mobile phones.

Keywords; mobile phone, procurement and supply chain, Shea business, ICT4D



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DEDICATION

This work is dedicated my belated grandpa, Uninkpel, BombeinBabayi and my dearest son, Bayi, Ndomoak Elias.

To my beautiful wife, Neina Linda and my nuclear family, it was not easy, but you stood strong behind me. I salute you all



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ACRONYMS

1G	-	First Generation Network
2G	-	Second Generation Network
3G	-	Third Generation Network
4G	-	Fourth Generation Network
5G	-	Fifth Generation Network
BI	-	Business Intelligence
EPA	-	Environmental Protection Agency
CBE	-	Cocoa Butter Equivalent
CBI	-	Centre for the Promotion of Imports from developing countries
DSc	-	Digital Supply Chain
EPCIS	-	Electronic Product Code Information Services
GSA	-	Global Shea Alliance
GSM	-	Global Systems for Mobile Communications
IoE	-	Internet of Everything
IoT	-	Internet of Things
ICT4D	-	Information and Communication Technology for Development
MoMo	-	Mobile Money
mSCM	-	Mobile Supply Chain Management

- PIN - Personal Identification Number
- SCM - Supply Chain Management
- SCN - Supply Chain Network



CHAPTER ONE

1.0 Introduction

Over the years, mobile phones have been used extensively for information delivery and trainings in areas of agriculture, health, education as well as trade in the areas of commerce (e-commerce), leading to its wide expansion, most especially in developing countries. Most rural populace who have not been formally educated are marginalized in using the mobile phone to access information and related services. Research conducted by (World Bank, 2012, GSMA, 2019) points to it that, mobile phone usage in the Shea industry contributes to growth in income and output. However, illiteracy was the major challenge in using the mobile phone by rural women in transacting shea businesses and related services. Using the tools of observation, interviews and advocacy/participatory worldwide research paradigm, this paper looked at some activities engaged by Shea processors physically and suggested ways by which such activities can be facilitated through the mobile phone to achieve efficiency in the Shea supply.

1.1 Background to the Research



Shea picking and processing into various products serve as a source of livelihood for majority of the women engaged in the industry most especially, in the Northern part of Ghana. Apart from a source of livelihood, the Shea industry again provides a surest means for corporate organizations and governments to promote women empowerment. For example, in the years 2015 and 2016, an amount of USD 33 million and USD 19 million respectively in terms of foreign exchange earnings were realized from the Shea industry (GEPA, 2017). This could help the government to engage in social activities such as building schools, Hospitals and/ or construct

good roads for its citizenry. Taking into consideration the importance of the Shea industry, it is worthy to explore relevant technologies to make activities in the industry less laborious.

Technology has evolved in most aspects of human life and still evolving in other to make life comfortable for mankind. This can be seen in robotics, Automobile industry, Aerospace, Biomedical engineering and so on. However, of all the above technological evolutions, the mobile phone has been described as “beyond belief” (Neuovo, 2004). Mobile phones have become part and parcel of our lives due to the comfort it offers. For example, before the adoption of mobile phones in Ghana, people had to travel for both far and near for information delivery or transact business in the market but with the adoption of mobile phone, people can now communicate to all corners of the world and or transact business with the click of a phone button.

In time past, the mobile phone was notably used only for communication. However, in recent times, the mobile phone can be used for variety of functions such as entertainment (Paying music), news updates (listening to news), for trade (mobile commerce). Text messaging is the next most widely used mobile application after voice communication and as at 2011, the number of text messages that were sent worldwide were about 5 trillion which represented USD106 billion in terms of revenue from value-added services (Informa, 2011). For people who are not immediately available to communicate, mobile phones can be used for meetings (Ling &Donner, 2009).

World Bank (2012), opined that mobile phones can transform economies, politics, and society. This is because the mobile phone has recently transformed into multimedia communication tool whereby it can download and uploading data, text and/or video. Shea processors that have mobile phones can now call and enquire market prices for their products, thereby saving time, energy and cost that could otherwise be spent in physically going to market to enquire market



prices, thus contributing to economic empowerment. According to Brisson and Krontiris (2012), mobile phones can be used to monitor elections and unpopular regimes toppled.

The above numerous advantages of mobile phone technologies can easily be accessed by people that have been formally educated since most of the communication languages are international and thus people that have not had formal education are marginalized in terms of fully harnessing the advantages of mobile friendly technologies. Even though in developing countries, users could use basic phones to access mobile technologies, most rural areas has limited broadband coverage and also higher cost of mobile phones especially smartphones has further limited the chances of accessing mobile technologies for rural dwellers (World Bank, 2012).

There are several thousands of rural women in the three Northern Regions engaged in Shea processing (United Nations Development Program (UNDP), 2010). The sector also has several local and multinational companies and NGOs that transact businesses with women in the industry. Field officers have had to manually engage several women groups on quality trainings, market price updates and so on, making it difficult and impossible to reach all groups within a shorter period. To meet end-end customer demand and satisfaction in supply chains, companies needs to be abreast with latest technological developments opposed to rudimentary methods of business transactions. For rural populace and people that have not had formal education, less cost mobile apps (mobile phones) could proof an efficient means of business transactions. Mobile apps have been defined as software designed to make use various mobile technology, thus helping to collect and transform data for economic and social activities whether commercial, administrative, or entertainment purposes (McNamara, 2009). Notable among them are WhatsApp, Facebook, Instagram, Twitter, Zoom, TikTok and so on.



1.2 Problem Statement

To fully derive the maximum benefits from M-apps, users have to be knowledgeable or have the technical know-how to use the applications to get the desired results otherwise, if wrong information is put into m-apps, the output is more likely to be wrong. That is the concept of GIGO (Garbage in, Garbage out) will be at play. However, the software and hardware of various M-apps are not written in local languages for illiterates such as those in the Shea industry to comprehend and use (Sharma, 2015). Unlike educated people who can use mobile apps to transact businesses such as checking account balances without physically going to the bank, buy items online without going to brick and mortar stores, Shea processors either have to rely on educated populace to enjoy the comfort of mobile technologies. Over 85% of Shea processors are reported to be illiterate in Ghana (Iddrisu et al., 2016)

Shea processors normally want to have access to market prices for informed decision on when to sell and get value for money. Products quality is also of keen interest to off takers and attract premium for shea processors. Quality trainings and price alerts have mostly been done manually by field visits. In addressing the challenges faced by illiterates in accessing ICT related information in business transaction, Odonkor (2016), attempted the use of Text -to-Speech Synthesis (TTS) for Twi and English language speakers in Ghana to directly engaged in business transaction whereby English language could be directly translated into Twi in the form of Voice SMS. The project was however unsuccessful because of technical challenges.

Apart from the Shea industry generating foreign exchange earnings for nations, it is also a source of livelihood for several thousands of Women engaged in Shea picking, processing, and trading. Over 600,000 women in Northern Ghana have benefited in incomes from the sale of



raw Shea and its products (SNV, 2006). However, there are many problems that women Shea processors face in the Shea supply chain ranging from the time of picking to processing and marketing such as the laborious nature of Shea collection and processing, inadequate access to finance, poor market for Shea products, deforestation of Shea trees for Charcoal and to pave way for infrastructural construction (Alhassan, 2020, Motin, 2016).

In this era of technological advancement, the study would take into consideration some technologies such as using mobile phone for business transactions, most especially among Shea processors as well as problems faced by Shea processors in assessing business services through the mobile phone. This will could lead to increased efficiency of operations in Shea supply chains and make business much comfortable for Shea processors.

1.3 Significance of the Study

This study seeks to explore the use of mobile phones by Shea processors in the Shea industry, as well as review and confirm previous studies on mobile phone usage in the Shea industry of Ghana. Therefore, Mobile phones ownership, education, and usage among Shea Processors is established in this study. Also, the challenges that undermines the ability of Shea processors in using digital technologies are highlighted in the study.

The recommendations in the study provides a good ground for operators in the Shea sector to harness the numerous advantages of mobile phones usage in the Shea supply chains and also regulatory authorities in the digital sector to innovate ways of digital inclusion for women in the Shea sector. Findings from this study also provides a good path for further research into improving the efficiency of Shea Supply chains using the mobile phone



1.4 Research Objectives

The primary goal of this study is to enable Shea processors to use mobile phones in their varied commercial activities. The precise goals are as follows:

- i. Assess mobile phone ownership among Shea processors.
- ii. Explore the potentials of Shea processors in accessing product prices, training materials via mobile phone.
- iii. Assess means of mass communicating information to large number of Shea processors simultaneously.
- iv. Assess the efficiency of business transactions in the Shea industry.

1.5 Research Questions

The following questions should be addressed at the conclusion of the study;

- i. How many Shea processors own mobile phones?
- ii. What are the potentials of Shea processors in accessing product prices, training materials via mobile phone?
- iii. What means of mass communicating information do large number of Shea processors use at the same time?
- iv. Do illiterate Shea processors use mobile phones in their daily lives and in transacting Shea businesses?



1.6 Scope of The Study

While several studies detailing several advantages of literates using mobile phones to access various services in health, commerce, agriculture, less is said of illiterates in doing same. The aim of this research is to access efficient ways of digitally including illiterate Shea processors in accessing several business services in the Shea supply chain using their mobile phones.

The research scope is limited to recruiting 200 Shea processors and 20 field staffs who are either 18 years old or more and will be contacted using cluster sampling technique. The recruitment period is for a maximum of three months and will expire when the 200 Shea processors and the 20 field staffs are met, or the three months elapsed. Each participant will be asked questions in order to understand Shea processors' usage of mobile phones and the efficient ways business activities could be done via their phones

1.7 Organization of The Study

The study is divided into six chapters. The first chapter includes the study introduction/background to the study, problem statement, research objectives, research questions, and the organization of the study. The second section reviewed relevant literature, taking into considerations conceptual, theoretical, and empirical aspects. The third part of the study places emphasis on the methodology, the background of the study area and the research philosophical assumptions/paradigm(s) that grounds the study. It also discusses the research design that has been used for the study, the population, sample and sampling procedure, instruments or tools that were used to collect data, data collection and administration procedure, data quality and trustworthiness, data analysis procedures and the study's limits. The fourth chapter dealt with data presentation and interpretation. Findings of the study were analysed and



interpreted in Chapter five whilst chapter six gives an account on conclusion, summary of findings, theoretical and managerial implications, research limitations and areas for further research



CHAPTER TWO REVIEW OF LITERATURE

2.1 Introduction

This section of the study investigates literature in relation to the subject matter of the study.

This is important in that the researcher did not only look at previous studies/research done by other researchers. Both theoretical and empirical research were reviewed specifically on the Shea industry in Ghana, Shea contribution to the economy of Ghana and the world at large, the livelihoods of Shea processors and various ICT technologies for commerce among illiterates.

2.2 The Shea tree and Shea Industry History

The Shea tree is scientifically called *Vitellaria paradoxa* (Dijkstra, 2016). Shea kernels are a product of the shea tree and come in two varieties: *Vitellaria paradoxa*, which grows primarily



in West Africa, and *Vitellaria nilotica*, which grows in Uganda's northern and southern regions (Ferris et al., 2016). It was until 1797 that the Scottish explorer (Mungo Park) took some shea specimen for scientific examination and that gave birth to the scientific name, *vitellaria paradoxa* as cited in the Cocoa Research Institute of Ghana (CRIG, 2002).

According to Fobil (2007) the Shea tree normally grows to about 15 m height and about 175 cm girth. The researcher also reported that Shea trees can withstand fire outbreaks because of their numerous branches and thick waxy bark. Shea trees grows exclusively in twenty African Countries-Ghana, Benin, Togo, Ivory Coast Mali, Burkina Faso, Cameroon, Chad, Kenya, Democratic Republic of Congo (DR Congo), Sierra Leone, Southern Sudan, Conakry, Niger, Nigeria, Senegal, Guinea, Guinea Bissau, Central African Republic, Ethiopia

Until quite recently where some organizations have started growing Shea parklands, Shea trees reproduced and grew on their own with dense populations in the Northern belt of Ghana- the Northern Region, Savannah Region, North East Region, Upper East, and Upper West Regions. There are also scattered populations towards Northern parts of Bono Region and Oti Region. To match up with the huge demand for Shea and its products, there are continuous efforts by some organizations to grow Shea plantations on large scale. The researchers experience in the field shows that women contribute immensely to increasing Shea populations by heaping some freshly picked nuts into the soil that then sprouts during the raining season in the presence of moisture.

According to Dogbevi (2009), the Shea tree attains its fire resistant ability around five years and at the early stage of germination, it grows slowly and becomes matured in about fifteen (15) years and can bear fruits for about two hundred years



According to Yussif, (2015), Shea picking and processing into butter and other products is a major activity of several women engaged in the Shea industry. Processed Shea kernels and or butter can be sold locally and or for export to gain income for Shea processors and their families. The Shea industry employs over six hundred thousand women that collect and process Shea (FAO, 2012, GSA,2020).

Apart from a source of livelihood for the women engaged in Shea picking and processing, the Shea industry also creates jobs for several people engaged in buying and selling, export and commercial processing into various product forms. According to Shea Dealers Association (2008), Shea nut transportation, haulage, and shipping from the Northern to Southern part of Ghana. According to LMC (2017), within a period of twenty years, Shea exports reached 350,000 tons of Shea kernels equivalent from initial 50,000 tones. The organization further stated that the huge growth margin was attributable to higher use of Shea globally in the food and cosmetic sectors. The increased Shea exports generated approximately two hundred million United States Dollars (USD 200 million) as income for Shea processing communities. Thus, the Shea industry has a huge potential of creating sustainable jobs for players engaged in the sector.

Most companies that also deals with Shea nuts and butter export, apart from paying cash to Shea processors are also engaged in several Corporate Social Responsibilities (CSR) that are geared in solving pressing community issues in areas of health, education, sports and sanitation (Field survey, 2020). In the year 2016, KI GH Ltd paid an estimated amount of GHC330,649.76 (USD 57,205.84) to over 450 communities and GHC 157,634.50 (USD27,272.40) to over 260 communities in the year 2018 (KI GH Ltd bonus payments, 2017 and 2018 business years). The basis for bonus payment is for groups that have achieved their expected quantities. This is



aimed at motivating communities that did not meet their expected quantities to produce more and get bonus for the subsequent years.

2.3 Uses of Shea

2.3.1 Traditional and Domestic Uses

According to Global Shea Alliance (2018), out of the twenty-one native Shea growing African Countries, it is estimated that about two billion trees grow indigenously on Shea parklands beginning from Senegal towards Southern part of Sudan.

Out of over 500k tons of Shea kernels gathered each year, 150,000 to 350,000 tones get imported into the international markets and the rest is consumed locally (CBI, 2019).

According to Bernice (2011), Shea fruits has high nutritional value and again contains about 0.7 to 1.3 grams and 41.2 grams of protein and carbohydrate respectively. Shea butter is also rubbed into the skin or hair to stave off the drying effect of the winds, especially during harmattan season. Shea butter is also used in soap making, water- proofing for walls and lamp fuel (Lovett and Mihelcic, 2015).

Traditional African healers have long used Shea butter for thousands of years. According to Hatskevich et al., (2011), Shea butter's therapeutic properties on burns, skin disorders, ulcerated skin, and stretch marks are almost mystical. It includes important vegetable fats that promote cell renewal and metabolism, making it an excellent skin cure and restored vitality. It also has inherent sun-protecting properties.

The fleshy pulp is eaten as food and the pulp is also used to make jam because of its sweetness (Muotono, *et al*, 2017). The by –product of Shea butter extraction (Shea cake or meal) can also be dried and used as a source of fuel for cooking, heating, and other household activities



2.3.2 Medicinal uses of Shea

Due to the presence of several fatty acids, Stearic and oleic acids, Shea butter contains good healing properties because it contains several fatty acids. Shea butter in its raw form is effective in treatment of skin rashes, scars, stretch marks, and stings. Vitamins A and E, present in Shea butter also makes it a good hair moisturizer as well as source of skin collagen, which works as anti-ageing and anti-wrinkle agents (Muotono et al., 2017). Shea butter also acts as a good sun screening agent as it is capable of absorbing and reflecting some of the ultraviolet (UV) rays from the sun thereby prevents it from scorching the skin. This property of Shea butter helps to protect the skin from sunburn, which is capable of reducing further risk of skin cancer induced by the sun's rays (Velasco veark., 2008) as cited in (Muotono et al., 2017).

Shea butter is also used as a pre-warm bath cream for babies in some parts of Northern Ghana to produce smooth, supple skin. For the treatment of dysentery and other diseases, some people boil the roots and bark of Shea trees or crush it into powder (Hatskevich et al., 2011)

2.3.3 Industrial uses of Shea

The economic importance of the shea tree cannot be overstated since in the 1970s, it gained attention for use as CBS when the world market price for cocoa became unpredictable, necessitating the search for a viable cocoa substitute in the candy and cocoa butter industries

Shea nuts are widely used in the beauty, candy, and chocolate industries and are also processed into a wide range of food products. Shea butter was approved for use among the six hydrogenated vegetables to serve as a Cocoa Butter Substitute (CBS) by the European Union in 2003 (LMC, 2019).

According to (Dogbevi, 2009 and Hatskevich et al.,2011), The Shea tree has huge potentials for producing significant volumes of fluid, which could be a valuable supply of raw material for the bubblegum and latex sectors. However, this potential remains untapped because of the



economic impacts of Shea and the inadequacy of Shea plantations. According to the researchers, mature kernel is known to contain more than 60 percent edible fat and can be used for medicinal and industrial applications

Table 2.1: Shea production volumes from Africa

Country	Rank	Production volume	Production share	Year reported	1-year Growth in production price	3-year Growth in production price
Nigeria	1	368.41k	54.1%	2013	+1.9%	+0.3%
Mali	2	173.80k	25.5%	2015	+3.7%	+81.4%
Burkina Faso	3	46.03k	6.8%	2007	+64.8%	+14.4%
Ghana	4	34.30k	5.0%	1998	-17.0%	-29.3%
Ivory coast	5	31.30k	4.6%	2009	-8.9%	-16.5%
Benin	6	14.36k	2.1%		+0.0%	+0.0%
Togo	7	12.62k	1.9%	1996	-10.6%	-15.8%

Source:(Tridge, 2019)

The table above ranks the top seven Shea production countries with respect to their production volumes, production share as well as price changes within the first and third years. In 2016, the total global Shea production stood at 680.82K tons(Tridge,2019). Nigeria produced 368.41ktons (54.1%) of the total volume, Mali produced 173.80k tons representing 25.5% of



the global production volume, Burkina Faso, ranked third and produced 46.03k tons (6.8%) of the global volume, Ghana accounted for 34.30ktons (5.0%) of the total global volume. The bottom three (Ivory coast, Benin and Togo) produced 31.30ktons, 14.36tons and 12.62 tons representing 4.6%, 2.1% and 1.9 % respectively of the total global volume produced (Tridge, 2019).

2.4.1 Shea Export between the twentieth and twenty first Centuries

According to (Chafin, 2014), both French and British colonies began exporting shea nuts and shea butter to Europe in the early 1900s, where it was used to make margarine. Shea was traded in Liverpool for less than 11 pounds sterling per ton in 1914. This clearly represented a loss since there was no industrial mass demand for Shea nuts that was typically regarded as opulence in African markets outside of the area where it was predominantly produced (Chafin, 2004)

Only about 2003, when Shea was used as a chocolate component, did the current price become financially reasonable, and Shea gained worldwide recognition. Since 1887, Messrs Loders and Nucline Limited of Silvertown (UK) have been developing Cocoa Butter Substitutes (CBSs), which led to the development of Nucoa, a coconut fat-based equivalent.

By 1930, saturated oil separation and formulation techniques continually progressed and Aarhus Oliefabrik was able to deploy another Cocoa Butter Substitute called CEBEST™ utilizing coconut stearin and research continued on hydrophobic illipe fats (Martin, 2004). However, it was not until the 1950s and 1960s that the first truly successful Cocoa Butter Equivalents (CBEs), using exotic stearin-rich fats, were first launched. By 1956 Unilever (UK) had developed and patented the CBE Coberine™ (Best, 1957) as cited in (Bello and Lovett, 2015). Contemporary equality of the products mentioned above Coberine and Illexao are now



produced by heirs of these firms, Loders Croklaan and AarhusKarlshamn (AAK), who even till date, are one of the biggest Shea buyers worldwide.

According to Chalfin (2004), due to advancement of the petroleum sector, there was a decrease in demand for bulk West African processing of low-cost, low-quality raw materials. This led to the termination of Ghana's Cocoa Board regulation of the sector, though without changes to state legislation and finally gave out shea industry to the private sector in after 1991.

Shea butter export began to rise in the year 2001 when a West African businessman came back from abroad to build up a shea production factor in northern Ghana (Ofosu, 2009). A modest extraction facility was successfully developed with soft financing from one of the primary converters, still crushing over 11,000 Sheanut Equivalent Tons yearly, either sold as nuts, butter, stearin, or finished product. The shea industry has spearheaded a number of high profile programs focused on upstream supply chain stages with the ambition to showcase the multitudes of sheanut collecting women, especially due to available financing and support from researchers, NGOs, and donors (USAID, the EU, GSA).

Plans to expand and refurbish larger shea extraction plants were soon realized throughout the next decade, and it is projected that once all capacity (23 plants in 7 countries) are active, it will be possible to mechanically process the whole Shea production yield exported from Sub-Saharan Africa (Bello and Peter, 2015). According to Mohammed et al., (2013), Africa produces roughly 1.76 million tonnes of uncooked shea nuts yearly from natural forests. There were a forecast of 94 million shea nut trees in Ghana, which were projected to produce a yield of over 50,000 metric tonnes of shea nuts per year for all shea butter manufactured locally (Ofosu, 2009). The yield could make up roughly 150 tonnes of shea butter, with less than 70% of it utilized locally and 25% sold in the international markets. *Vitellaria* makes up more than 80% of the woody vegetation in Northern Ghana (Lovett and Haq, 2000).



Presently, there are a larger number of Shea processing plants both in Europe, Asia and Africa, with the latest being the largest Shea processing factory established in Ghana, West Africa by Bunge Loders Crockan.

Table 2.2: Africa Shea nuts production volumes from 1997-2016

YEAR	VOLUME (*10 ³ TONS)
1997	692.69
1998	687.21
1999	686.52
2000	700.78
2001	696.79
2002	692.05
2003	735.29
2004	735.29
2005	679.31
2006	636.83
2007	777.44
2008	731.54
2009	654.15
2010	654.35
2011	685.29
2012	717.38
2013	699.99



2014	554.7
2015	558.99
2016	680.82

Source: (Tridge, 2019)

From the table below, the highest volume of Shea nuts ever produced was in 2007 and since then the yield has always been reducing. This could be due to bad practices such as bush fires, deforestation that could lead to significant reduction of Shea populations. Until quite recently that a number of organizations have raised awareness of Shea parkland plantations, no one ever carried planting Shea trees.

2.4.2 Shea Exports from Ghana

A total of US\$ 69.4 million worth of Shea butter and its derivatives were exported from Ghana in 2017. The figure rose to US\$ 90 million worth of Shea butter and its derivatives (circa 55,990 tons) exported to 24 countries in 2018. Ghana was placed in 9th position out of the countries that exported products under the sector in spotlight (GEPA, 2019). Malaysia was the largest importer of Shea butter from Ghana, with imports worth about US\$ 31.9 million of the product.

The countries with the least imports (US\$1,000 each) were France, Kuwait, Saudi Arabia and

South Africa. Other countries that imported Shea butter from Ghana included Denmark (US\$ 23.72m), Belgium (US\$ 13.53m), the Netherlands (US\$ 11.8m), India (US\$ 3.64m). Malaysia,

Denmark, Belgium, the Netherlands, absorbed about 93.8% of the total shea butter exported

by Ghana. In 2018, Malaysia's global importation of Shea butter and its derivatives were valued at US\$ 83.54 million with Ghana being the biggest supplier to the Malaysian market. Apart

from Shea butter exports there are notable companies owned by both locals and as well as

foreigners that export the raw Shea nuts to Europe, Asia for processing into various products for use in the cosmetic, chocolate, edible fats and confectioneries.



Table 2.3 : Selected Potential Shea Market Growths for Ghana

COUNTRY	2018 Imports (million)	2014-2018 Average input growth (%value)	2014-2018 Average input growth (quantity)	2018 Import growth (%value)	Ghana's Market share (%)	Leading Suppliers/Market share in identified markets
Norway	14.9	109	249	-26	0	Russia (67.9), Lithuania (9.4), USA (5.9)
China	69.2	39	25	63	0.2	Australia (42.3), USA (9.5), France (8.7)
Russian Federation	42.7	23	29	19	0	Sweden (45.2), Netherlands, (31.5), Italy (3.5)
Hong Kong	11.5	23	48	-3	0	Malaysia (31.4), Thailand (22.8), Italy (11)

Source:(Trademap, 2019)

2.4.3 Global Shea demand and supply

Global demand for fixed vegetable fats and oils were estimated at US\$ 1.82 billion, US\$ 1.94 billion and US\$ 2.1 billion in 2016, 2017 and 2018 respectively (GEPA, 2019). The United



States of America (USA) emerged the largest importer of Shea products with an estimated import value of US\$ 326.5 million, followed by France (US\$185.8m), Netherlands (US\$132.2m), Germany (US\$125.9m), Japan (US\$101.3m), Sweden (US\$88.2m), and China (US\$69.2m). Between 2014 -2018, China's imports of Shea products grew by an estimated 39% (see table 2.6.1 below). Norway (113%), China (39%), Russian Federation (23%) are other countries with emerging markets that are attractive and has good growth rates for market diversification and penetration by Ghanaian companies (GEPA,2019). The average positive growth rates chalked by the above countries countries is indicative of higher demand for Shea products .Apart from the Netherlands which recorded a negative two percent (-2%) growth rate in terms of quantity imported between 2014-2018, all the top five global importing countries recorded positive growth rates of 16%, 2%, 2%, and 4% for USA, France, Germany and Japan respectively (Tradmap,2019).

2.4.4 Global Shea Market Trends

Shea butter was accepted as a vegetable fat to act as a Cocoa Butter Equivalent (CBE) by the EU in 2003 (Schreckenber, 2000). Part of the reasons for the increasing demand for CBEs is because of higher prices of Cocoa (LMC,2019). According to Global Market Insights (2019),the global shea butter market is projected to reach nearly USD 3 billion from 2019 -2025 which is about 10.5% CAGR. This is due in part to a transition in consumer behavior toward fresh and safe food products, as well as changes in the food industry environment.

2.5 Mobile Telecommunication Networks in Ghana

With the advancement of wireless communication infrastructure, mobile phone communication has become a part of millions of people's daily lives. Mobile phones have increasingly become the new mode of communication in all parts of the world due to its convenience and ease of use (Sey, 2018). Mobile data subscription increased from 10.6 million 2013 to 20.1 million in



2017(NCA, 2018). MTN, Vodafone, Globacom (Glo), AitelTigo, Surflin are some of the notable companies operating within the Ghana Telecom sector ((NCA, 2018).

Electronic marketing channels (e-commerce) has made it possible for both buyers and sellers to connect in a supply chain, thereby improving access to market and maintaining customer intimacy, as buyers and sellers cannot always physically interact but virtual communication with mobile phones). Shea processors routinely engage with several business partners thanks to various networks or service operators. According to a study conducted by Iddrisu et al., (2016), MTN was the highest service network (62%) used by Shea processors with Airtel and Tigo sharing 6.5% and 1.5% respectively.

2.5.1 Mobile Phone Ownership

As at 2018, global unique mobile subscribers reached 5 billion .Out of these, 4 billion people from emerging markets accessed services through their mobile phone by the close of 2019 (GSMA, 2020). According to Omondi and Okeleke, (2020), the number of unique mobile phone subscribers in Ghana were 16.7 billion people at the third quarter of 2019 with over 15 million smartphone devices and more than 10 million mobile internet users . The authors further stated that 3rd Generation connection accounted for 60 per cent of the total coverage , 4th Generation has started gaining traction and will overtake 2nd Generation services in the next three years. 3G and 4G will account for over 94% per cent of total connections by 2025. Ghana has the greatest mobile penetration in West Africa (second only to South Africa on the continent) and continues to exceed many of its regional rivals, with mobile adoption reaching over 53 percent by the end of 2019 and higher than the regional average by nearly 7% (Omondi and Okeleke, 2020)



This suggests that digital services can benefit a large number of individuals, boosting the digital economy's growth. A chunk of Shea processors use mobile phone in their daily dealing with numerous actors in the Shea supply chain as well as reaching out to family members and a whole lot.

2.5.2 Mobile Phones for Business Transactions in Various Sectors

Three important prerequisites for inclusive marketplaces can be addressed with mobile phones and these are- direct development benefit for the poor through personal access and usage, enabling access to market information and transactions, and having the prospect for financial viability due to its low cost, capacity to manage small quantities, and transactions.

Aker and Mbiti (2010), further recognized five importance of mobile phone usage to both the customers and the manufacturers including (a) Enhancing accessibility to and use of data, hence reducing search costs, improving coordination among representatives and increasing market economic output , (b) an improve operating capacities and (c) enabling communication among social networks in response to shocks, thus reducing households' exposure to danger.

Aker and Mbiti (2010) identified f more than four additional benefits of mobile phone use for both customers and manufacturers, including (a) improved access to and use of information, resulting in lower search costs, improved coordination among representatives, and increased market productivity, (b) improved productive efficiency, and (c) Fostering inforamtion flows among social networks in response to perceived threats.

Several factors, including the cost of using a mobile phone (Zhang & Yuan, 2002) and the user's personal characteristics (Hooper & Zhou, 2007), may influence the use of mobile phones by many businesses.



Mobile phones have facilitated connections between buyers and sellers in several markets, thereby creating more efficient markets (Bornman 2012; Sey 2011). The phenomenon of phone sharing in Ghana, has even made it possible for those without phones to relate to their clients in business dealings either through text messaging or voice calls where a third party delivers information to the intended message receiver.

According to Iddrisu et al., (2016), there is a link between mobile phone use and the level of income of Shea processors, as the majority of respondents who adopted the use of cell phones had a significant boost in their income compared to those who did not use mobile phones. According to the survey, Shea processors had an average revenue of about GH100.00 prior to the introduction and usage of mobile phone technology, which grew to over GH200.00 after adoption and use. This leads to the conclusion that mobile phone adoption and use have a favorable impact on respondents' revenue levels, implying that mobile phone use helps to alleviate poverty among women processors.

According to Salia et al. (2011), 74.3% of Fishermen had to walk to the source of the input to acquire supplies, whereas roughly 19% said they hired local vendors to order supplies for them, and 6% said they had relatives who bought supplies for them. The percentage of fisherman who walked or traveled to the sales point of the inputs supply decreased to 44 percent after the municipality introduced mobile phones, while about 31.5 percent used mobile phones to organize purchases of inputs from their suppliers.

Also, about 75% of Fishermen responded they used mobile phones to stay connected with their customers and suppliers, while about 71% of Fishermen said they were able to get prices for fish and fish products from different markets. Esselaar et al. (2007) as cited in (Iddrisu et al., 2016), the results of a survey done in 14 African countries revealed that business people with mobile phones utilized them more frequently than any other form of communication to



maintain contact with clients and consumers. Furthermore, smallholder farmers in Kenya who used Virtual City AgriManager (M-app) had their incomes increase by over 8% as a result of improved weighing and tracking of produce weights (Esselaar et al. 2007 as cited in Iddrisu et al., 2016). Due to timely access to more veterinary services, the adoption of e-Diary, another M-app in Sri Lanka, resulted in an extra income of more than \$260 per additional calf, representing a 30% increase in milk production Qiang et al., 2012). Mobile phone technology has mainly been employed in Ghana as a delivery channel for agricultural extension services to farmers (Aker & Fafchamps, 2010). Ministry of Food and Agriculture in partnership with several Non-Governmental Organizations have implemented several m-agriculture platforms that addressed farmer challenges.

An automatic identification and data capture technology is device known as radio frequency identification device which composed of three elements, these include: a tag formed by a chip connected with an antenna, a reader that emits radio signals and receives in return answers from tags and finally a middleware that bridges RFID hardware and enterprise (Ngai et al, 2005). According to Ngai et al. (2005), it is now possible to do unique product identification, traceability, and timely information access on a mobile phone through an entire supply chain.

According to World Bank, (2014), mobile phones are used mainly for voice calls and SMS messages in Ghana. Even mobile phones that can browse the internet, only 11 per cent use this feature (mainly in urban areas). Mobile phones are valued in information delivery because they facilitate faster connectivity with friends and family, and thus intensify social networks and social interaction, compared to people traveling from place to place for information delivery. A study conducted by Martin (2011) showed that, prior to the development of mobile technology, an individual could pay to travel to an input dealer only to discover that all inputs had been purchases. When cell phones were introduced, nearly 90 percent of those surveyed



were able to utilize cell phones to coordinate access to agricultural training, livestock, seeds, and pesticides from local merchants, government and non-government agriculture extension officials, and community members. Before spending time, energy, and money on travel, the farmer may now phone ahead, determine availability, schedule a meeting, and agree on the price per deal.

2.6 Mobile phones for Digital Services (M4DS)

2.6.1 Mobile for Mobile Money (M4MM)

Mobile money is a set of “sensitive” technologies that enable phones to send money to contactless cash registers (World Bank Report, 2012). Mobile phones, either smart or “yam” phones have been used for mobile money transactions. This is made possible via a cash-in, cash-out infrastructure, which is often implemented through a network of "cash merchants" (or "agents") who are paid a modest charge for converting cash into electronic value and the other way round (World Bank, 2012). With regards to previous findings about 866 million people registered accounts and live services across 90 markets (GSMA, 2020), the mobile money industry is presenting a monetary future to millions of customers around the world. Mobile money business has transformed from basically a service to send money home to a service where millions of consumers in their daily activities save for the financial future of their household, access loans to invest in their farming activities, pay their children’s school fees through the initiative and which is anticipate to mitigate financial risks and shocks.

At te beginning of of year 2020, there were over 1 billion registered MoMo accounts, with a total value worth nearly \$700 billion in MoMo transaxtions, processing nearly \$2 billion in transactions daily (GSMA, 2020). According to the study, by the end of 2019, Sub-Saharan



Africa (the epicenter of mobile money) had gained almost 50 million new accounts, East Asia and Pacific had added more than 29 million, and South Asia had added over 14 million accounts. According to Economic Times., (2018), annual mobile money transactions in India alone is projected to surpass \$1 trillion dollars by 2023. It is also expected that account usage will continue to grow in Sub-Saharan Africa, with the area surpassing the half-billion mark by the end of 2020. (GSMA, 2019)

Mobile Money can be done through various channels either than the mobile phone, with the latest technology of payment being WhatsApp Pay, which started making Mobile money payment to 20 million users out of a total of 400 million users in India, with plans to expand worldwide. WhatsApp Pay partnered with five Indian banks; State Bank of India, HDFC Bank Ltd, ICICI Bank Ltd, Axis Bank Ltd, and Jio payment services (Bloomberg Quint, 2020; WhatsApp Inc, 2020).

2.6.1.1 Importance of MoMo

Mobile money is much less expensive than conventional cash alternatives (Word Bank, 2012). This is reinforced by McKay and Pickens (2010), who found that branchless banking, such as mobile money banking, was over 18% cheaper on average than alternative services in an international comparison of 26 institutions. This gap more than doubled at low business transaction quantities or for informal money transfer choices.

2.6.1.2 Mobile Money for Sustainable Development (M4SD)

The United Nations Development Programme (UNDP, 2012) claims that, “Mobile phones can enhance pro-poor development in sectors such as health, education, agriculture, employment, crisis prevention and the environment that are helping to improve human development efforts



around the world”. Mobile Money according to (GSMA, (2019) has assisted in the achievement SDGs in the manner below:

- a. When it comes to utility services, “the mobile money industry is playing a catalytic role in expanding the reach of utility services, which is critical to achieving SDG 6 (Clean Water and Sanitation) and SDG 7 (Affordable and Clean Energy) (International Energy Agency, 2017). More than one billion people and roughly 2 billion people did not have access to power and basic sanitation facilities respectively (Ibid, 2018,). According to JMP (2019), more than 2 billion did not have access to clean drinking water by the end of 2018. Access to basic utility services that is insufficient or unreliable stifles economic progress and makes it harder for individuals and communities to reach their full economic growth. IFC and GSMA (2019), centralized utilities in countries like Kenya and Uganda have been introducing mobile money systems to make payment collections faster and more safe, enhance revenue recovery, and invest in their service coverage to address the above difficulty utilizing mobile phones. According to their findings, utility purchases (energy and water) accounted for 44% of all bill payments made via mobile money services globally at the end of 2019, and over 400 utilities firms had a mobile money bill payment account. Utility payments account for 53% and 55% of the total amount of bill payments handled via mobile money, respectively, in markets in Sub-Saharan Africa and South Asia, where there are significant access gaps in utility service providers.

Mobile money has also helped to support the fast increasing Pay As You Go (PAYG) in the energy sector. In 2018, two million solar home systems (SHS) were marketed on a pay-as-you-go basis (GOGLA, 2019). According to Mackenzie, (2019). from the \$500 million invested in the off-grid energy sector in 2018, PAYG solar providers seized 91



per cent of the total value invested. Furthermore, seventy-four percent of organizations who received financing from the GSMA's Mobile for Development (M4D) Utilities Innovation Fund integrate mobile money in their business models, indicating that mobile money is helping to establish and scale sustainable enterprises (GSMA, 2019).

- b. **Cash aid for humanitarian purposes:** Mobile money has the potential to be a strong tool for delivering humanitarian aid and contributing to the achievement of SDG 10 (Reduced Inequalities). According to UNHCR (2019), As of the end of 2018, there were more than 41 million forcibly displaced people internally, 70.8 million were forcibly displaced around the globe and refugees number were over 25 million people. Clearly, it would be very difficult if not impossible to physically offer humanitarian assistance to the millions of people worldwide. The humanitarian sector is shifting away from in-kind material help to cash support in order to reach as many people as possible in a shorter period of time, with the prevailing recommendation to always consider cash in circumstances where it is appropriate and practicable (Baah ,2019). As a result of the shift away from cash, aid agencies are increasingly turning virtual.

In at least almost half of all nations worldwide, with a functional mobile money service since 2017, mobile money platforms have been utilized to give cash and voucher assistance (CaLP, 2019). According to the GSMA's (2019) Global Adoption Survey, 60% of mobile money providers said they had teamed up with a charitable organization to deliver mobile money-enabled Cash and Voucher Assistance (CVA), and that as of the end of 2019, the mobile money industry had supported online cash assistance to nearly 3 million unique mobile money accounts used by people suffering from crisis (GSMA, 2019).The inherent benefits of Mobile money for both humanitarian organizations and recipients are that, Organizations benefit from increased openness,



responsibility, speed, and cost efficiency, while affected individuals benefit from more dignity, flexibility, security, and access to financial services (GSMA, 2019)

- c. **Financial Inclusion:** in the attainment of SDG2 (Zero Hunger), Through automating value - chain payments, mobile money has made a significant contribution to closing the financial inclusion gap, particularly in rural areas. In 2019, about 54 per cent, 44 per cent and 14 percent of the total labor force were employed in agriculture in Sub-Saharan Africa, South Asia and Latin America respectively (World Bank Group, 2019). Pointing clearly that there represents a greater percentage of the labor force in Sub-Saharan Africa. Through automating value - chain payments, mobile money has made a significant contribution to closing the financial inclusion gap, particularly in rural areas. Around 75% came from Sub-Saharan Africa, whereas 11% came from South Asia and Latin America (GSMA, 2019).

2.6.2 Price Information: Agricultural producers were frequently forced to rely on dealers and agents for price information in order to decide whether, when, where, and for how much to sell their crops. Until the growth of mobile networks, which allows them to receive market pricing for their produce swiftly and reliably, they were uninformed of current market prices. Delays in obtaining this data, as well as misinterpretation of second-hand pricing information, can result in agricultural producers underselling their products, providing too little or too much, or having their products wither away. Esoko is a key player in Ghana, distributing pricing for various commodities across Ghanaian markets for farmers who have enrolled on their website. Reliance on traders or agents leads to "information asymmetry" (differing prices for the same product in markets separated by only a few miles), resulting in lost income for some farmers and higher prices for consumers. In Ghana, for example, traders who utilized mobile phones tended to sell at higher prices and were also larger-scale traders than those who did not. Their



incomes also increased by 36% compared to traders who did not use mobile phones (Egyir, et al., 2010). Half of maize, groundnut, and cassava farmers surveyed who received market values via SMS saw growth in revenues by 10% in Ghana (Subervie, 2011). Commercial farmers, not subsistence farmers who used mobile phones, showed income gains of between (11-17%) for a range of crops as well as perceived growth in producers' trust of traders (Labonne and Chase, 2009).

2.7 Supply chain and mobile phone

There is no ideal definition of supply chain. However, methods and tools that enable the improvement of the movement of goods and information and to work closely with actors on manufacture and delivery of product (service) to final customer cut across most definitions. These actions can improve all the processes throughout the supply chain and consequently reduce costs and improve customer service (Janiak et al., 2015). According to Szozda and Werbinska-Wojciechowska (2013), The integration and coordination of activities related to efficient material and information flows on the basis of long-term cooperation of all companies and organizations involved directly or indirectly in the production and delivery of the right product/service to final customers is what supply chain management is all about.



In a supply chain, a fast and adequate flow of information is critical. Manufacturer and supplier segments, as well as retailers and distributors, make up the majority of the supply chain. There are three flows among these sections: information, product, and funds. The efficient and speedy transmission of information between these segments is required to meet client demand in a timely manner. The goal of the supply chain is to manage as much of the customer demand as feasible in real time.

According to Kit et al., (2006), a value chain is similar to a supply chain except that there are no legally enforceable or desired formal or informal links unless such goods, services, or financial agreements are transacted. According to Mentzer et al. (2001), a supply chain is defined as a group of three or more entities (i.e., organizations or persons) that are actively involved in the upstream and downstream flows of products, services, funds, and/or information from a source to a customer. The role of information exchanges between firms is highlighted in the definition, particularly at the activity and business process levels.

Mobile supply chain management (Gökhan et al., 2016) is the use of mobile devices to assist the performance of supply chains, allowing enterprises to decrease the cost of products and processes, provide fast responsiveness, and achieve a competitive edge in supply chains. Tablets and smartphones have taken on a significant role in allowing professionals to manage supply chain activities from anywhere, not just with a connection, but also without one, thanks to the offline potential of several logistics and transportation software.

2.7.1 Background of Mobile phones use in Supply chains

Mobile phones have been used in supply chains since the late 1990s and have been recognized as "stand alone" devices. These units differed from today's integrated mobile devices in that early devices required external modems and reading modules to capture and send data, whereas an integrated device to handle multiple functions did not exist at the time (Clemens et al., 2012).

Multi-tasking devices, such as PDAs (Personal Digital Assistants), handheld PCs, and others, were developed in the mid-2000s. Mobile phones at the time had relatively basic structures, such as a small keyboard, a resolution of 150x150 pixels, and a text capacity of up to 12 lines on the screen. Smartphones with more advanced structures allowed for larger screens due to higher processor power, storage, and memory capabilities, as well as the ability to use



browsers. Huge technology advancements and advances in smartphones, tablets, and related software applications have created several opportunities to improve corporate processes in recent years.

According to Gökhan et al., (2016), there are many tablets on the market that rival with the iPad, including those made by HTC, Motorola, Samsung, and Sony. Tablets are gaining market share every day since they have already established themselves as a complementing product to smartphones when a larger device and better processor power are required, particularly in corporate settings. Furthermore, it is easy to claim that tablets are considered as a comparable product to laptops and even PCs used in businesses as enterprise solutions. Mobile technologies are also being developed to advance from the Internet of Things (IoT) approach, as stated by (Martern and Floerkemeier, 2016)

Items with Internet of Things (IoT) or Internet of Everything (IoE) capabilities use wireless interfaces such as Bluetooth, NFC, and WLAN, and with the help of Internet of Things-capable products, businesses may connect customers to their services and software updates. As a result, the company will have a closer relationship with its customers than ever before (Gökhan et al., 2016). M2M (machine-to-machine systems) has advanced at a faster rate than others, according to the Cisco Visual Networking Index (2014-2019). According to the analysis, IoT will rise at a rapid rate in the coming years. MIT was the first to introduce the Internet of Things (IoT) in the year 2000. It means that smart gadgets and systems connected the entire universe by connecting with one another.

2.7.2 Areas of Mobile phones and IoT Usage in Supply chain



According to (Gökhan et al, 2016), some of the areas where mobile phones and IoT can be used in supply chains include:

a. Customers can use their mobile phones, notably smartphones, to buy products over the internet rather than in brick and mortar stores, thanks to internet-connected gadgets. In a short time, checking the price of a product on the internet before visiting a physical store to purchase one will be commonplace, as will checking the price of a product on the internet using a smartphone while in a physical store and purchasing the product on the internet if it is cheaper than in the physical store. As a result, client satisfaction is reached through the use of mobile phones.

b. As technology eliminates regional obstacles to purchasing and expands the market area globally, mobile phones connected to the internet have created what is called as “omni channel retailing”, defined as “customers’ freedom of choosing interaction channel which is convenient to search, get information and purchase the products for improving shopping experience” Quantum Retail Technology Inc Retail Outlook, (2012)

c. Barcode scanning: Mobile internet-connected gadgets that capture barcodes may search the internet for availability and price of the same product. For example, the RedLaser smartphone app can be used to scan barcodes and look up the pricing of a product. In this case, internet retailers must design applications that allow customers to search for a product, get product information, read customer reviews, buy the goods, or place a backorder if the product is not available. EPCIS is used in meat supply chains, for example, to offer tracking and tracing information on meats to supply chain partners, customers, and regulatory authorities (Huub et al., 2014). According to Bughin et al., (2013), it is possible to buy a product through barcodes scanning. According to the same study, Tesco and Delhaize in 2011, respectively put promotional displays in South Korean and Belgian subway stations. Customers can order and



purchase things from actual stores using their smartphones with the help of these promotional displays. Customers' information demand and search, as well as consumer reviews of products via company-specific applications, provide manufacturers, suppliers, transporters, warehouses, and retailers with important data to evaluate their product processes. From the standpoint of the manufacturer, supplier, transporter, warehouse, and retailer, scanning the barcodes of products using a mobile internet-connected device is a must.

d. Apart from barcode scanning, transportation companies have also used RFID (Radio Frequency Identification) tags to automatically deliver product information. FedEx's Sense Aware Program, according to Bughin, Chui, and Manyika, (2011), uses devices such as a GPS system, temperature, light, humidity, and barometric pressure sensors, which are installed on sensitive parcels to provide location and atmospheric information. According to Bardaki et al., (2012), RFID-enabled services can be utilized in retail supply chains to change dynamic pricing of fresh and perishable products as well as manage shop promotions. Promotions can be tracked and assessed using RFID-enabled technologies in order to determine current and future promotion events. Furthermore, products with a near-expiration date can be priced dynamically to generate demand.

e. Delivery: Proof of delivery can also be sent via mobile internet-connected devices and mobile apps. This can be done by either having the recipient sign on the screen with a pen or having the recipient's signature on paper photographed for further investigation (Maciej, 2013). This is very beneficial in supply chain transportation segments. Transportation operations are reduced in paperwork, automated (real-time transportation information is provided), and the availability of this information is raised as a result of this use.

f. Field Sales: Mobile internet-connected devices and mobile apps can also be utilized for field sales in supply chains. According to Bridget (2014), Karlsburger Foods Inc. field sales



representatives might give electronic or paper receipts using handheld Bluetooth printers using a mobile solution. Additionally, these field sales can be done with or without a connection. Furthermore, the nuVizz mobile solution (mobile software) developed by nuVizz Inc. allows drivers to complete deliveries even when they are not connected due to the mobile program's built-in offline functionality.

g. Payment services: Mobile internet-connected devices and software, particularly smartphones, can be used as mobile payment devices across the supply chain, from clients to transportation. According to Bughin et al., (2013), there is a growing trend of mobile payment services in developing nations, with the aid of these services, Dutch-Bangla Bank Limited (DBBL) in Bangladesh has garnered more than a million mobile payment users in 10 months. Apple, for example, uses the EasyPay system in its stores instead of traditional POS equipment, owing to mobile devices. After scanning the product bar code with an iPhone, users can simply complete transactions using an iOS application. Other customers can make requests.

h. Credit card transactions: Smartphones or tablets can also be used in credit card transactions if they have contactless technology to capture the credit card information. However, in this type of usage, there can be security issues. To address these issues, transactions can be done via official applications on the credit card owner's smartphone or tablet (Gökhan et al., 2016). According Lee and Lee (2015), IoT applications can be classified into three categories: monitoring and control, big data and business analytics, information sharing and collaboration. For example, smart home solutions are well known applications as a monitoring & control system so that IoT enabled devices can be monitored and controlled remotely through a smartphone or tablet. Some specific examples of smartphone or tablet enables IoT applications in supply chains are;



i. UPS has already begun to deploy IoT-enabled fleet tracking solutions to save costs and improve supply chain efficiency (Lee and Lee, 2015)

j. People have been discussing their demands, choices, and pros/cons of products through numerous media channels as social media usage has grown. Because the end user dictates mobile consumption and drives the market, organizations can leverage information sharing to develop knowledge libraries (Bridge, 2013)

k. IoT devices (smartphones and tablets) and sensors capture massive amounts of data, which is then transferred to databases for analysis or post-processing. This necessitates the use of a business analytics tool to provide customers with value-added services. Because of the Oral-B electric toothbrush's big data capabilities, Proctor & Gamble was able to measure and record their consumers' brushing behaviors. Disney has released a new wristband (MagicBand) containing an RFID chip that functions as a ticket and connects to Disney's guest database. In addition, as part of its IoT solutions, General Electric uses sensors in its jet engines, turbines, and wind farms (Lee and Lee, 2015).

Customers' search for products can be recognized using credit card information, and special discounts on these products can be offered to customers, resulting in lower demand collection costs and less demand uncertainty than traditional systems, thanks to the collection of real-time product information via mobile applications (Gökhan et al., 2016).

2.8 Drivers of Mobile Supply Chain Management (mSCM)

According to Umney (2014), smartphone manufacturing has resulted in the increase of mobile supply chain management and the emergence of new user behaviors. Changes necessitate



acclimating to new settings and conditions for industries, as well as devising new corporate strategies to achieve a competitive advantage.

Gökhan et al., (2016), in their current and future Mobile Technologies advancement in Supply Chain details Globalization, Integration, Replace unused systems, Novel process, and Mobile information as the drivers of mSCM.

2.8.1 Globalization: globalization is a very significant driver of SCM as it propels the penetration of devices such as tablets, smartphones, and apps. Even in remote locations where fixed landlines are unavailable, mobile networks (2G, 3G, 4G) and the most recent sophisticated mobile network (5G) can provide important means of mobile communication. Mobility is now incredibly practical and valuable between countries, thanks to global roaming services provided by mobile network employees in practically every country where making international calls was once considered weird. Because of advancements in mobile technology, mobile communication services in various nations have already surpassed the lan.

As a result, business environments and the general public are increasingly relying on mobile communication facilities to conduct whole transactions with other businesses. Mobile communication has the capacity to both deliver and improve company operations and transactions with multinational enterprises in global supply chains, according to Umar and Ofir (2005).

2.8.2 Replace Unused Systems

The world is advanced in several technological developments particularly in mobile communication. For instance, poor network infrastructure dated some 15 years ago, made



people to look for alternatives such as climbing on trees before they could make voice communications in Ghana. But now, advancement in network technologies and infrastructure even make it possible and easier to access internet and browse for information in some rural areas. 5G is the most recent advancement in mobile technology, with extremely high capacity and speed, and serves as a backbone for internet, multimedia, and telephony. 5G mobile technology is also the future wireless networks, bringing Gigabit mobile broadband and the Internet of Things (IoT) (Agarwal et al., 2019). Because of the lifecycle of mobile technology, some systems become obsolete after a while, and businesses must replace them with new types to keep up with market competitiveness.

2.8.3 Integration: Integration (internal and external) are important characteristics for mobile tools and applications to be compliant in diverse business environments. The growth of mobile internet and mobile device-based applications has opened up a slew of new opportunities for cross-functional company operations. The ability of mobile technology to increase internal and exterior inclusion in supply chain management drives their adoption. According to Umar and Ofir (2005), basic communication capabilities such as voice calls and push-to-talk services promote internal integration, while mobile apps that allow quick access to pertinent information for final consumers, retailers, and transporters improve external incorporation. For example, a company can use GPS and wireless data services to determine the location and status of a delivery. Due to recent advancements in cloud technology, which refers to huge sums of data collected from a massive number of business systems, equipment, devices, and sensing stored on remote servers known as cloud systems, internal incorporation is improved over the internet between employees by providing them with access to organizational data anywhere and anytime (made more possible) (Ghadge et al., 2020). Cloud systems can be contacted and vast



amounts of data can be retrieved (Accenture consulting, 2016). Bridget (2014) claims that adopting cloud systems allows for real-time supply chain management and logistical visibility.

2.8.4 Novel Process: Companies are increasingly using mobile devices and applications to manage operational business activities as the market evolves and becomes more competitive. McDonald's, for example, is well-known around the world for its competitive advantage in the market and innovative business practices.

2.14.5 Mobile Information: Using a mobile app while on the go eliminates paper-based or manual operations and can considerably speed up processes. Electronic signatures and delivery information (time, person, location, etc.) via mobile devices further improve supply chain management by allowing for more efficient and well-organized information operations. Instantaneous data transfer allows for faster execution throughout the supply chain by making real-time information available. In addition, it immediately integrates various concerned departments or work groups with alerts and alarm mechanisms in emergency scenarios. Finally, with mobile technology, order-to-delivery times are quicker and service management responses are faster. Ghadge et al., (2020), however pointed out that, the key drivers to digitizing supply chains are; agility, accuracy, customization, and efficiency.



Agility: Real-time planning and control are enabled by mSCs (Mobile Supply Chains) or DSCs (Digital Supply Chains), allowing firms to be flexible and nimble in responding to rapidly changing situations. According to Oztemel and Gursev (2018), mSCs shorten planning cycles and freeze periods by responding more quickly to changes in demand, supply, and prices. Furthermore, business analytics methods can forecast future events and characteristics such as client behavior and attitude, distribution and delivery times, and industrial production. Real-time delivery routing and tracking also allows logistics operations to be more flexible, efficient, and agile (Barreto et al., 2017)

Accuracy: Information and communication technologies (ICTs) integrated into supply chains provide real-time, dependable, and exact data, allowing for more informed decisions. As a result, next-generation performance management systems will provide improved end-to-end visibility across the entire value chain (Miragliotta et al., 2018). Client service and order completion levels are included here, as well as in-depth process data (exact location of trucks in the logistics network). Major transportation companies like UPS and FedEx used GPS-centric applications that provide tracking and data information about routes, the ability to reroute vehicles, and the condition of goods on trucks with the help of mobile technologies. It is also possible to provide End-to-end transparency operations using IoTs such that when trucks break at whatever location or time, someone at headquarters can see this and dispatch help when needed (Mary Shacklett, 2019)

Customization: Firms can use techniques like mass customization, micro-segmentation, and advanced scheduling practices to help them offer multi-choice packages to clients, overcome last mile challenges efficiently for high-value items, and deliver clients' orders at a faster rate by using innovative distribution techniques like drone delivery and digitized delivery. They can also go above and beyond client expectations by using techniques like mass customization, micro-segmentation, and advanced scheduling practices (Hofmann and Rüsçh, 2017; Ghobakhloo, 2018)

Efficiency: According to Vaidya et al., (2018), a large number of organizations are employing automated technology in their logistics systems (shipment tracking, fully automated warehouses, material handling robots and cranes, robotic autonomous vehicles, automated pallet handling systems). Through cross-company transportation optimization, such companies can cooperate, collaborate, and share facilities in order to enhance truck utilization and boost



transport flexibility. The SCN setup is constantly tweaked to ensure a perfect fit for business needs.

2.9 Barriers Associated with Digitizing Supply chains

Though there are so many reasons why organizations would want to digitize their supply chains, there are however certain challenges, forces normally faced with implementing DSCs/mScm technologies according to Luthra and Mangla (2018), Legal and ethical considerations, strategic perspective, organizational nature, and technical component are basically the four business proportions organizations should keenly consider in digitizing supply chains. Some commonest of the barriers are;

2.9.1 Resistance to Change: According to Theorin et al., (2017), some industries are uninformed of the advantages of digital transformation and are thus unwilling in adopting it.

Some working and management systems are becoming increasingly sophisticated as a result of globalization and the development of commercial networks and markets. Firms' reluctance to adopt Industry 4.0 technologies is exacerbated by a lack of global data management capabilities as well as new technology developments (Ras et al., 2017).

2.9.2 Legal Issues: Because data transactions across the value chain pose a cybersecurity risk, privacy and security concerns must be considered while using DSCs/Mscm (Kamble et al., 2018). Government policies and support are lacking: Governments are responsible for providing the required infrastructure (internet and communication networks) for the digital world in most nations. However, there is a lack of a clearly defined path in transforming industrial infrastructure, notably in implementing the 5G network and its benefits for Industry 4.0) in terms of Industry 4.0's repercussions (BRICS Business Council, 2017)



2.9.3 Lack of management support: Transitioning from manual to digital supply chains is swift, but it necessitates proper skill development and training, which is difficult to do without strong management support (Gökalp et al., 2017). According to Ras et al., (2017), the fundamental prerequisite for implementing ICTs is the creation of cross-functional teamwork through the digitization of all value chain network parts.

2.9.4 Financial Constraints: Financial constraints are a significant barrier to adopting DSCs/Mscm in terms of developing improved current infrastructure and developing sustainable process improvements (Theorin et al., 2017). The key focus that affects the scale of investment is the targeted organization's technical capabilities. However, from a financial aspect, the DSCs adoption is still in its early stages; a lack of transparency on cost-benefit analysis and economic rewards on digital investments is an authoritative problem (Arnold et al., 2016).

2.10 Benefits Associated with Supply Chains Digitization

In many stages of SCs, such as new product development, manufacturing, procurement, planning, logistics, and marketing, DSC networks now use a variety of technologies to develop efficient and well-organized transparent, adaptive, and robust systems. According to Ghobakhloo, (2018), when supply chains are digitized, they can achieve more precise forecasting and planning through integrated flow and increased tracking of materials and products, improved supplier performance through real-time information sharing and synchronization with suppliers, and intelligent warehousing and vehicle routing systems.

Digital supply chain (DSC) benefits include cost-effectiveness of services and value-creating activities that benefit many actors in the ecosystem, including enterprises and their suppliers, employees, and customers, according to Maier et al., (2011). Another rationale for digitizing



supply chains is to reduce governance expenses, such as transaction costs with other ecosystem actors and inside specific firms (Santos and Eisenhardt, 2005). Cost savings from information technology also allow for more information to be processed more correctly and often, from more sources throughout the world (Neubert et al., 2004). When tea is in short supply

Supply chain digitization causes disruption, putting pressure on businesses to reconsider how they construct their SC networks. Some benefits provided by e-commerce platforms, such as transparency and simple access to various options for where to purchase, what to buy, and when to buy, stimulate supply chain competition. IoTs play an important role in the transformation of SCs by allowing for remote and real-time monitoring of vehicle location and speed, the condition of perishable products via temperature sensors, and machine status and performance (Manavalan and Jayakrishna, 2019).

Smart Supply Chain is a dimension of Industry 4.0 that covers digital platforms with suppliers, retailers, customers, and partners, according to Frank et al. (2019). Increased information exchange and synchronization of operations across SC partners aid in the reduction of total expenses as well as the overall efficiency and agility of SCs.

2.17 Industry 4.0 in supply chains



What has been dubbed "industry 4.0" is the development and integration of information and communication technology into business processes (Wagire et al., 2019). Industry 4.0 is also known as an automated system that allows for customization, agility, and speed in manufacturing and service operations by providing data from a variety of tools, sensors, and devices (Deloitte, 2014). Industry 4.0 is predicted to have a substantially greater impact in the fields of industrial manufacturing and management, logistics, and business process management, according to Strange and Zucchella (2017).

Some key Industry 4.0 technologies and their business applications are;

- **Cloud Technology:** Cloud systems store large amounts of data acquired from a large number of business systems, devices, equipment, and sensors on remote servers. Cloud systems allow for real-time access and retrieval of massive amounts of data (Accenture Consulting, 2016). The environment around cloud computing, according to Oztemel and Gursev (2018), is fast growing and generating more data-driven and intelligent supply chain operations.
- **Simulation:** Data from big data and cloud technologies can be fed into a virtual model to examine all conceivable scenarios in regard to product design, development, production, and the SC network (Zhong et al., 2017). In business models, simulation is often used to influence real-time data and imitate the actual working world in a virtual ecosystem. Process testing and optimization through simulation, according to PwC (2016), allows individuals to reduce business changeover, risk, setup time, and increase quality control for planned operations and services, even before the changes are implemented in the real world.
- **Autonomous Robots:** Robotics technology, according to Demetriou (2011), has been applied in a wide range of fields, including manufacturing, logistics, e-commerce, and education. Robots may communicate with one another, operate side by side with operators in a safe and harmonious manner, and support them. It is also projected that in the future, robots will be more cost-effective and have a broader variety of capabilities than those currently in the system



- **Big Data Analytics:** Big data analytics enables the utilization of massive amounts of data to increase proficiency and production (Wamba et al., 2017). Big data analytics enables businesses to extract value from massive amounts of data in order to improve process efficiency and performance, increase flexibility and agility, and improve product personalization (Ghobakhloo, 2018). To enable real-time and speedy fact-based decision-making, the collection and assessment of data from several systems will become the norm (McKendrick, 2015)
- **Augmented reality:** Augmented-reality-based systems can be used to do a variety of tasks, including creating a warehouse or production line layout and conveying maintenance instructions via mobile or other remote-control devices (Vaidya et al., 2018). These systems are currently in their early phases, according to (Bcg views, 2016), but will have a much bigger breakthrough in the future for enterprises to better their business procedures and decision-making process.
- **Business Intelligence (BI):** Business intelligence refers to the technical platforms that are used to gather, analyze, store, and present business data from many sources (Mulcahy, 2007). It aids decision-making by turning unstructured corporate data into useful information and ideas



2.11 Supply chain management in the shea supply chains

Basically, every business operates in one or more supply chains which is critical for it to deliver services to its customers and survive in the market. Companies must be aware of the supply

chains they participate in and comprehend the roles they play as a result of technological advancements combined with market uncertainty.

A supply chain is defined by Mentzer et al. (2001) as a group of three or more entities (i.e., organizations or persons) that are directly involved in the upstream and downstream flows of products, services, funds, and/or information from a source to a client. For example, in a simple supply chain, the waakye seller in the street of Tamale is part of the supply chain as she conducts the upstream process of buying cowpea and rice from suppliers and also the downstream process of turning the cowpea and rice into waakye. Also, a simple kiosk seller is also part of the supply chain as he/she buys supplies from suppliers and re sell to consumers. However, complex supply chains such as in the automobile industry, Thousands of companies make up the automobile company's supplier network, which provides everything from basic materials like steel and plastics to complicated assemblies and subassemblies like transmissions, brakes, and engines.

Logistics is concerned primarily with the procurement, movement, and storage of materials and/or parts from the point of manufacture to the final consumers, whereas supply chain is concerned with the procurement, movement, and storage of materials and/or parts from the point of manufacture to the final consumers. There are various interrelated internal and external operations that make up a supply chain. These activities have a wide range of scope, and the people that support them are often spread across geographical boundaries and originate from a variety of cultures.

As a result, in order to achieve competitive advantage, it is necessary to effectively manage the activities and relationships among the various actors in a supply chain, introducing the concept of Supply Chain Management, defined as "the management of upstream and downstream relationships with suppliers and customers to deliver superior customer value at lower cost to



the supply chain as a whole." (Martin., 2005).Supply chain management may also be defined as "the coordination of production, inventory, location, and transportation among the participants in a supply chain to achieve the best mix of responsiveness and efficiency for the market being served (Michael., 2003)). The goal of SCM is to increase sales of goods and services to the final and/or end user while at the same time reducing both inventory and operating expenses.

Supply chain management is different from logistics in that logistics refers to activities that occur within the confines of a single organization and supply chains refer to networks of companies that work together and coordinate their actions to deliver a product to market. Logistics also focuses its attention on activities such as procurement, distribution, maintenance, and inventory management. Supply chain management acknowledges all traditional logistics and includes activities such as marketing, new product development, finance, and customer service. According to (Martin., 2005)logistics is essentially a planning orientation and framework whose objective is to create a single plan for the flow of product and information in a business while supply chain management builds upon this framework and seeks to achieve linkage and co-ordination between the processes of other entities in the pipeline (suppliers, customers and the organization itself).

2.12 Drivers of Supply Chain Management

According to Michael., (2003), in his book, Essentials of Supply Chain Management, the drivers of supply chain management are - Production; Inventory; Location; Transportation; and Information. Whatever decision that is made with any of the above drivers should be geared towards achieving responsiveness and efficiency in supply chains. Chaudhary et al., (2013), further stated that there are six drives of supply chain Management. These are-Inventory, pricing, Transportation, Information, Sourcing, and Facilities. The researchers further stated



that the drives are closely related, and organizations need to make sure the practices of responsiveness and efficiency are at greater levels order to increase performance.

2.13 Managing the Drivers of Supply Chain

Production: According to Michael, (2003), production refers to the ability of a supply chain to make and/or store products. Factories and warehouses are the basic facilities that enables production. During production, the major decision-making managers face is the balance between efficiency and responsiveness. If factories and warehouses are well built with a lot of excess capacity, they can be very adaptable and respond quickly to various fluctuations in product demand

Location: Location refers to the geographical positioning of supply chain facilities. It also includes the decisions related to which activities should be performed in each facility. The responsiveness versus efficiency balance here is the decision whether to centralize activities in fewer locations to gain economies of scale and efficiency, or to decentralize activities in many locations close to customers and suppliers for operations to be more responsive (Michael., (2003).

The cost of facilities, the cost of labor, skills available in the workforce, infrastructure conditions, taxes and tariffs, and proximity to suppliers and customers are the key decisions managers should consider when making location decisions.

Inventory: According to Michael., (2003), inventory cuts across the supply chain and comprise everything from raw material to work in process, processing the raw material into finished goods, that are held by the manufacturers, distributors, and retailers in a supply chain



Michael further categorized inventory into three types. These are;

a. **Seasonal Inventory**—Inventory that is developed in expectation of predictable increases in demand that happens during certain times of the year. For example, it is predictable that demand for anti-freeze will increase in the winter, that during harmattan season, the demand for Shea butter and Shea butter lotions will increase. Thus for organizations that processes Shea butter and its related products at a fixed production rate that is expensive to change, then it will try to manufacture product at a steady rate all year long and build up inventory during periods of low demand to cover for periods of high demand that will exceed its production rate in order to meet peak customer demands in the harmattan season.

i. **Safety Inventory**—Inventory that is kept in places a cushion against uncertainty. Since every forecast has some level of uncertainty in it, that uncertainty can be catered for by holding additional inventory in case demand is suddenly greater than anticipated.

ii. **Cycle Inventory**—This is the amount of inventory that a firm needs to meet demand for a product in the period between purchases of the product. Here, companies tend to produce and/or buy more in order to take advantage of economies of scale. This may however come along with carriage cost in terms of which arise due to cost of inventory storage, handling, and inventory insurance.

Chaudhary et al., (2013), proposed six ways by which perishable inventories can be managed and these are: a. Organize and control transparency of inventories where it is important for inventory management workers to well known about their home inventory to forecast their



next requirement of inventory. b. Hire experienced staff and provide them trainings for better output in relation to inventory management. c. Define targeted stock levels and order patterns which demands that staffs for inventory management be well known about the targeted stock levels and must know order patterns of respective organizations. d. organizations must follow up the simple inventory management procedures of their firms.e. organizations must keep fresh stock in their inventory and maintain, check and balance the shelf life of inventory. They must use inventory before they expire.

Transportation

This refers to the transit of everything starting from raw material to finished goods between different facilities in a supply chain. In transportation the balance between responsiveness and efficiency is manifested in the choice of transport mode (means of transport) (Michael., 2003). Fast modes of transport such as airplanes are very responsive but very expensive whereas slower modes such as ship and rail are very cost efficient but not responsive compared to the airplanes.

Information is the bedrock upon which decisions are made regarding the other drivers discussed above. Information is the interconnection between all the activities and operations in a supply chain. To the extent that this link is a strong one (data is accurate, timely, and complete), the companies in a supply chain will each be able to make good decisions for their own operations (Michael., 2003). He further suggested that information play two major roles in supply chains-Coordinating daily activities: deal with the functioning of the other four supply chain drivers (production; inventory; location; and transportation). The companies in a supply chain use available data on product demand and supply to make decisions on weekly



production schedules, inventory levels, transportation routes, and stocking locations and Forecasting and planning. Available information is also used to make tactical forecasts to guide the setting of monthly and quarterly production schedules and timetables. Information is also used for strategic forecasts to guide decisions about whether to build new facilities, enter a new market, or exit an existing market. This way of forecasting and planning is very important in preventing bullwhip effects in supply chains.

According to Chaudhary et al., (2013), a company can identify its customers or distributor companies for strategic planning input by four ways :(a) Use 80/20 rule, this rule states that the company must in conversation with those specific top 20 percent customers that generate 80 percent of company income. Continue with companies that want to continue with you. C. Choose the companies in different conversation channels. Choose that company that considers your product or service for different applications.

Facilities

Facilities refers to a place where a product is being stored, assembled, and fabricated (Chaudhary et al., (2013). Better management about the role, location, capacity, and flexibility of facilities have a positive effect towards supply chain performance. A shutdown of facilities leads to downsizing of firms and Chaudhary et al., (2013), proposed the below eight factors that managers need to take into consideration before shutdown of facilities:

- a. Capacity: this is closely related with size of plant or site. It may occur due to differences in capacity of one site from the other. The few activities and small capacity associated with small size plants and sites respectively. Plants sites with lower and small capacity cannot survive and managers should prioritize these types of plants and sites.



- b. Plant Size: large plants are highly efficient than small ones. At small plants the average cost of each unit produced at small plants is higher than that of large plants and thus, would need to close the plants of small size rather than large size.
- c. Distance from Main Office: if the production plants or sites are far from organization's head office than the authority of head office, top management become limited. They have less information about their subordinates at concerned site. Therefore, if an organization having two plants one near to head office and other far from head office than closure would be given to high distant site.
- d. Site Constraints: this is important in that; extra space is indispensable for vehicles and car parking. Extra space is also important for the future modification of production and storage facilities. Managers would decide for closure of less space and high constraints sites.,
- e. Labor Productivity: Here, managers must check and balance the labor characteristics and productivity regarding each plant. Closure should be given to those plants and sites that have low labor productivity.
- f. Remoteness: this includes transportation cost that come from different production and storage sites and managerial time involved to maintain it. Closure would be given to those sites where these types of activities are unusual.
- g. Grants Elsewhere, this factor includes plant expansion, building rehabilitation and training cost. Grants are given to those sites where distance from main office, age of plant and remoteness could be done



h. Age of Building or Plant: old age building and plants require high cost of maintenance. So, managers must give closure to those plants or sites where the building or machinery is old and requires high cost for operations

Sourcing

According to Juma'h and Wood (2000), there are many benefits that arise when a firm outsources its operations such as reduced employment cost (salaries and wages), reduce equipment expenditure (maintenance and repairs), reduce research and development (access to immediate technology and solving future problems). The researchers further stated that there are four strategies of outsourcing for any firm to adopt and these are:

a. Focus always adopt this strategy is being used by – Nike and Dell in focusing its corporate resources. When Nike started its business in 1960's, its sales were just \$ 2 Million in the first decade. Even with low volume of sales and profits the managers continued to focus primarily on activities and outsource most of production functions. At the start of second decade, Nike became core competent in brand building and design at the beginning of the second decade and sales reached \$ 700 Million at the end of the second decade.

b. Disruptive innovation: IKEA, Canon and Ryanair, disruptive innovation includes setting prices low at starting to attract customers and then increase step wise to show the improvements in business. In this approach, firms not only outsource their production functions but also outsource the final assembly to others. For example, IKEA's entry into furniture retailing, Canon into photocopying makes and Ryanair into European airline industry

c. Strategic repositioning: IBM's traditional strategy was to provide services tied only to final product that they sold. According to Leavy (2004), IBM later adopted innovative strategy



of providing consultancy and solutions to problems of customers. In this strategy, it also serves as provider of outsourcing services for other manufacturers and companies.

d. Scaling with-out mass: Nokia and Nortel, outsourcing made organization to exist in market without expansion in business size. For example, in 2000, when the employees at Nokia were increasing at 1000 per month and approaching 6000, the CEO of Nokia decided to be outsourced most of its production function to third parties to maintain same high share in market without expansion in business.

2.13 Sustainable and Ethical Sourcing in The Shea Supply Chain

According to Lambrechts (2020), sustainable sourcing refers to obtaining the materials, products, and services that an organization requires from its suppliers in a sustainable manner, while also considering the environmental and social implications of its supply chain strategies and activities. Sustainable sourcing is different from business as usual businesses in that companies holistically pay keen attention to the environmental as well as social aspects of their supply chains rather than being compelled by state agencies for compliance.

At the global level, products and services sourcing extends to several countries. The Globalization, as well as companies' decisions to outsource and offshore components of their manufacturing processes, has resulted in significant competitive advantage and economic growth mostly to the Western multinational companies. Consequently, this development has had negative repercussions on the environment and populations in other parts of the world due to the expansion of supply chains and constant pressure to lower manufacturing prices (Osland, 2003, Lambrechts, 2020). According to Veit et al., (2018), scandals in the 1990s and 2000s raised awareness of the unethical and unsustainable implications of globalized production and consumption practices, and as a result, businesses are held accountable for what occurs in their



supply chains. In the context of supply chains, 'association by guilt' occurs, and multinational corporations may reconsider reshoring, backshoring, or nearshoring sections of their manufacturing operations.

Ethical sourcing on the other hand is defined as Coordinating the activities of supplying the organization with essential supplies from a group of suppliers in an ethical and socially accepted manner, irrespective of the formal accountability of the organization in question (Kim et al., 2018, lowfield, 2003). Unethical sourcing may be in the form of lower pricing attained through global sourcing in poor and/or emerging countries in a globalized society as these countries have fewer societal and environmental constraints (Veit et al., 2018). In order to gain competitive advantage, gain good image for companies, many organizations have developed sustainable and ethical sourcing practices along their supply chains. For example, in response to the aftermath of the child labour scandal in 1996, Wal-Mart announced a commitment to enhance working conditions at its suppliers' locations and when Nike's sweatshop first surfaced in 1996, Life magazine published an article about child labor in the company (Strom 1996 and Banjo 2014). In spite of the criticisms received by the above two companies, they implemented ethical sourcing measures to redeem their images and are among the leaders of social responsibility now. Other researchers have interchangeably referred to ethical sourcing as responsible social buying, socially responsible sourcing, purchasing social responsibility (Maignan et al. 2002, Zorzini et al. 2015, Carter and Jennings 2002).

When companies source unsustainably and unethically, it is not only the ecosystem that suffers. Companies' profitability is suffering because of this lack of sustainability. Natural disasters, which are directly linked to climate change, are predicted to cost Unilever €300 million yearly (Nutburn, 2019). The same author proposed that to achieve sustainability in supply chains, a corporation must address environmental, social, economic, and legal considerations across its



supply chain and if that is done using a holistic approach, waste and environmental impact are reduced, while labour conditions, health and safety are improved, and worker exploitation is avoided.

According to the Chartered Institute of Procurement and Supply (CIPS, 2020), below are the advantages of a sustainable supply chain;

New Partnership Potential: A company having a long-term supply chain is also appealing to other companies wishing to partner with it. Your environmental credentials will very certainly coincide with the values of another company. As a result, potential partnership opportunities arise. As an example, consider Sainsbury's. To help its dairy farmers, the business teamed with veterinarians and taught them how to spot and treat common health issues. As a result, each of the 55,000 cows produces 140 litres of milk each day, which is 140 litres more than the national average. Healthier cows are happy cows, which means fewer cows are needed to meet demand.

Reduced Environmental Impact: There is a common perception that it is expensive to decrease a company's environmental impact. However, it has the potential to save a lot of money. You may instantly see results by decreasing waste and improving the efficiency of buildings, cars, and machines. For example, John Mitchell Ltd saved over £650,000 by investing in driver training for its transport fleet. Nike modified the way it makes select trainers, cutting labour expenses by up to 50% and cutting material utilization by 20%, which resulted in a 0.25 percent margin increment.

Guarantee supply continuity: Continuity of supply can be achieved by diversifying your supply chain to prevent being overly reliant on a single connection. Over the years, there have been several instances of suppliers failing to deliver a service or product, resulting in negative consequences for other organizations. Having numerous suppliers in different parts of the world might help you maintain the consistency of your products or services, avoiding costly



downtime and damaging your brand. According to Nutburn, 2019, a difficult monsoon season in Thailand in 2011 (which was linked to climate change) prompted global hard drive prices to surge. Two of the world's major hard drive manufacturers were unduly reliant on Thai suppliers, who were unable to fulfill orders, resulting in devastation.

Win More Deals: As you demonstrate your green credentials, a sustainable supply chain might help you land more business. Internationally recognized standards, such as ISO 14001, can help you out even more. ISO 14001 is a management system that helps you find holes in your organization where you may achieve green efficiency savings. It's frequently a requirement in commercial tenders. With an accreditation to back up your environmental efforts, you can demonstrate to potential clients that you're making important steps to lessen your environmental effect. If your company examines its supply chain and can adjust, the benefits are numerous. Positive action can result in significant savings and improved margins, as well as a reduction in costs.

Protecting Company's brands: Your supply chain has an impact on your brand reputation because information is readily available online. To boost business growth, it's critical to safeguard your reputation. Ascertain that your sustainability approach benefits every worker in the supply chain. This involves providing equal pay for equal effort and reducing environmental impact. Worker safety should never be jeopardized. Apple has been a victim of this in recent years, with its Chinese factory's labor conditions being questioned. There were fears that their new, less expensive iPhone was being made in an illegal and abusive environment. Between 2016 and 2018, the technology brand dropped 27 spots, from second to 29th (Nutburn, 2019)



CHAPTER THREE METHODOLOGY

3.1 Introduction

This section examines the methodology employed to carry the research. Specifically, the section looks at the research design, study population, data collection methods, data analysis tools, research paradigms, research design, reliability of the research, research validity and ethical issues



3.1 Profile of the Study Area



Figure 3.1.1: Map of Northern Ghana displaying the Districts

Source: Adapted from Archives of Districts Map of Northern Ghana, 2018

According to Ghana Statistical Service (2010), the Northern region, whose capital is situated in Tamale, has about 70,384 square kilometers (largest land mass region in Ghana). It shares boundaries with the Upper East and the Upper West regions to the north, the Brong Ahafo and

the Volta regions to the south, Togo to the east, and Côte d'Ivoire to the west. In addition, except in the northeastern section along the Gambaga escarpment and in the western corridor, the ground is mostly low lying. The Black and White Volta Rivers, as well as its tributaries such as the Nasia and Daka rivers, drain the region.

The climate in the region is relatively dry, with only a single rainy season every year.

The yearly rainfall ranges from 750 millimeters to 1,050 millimeters. The dry season runs from November to March/April, with maximum temperatures in March/April and minimum temperatures in December and January. From December to early February, the harmattan winds blow (Ghana Statistical Service, 2010).

3.2 Profile of the study organization

KI Ghana Ltd is a limited liability company that was established in 1963 under the Companies Act (Act 179). With over sixty years of experience in the Shea nuts industry, the company is a major player. The nuts are sourced directly from rural women groups, numbering over 150,000 women and still counting.

Shea trees provide the raw material (Shea nuts). Shea trees are abundant in Ghana's Northern, Upper West, and Upper East regions, with isolated populations in the Volta and Brong-Ahafo regions. Shea nuts are traditionally collected and processed by women. Shea is a crucial source of nutrition since edible fruit falls from the trees during a time when few other crops are being collected. A portion of the shea crop is marketed as well, providing a valuable source of revenue.

In KI Ghana Ltd Supply chain, the business process begins with forming women groups in rural areas. Each group opens a bank account with group leaders being signatories to the bank account. The company operates under "fair trade" principles. Each woman in a group, is pre-

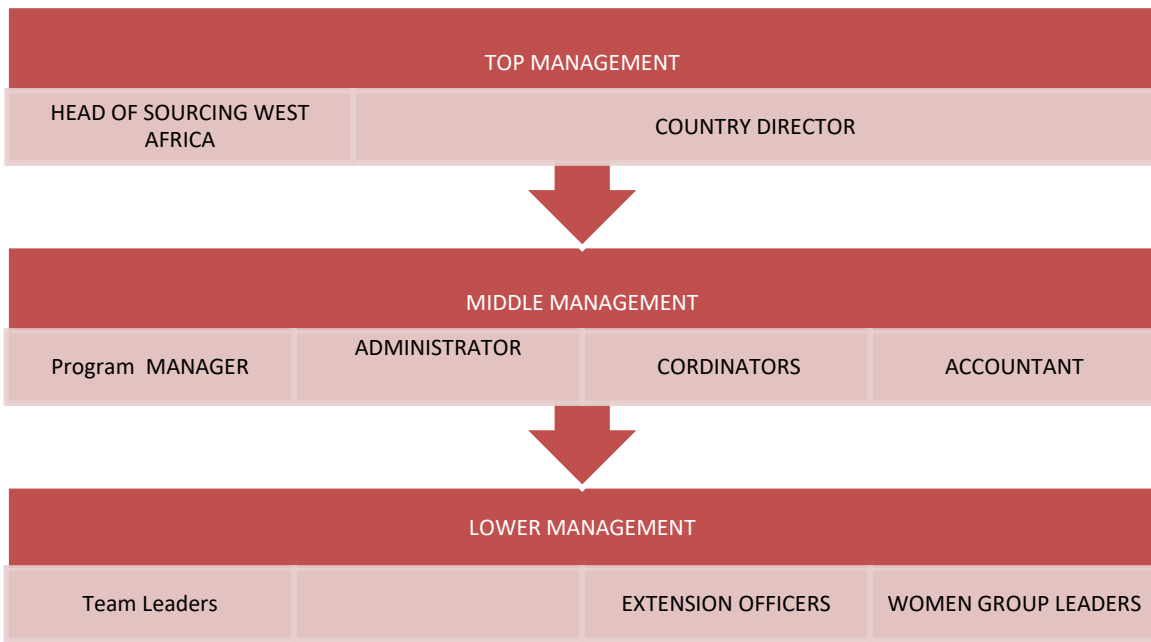


financed with an amount of money, which she relies on for some daily expenses, while keeping her nuts until the time there is fair market price, where field Officers then evacuate her product and pay her the remaining balance. The whole group is also paid a bonus amount when their expected volume target is met.

The shea nuts do not only end In Ghana, but shipped to processing facilities in Denmark, Columbia, Japan, Spain etc, where the nuts are processed into shea butter, used in the manufacture of chocolate, bread, animal feed, cosmetic products.



Below is the organogram of Ki Gh Ltd.



Firm resources

The resources of a firm are the human and other material items that work together to achieve the goals of a firm. The basic resources of KI Ghana Ltd are

- a. Human resources: The people who work for the company and the departments responsible for managing employee resources. Example Human Resource manager. The department here is responsible for job recruitment, selection and promotion.
- b. Material resources such as trucks for conveying Shea nuts from field to warehouse, motorbikes for field journeys, office cars for running daily activities
- c. Technology resources:
 - I. Computers which help processing data to useful information
 - II. Smart phones, for communication, data collection and processing
 - III. Weighing scales for measuring weight of nuts
 - IV. GPS trackers for tracking movement of vehicles
 - V. Dropbox for storing files online
 - VI. Emails for reporting

3.3 Target Population

According to Babbie (2007), it is important for a researcher to state whether his/her population sampling design is single or multistage (clustering). This study used multistage clustering, which involved identifying clusters made up of groups and/or organizations to obtain access to the names of persons within the clusters, as well as samples within them.

Women Shea Processors in Savelugu and Bimbilla Municipalities made up the study's population. Field Officers and Team leads in Bimbilla Municipal, Wa Municipal, Savelugu Municipal, Jirapa and Tumu Districts ,Salaga District, Yendi Municipality, Nakpanduri District, Wulensi District ,Garu and Zebilla Districts working in the Shea supply chain. Field



Officers were interviewed to get their perspectives on Mobile Phone usage with Shea processors in their daily transaction and some Field activities that could be enhanced and/ or facilitated through the mobile phone

Table 3.3.1 The target population's distribution

Item	Number
Women Shea Processors (Bimbilla)	100
Women Shea Processors (Savelugu)	100
Field Officers/Team Leads	20
Total	220

Source: Field work (2020)

3.4 Research Philosophy

According to Creswell (2003), a research paradigm, or a set of common beliefs among scientists, can be defined as a set of agreements about how problems are to be understood, how we view the world, and how we go about conducting research. The researcher again stated that, there are basically four types of research paradigms -Pragmatism, advocacy/participatory, constructivism and post positivism

For this research, the researchers used advocacy/participatory research paradigm/worldwide view, since it is focused on empowering rural women to access information through mobile phone.

Post positivist Paradigm: This research paradigm also called scientific research, empirical research, and positivism, as it refers to post-positivist thought that questions the traditional



notion of absolute truth in knowing (Philip and Burbles, 2000). It also emphasizes that while researching human behavior and activities, we cannot be "positive" about our claims of knowledge. Post positivism, according to Creswell (2009), contains the following characteristics:

1. Postpositivists believe in determinism, claiming that causation will most often predict outcomes or outcomes.
2. Postpositivist problems represent the requirement to find and assess causes that predict outcomes, such as those identified in trials
3. It's also subjective in the sense that the sample under investigation is broken down into small, distinct samples to test, such as the hypotheses and research question variables.
4. There are laws and ideas that control the world, and they must be validated and polished for humans to comprehend it.



Advocacy/Participatory Research Paradigm: This position arose in the 1980s and 1990s from individuals who felt that postpositivist assumptions imposed structural laws and theories that did not fit marginalized individuals in society or issues of social justice that needed to be addressed. This assumption is commonly seen in qualitative research, it can also be a foundation for quantitative research (Creswell, 2009).

Fay (1987), Kemmis and Wilkinson (1998), have arose the importance of advocacy paradigm in their studies. These researchers believe that inquiry needs to address political and social issues. In accession of this research should contain the agenda of reforms that ultimately address the issues of empowerment, inequality, oppression, domination, suppression, and alienation.

The researcher often begins with one of these issues as the main agenda of the study.

It is also advisable the researcher collaborates well with participants so as not to further marginalize them during the inquiry process. In this regard, participants may help design questions. Collect data, analyze information, and reap the benefits of the research. Advocacy research provides a voice for participants, advancing an agenda for change to improve lives of participants (a united voice for reform and change).

According to Wilkinson (1998), key characteristics of the Advocacy/Participatory paradigm are;

- A. The type of research emphasizes on releasing people from the limits imposed by the press, language, work procedures, and power relationships in the educational sector. Advocacy or participatory usually begins with problems in society, such as the need for empowerment.
- B. Advocacy is also repetitive or dialectic in nature, with the goal of changing practices. As a result, researcher advocacy should result in the advancement of a change agenda.
- C. It is emancipator in the notion that it assists people in breaking free from the shackles of unreasonable and unjust structures that stifle self-development and personality.
- D. Also, it is realistic and collaborative in nature because it's an investigation done with others rather than "on" or "to" others. As a result, advocacy authors involve participants in their study as active partners.



Pragmatism Paradigm/ Worldwide View: Pragmatists use a mix mixed methodology to uncover flaws in a study and reinforce it (Johnson and Onwuegbuzie, 2004). The proponents of this concept claim that a mix method approach can yield actual knowledge. Unlike post positivism, pragmatism is based on acts, situations, and results rather than prior circumstances. The problem is more essential than the method, and researchers should apply all approaches to grasp the problem statement (Tashakkori and Teddlie, 1998). There is no system or philosophy that is associated with pragmatism.

Pragmatism paradigm has the following features (Creswell, 2009).

- i. Researchers can use mixed methods; the important thing is to find the optimal research methodologies and procedures to address the issue statement.
- ii. Realists agree that research takes place in a variety of historical, social, political, and other settings. Mixed methods research may contain a postmodern turn, a theoretical lens that reflects social justice and political demands, in this way.
- iii. Researchers have the freedom to choose the study methodologies, strategies, and processes that best suit their needs and goals.
- iv. Pragmatists consider the "what" and "how" of research in terms of the expected outcomes—where they want to go with it.

Constructivism Paradigm/Worldwide view: Individuals want comprehension of the world in which they live and work, according to social constructivists. Individuals create subjective meanings based on their experiences, which are directed at certain objects or things. These meanings are diverse and multifaceted, forcing the researcher to look for diversity in viewpoints rather than pigeonholing them into a few categories.



The goal of this study is to rely on respondents' perspectives on the topic as much as possible. Researchers acknowledge that their own experiences influence their interpretation, and they place themselves in the research to acknowledge how their interpretation is influenced by their personal, cultural, and historical viewpoints.

Crotty (1998), identified some assumptions of constructivism research in the following;

- A. Human beings create meaning as they interact with the reality they are interpreting. To allow participants to offer contributions, qualitative researchers frequently use open-ended questions.
- B. Meaning is always socially generated, coming from back-and-forth dialogue with a human society. The method of qualitative data inquiry is essentially inductive, with the inquirer deducing meaning from the data gathered in the field.

3.5 Sample and Sampling Techniques

According to Hamed (2016), there are basically two types of sampling techniques- Probability (random) sampling and non- probability (non-random) sampling. The study used cluster sampling and multistage clustering sampling techniques.

In cluster sampling is the whole population were divided into clusters or groups and a random sample was taken from these clusters, all of which were used in the final sample (Wilson, 2010). Cluster sampling is advantageous for those researchers whose subjects are fragmented over large geographical areas as it saves time and money (Davis, 2005). Multi-stage sampling was further used to sub-divide the clusters into smaller units (Hamed, 2016). The advantage of multi-sage sampling made it possible for resources to be concentrated on limited number of sample units as well as save time and money (Singh and Masuku, 2014; Hamed ,2016)

Using the Yaro Yamin's formula;



$n=N/(1+N(e)^2)$; where n =Sample size required, N =number of people in the population (400 Shea Processors and 21 field officers), e =Margin of error (5%) and 1 is a constant, a sample size of 200 Shea processors were chosen, subdivided into two separate districts thus, Bimbilla and Savelugu and 20 field officers as shown in table 3.3.1.

3.6 Research Design

According to Creswell (2009), research design refers to the plan or proposal to conduct a research. It includes the intersection of philosophy, specific methods, and strategies of inquiry. In the context of the discussions from the research paradigms above, the researchers employed advocacy/participatory research paradigm. The research is both qualitative and quantitative in form (Creswell, 2005) and used survey and interview guide approach in data collection specifically the use of a study questionnaire.

Furthermore, the research used cross-sectional study design. This type of design is used to find out the prevalence of a problem, phenomenon, attitude, or issue by taking a snapshot or cross-section of the population. In a cross-sectional study, data are collected on the whole population or a subset at a single point in time to examine the relationship between variables of interest (Iddrisu et al., 2016)



3.7 Sources and Data Types

The study used research adopted from primary data sources. Primary data was obtained primarily from the questionnaire administered to respondents to solicit responses. The research questionnaire was however structured and based on questions of the research which also reflects the study objectives. Data was again taken from journals, books, industrial reports, research publications that relate to the study in literature review.

3.8 Collection of Data

Purposive sampling as already mentioned was used for the study and the main instrument for data collection was questionnaire. The interviews were employed as it made it possible for the researchers to be flexible in the search for information from the respondents. The use of interviews in this study made it possible for the researcher to attain knowledge of the participants' beliefs and attitudes towards the use of mobile phones for various activities in the Shea supply chains and some of the challenges associated with using mobile phones by Shea processors.

A total of fifty-three (53) questionnaires were administered in the study. Data collection and questionnaires were done by the researcher with assistance from Field Officers/ Team Leads working in the Shea supply chains using Insyt app installed on their phones. Data enumerators were randomly selected in twelve (12) Shea operational areas and given the



necessary training to administer the questionnaires. Pre-testing was done on some Shea processors in Savelugu Municipality prior data collection to assess the appropriateness and ambiguity of the questions. Savelugu was selected for pre-testing based on proximity to the researcher. Data responses were uploaded automatically and could be accessed by the researchers any time an enumerator connects online. The questions were first translated into Dagbani and Likpakpaln to get a fair response from the respondents since most of them could not read/ write in English Language.

3.9 Data Analysis

A total of Forty (40) questionnaires administered to 220 respondents were used for the analysis. Descriptive and inferential statistics were used to analyze the data. The descriptive statistic included percentages, means, frequencies and standard deviations. Independent Cramer's V-test was used to test mean differences between two separate parameters. Insy, after data collection, could not give very good data analysis and was substituted with computer data analyses software -Statistical Package for Social Sciences (SPSS) and Microsoft Excel which were the main tools employed to analyze the data in order to help interpret the results. The two tools facilitated word processing and data analysis as well as gave accurate pictorial presentations.

3.10 Research Reliability and Validity

According to Long et al., (2000), validity in research can be defined as the quality, operational procedure undertaken and the precision in which the findings accurately agrees with the data, while reliability refers to consistency within the analytical methods used. Patton (2001), stated that validity and reliability should guide qualitative researchers in designing a study, analyzing the results as well as proofing the quality of the study

During the study, researcher ensured;



- a. To avoid bias and the possibility of omitting crucial information that would affect the study's validity and reliability, accurate recording and data collection, consistent and transparent data interpretation, and in some cases, voice recordings were taken and afterwards translated into English.
- b. When it comes to administering questionnaires, enumerators were thoroughly trained to administer questionnaires in-person to respondents tracked by time and GPS coordinates of areas where questionnaires were administered. The researchers personally conducted qualitative interviews for the study.
- c. The researchers also demonstrated clarity during the process of data collection and data analyzed were the raw data obtained from the questionnaires while invalid data were discarded to prevent biases in the study. of thought processes during data analysis and subsequent interpretations.

3.11 Ethical Issues

Israel and Hay, (2006) stated that ethical issues are apparent in modern day research taking into consideration issues of personal disclosure, researchers' roles in cross-cultural contexts, privacy of individuals in terms of internet data collection, authenticity as well as credibility of the research report.



Shea processors are marginalized in assessing digital technologies for their daily business activities and in order not to further marginalize Shea processors, the research topic was carefully chosen, and data collection and interviews translated into the local dialects of Shea processors. Researchers and data enumerators were consciously reminded to maintain mutual respect for respondents during the survey, not to shout, speak ill of respondents and most especially, offer extra help to older respondents.

No one was coerced into partaking in data responses as well as interviews. Consent of respondents was sought, and time agreed with them in respect of their off days from busy schedules. The study was carried out mainly to benefit Shea processors and not for any ill intention purpose. In the process of data analyses, individuals' responses were kept anonymous to protect their privacy. Findings were presented in figures, tables and made no disclosure of names and other private identities. The research language was carefully chosen to make do away with vulgar languages, respect of gender, disability. During festive occasions and funerals, days for questionnaires administration were rescheduled in respect of the cultural settings of the communities.



3.12 Research Limitations

Some challenges were encountered during the research. The research was constraint financially as the researchers could not afford funding to acquire applications that could directly translate international languages such as English Language, French into Dagbani and Likpakpaln. Thus, organizations in Shea supply chains should provide funding for research into exploring applications for direct language translations for Shea processors.

Unlike urban areas where there is network coverage for effective and easy communication, most Shea communities are in hinterlands that have less coverage or do not at all have network coverages and thus communicating business information where there is no network coverage represented a greater challenge. Telcom operators should provide network coverage in rural areas to ease business transactions in rural areas. For time constraint, the sample size was reduced to 200 Shea processors and thus, findings of the research could not be generalized. Further research could be carried with a larger sample size. The research could not also quantify the financial capacity of rural mobile money operators for time limit.





CHAPTER FOUR ANALYSIS AND DISCUSSION OF DATA

4.1. Introduction

The outcomes of the data analysis and major study findings are presented in this chapter. Questionnaires and data collecting equipment were used to collect data, and the results were displayed in the form of frequency distribution tables and graphs. Educational status, Sources of mobile phone ownership, Mobile Money Registration, Phone types, uses of mobile phones among Shea processors Achieving efficiency of operations in the Shea industry were the areas specially considered for discussion.

Table 4.1 Phone Ownership and Mobile money

		Mobile	Money	
		1	2	Total
	Count	79	51	130
	% within phone ownership	60.80%	39.20%	100.00%
	% within Mobile money	58.10%	79.70%	65.00%
		1	2	

Phone Ownership	Count	57	13	70
	% within phone ownership	81.40%	18.60%	100.00%
	% within Mobile money	41.90%	20.30%	35.00%
Total	Count	136	64	200
	% within phone ownership	68.00%	32.00%	100.00%
	% within Code for Mobile money	100.00%	100.00%	100.00%
Symmetric measure			Value	Sig.
	Nominal by Nominal	Phi	-0.211	0.003
		Cramer's V	0.211	0.003
	No. of Valid Cases		200	

Source: Field survey, (2020)



136 (60.8%) of Shea Processors were registered for mobile money while **64 (39.2%)** were not registered for mobile money. **81.4%** of Shea Processors registered on mobile money also had mobile phones against **18.6%** of Shea processors who were not registered for mobile money also did not have phones. The higher % of women registered on mobile money against mobile phone ownership means that quite some number of women have SIM cards registered for mobile money but do not have phones. In all, 68% of the Women both had both registered for mobile money and had phones while 32% neither had phones nor registered for mobile money. There is a significant

difference between mobile money registration and phone ownership ($P < 0.005$). Findings from the study of mobile phone ownership is higher than the national.

According to GSMA (2020), Ghana has the highest mobile phone penetration in the whole of West Africa (55%). Also, study conducted by (Robert, et al., 2017) show that mobile phone ownership drives financial Inclusion by 39.8%. Mobile phone ownership in the Shea sector is higher above the national penetration rate and thus, there is a huge potential for financial Inclusion through mobile phones in the Shea industry since higher percentage of Shea processors own phones and thus can be served digitally, with a positive impact on the digital economy.





Table 4.2: Education and Phone Ownership

		Education		
		1	2	3
phone ownership	Count	109	21	0
	% within phone ownership	83.80%	16.20%	0.00%
	% within education	62.30%	100.00%	0.00%
	Count	66	0	4
	% within phone ownership	94.30%	0.00%	5.70%
	% within education	37.70%	0.00%	100.00%

Total	Count	175	21	4
	Expected Count	175	21	4
	% within phone ownership	87.50%	10.50%	2.00%
	% within education code	100.00%	100.00%	100.00%
Symmetric Measures			Value	Approx. Sig.
	Nominal by Nominal	Phi	0.311	0
		Cramer's V	0.311	0
	N of Valid Cases		200	

Source: Field survey, (2020)

83.8% of Shea Processors had no formal education, 16.2% of Shea processors had basic education while none of the populace had tertiary education. 94.3% of the populace who did not have formal education had phones 0.0% of the populace who had basic education had phones while 5.7% of the population that had second-cycle education owe mobile phones.

In total, 87.5% of Shea processors both had no formal education but owe mobile phones while 10.5% of the population both had basic education and owe phones and the % of Shea processors who had Second-cycle education and owe mobile phones stood at 2.0%. There exists a significant relationship between mobile phone ownership and education.



It can be seen from the study that one's ability to buy a phone is not dependent on formal education. This is because a higher proportion of the women who did not have formal education had mobile phones. It is also worthy to note that higher number of Shea processors could use yam phones than smart phones as confirmed from the 2020 household survey on ICT in Ghana where it was stated that the ownership of yam/basic phones is inversely proportional to one's higher education while ownership of smartphone is directly proportional to one's higher education. Also, as over 80% of the population are had no formal education and operating a smartphone would require a bit of illiteracy, a higher percentage of Shea processors would rather opt for yam/cell phones.

This study again confirms the findings from (Iddrisu et al., 2016) where they had 88.0 % of Shea processors being illiterate. The smaller reduction in illiteracy rate might be a result of Non-Formal education embarked by some organizations such as Plan International, Ghana.





Table 4.3 Literacy and phone type

		Literacy		
		1	2	Total
	Count	18	173	191
	% within code for phone type	9.40%	90.60%	100.00%
	% within Literacy code	75.00%	98.30%	95.50%
		1	2	
Phone type	Count	6	3	9
	% within code for phone type	66.70%	33.30%	100.00%
	% within Literacy code	25.00%	1.70%	4.50%

	Count	24	176	200
Total	% within code for phone type	12.00%	88.00%	100.00%
	% within Literacy code	100.00%	100.00%	100.00%
Symetric measures			Value	Appox. Sig.
	Nominal by Nominal	Phi	-0.365	0
		Cramer's V	0.365	0
			200	

Source: Field survey, (2020)

The researchers wanted to see if there is any relationship between the type of phones Shea processors use and their educational background. Out of 200 Women surveyed, 9.4% had formal education and/or could read or write in their native language and/or English Language while 90.6% did not have formal education nor could read or write in either English Language or their native language. 66.7% of the populace who had basic education and/or could read/write had cell phones/yam phones while 33.3% of the populace who had at least second-cycle education used smartphones. This research confirms the findings of the 2020 Household survey on ICT in Ghana where they found out that ownership of basic phones (61.3%) was more than twice that of smartphones (28.1%) in rural settings. There exists a significant relationship between education and phone type shea processors use ($P < 0.005$). The smaller population that use smartphones could be due to their ability to Speak and /or write English language, thus, making it easy for them to use smartphones.



Table 4.4 Momo Pin and Literacy

		MoMo PIN		Total
		1	2	
	Count	14	10	24
	% within Literacy code	58.30%	41.70%	100.00%
	% within CODE MOMO PIN	77.80%	5.50%	12.00%
		1	2	
Literacy	Count	4	172	176
	% within Literacy code	2.30%	97.70%	100.00%
	% within CODE MOMO PIN	22.20%	94.50%	88.00%
Total	Count	18	182	200
	% within Literacy code	9.00%	91.00%	100.00%
	% within CODE MOMO PIN	100.00%	100.00%	100.00%
Symmetric measure			Value	Approx. Sig.
	Nominal by	Phi	0.637	0
	Nominal	Cramer's V	0.637	0
	N of Valid Cases		200	



Source: Field survey, (2020)

Here, Researchers intended to know whether knowing momo pin is related to educational status. 58.3% of the population knew their momo pins against 41.7% who did not know their momo pins. 2.3% of Shea processors who knew their momo pins either had formal education and/or could read/write in their local language while 97.7% of those who could neither read nor write did not know their momo pins. In total, 9.0% of the populace who knew their momo codes also had formal education as against 91.0% who neither had formal education nor knew their momo pins. There exists a significant relationship between knowing ones momo pins and education.

Thus, knowing a momo pin could be linked to formal education as higher percentage of Shea processors who did not have formal education did not know their momo pins. Higher number of Shea processors thus had to rely on respective mobile money vendors to enter their passwords for financial transactions and/or had they had to write it on pieces of papers and show to vendors for financial transactions. Issues of fraud could be higher risk since mom pins are exposed to vendors for financial transactions. According to the Bank of Ghana, 2,295 fraud cases were reported in 2019, as compared to 2,175 cases reported in 2018.



Table 4.5 Calls and Momo Status

		Calls		
		1	2	Total
	Count	42	80	122
	% within Mobile money	34.40%	65.60%	100.00%
	% within calls	34.40%	65.00%	67.40%
MoMo	Count	16	43	59
	% within Mobile money	27.1%	72.9%	100.0%
	% within calls	34.40%	35.00%	32.60%
Total	Count	58	123	181
	Expected Count	34.40%	123	181
	% within Mobile money	32.0%	68.0%	100.0%
	% within calls code	100.0%	100.0%	100.0%
Symmetric measures			Value	Approx. Sig.
	Nominal by Nominal	Phi	0.073	0.323
		Cramer's V	0.073	0.323



	N of Valid Cases	181	
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Source: Field survey, (2020)

It was revealed that 34.4% of Shea processors could self-make calls while 65.6% could not self-make calls. Out of this numbers, 27.1% were registered for mobile money while 72.9% were not registered for mobile money. There is no significant relationship between ability to self-make calls and mobile money registrations. The number of women who cannot self- make calls had to rely on people to search for contacts and make calls for them. However, they can always receive calls. Not all women that can self-make calls were registered for mobile money. A total of 32.0% who could self- make calls had also registered for Mobile money while 68.0% of those who could not self- make calls did not also register for Mobile money. It could be quite easier for organizations to call Shea processors for business transactions in their languages. However, efforts should be made such as using images to store phone contacts of business entities on the phones of Shea processors where they could easily relate and self- make calls to entities to have a two-way communication through phone calls.

Table 4.6 education and calls status

		calls		Total
		1	2	
education code	Count	47	123	170
	% within education	27.60%	72.40%	100.00%
	% within calls code	81.00%	100.00%	93.90%
	Count	11	0	11
	% within education	100.00%	0.00%	100.00%
	% within calls	19.00%	0.00%	6.10%
Total	Count	58	123	181



	% within education	32.00%	68.00%	100.00%
	% within calls	100.00%	100.00%	100.00%
Symmetric Maure			Value	Approx. Sig.
	Nominal by Nominal	Phi	-0.37	0
		Cramer's V	0.37	0
	N of Valid Cases		181	

Source: Field survey, (2020)

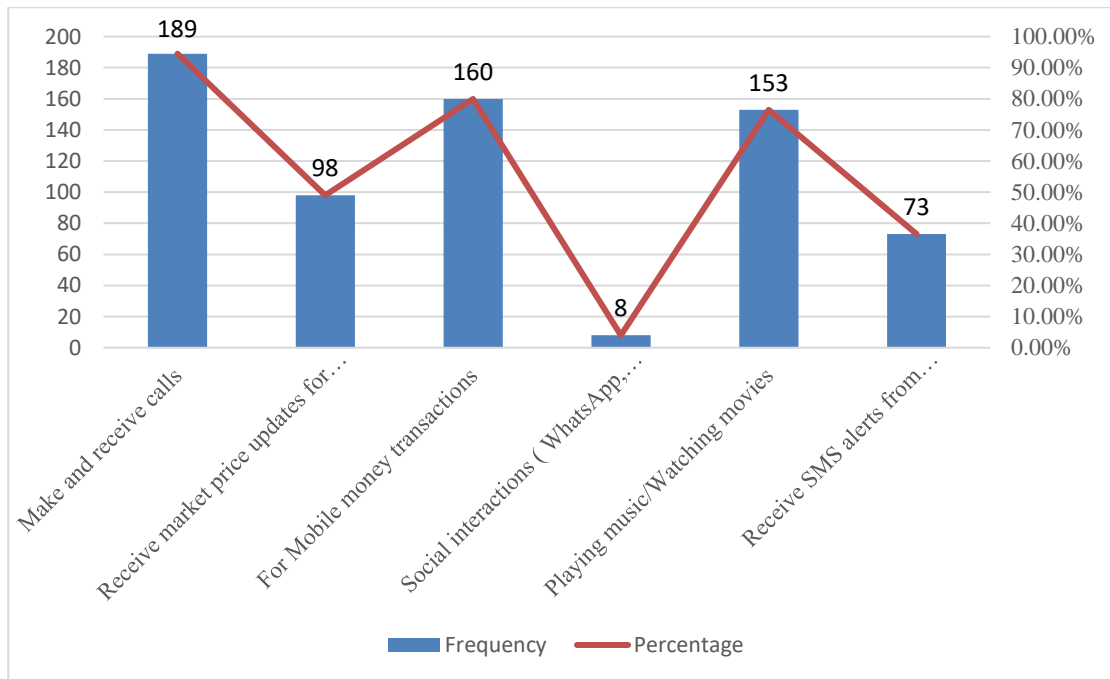
27.6% of Shea processors can self- make calls compared to 72.4% who cannot self-make calls and thus had to rely on literate people to search phone contact and make calls for them. 100.0% of all women who had formal education could self- make calls. This means that education play an important factor in one’s ability to make calls as all the phone used by Shea processors are written in foreign languages and not in the local language of Shea processors. In total, 32.0% of those that could self- make calls also had basic education while 68.0% who did not have basic education could not also self-make calls. Meaning that higher number of Shea processors can receive calls than can self- make calls, thus higher number had to depend on people to make calls. There is a link between education and the ability to make decisions on one's own.



9 Shea processors remained neutral in this query. The study confirms that finding from (Iddrisu et al., 2016) where they reported that majority of Shea processors could not self- make calls.

Figure 4.6.1 Uses of Mobile phones by Shea processors

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Source: Field survey, (2020)

Out of 200 Shea processors interviewed, 189 (94.5%) used their phones for making and receiving calls. Thus, mobile phones are mostly used for by Shea processors to make and receive calls from to their clients, family, and other relatives. The finding is in line with the 2020 household survey on ICT in Ghana where they reported that 80.9% of rural localities use

phones for their personal activities compared to 67.8% of urban households. Moreover, the number of Shea processors who connects with families and business partners by either calling or receiving calls is higher than the findings of Allabouche et al., (2016) where they discovered that that In lieu of personal visits, more than 80 percent and roughly 70 percent of Moroccan and Italian respondents, respectively, made phone calls or sent texts to close relatives.. Showing clearly that the mobile phone remains a good tool to be in touch with family and business contacts apart from physical contacts. In this present time of Covid-19 where social gatherings are restricted, mobile phone remains very important for virtual activities.

98(49%) received market price updates for their produce. Majority of respondents in this category were retailers of Shea butter and Shea nuts who would want to know the price for their produce before making decisions as to where and when to sell. This finding is in line with the findings of Aker, and Mbiti, (2010) where they found out that mobile phones facilitates business transactions as it provides business populace with quick access to information on producer prices precisely. The researchers further stated that at about 658 km from Tamale to Accra, farmers in Northern Ghana can access the rice for corn and tomatoes through their mobile phones

160 (80%) transacted mobile money via phones. Though some might have carried mobile money transactions without physically owing a phone as they can do that from their neighbors' phones. This finding however disagrees with that of household survey on ICT in Ghana (2020), where they stated in rural areas, 32.1% used mobile money while the remaining 67.9% who do not do not use mobile money

In terms of using phones for playing music, 76.5% of Shea processors use their phones for such purposes basically to entertain themselves. Ideally, most basic phones support memory cards that enables Shea processors to pull songs from various sources onto their phones. Allabouche



et al., (2016) investigations revealed that 8% of respondents use phones for music, videos, games, and movies. Our higher percentage of using phones for music or watching movies could be so because most Shea processors' means of entertainment is basically the mobile phone as most cannot either afford to buy and/or operate advanced communication mediums such as computers, Television sets.

Only 8 women (4.00%) used their phones for social interactions (WhatsApp, Facebook, twitter). Phones for Social Network (Facebook, twitter, what's up) however was the second highest (23%) only to phone calls (24%) among Moroco and Italian respondents. Again, the case of smaller proportion of Shea processors using phones for Social networking could be due factors such as higher illiteracy rate to access and use social networking platforms, issues of internet challenges, higher number of Shea processors owing basic phones, compared to owing smartphones and feature phones.

73 (36.5%) received SMS alerts from corporate organizations for varied services such as weather forecast, as to when it will rain, the type of crops to plant at what time , SMS or voice messages on market prices for food produce and SMS alerts on maternal and child health information for pregnant women and their relatives. Further investigations revealed that

ESOKO and Savanna Signatures were the organizations that provided the services above. In its project dubbed "Scaling up climate smart agriculture technologies with focus on downscaled seasonal forecast information through mobile phone to farmers in Northern Ghana"

'ESOKO claimed that since 2014, over 300,000 farmers have been able to use the Esoko platform to receive and use annual forecast information to their farm management operations and other livelihood activities (www.esoko.com).Savanna Signatures, through the Technology for Maternal and Child Health Project (T4MCH) used ICT tools to communicate information on maternal child health to pregnant women and new women through their mobile phone who



could otherwise find it difficult to access such information due to bad roads, inadequate transportation for navigation (Savanna Signatures, 2019). Considering phone ownership among Shea processors and the various activities they have accessed through the mobile phone, there represent a huge potential for mobile phone usage for activities in the Shea supply chain

4.7 How phones have helped Shea processors

When I did not own a mobile phone, I found it difficult to call family members to offer helping hands in processing Shea nuts and /or butter especially during bumper seasons. But now I own a phone, I can call family members from afar; ask of market prices for Shea products and this has made life very simple and enjoyable.” we also get SMS alerts from Ministry of Food and Agriculture on weather forecast and good agricultural practices which has helped to plant at the right time, follow good agronomic practices and that has increased crop yields”.(Mma Bandiba Abukari, SUGLO NBORI BUNI WOMEN GROUP, Bunlung, Savelugu Municipality).

“With my phone, I can make calls to business partners without having to travel at long distances” (Bamondo Akua, Kimobaan. Women Group, Gundoo, Bimbilla).

This makes it easier to have regular touch with customers and family members, thus saving cost of transportation and quick decision making. “In times of bumper harvest, I can call family members from both far and near to help in Shea nuts collection and/or butter processing. Thus, it increases my income through more hands” (Salamatu Ibrahim, Suglo Ngbibisaanba Women Group, Zoggu, Savelugu). She further stated in case of severe sickness, a call can be made while picking Shea nuts in the bush for help.



Thus, distressed Shea processors can connect with family and friends for medical help when in dare need

Table 4.6.1Frequency of flows demand by Shea processors

Category	Daily	Weekly	Monthly	Total
Product flow	48	112	40	200
Percentage	24.00%	56.00%	20.00%	100.00%
Information flow	53	121	26	200
Percentage	26.50%	60.50%	0.13	100.00%
Cash flow	127	68	5	200
Percentage	63.50%	34.00%	2.50%	100.00%

Source: Field survey, (2020)

Product flow, information flow, and financial flow are the three basic categories of flows in supply chain management, according to Rouse (2010). The attention of the researchers was to access when (time) the above activities should be delivered to them. Products in the Shea industry may include logistics (sacks/pallets and or containers) required for packing as well as Shea nuts and/or butter. Mostly, it is the duty of the off takers to provide logistics for products packaging. In the product flow category, 24 %, 56% and 20 % responded they would want products delivered to them on daily, weekly, and monthly basis respectively as most of them do not have the logistics for storage. The same could apply for reverse products flow (Shea nuts/butter) from women to off takers as most women do not have spaces to keep produce for longer time after sale.

26.50%,60.50% and 0.13 responded they would want to access information about their Sha business activities daily, weekly, and monthly respectively. In other to achieve customer



intimacy, information flow should be a two-way system which allows women to receive information such as price updates, time of produce evacuations, meetings as well as communicate their concerns back to business partners. The higher percentage of women wanting to receive information on weekly basis could be because most of the Northern markets are normally on weekly basis and thus women would want to receive price updates almost every week for their produce. Financial flow is very much important as Shea processors would want to be paid for their products and services in the fastest possible time. Majority of Shea processors (63.5) would want to be paid the day produce are sold while the remaining 36.5% fell within payment on weekly and monthly basics. Considering the issues of theft and armed robbery in the movement of bulk physical cash, e-cash payments for produce which could easily be done through the phone (mobile money) could be the safest and fastest method of cash flow in the Shea industry.

4.8 Community Visits by Field Officers

Table 4.8.1 Visits by Field Officers

STATION	NO.COMM	AV.VISIT/WEEK	Average	No.	Total
				WoMEN/GROUP	No.women
					Visited
					/week
Bimbila	87	2	120.23		240.46
Garu	203	11	67.60		743.56
Jirapa	81	6	64.37		386.22



Karaga	89	8	78.22	625.80
Nakpanduri	178	9	63.52	571.65
Salaga	120	6	111.27	667.60
Sang	77	7	88.60	620.18
Savelugu	102	4	106.05	424.20
Tumu	31	4	201.90	807.61
Wa North	101	7	71.70	501.92
Wa South	114	12	92.68	1112.11
Walewale	71	3	123.97	371.92
Wulensi	85	4	31.47	125.87
Yendi	103	8	95.80	766.40
North				
Yendi	86	5	71.19	355.97
South				
Zabzugu	108	9	128.49	1156.40
Zebilla	97	9	96.72	870.50
17	1,733	6.71	65.88	608.73

Source: Field Survey, 2020 (2020)



Out of 17 operations areas of KI Ghana LTD with a total of over One Hundred and Fifty-Two Thousand (125,000) Women in 1,733 communities, the researchers analyzed the number of communities visited per week by fifty-five Extension Officers. It was found out that; An average of 6.71 communities were visited every week (an average of 608.73 women) visited per week. Thus, business activities such as daily visits, cash payments, evacuation were only

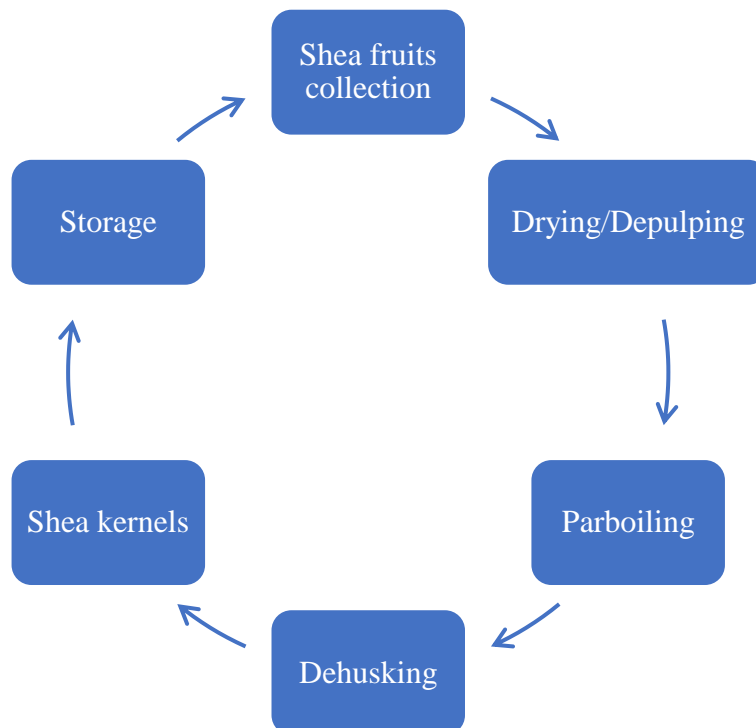
carried in about 7% of the communities while the remaining 93% of the communities could not be attended per week.

Every operational area had an average of 3 Extension Officers. Therefore, it can be said that an Extension Officer could transact business to about 203 women per week. According to Gordon (2021), in about an hour time, ESOKO can blast SMS and/or Voice SMS to about Three Hundred Thousand (300,000) clients which can be accessed through their mobile phone.

The mobile phone thus remains the most important tool in communicating business activities to larger number of Shea processors at a faster speed and cost-effective manner

4.9 Shea kernels production stages

As already discussed in chapter three, in a supply chain there exist material, information and cash flows. From key informant interviews, this thesis investigated the processes leading the production of raw materials (Shea kernels) in the Shea supply chain diagrammatized below



Source: Field survey, 2020

Shea Fruits collection: The first stage in Shea kernel processing begins with collection of Shea fruits from the base of Shea trees. Around late March to Early April, ripped Shea fruits start to self- fall around the base of Shea trees. Mostly, women and children then start to pick the fallen Shea fruits for onward processing. This is also collaborated by Edna (2017), that Women and children harvest fallen shea fruits from their farms and communal forests, which are then processed into Shea nuts.

In some cultural settings, women are only allowed to pick from only their husbands' farmlands, however in areas where no there are no farms, it is free picking for all. After the fruits are picked, they are carted to communities by women either by them carrying on their heads, or by using tricycles, donkeys. The culture where women are only restricted to Shea picking in their husbands' farmlands creates economic disparity in the sense that those whose husbands have less farmlands gets smaller volumes of Shea nuts and those whose husbands have abundant farmlands get huge volumes of Shea nuts. This phenomenon of economic disparity can be curtailed either through traditional customs and or sharing picking areas with those that has fewer picking areas. It is in line with these that the late Bayi Bombein (2015), the former traditional head of Nakpanboni in the Saboba District of Northern Ghana passed a custom that every woman in Nakpanboni is free to pick Shea fruits from any farmland or forest in Nakpanboni.

Drying/ Depulping: The shea fruit is a green oval-shaped fruit with a diameter ranging from 2cm to 5cm. A green epicarp, a fleshy pulp or pericarp, and a somewhat hard shell or endocarp that encloses a shea kernel or embryo make up the shea fruit. The sweet fleshy pulp is consumed as food. Jam is also made from the pulp (Maanikuu and Peter, 2017). From field observations, not only humans but also animals such as cattle, sheep, goats, sheep, bats eat the Shea pulp. It



was further discovered that most especially lean season when there is no abundant food, when you eat a good quantity of the Shea pulp, it makes you drink enough water which can take you for some time without getting hungry (Ndanbe Ajua, 2019). Shea fruits does not only contribute to food security, it also contains essential micronutrients for good body health. According Maanikuu and Peter (2017), the pulp of Shea fruits contains ascorbic acid 196.1mg/100g while orange, contains only 50mg/100g. The pulp also has a significant sugar content, with glucose, fructose, and sucrose evenly distributed and accounting for 3 to 6 percent of the total sugar content.

In rural areas of Ghana, depulping can be done by exposing fresh Shea fruits to nature whereby animals eat the pulp leaving the Shea nuts or alternatively allowing the Shea fruits to ferment whereby the pulp can easily be squeezed out using the hand.

Parboiling: Parboiling is a cooking technique that involves partially cooking food in boiling water. When a recipe calls for parboiling, it is referring to the partial boiling of an ingredient just until it is soft but not cooked through (Saad, 2019). During the process of parboiling, women usually use big cooking pots mounted on a three- four stone structure to support the cooking pot. Fuel wood is then placed under the stone structure and fire is set which is the main energy used in parboiling (see pic 1). Shea parboiling until recently where sustainable sourcing companies such as AAK devised better parboiling methods, used a lot of fuel wood. It is estimated that fuel wood use in parboiling contributes negatively to Ghana's forest cover loss. For example, according to Global Forest Watch (2020), Ghana has lost about 1.31 million hectares of its forest cover within the last decade. Thus, it is important for stakeholders in the Shea supply chain to consider sustainable fuels for Shea parboiling. The shell that encases the Shea nut is a hard one and thus parboiling is done to easily crack the shell to get the Shea nuts





Pic 1: Field Survey, (2020)



De-husking of Shea nuts: Livelihoods, (2021).



De-Husking: After the Shea nuts are parboiled, the hard shell becomes softer and is then de-husked by using sticks to beat the nuts or light pounding in mortar. After de-husking, women may get the de-husked shells (chaff) winnowed away leaving only the shea kernels. According to Maanikuu and Peter (2017), The shea nut's shell or husks are employed in the purification of water as it can remove large amounts of heavy metal from aqueous solutions. The shell is pounded into a paste that is used to coat traditional mud dwellings in northern Ghana. This treatment is decorative while also extending the longevity rendering them resistant to moisture and lowering their rate of absorption (Agyekwena, 2011).

Shea kernels and Storage: Shea kernels otherwise called shea nuts is the seed of the Shea fruit (see pic 2) and is the precious raw material in the Shea supply chain which is either sold in the raw form for cash and/or processed in to butter and related products. According to Jibreel et. al., (2013), about 60% of the edible fat (Shea butter) and residual product is found in the kernel. Fresh kernels are then sun- dried and kept in jute sacks for storage.



Pic 2. Shea nuts in jute sacks; Filed survey, (2020)



The SDGs and Shea Industry

The 2030 Agenda for Sustainable Development, which was endorsed by all United Nations (UN) Member States in 2015, presents a shared roadmap for peace and prosperity for people and the planet today and in the future. The 17 Sustainable Development Goals (SDGs) are at its core, and they represent an urgent call to action for all countries - developed and developing - to work together in a global partnership. They understand that eradicating poverty and other forms of deprivation must be combined with efforts to enhance health and education, decrease inequality, and boost economic growth – all while combating climate change and protecting our oceans and forests (UNDP, 2020)

GSA through its sustainability program, adopted eight out of the seventeen SDGs presented in the image below. This portion of the thesis interviewed resourced personnel in the Shea industry as well as Shea processors on how the SDGs adopted by GSA are being achieved.





Source: GSA (2020)

Zero Hunger (SDG 2): The Shea industry has contributed to reducing hunger in so many ways. Apart from the Shea fruits that can be eaten by humans as well as animals as already discussed in chapter three, Shea products (Shea butter) also serve as source of domestic cooking oil for lots of households in rural areas. In Shea supply chains, some buyers pre- finance Shea before processing whereby the amount pre- financed is deducted from total amount realized from sales. From interviews some women have used proceeds from Shea for farming crops such as groundnuts, maize, okra, etc. This in a way has contributed to food security through crop farming where households could get food to eat. For example, more than 600,000 women in Northern Ghana rely on sales of Shea butter and other Shea-related products for their daily livelihood, according to the United Nations Development Programme (2017).



In 2019, I was able to farm an acre of Groundnuts which costed GHC 90.00 from GHC140.00 I received as pre-finance from KI GH Ltd. During harvest, I got enough groundnuts from which I bought maize for my family and reserved the rest for house keep (Nwajo Ntanan, 2020)

Quality Education (SDG 4): Here, it is the goal of players in the Shea industry to ensure inclusive and equitable quality education and promote lifelong learning opportunities for all. At the field, organizations such as AAK, 3F, train Shea processors on sustainable Shea fruits picking -Picking only fruits that self-fall at the base of shea trees. Women have also been taught improved methods of Shea nuts parboiling using less water and fuel wood. According to Suraj (2020), as opposed to the old method of Shea parboiling where women used a lot of water, energy and time to parboil, the method used by AAK in parboiling is well accepted by Shea processors and even if they don't have fuel wood, they have also been taught to use Shea kernel shells.

According to GSA (2020), over 51,000 women collectors have so far been trained in cooperative formation, business development, and kernel aggregation throughout five nations. Group formalization, the construction of a leadership structure through elections, and the adoption of a constitution are among the cooperative development trainings. Cooperatives can effectively manage the warehouse, negotiate, and deliver on contracts, and ensure equal distribution of benefits to all members, thanks to business development trainings and their newly defined structure. Shea processors have also received training on record keeping, profit calculation to make their business viable. Indirectly, some women groups have also used bonuses from sale of Shea nuts to roof school building, buy notebooks and other school items for their wards, expanding access to formal education.



Gender Equality (SDG 5): As discussed already in chapter three, Shea nuts picking and processing is mainly done by women. Proceeds from sale of Shea and its products empower women in one way or the other where they can independently meet their financial demands as well as invest in other areas such as retail trading, farming, investment in Susu group savings. Shea butter production has the potential to dramatically increase the amount of money available to improve the living conditions of local women and their families and also the potential to develop into a profitable export industry, as private enterprises in a number of countries have expressed interest in importing Shea butter (Global Shea Butter Industry, 2010).

Decent Work and Economic Growth (SDG 8): Health and safety of workers in an industry is crucial for the sustainability of such industry. During Shea picking and processing, Shea processors are exposed to several hazards such as snakes bites and scorpion stings during picking of Shea fruits, inhalation of smokes from firewood which impacts negatively on their health and the tedious nature of Shea picking and processing as most of the activities are manual. According to World Health Organization (2020), nearly 2 million people die annually from pollutions due to exposure to smokes from unclean biomass fuels. It was observed in the field that women have been trained to;

- a. Avoid picking Shea fruits in darkness as they might not see reptiles in the bush that could harm them
- b. As much as possible, pick Shea fruits from Shea trees that are cleared of bushes and in case of bushy areas, use long sticks to hit the bushes so reptiles could move away when present
- c. Use improved Shea parboiling methods which could reduce burns from hot water and fuel wood. This method make use of less fuel wood and water and at the time



the kernels are parboiled, there could only be little and/or no water again in the cooking pot.

- d. Some partnership organizations provided hand-gloves and wellington boots for Shea processors for safety during Shea picking
- e. The Netherlands Development Organization (SNV) developed Shea rollers that reduces bending to pick Shea nuts, thus improving significantly on their health

Climate Action (SDG 13): The negative effects of climate change are now disgusting exemplified in rising sea levels, extreme temperatures, unpredictable rainfall patterns, drought, food insecurity just to mention a few. Specifically in Ghana, about 676 million tons of CO₂ has been emitted into the atmosphere as a result of loss in the country's tree cover during the last decade (Global Forest Watch, 2020). In view of the negative consequences of climate change, a lot of interventions such tree planting, reducing Green House Gases (GHG) emissions haven been implemented in several areas of the world. Specifically, to the Shea industry, the following measures were observed as a measure of impacting positively on the climate- Shea collectors heaped portions of Shea fruits in the soil which they practiced for long time which when regenerated, increases the trees population. Apart from the Shea and its products impacting on livelihoods of Shea processors, the trees conserve soil, absorb CO₂ and act as habitat for living organisms. Furthermore, Shea producing communities have also been sensitised on the negative effects of deforesting Shea trees leading to some traditional leaders passing customs against the cutting of most especially, economic trees such as Shea and dawadawa.

As discussed already in chapter three, the foundation of every business is based upon the availability of raw materials for production. In line with this, companies operating sustainably



in the Shea supply chains have planted several thousands of Shea seedlings through the Action for Shea Parklands initiative founded by GSA. Partners have been constructing nurseries, maintaining old trees, and advocating farmer-managed natural regeneration in recent years. Over 14,000 Shea seedlings have since been raised and in the year 2019, 7,700 shea plants were transplanted from nurseries created by partners in Ghana and Togo. Women collectors were also taught how to protect naturally regenerated plants so that they reach full maturity, prune old and unhealthy trees, and graft younger trees for faster fruiting (GSA, 2020).

Responsible Consumption and Production (SDG 12): This goal is to ensure that the whatever the current generation produce as well as consumption of Shea products does not negatively affect the lives of future generations so they can also grow and benefit from Shea.

Partnership for the Goals (SDG 17): Though Shea sourcing is the core business of companies in the Shea supply chains, there are other goals that run in partnership with other non- Shea sourcing organisations to make live better for Shea procesors. For example, it was revealed that a Non- governmental Organization by name Saha Global partnered with AAK to provide quality and affordable water for some of the Shea producing communities in Bimbilla, Northern Ghana (Saha Global and AAK, 2020). Many Shea Women opined that access to clean and affordable water made it easy for Shea processing and they could also get clean water to wash their hands especially during the outbreak of Covid-19.

Also, A public-private collaboration has been formed between Mars, Inc., AAK, non-governmental groups, and an investment fund to enhance the lives of women working in Ghana's shea supply chain. The project dubbed Women in Shea Initiative (WISH) intends to reach 13,000 women shea collectors from more than 150 communities in northern Ghana.



The goal of the initiative is to increase women's access to savings and credit, improve natural resource management techniques, and reduce the time and effort involved in collecting and processing shea kernels (AAK, Mars Inc., 2020).

Life on Land (SDG 15): The aim of this goal is to Protect, restore, and promote the sustainable use of terrestrial ecosystems; manage forests sustainably; battle desertification; and prevent and reverse land degradation and biodiversity loss (UN SDGs, 2021). The main fuel for Shea processing in rural areas was observed to be fuel wood (see pic 3). This practice of deforesting wood most especially of Shea trees as it was also revealed that the charcoal from Shea tree is among the best sources of charcoal is unsustainable and thus urgent steps should be taken to curb this. It was observed from field that some Shea sourcing companies partnered with research institutions to raise Shea seedling for onward distribution to Shea collectors for planting. Byelaws in collaboration with selected community actors were also passed to ensure the protection of planted Shea seedlings from bush fires and grazing by animals. In support of Green Ghana Campaign project in 2021, GSA planted 1,000 Shea seedlings to ensure sustainable Shea supply (GSA, 2021)



Pic 3: Deforestation in rural areas

CHAPTER FIVE SUMMARY OF FINDINGS, CONCLUSIONS, MANGERIAL CONSIDERATIONS AND RECOMMENDATION

5.0 Introduction

In this section, the conclusions, managerial considerations, and recommendations are based on the important findings of the results in accordance with the research objectives.

5.2 Findings of the Research

The study's two main goals were to: assess mobile phone ownership among Shea processors and explore the potentials of Shea processors in accessing the flows in a supply chain through the mobile phone. It can be concluded that the objectives of the research were achieved from relevant literature review and research findings.

Over 80% of the women that had phones were also registered for MoMo. This means that mobile phone ownership among Shea processors is very high and this presents a great opportunity for digital inclusion of Shea processors.

Also, there exist high potentials of Shea processors in accessing services such as product prices, training materials via mobile phone as 94.5% of Shea processors can connect with business partners and families through phone calls. 49% of Shea processors accessed Shea nuts and butter prices through their mobile phones. 80% of Shea processors received e-cash (Mobile money) via phones. There is, however, lower interaction of Shea processors with business partners, families, and friends via social media channels (WhatsApp, Facebook, twitter).

The study also discovered that mobile phone is the key tool of mass communicating information to large number of Shea processors at the same time as it can be used as an omnichannel of communication. Mobile phone further remains the most efficient and faster means of business transaction in Shea supply chains. This is because over 300,000 Shea processors can access market prices, trainings, and other business information in about an hour.

5.3 Conclusion

The research concludes, based on the primary research findings, that mobile phone is used by both Shea processors as well as organizations transacting business in the Shea industry. However, Shea processors are disadvantaged in using mobile phones for access to business information such as market prices, making calls as majority of them do not have formal education. Organizations willing to use mobile phone technologies to transact business with Shea processors should take into consideration illiteracy, Text to Speech Synthesis, available mobile networks availability and trainings before implementation

Also, the study showed that, there exists a significant relationship between mobile phone registration and mobile phone ownership. Thus, incentives such as funding the cost of mobile phones and/or donations from organizations is necessary to ensure more mobile money registrations and transactions. There again exists a significant relationship between education and the type of phones used by Shea processors as most of them own basic phones (yam



phones) because they cannot easily use smartphones due to its sophisticated nature. Thus, business activities that can be facilitated with the support of mainly basic phones should be considered in using augmenting mobile phones with manual transactions.

5.4 Managerial Consideration

It is the aim of every business to make profit and continuously be in business. Most of the flows in the Shea supply chain are done manually which comes with cost such as transportation, fuel, and maintenance costs. Also, officers cannot always physically be in touch with Shea processors all the time and/ or can only reach out to limited number of people at a time. Mobile phone is a good tool for businesses that aim to reduce cost of operations, increase efficiency and productivity. Mobile phones for business transactions can reduce the amount of time travelled to transact business, reducing transportation cost, and increasing productive times. Taking into consideration the comfort, cost efficiency and the speed mobile phones offers, it is prudent for supply chain operators to relook at their supply chain designs and augment some operational activities through the mobile phone.

Customer intimacy is very keen in supply chains as it makes customers feel part of the chain and can offer feedback for improvement. It is undeniable that person-to-person contact of maintaining good customer relations is less efficient than that of mobile phones. Therefore Supply chain managers can leverage on the findings of this research and design customized information that can be automatically delivered to larger number of clients .Finally, since majority of Shea processors are registered for mobile money, Managers can reconsider their supply chain cash flows through Mobile money for Shea processors, considering the current armed robbery targeted at customers with physical cash. E-cash transaction will also ensure faster, transparent, and easier transactions than having to travel through poor road networks to banks



5.5 Recommendation

Taking into consideration the key findings of the study, this study recommends that;

1. There should also be a close collaboration between telecommunication operators and organizations working in the Shea industry to educate Shea processors on MoMo transactions especially with their MoMo PINs. If possible, MoMo transactions should have tools that can identify users by their fingerprints to enhance total financial inclusion for Shea processors.
2. MoMo agents in rural areas should be supported to have enough cash available to serve Shea processors so they do not have to travel to urban areas for bulk MoMo transfers. Organizations in the Shea industry wishing to flow their cash through MoMo for Shea processing groups should do so through the few that knows their MoMo pins to reduce MoMo fraud.
3. Corporate organizations working with Shea processors should pay a keen attention to methods of Shea nuts parboiling and Shea butter processing. This could be done in close collaboration with Ghana Environmental Protection Authority (GEPA) to tackle carbon emissions generated from Shea processing activities thus contributing possibly to climate change.
4. over 300,000 Shea processors can access market prices, trainings, and other business information in about an hour and thus supply chain managers should consider augmenting some of their activities with the mobile phone for higher efficiency and reduced operational cost



5.6 Prospective Research Areas

Text to Speech Synthesis (TTS) research of business transactions for illiterates in Ghana, especially rural women and the vulnerable in the Ghanaian society should be carried out. This could allow direct business transactions between illiterates and people who cannot speak their native languages. Research should also be carried to quantify the financial capabilities of rural Mobile Money Vendors to ensure easy decision making in terms of electronic cash transactions. Research should be carried out to map out communities without network coverage so that telecommunication companies could target those communities for wider coverage.



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