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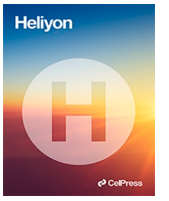

An assessment of the structure of shea global value chain in Ghana and implication for policy development

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ABSTRACT

The global value chain for shea has witnessed major transformations in the last two decades. This study was aimed at providing a detailed understanding of the structure of the shea value chain in Ghana. Data were collected primarily from primary source and secondary sources. A total of 820 upstream actors, 20 aggregators, 2 processing companies and other experts were interviewed using both closed-ended and open-ended questionnaires to gather qualitative and quantitative data. The study employed the value chain framework to analyse the structure of the shea value chain in Ghana. Data analysis was primarily descriptive in nature. A value chain map, schematic diagram, and flow charts were generated to show the linkages between actors and the flow of resources, materials, products, information, and funds. The results show that the shea value chain is highly gendered, with women at the base of the chain, working as shea kernel producers and processors of crude shea butter, using mainly traditional methods, hence output is sub-optimal. The mid-stream actors were all males, whose main function involves aggregating shea kernels across several communities for industrial processors and export companies. Processing companies, using mechanised methods, process and export several derivatives of shea (shea grits, shea butter, stearin, and olein) to mainly to high-end markets in the E.U and Asia. Though female participation in the shea global value chain is prominent, their output is way too low at the current level to make significant impact. Policy focus must be on supporting upstream actors through the provision of improved processing facilities, community infrastructure, and skills training to enhance the capacity of upstream actors to improve their performance.

1. Introduction

1.1. Background to the study

Shea nuts is an important domestic and industrial crop derived from the shea tree. The shea tree (*Vitellaria paradoxa)* is a parkland tree crop (a non-timber forest product) that is indigenous to Sub-Sahara Africa (SSA) and grows across 5,000 Km-wide expanse of semi-arid savannah, south of the Sahara [1]. The crop grows in the semi-wild and stretches across the African Savannah covering about 20 countries. However, only about seven countries (Ghana, Burkina Faso, Mali, Benin, Nigeria, Cote d'Ivoire, and Togo) have large volume international trade in the commodity. Ghana's shea eco-zone which covers an area of about 77,670 km^2 (Adomako and Frimpong, 1985 cited in Ref. [2] is said to be populated with an estimated 9.4 million trees that can generate about $100 million per annum [3]. In Ghana, the shea crop and its derivatives, shea kernels and shea butter, are regarded as a food security crop as contained

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in the Food and Agricultural Sector Development Programme (FASDEP-II) of MoFA [4], a non-traditional export commodity [5], and a high-value crop [6].

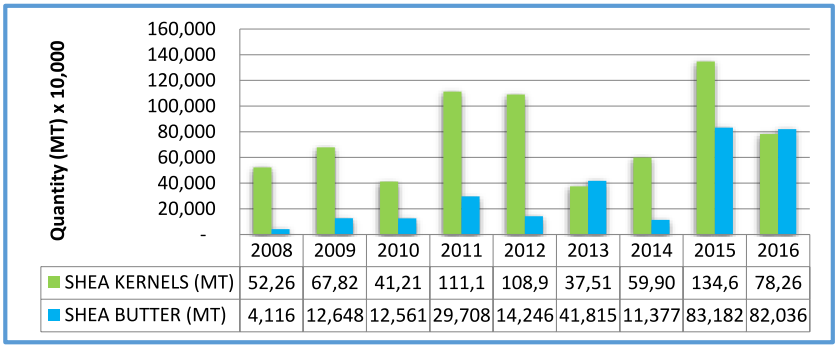
At the national level, shea exports generates much needed foreign exchange into the Ghanaian economy. Between 2008 and 2016, average volume of shea kernels exported was estimated at 76,687 MT per annum with a value of $22.6 million, whiles annual exports volumes of shea butter averaged 32,410 MT with export earnings of about $27.8 million (Figs. 1 and 2). For the government, the insertion of shea as a non-traditional export (NTE) commodity [5] into the global value chain (GVC), is part efforts to expand the portfolio of NTE commodities, diversify the economy and insulate it from the over-reliance on traditional export commodities, which is characterized by perennial shocks of international commodity price crest and troughs.

At the household level, shea butter is widely utilized for domestic purposes (for local food preparations, medicines, skin ointments, among others) and also plays an important role in the socio-cultural settings (for gifts, marriage and child naming rite, and funerals). In Ghana, an estimated 500,000 households are reported to depend on shea products as a source of livelihood [8], for food security, and as an important source of female household income (Puliot, 2012). Income from shea play an important role in alleviating poverty in rural households especially during the hunger periods of May–July (WFP, 2012). For many of these resource-poor and asset-constrained rural women [9], who suffer food insecurity and poverty especially in the off-farm season (WFP, 2012), it is a major boost to improve living standards and economic wellbeing. But even more importantly, these women in rural Northern Ghana are able to link to the global shea market through buyers and processors in Ghana who export the shea and its derivatives to multinational companies (MNCs) in Europe and Asia.

Two major factors have influenced linkage of rural shea producers to the global market. First, value chain influencers, international and domestic NGOs, and development agencies [10]; CARE, SNV, UNDP), have actively supported women in Northern Ghana producing shea kernels and butter for domestic purpose, to shift from traditional production methods and subsistence, to improved methods for commercialization of the commodity. Secondly, the high price of cocoa products is driving growing global market demand for shea products by multinational companies (MNCs) since the 2000s [11,12]. Specifically, stearin which is a highly-prized shea derivative, constitutes a major ingredient used as cocoa butter equivalent (CBE) in food products like chocolates, confectionaries, and margarine by food manufacturing firms because of its superior functionality and cheaper price compared to cocoa butter [13]. Similarly, the cosmetic and pharmaceutical industries in North America and Japan, value shea butter's stearin and olein for its moisturizing, anti-inflammation, and healing properties, and have integrated it into high-end product lines [13,14]; like sunscreens, soaps, shampoos and conditioners (WATH, 2015). A number of these cosmetic and pharmaceutical companies patronize artisanal–-produced butter from West Africa [12].

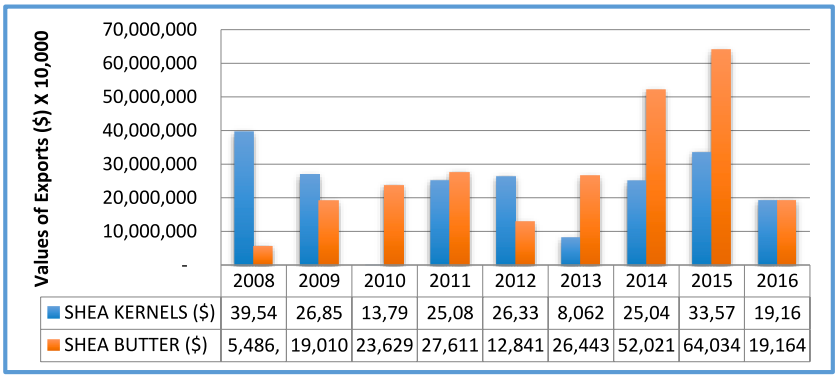
These recent transformations, have culminated in and catalysed the emergence of a nascent shea value chain in Ghana and an opportunity for rural women to benefit from participation in the international commodity market, through the production of shea kernels and shea butter for exports. Participation in the shea global value chain (shea-GVC) potentially serves as an opportunity for poor women upstream actors in Northern Ghana to access high-end markets, acquire new skills and technology, receive premium prices for quality produce, and enhance their living standards [15,16]. The question that remains is, whether rural women producing shea products are well-positioned, to realize the full benefit of participating in the shea-GVC. For this to happen within the context of GVCs, a lot will depend on the role of actors in the value chain, the governance mechanism that prevails within the chain, and the capacity and skill of actors to add value to the product.

Thus far, empirical studies on GVC of agricultural commodities have focused on fruit and vegetables, root crops, tree cash crops, and grains [17–23]. In Ghana, there are very limited studies on the value chains of Non Timber Forest Products (NTFPs) like shea commodity, and their linkage to the global markets in particular. The few studies so far have focused on the economic and livelihood benefits [24]; Laube 2011; Jenicek, Hatskevich, and Antwi-Darkwah, 2011), processing and quality issues (Bello-Bravo, Lovett, and Pittendrigh, 2013), and production efficiency of shea products (Ishaku, Sarpong and Al-Hassan, 2011). Limited as they are, most of these studies have focused on the domestic shea market. Most of the empirical studies on shea value chain have not considered the global market (except Lovett, 2012 for West Africa), the role of the various actors in the value chain, the various transformational processes through which the commodity traverse across different nodes of the chain or geographical locations, and the value-adding



	2008	2009	2010	2011	2012	2013	2014	2015	2016
SHEA KERNELS (MT)	52,26	67,82	41,21	111,1	108,9	37,51	59,90	134,6	78,26
SHEA BUTTER (MT)	4,116	12,648	12,561	29,708	14,246	41,815	11,377	83,182	82,036

Fig. 1. Volumes of shea kernels and shea butter exports (2008–2016).
Source COCOBOD [7].



	2008	2009	2010	2011	2012	2013	2014	2015	2016
SHEA KERNELS ($)	39,54	26,85	13,79	25,08	26,33	8,062	25,04	33,57	19,16
SHEA BUTTER ($)	5,486,	19,010	23,629	27,611	12,841	26,443	52,021	64,034	19,164

Fig. 2. Value of shea kernels and shea butter exports (2008–2016).
Source COCOBOD [7].

activities and processes. Yet, these are fundamental issues that, if critically explored can open up discussions for improving the shea value chain sector, especially for pro-poor development, job creation, employment generation, and inclusive growth [25,26]; OECD, 2012a), especially for women and youth in the rural areas. For the several thousands of rural women however, participation in the shea global value chain is influenced by their capacity, access to resources, and the functions and roles they play in the chain.

A detailed analysis is therefore required to describe the structure of the shea–GVC within the context of emerging global shea market, flow of commodity along the chain, information and feedback mechanism, and how these affect the capacity of small actors to participate in the global value chain. Therefore, the main objective of this study is to examine and describe, to some fine detail, the current structure of the shea – GVC in Ghana. Specifically, the study addresses the questions: who are the actors and what are the functions of the various actors in the shea global value chain? What are the various transformational processes through which the shea commodity traverse across different nodes of the chain and geographical locations? What are the value-adding activities and processes? What are the industrial linkages and transactions within the shea sector? This study fills the gap in literature and contributes significantly to expanding knowledge and understanding of the structure of the shea–GVC. The study is based mainly on the Value Chain Analysis (VCA) framework of [27]; Gerreffi et al. (2004), and [28]. An analysis of the shea value chain in this study is expected to provide a better and clearer understanding of the current structure shea subsector. This is even more important, given the emerging transformation of the global shea value chain, occasioned by the huge demand by MNCs [11,12]; GEPA, 2019). Understanding the shea–GVC structure, helps unravel the operational and policy gaps, and identify the constraints faced by upstream actors in particular. Such understanding is expected to influence policy interventions on how in particular, upstream actors, can be supported to improve their operational activities and hence performance. Findings from this study can inform policies that contribute to the rapid development of the nascent shea value chain in Ghana. Specifically, policies that aim at the provision of productive assets, production infrastructure, and better skills for resource-poor shea upstream actors at the rural and peri-urban communities of Northern Ghana, in order to improve their welfare.

The rest of the paper is organized as follows: the next section presents a brief of the global value chain concept, and the conceptual framework for the study. Next is a brief overview of the shea value chain industry in Ghana. This is followed by methodology employed in the study, presentation of results and discussion, and finally some policy recommendations.

1.2. Global value chain: brief Theoretical concepts

The last three decades or so have witnessed a global economy that is increasingly constructed around global value chains (GVCs) [29]. [27]; P.4) give a classic definition of value chain as "the full range of activities required to bring a product or service from conception, through the different phases of production (involving a combination of physical transformation and the input of various producer services), delivery to final consumers and final disposal after use". According to Ref. [25]; P.3), value chains are "a set of actors connected along a chain, producing, transforming, and bringing goods and services to end consumers through a sequenced set of activities". Another definition of the concept is given by CIP as "all actors, and the entirety of their productive activities, involved in the process of adding value to a specific crop or product" (CIP 2006, p. 159 in Ref. [30]. The varied definitions suggest the wide applicability of the concept in many sectors and by different authors. Value chain as a concept or an approach, has been employed in several sectors of the economy such as fresh agri-food commodities, processed food, tourism, electronics, garment, and services [29], with the aim of improving economic efficiency and addressing other gaps in particular industries or subsector. A brief description of key elements of value chain is presented here, using the agri-food commodity value chain as a common example.

The value chain framework consists of a complex interaction among actors at the micro, meso, and macro level [31]. The main elements of a value chain are the chain actors (at the micro-level), the value chain supporters and influencers (at the meso-level) and an enabling environment (macro-level) within which the chain operates [32]. indicates that there are three levels of participation in a value chain: the value chain actors, the value chain supporters, and the value chain influencers.

Value chain actors are the main economic agents who own and directly produce, handle, and add value to a commodity or product

as it moves from one actor or segment of the chain to the other. Value chain actors may consist of upstream actors, midstream actors and downstream actors. The upstream actors are those who occupy the lower segments of the chain and begin the whole production process or perform activities close to the exploitation of natural resources and raw materials [33]. In a typical agricultural commodity value chain, upstream actors may include growers, or producers, or smallholder farmers, and farmer based organizations. The midstream actors, refer to the actors who add some amount of value to raw commodities from producers by converting them to semi-finished or intermediate products, or finished products. They usually link upstream actors to downstream actors, and may include aggregators, processors, manufacturers, and wholesalers. Downstream actors are economic agents such as firms, processors, wholesalers, retailers, or supermarkets, that occupy the end segment of the value chain that link or interface closely with end-users or consumers of a product. Downstream actors are usually responsible for customization, branding, marketing of final products and delivery of after-sales service [33]. Depending on the commodity or product involved, chain actors like processors (primary or secondary processors), wholesalers, retailers may be classified as downstream actors or midstream actors or even upstream actors. The categorisation of these actors into segments of a value chain is therefore commodity-specific and also based on the position of the node an actor finds himself or herself, or the functions played by the actor.

At the meso-level are value chain supporters. Value chain supporters may include public or private sector agents that usually provide inputs (e.g. improved seeds, fertilizers, drugs, package materials) and provide services (e.g. skills and technology, education, training, transport, storage, warehousing, credit, certification, insurance, extension, quality analysis) to actors across the value chain. Value chain supporters in the agri-food sector include agro-input dealers, animal feed manufacturers, hatcheries, transporters, extension agents, financial institutions, insurance companies [34].

Value chain influencers, at the macro-level, usually consists of government institutions, non-governmental organizations (domestic or international), international development agencies, and donors, whose main role is to shape policies that enhances development of the value chain and help improve or make the value chain better [32]. They do this through formulating, analysing, and supporting policies, regulations, rules and laws. In addition, value chain influencers may contribute to chain development by providing infrastructural facilities or even facilitating capacity building for chain actors. Thus, value chain influencers play a role to enhance the development of the environment in which value chain actors operate [35,36] and thereby strengthen otherwise weak value chains. The value chain enabling environment usually comprises both formal and informal structures, the rules, regulations and systems, and the organizations that implement or enforces policy regulations [27,34]. When value chains transcend geographical borders between two or more countries, then we are looking at global value chains (GVC).

Global value chain (GVC) refers to the interconnected process that goods, commodities, and services undergo from conception and design through production, marketing and distribution up to final consumption at geographically distinct locations across the globe [15,37]. Global value chains (GVCs) have emerged as a framework for linking actors or small scale businesses, mostly from the developing world, to high-end markets and sophisticated multinational companies (MNCs) in the advanced economies through international trade [15]. GVCs thus link small enterprises (including smallholder farmers, FBOs, processors, agri-SMEs, firms, etc.), and workers (including women, youth) to MNCs including supermarkets and thus help integrate developing countries into the global economic system [15]. In the last three decades, GVCs have proliferated, often characterized by massive participation by developing country economies in international production networks [38].

GVCs are characterized by cross-border market demand and supply structure; geographical dispersion of global actors; fragmentation of production processes; governance and power relationship; some degree of interdependency and interaction; the ability to upgrade; the possibility of accessing high-end markets especially by smallholders including export to lucrative international markets [27,35]. GVCs also enables specialization and long-term complex relationship in production networks between advanced industrial countries and developing countries (UNCTAD, 2013). These are expected to generate the win-win situation and the much touted pro-poor benefits through improved productive operations, employment generation and income earnings, poverty reduction, economic growth, gender equity and other development goals (SDGs)' [25,26,39]. It is essentially from this latter perspective, that many development agencies, donors, and governments have promoted value chain development as a key element for rural poverty reduction strategies and interventions (see Refs. [40,41]).

1.2.1. Limitation of the GVC theory

The GVC theory, advanced by Refs. [27,35]; Gereffi et al. (2005), though heuristic, flexible, and widely used in empirical studies, it has its own shortcomings. First, the GVC theory has been criticized as a complex construct which is conceptualized and applied differently by different authors (Kano, Tsang and Yeung (2020). Which suggests that, there is no dominant or unifying theory that guides empirical studies. Again, Gereffi, Kaplinsky, Humphrey, and Sturgeon (2001) also questioned the predictive power and applicability of GVC in empirical studies, which gives room for non-robust analysis and recommendations. Similarly, Neilson et al. (2018), and [42] have cautioned that the absence of empirical studies to test the generalizability, validity, and robustness of the GVC theory, represents a major weakness in the application of the theory to case studies and different value chains for example. Short of these weakness, the GVC theory continues to be the most favoured and widely used tool in GVC research.

1.3. Overview of shea value chain in Ghana

The shea crop is an important commodity found in the savannah parklands of sub-Saharan Africa. Reports by LMC [43] indicate that, 8 countries in the West African sub-region including Mali, Burkina Faso, Nigeria, Senegal, Ivory Coast, Gambia, Benin, and Ghana lead the commercial production and supply of shea to the global market. An estimated 8 million women are involved in the shea value chain across the sub-region [43]. Over the years, Ghana has emerged as the sub-regional hub for the export trade of shea kernels and

shea butter, worth about US$ 152 million (UN-COMTRADE, 2019; Coriolis, 2018).

The shea global value chain (shea-GVC) can broadly be described as consisting of all the players (individuals, firms and institutions) and the sequence of activities that they perform across different geographical locations in transforming raw shea nuts to value-added products and its final consumption across the globe. Several chain actors operate within the shea value chain [44]. and Alhassan (2015) identify the main actors in the shea value chain in Ghana to include shea nut collectors, local buying agents, traditional butter processors, traders and aggregators; large scale processors, international buyers and processors; domestic micro and small-scale entrepreneurs manufacturing shea butter-based cosmetics for local markets; and large-scale exporters of shea kernels.

The operations of the shea–GVC in Ghana is characterized by a complex interaction of several actors involved in the sourcing of raw shea fruits from parklands; processing at the rural areas; procuring kernels and distributing to industrial processors in the peri-urban and urban areas; and final export of the shea derivatives overseas.

Production of shea kernels and butter in rural savannah: Production of shea kernels is undertaken by an estimated 2 million women (LMC, 2017), who begin the value-adding and commercial activities in the chain. Women from rural households in Northern Ghana, working as individuals, groups or cooperatives are responsible for picking ripe shea fruits from the fields, and processing them into shea kernels. Shea kernels are converted into unrefined ('crude') shea butter by women processors using mainly traditional methods, either for household consumption or sold at the local market. In the last few years, several women have been organized into co-operatives and trained to produce shea butter using semi-mechanised methods (Al-hassan, 2015) in order to meet commercial volumes demanded by buyers who are linked to the export market.

Aggregation and distribution: The main buyers of shea kernels at rural communities are middlemen, commissioned agents, local agents, and itinerant village agents who procure for large scale operators (processing firms and exporters). Aggregators serve as the link between shea kernel producers in rural Ghana and industrial shea processing firms and exporters in urban areas.

Industrial Processing and export of shea: Industrial processing of shea kernels into shea derivatives has improved in Ghana, but still small in volume ((USAID-WATH, 2010; LMC, 2017). Both small and medium scale processing firms co-exist and operate in the industrial processing and export of shea products from Ghana. About 12 industrial processing firms and exporters operate within the sub-region as multinational corporations [45,46]; LMC, 2017). Industrial production of shea derivatives is dominated by MNCs. Approximately 80–90% of shea is exported in raw form as kernels whiles only a fraction of about 10–20% is processed in-country and later exported [1]; LMC, 2017). Four multinational companies, with bases in Ghana, namely: AAK Aarhus United from Denmark, IOI Loders Croklaan from Netherlands, 3F (Feed, Fats and Fertilizers) from India, and Ghana Specialty Fats, dominate the shea export market in Ghana and the sub-region as oligopsonies by virtue of their market power. AAK is the market leader (about 60% by volume), and exports mainly shea kernels for further fractionating in Europe (USAID-WATH, 2010). This is followed by Loders Croklaan (25%), which trades in raw kernels and converts them into crude butter via third parties (USAID-WATH, 2010; LMC, 2017). Other significant shea processing companies in the shea-GVC in Ghana include; Ghana Nuts Company Limited (GNCL) based in Techiman, SEKAF Limited at Tamale, parastatal COCOBOD at Buipe, and Savannah Fruits at Tamale.

Unlike the cocoa-chocolate global value chain, the international trade in CBE industry is fragmented and traded privately (Bockel et al., 2020) and has thus been criticized for being opaque. A handful of manufacturers of CBEs exert market power in the shea-GVC by virtue of their core competencies in the production of highly-prized stearin using advanced refining and fat-splitting technologies (Rouseau, Gautier and Wardell, 2015). Downstream actors in the shea–GVC include global manufacturing giants: OLAM, L O'citanne, Nestlé, Mars, Mondelez International, Meiji, Arcar, and others (Coriolis, 2018).

Policy environment: Ghana has a tree crop development policy that aims among other to support increased production and productivity, promote investments and increased processing capacities, improve marketing through value chain development. Shea is one of the priority crops under Ghana's tree crop policy. The role of stakeholders in value chain development is emphasized under the policy guide. Major stakeholders that have supported and influenced policy in the shea industry include non-governmental organizations NGOs (both national and international), international development organizations like USAID, DFID, UNDP, SNV, and DANIDA [47]; Lovett and Pittendrigh, 2015), professional bodies like Global Shea Alliance (GSA), and the government through Ghana Cocoa Board, Ghana Standards Authority, and the Ministry of Trade and Industry (WATH, 2014). A major policy gap has been the absence a more open and transparent trade, standards, and favourable pricing regimes for women producing shea kernels and butter.

2. Materials and methods

2.1. Study area

The study was conducted in the shea producing regions of northern Ghana (Northern, Upper West, and Upper East regions). The three regions are within the Savannah and Guinea Savannah ecological zone which is characterised by hot weather and dry conditions. The regions experience a unimodal rainfall pattern and therefore have limited window of opportunity (mostly between June–November) for active rain-fed farming activities. Common trees of economic value include mango, baobab, dawadawa, acacia, and shea nuts [48]. Together the three regions cover over 40% of Ghana's total land mass but have a population of 3,317,478, representing approximately 23% of Ghana's population [48].

The three regions share similar characteristics in terms of climatic conditions, agro-ecology and livelihood opportunities. Agriculture is a predominant livelihood activity especially in the rural areas, where mixed farming system is a common [49]. Females in Northern Ghana do not customarily own land, compelling them to engage in other non-farm economic livelihood activities such as petty trading, food processing, pito brewing, beads making, and weaving, etc. In addition, rural households, particularly females, make use of natural resource endowments particularly shea, as an important source of economic livelihood product. Shea collection and

butter processing is especially crucial for food security and alternative income sources, especially during the hunger periods (WFP, 2012; Puliot, 2012). Shea kernel and shea butter are now important commercial activities in the Northern Regions.

2.2. Sampling techniques and procedure

The study employed a multistage sampling technique to select respondents, using data and information provided by Ghana Shea Alliance (GSA) and Shea Network Ghana (SNG) in Tamale. The three regions in Northern Ghana were selected because they represent the shea nut growing zones.

In the first stage, five districts in the Northern Region (East Gonja, Mion, Tolon, Savelegu, and Sagnarigu) and two districts each in the Upper East (Garu Tempane and Kassena Nankana) and Upper West Region (Wa West and Jirapa) were purposively selected. Five districts were selected in the Northern Region, because it has approximately twice as many districts (26) as there are in each of the Upper East (13) and Upper West Regions (11) [48]. In addition, the Northern Region have a comparatively large numbers and vibrant shea processing enclaves and shea processing groups. In the second stage, three communities from each of the eight districts were sampled purposively with the assistance of and based on expert information provided by representatives and agents of the shea working groups and list obtained from SNG. Specifically, these districts and communities have shea kernel producers and butter processors whose commodities are procured by aggregators for exporting companies. At the third stage, simple random sampling technique was used to select upstream actors from the communities. Three distinct categories of upstream actors (shea kernel producers; shea butter processors; and those who produced both shea kernels and shea butter) were sampled randomly. Through random sample approach, such that: at least twenty shea kernel producers were selected from each community, and twenty traditional shea butter processors were selected from each district. In addition to the four districts selected from the Northern Region, sixty semi-mechanised butter processors were chosen from processing communities in Sagnarigu district near Tamale. Ten actors, who engaged in both shea kernel production and shea butter processing were selected from each of the 8 districts. Finally, based on their willingness to participate in the study, twenty aggregators, and two industrial processing firms were purposively selected.

Percentage in parenthesis.

2.3. Data collection methods and approach

This study employed both qualitative and quantitative approaches to data collection. The main instrument for data collection was a questionnaire designed to collect mainly quantitative data. Qualitative techniques employed included key informant interviews, in-depth interviews, and focused group discussions. Qualitative approach gave some in-depth assessment and understanding of the operations, functions, and activities of actors in the value chain. First, key informant interviews were held using conversional formats to solicit information from key informants. Some of the key informants interviewed, with the aid of interview guide, included two officials of the Ministry of Food and Agriculture in Tamale, two officials of shea Division of Ghana Cocoa Board in Accra, one senior researcher from the University of Development Studies in Wa campus, and two project officers working with NGOs in the shea value chain in Tamale. Second, using a semi-structured questionnaire, in-depth interviews were held with some key persons in the shea value chain including four aggregators and four officials of shea processing and exporting firms. Aggregators gave insight on procurement activities, contract with their buyers, value-adding activities, constraints, and prospects of the industry. Officials of four processing firms and exporters based in Tamale, Techiman, Buipe, and Tema, gave some discourse on relevant industry operations including procurement practices, processing activities, final products derived, inter-firm business transactions, product flows and quality, market outlets, and their perspective of industry outlook. Only two of the processing firms were ready to provide some quantitative data to buttress qualitative information provided. Third, using a check list as a guide, focused group discussions were conducted that involved between eight and ten shea kernel producers and butter processors in at least one community in each of the four districts selected in the Northern Region. Six separate focused group discussions were held all in the Northern Region involving about seventy of the upstream actors. Information gathered through the qualitative approach related to shea kernel value chain activities, the roles, functions, and processes involved in raw material procurement, material resource use and requirements, shea kernel and butter production processes and methods, and constraints in operations. Quantitative method involved the use of questionnaire to collect data on the socio-economic characteristics of the actors, quantities of shea kernels and shea butter produced, resources used, and market outlets.

In this study, the unit of analysis are the value chain actors who participate in the international shea export trade. They are the participants in the shea sector who directly own, handle, and add value to the shea commodity as it moves from one segment of the value chain to the other, from the savannah parklands in Northern Ghana through peri-urban and urban Ghana, to overseas market destinations. The most commonly traded commodity at the domestic rural economy is shea kernel, which serves as the raw material or main input for further processing into shea derivatives.

2.4. Analytical methods and estimation technique

To get an understanding of the current structure of shea value chain in Ghana, this study employed the value chain analysis (VCA) framework [27,35]; Gereffi et al., 2005). The VCA serves both as a descriptive and analytical tool [50] to address both qualitative and quantitative components of the value chain [51,52]; and the relationship between the actors (Ellis, Kwofi and Ngadi, 2019). Value chain studies often employs qualitative approach [53,54] to generate relevant information for indepth understanding of complex phenomenon. Following [55]; qualitative data from key informant interviews and focused group discussions were analyzed using thematic content analysis. To enhance the rigour of the qualitative analysis of the structure of the shea global value chain, data

collection sources and methods were triangulated to improve validity of constructs and reliability [56]. The relatively small sample size of respondents under the qualitative study was addressed through the use of generalizability.

The GVC methodology and analytical framework consists of four main dimensions [35]; Gereffi et al., 2005): (i) the input-output structure, which identifies and describes the actors and the key economic activities involved in transforming raw materials into finished products, (ii) territorial configuration, which maps the geographic scope and the different scales of operations of GVC at the local, national, and international level, (iii) the governance structures and upgrading, which articulates the power relations within the GVC, the role of lead firms and how this influences the capacity of small actors to shift to high nodes of value chain: and (iv) the institutional context, which describes how local, national and international regulations, policies, and contexts shape GVCs [35,57].

The functional analysis of the shea value chain, which is the main objective of this study, was analyzed by employing a partial component of the GVC framework proposed by Ref. [35]. Specifically, the first two dimensions of the framework were used for the analysis and the deliverables generated were: a general description of the shea products, stages and technical process involved in production process; the types of actors, main features and practices; the flows, volumes and end-markets; and the geographical distribution of shea products.

A functional analysis was conducted using guidelines prescribed by Bellu [58] and FAO (2005a) and followed empirical studies of Fink (2014), [53,59]; and Chagomoka, Afari-Sefa and Pitoro [60]. The functional analysis involves identification of actors and description of functions at each node of the chain, the linkage between actors, the geographical flow of products and services, and the state or form of the commodity at each stage of the chain (FAO, 2005a). A major deliverable and output of this study is a value chain map, which is an illustrative representation that summarizes the complex interactions of the various actors. The value chain map so derived provides the relative importance of each chain segment and contribution of actors in the chain. Results are presented using qualitative and descriptive statistics to give a vivid description and better understanding of the structure of shea value chain emanating from rural northern Ghana.

3. Results and discussion

The functional analysis of the shea value chain consists of a description of the core functions and roles of the actors identified in the study; the volumes and quantities of shea products produced; the flow of resources like shut nuts, kernels, butter, information, and funds, within and outside the country. Illustrations through value chain map, schematic diagrams and flow charts are presented to give a vivid account of the shea Global Value Chain structure. Through in-depth interviews with key informants and focused group discussions, some detailed insights and perspectives of shea value chain structure were gathered and presented in the form of illustrative accounts (see Table 1).

3.1. Functions and role of main actors in the Shea–Global value chain

This study identified five main actors in the shea value chain in Ghana and these include: upstream actors such as shea kernel producers, shea butter producers (traditional methods), shea butter producers (semi-mechanised methods); primary midstream actors referred to as aggregators; and second level midstream actors, mainly industrial processors and exporters. The core functions of each of these categories of actors in the shea value chain is presented in the preceding pages that follow. Results are summarized and presented mainly in qualitative form (illustrative quotes) and quantitatively (Table 2).

3.1.1. Shea nut collectors (kernel producers)

Shea nut collectors, all of whom are females, form the base of the pyramid in the shea value chain. In the study, 820 women collectors were sampled (55% from the Northern Region, 22% from the Upper East Region and 23% from the Upper West Region). The main season for shea collection is between April and September. Picking of shea fruits is usually done early in the morning, with some women setting off for the task as early as 5.00am, depending on the distance to be covered, and the availability of the commodity. Collection of shea fruits for kernel production is usually done by women in groups of households or as neighbours. Shea kernel production is largely through manual operations. A summary of the key functions and processes involved in kernel production by shea nut collectors include: picking of ripe shea fruits from the field, de-pulping, parboiling of nuts, first drying of kernels, cracking or shelling to separate shells from the kernels, second drying, sorting, and storage of kernels in dry and well-aerated conditions. Studies by Ref. [44]; Hatskevich (2012), [24,61]; and Kent (2017) show that shea nut picking and kernel production is the preserve of rural women in Northern Ghana, and production is largely carried out manually.

Table 1
Summary of upstream actors sampled for the study.

Region	Upstream Actors in Shea Value Chain			
	Shea Kernel Producers	Shea Kernel Producers + Processors	Shea Butter Processors Only	Total
Northern	240 (50.00)	33 (46.48)	180 (66.92)	453 (55.24)
Upper East	120 (25)	21 (29.58)	37 (13.75)	178 (21.71)
Upper West	120 (25.00)	17 (23.94)	52 (19.33)	189 (23.05)
Total	480 (100)	71 (100)	269 (100)	820 (100)

Source: Authors Compilation from field data, 2019.

Table 2
Summary of functional characteristics of shea value chain actors.

Variable	Shea Kernel Producers (n = 480)	Shea Kernel Producers and Butter Processors (Traditional) (n = 71)	Artisanal Processors (Traditional) (n = 210)	Artisanal Processors (Semi-mechanised) (n = 59)	Aggregators (n = 18)	Industrial Processors (n = 2)
Location	Rural areas in Northern Ghana	- Rural areas in Northern Ghana	- Rural areas in Northern Ghana	- Peri-urban areas in Northern Ghana	- Peri-urban areas in Northern Ghana	- Peri-urban areas in, Techiman, Buipe, Tema,
Main Function	- Shea nut collection - Shea kernel production	- Shea nut collection - Shea kernel production - Shea butter production	- Shea butter production	- Shea butter production	- Mobilise stocks of shea kernels - Procure shea kernel	- Processing of kernels
Raw commodity	- Shea nut fruits	- Shea nuts fruits - Shea kernels	- Shea kernels	- Shea kernels	- Shea kernel	- Shea kernels - Shea grits - Shea butter
Finished product	- Shea kernels	- Shea shea butter	- Shea shea butter	- Shea shea butter	- Shea kernels	- Stearin - Shea grits - Shea butter
Value-adding Activity	- Drying - Sorting/cleaning - Parboiling - Storage	- Drying - Sorting/cleaning - Parboiling - Roasting - Processing and Packaging	- Sorting/cleaning - Packaging - Roasting	- Sorting/cleaning - Roasting - Processing - Packaging	- Transporting - Sorting/cleaning - Drying - Storage - Volume delivery	- Sorting/cleaning - Drying kernels - Processing - Packaging
Raw commodity process rate	Not applicable	25–30%	25–30%	30–35%	Not applicable	40–48%
Main buyers	- Aggregators (70%) - Exporters (15%) - Artisanal Processors (14%)	- Industrial (18%) - Exporters (local-based) - Exporters (foreign-based) (61%) - Local manufacturers (21%)	- Exporters (local-based) - Exporters (foreign-based) - Local manufacturers	- Exporters (local-based) (68%) - Exporters (foreign-based) (28%) - Local manufacturer (4%)	- Industrial processors (64%) - Exporters (38%) - Semi-mechanised processors (8%)	- ractionators foreign/ domestic - Fractionators domestic - Cosmetic firms - Confectionary firms
Average quantity per actor (Kg)	345 kg	140 Kg	850 Kg	1546 Kg	440,300 Kg	124,500 kg

Source: Author's computation, 2019

Processing the shea nuts into kernels through this procedure or method stabilizes the kernels to increase the shelf life for about one year and also ensure the quality of kernels. Shelling of dry shea nuts was manual because none of the actors had mechanical nut-crakers. Similarly, none of the kernel producers had moisture meters to determine the recommended moisture content of dried kernels, thus moisture content was determined subjectively, based the women's own experience. Sorting of dried shea kernels was done to remove mouldy and dark kernels, stones, and other debris which that may affect quality. Finally, clean, and wholesome kernels are kept or packaged in jute sacks or large basins for temporary storage for sale. The key value-adding activity in shea kernel production are parboiling nuts to prevent germination and to get kernels with less free fatty acid, drying kernels to appropriate moisture content (8%−10%), and sorting kernels to remove chaff and debris (Table 2).

During the focus group discussions, it was revealed that some NGOs and organizations like USAID, SNV, UNDP, and some processing companies, had provided training in the best practices for kernel production. This assertion was evidenced by posters displayed on door post or walls in the homes of some shea kernel producers. The posters show the step by step approach on recommended best practices for shea nut processing. The support provided by NGOs to build capacity of upstream kernel producers in Northern Ghana is common and corroborates the findings of [47,62]. Some of the best practices include sorting to exclude rotten shea fruits, parboiling shea nuts for less than 1 h (at best 30–40 min) in order to retain quality attributes, drying to appreciable moisture content of 8%–12%, and storing shea kernels in dry well-aerated storage bins or facility. However, observations and personal communication with actors from Jangyili, Jantong, and Nabligu in the Northern Region revealed that shea nuts were boiled for more than 1 h, in some cases. Excessive boiling nuts contributes to high levels of free fatty acid, which degrades the quality of kernels, and this has implications for price offered by buyers. However, some shea kernel producers indicated that they did not realize any price differentials (premium price) based on the quality of nuts produced. According to Hajia Meimouna, head of shea kernel producer group from Nabligu in the Tolon district:

> "*following the recommended practices taught in training sessions about kernel processing is tedious but the buyers pay the same price for shea as they pay anybody, whether you follow the recommended methods or not*". (Focused group discussion, Tolon, 2019)

3.1.2. Aggregators

Aggregators in the shea value chian can be classified as primary mid-stream actors. In all 18 aggregators of shea kernels (10 from the Northern Region, and 4 each from the Upper East Region, and Upper West Region) were interviewed. The aggregators are the link between upstream actors (shea nut collectors) and end-buyers in Ghana (processors and exporters). All the aggregators in this study were males and independent entrepreneurs, who mobilise their own resources (cash and logistics) to aggregate small volumes of shea kernels across several communities in the shea producing districts. While, the aggregators from the Upper East Region and Upper West Region procured shea kernels from their respective regions, five of the ten aggregators in the Northern Region, mobilised shea kernels from all the three regions. All the aggregators interviewed, were based in the regional capitals, Tamale, Bolgatanga, and Wa.

The main functions of the aggregators in the shea value chain include identifying and linking up with shea collectors, tracking the source or location of shea kernels, procuring and bulking shea kernels, drying, storing, and re-bagging kernels into specific weights, and transporting kernels to factory site of buyers based in Tamale, Buipe, Techiman, and Tema. The value-adding activities of the aggregators include transporting shea kernels, drying, cleaning, grading, re-bagging, and storage (Table 2). None of the aggregators work directly for any of the processing companies; rather they have pure business transactions to supply shea kernels under specific contracts. All the eighteen aggregators indicated that they had some formal written contracts especially with industrial processors and exporters. The most important outlets for aggregators were the industrial processors (64%) and exporters of raw shea kernels (38%). They also supply kernels to women processor groups but on a smaller scale (about 8%), through informal arrangements. A prominent aggregator in the Tamale, with several years of experience, complained of the erratic supply of shea kernels over the years and the increasing demand in volumes from buyers and new entrants in the value chain.

> "*The demand for shea kernels is growing, becuase now people are buying shea butter for export to European customers. You need more ready cash to buy more kernels to meet the request of customers, especially industry processors*." (Remarks of a prominent aggregator during in-depth interview, Tamale 2019).

3.1.3. Artisanal shea butter processors (traditional)

In this study, the artisanal shea butter processors are classified either as traditional artisanal processors or semi-mechanised processors. The processing methods of the traditional group are largely manual in nature with minimal use of modern equipment. These actors are based mainly in the rural areas. Converting raw kernels into butter is a laborious task which involves a series of activities.

The main functions of the processors in this segment of the value chain include procuring of shea kernels, sorting and cleaning, pounding the kernels into grits, roasting grits, milling roasted grits into a paste, kneading with water, boiling the mixture and skimming to separate the fat from chaff and cooling to obtain the shea butter. Depending on the market specifications, shea butter is weighed and packaged in boxes. The value adding activities here are cleaning kernels, roasting, and extracting the butter (Table 2). The traditional methods of shea butter production can be very tedious, exhausting [11]; SNV, 2009; [63], and resource-demanding. Issahaku, Al-Hassan and Sarpong, (2011) reported poor technical efficiency with these traditional methods. During a focus discussion, some processors in Savelugu expressed concern about the challenges they encounter in processing activities in some seasons as:

"The shea butter work is difficult and plenty of firewood and water is used. This is difficult for us, since we don't get water nearby all the time. We have to travel far to get water in the dry season and we sometimes buy firewood at a cost. Our work would be made easier, if we are supported with machines and boreholes for water'' (Woman processor leader in Savelugu, Northern Region). (Focused group discussion, Savelugu, 2019).

3.1.4. Artisanal shea butter processors (semi-mechanised methods)

Most production activities of this category of shea butter processors take place within the peri-urban areas of Saganarigu District. The main functions of actors in this segment of the value chain include procurement of shea kernels, cleaning of kernels, crushing kernels into grits, roasting grits and milling into paste. The paste is kneaded with water and the resulting mixture boiled in large pots to yield crude shea butter. Operations such as crushing, kneading and milling are automated for most of the actors. Based on the buyer and contract specifications, crude shea butter is packaged into boxes and labelled.

Shea processing follows a similar pattern as explained for traditional butter processors, except that operations here are semi-mechanised, relatively more efficient, well organized and with consistent quality. Although the level of sophistication is much lower, compared to industrial processors, these processors are able to meet the basic quality standards as per the requirements of their buyers (personal discussion with processors). Shea butter extraction rates were found to be about 5%–10% more than the traditional methods of processing (Table 2).

3.1.5. Industrial processors

In this study, only two industrial processing companies out of six listed with the Global Shea Alliance agreed to participate in the survey and were able to provide some information through a questionnaire and an interview guide. The industrial processors that provided information for this study were Ghana Nuts Company Limited (GNL), located at Techiman in the Brong-Ahafo Region and PBC-Shea Limited (PBCSL), located at Buipe in the Northern Region. The company is a subsidiary of Produce Buying Company Limited (PBCL). The two companies shared some common operational characteristics, some of which include sourcing shea kernels from multiple suppliers across all the three regions; they have well-structured systems of processing operations, and use mechanised shea extraction methods. In addition, they both have contracts with suppliers (aggregators) of raw materials and buyers of shea butter. The main functions of these two companies are shea butter extraction and export.

Two common shea extraction methods employed by industrial processors are the oil press method and the conventional method. Typical processing operation involves a number of steps including: receiving stocks of kernels, temporary storage, and cleaning of kernels. The kernels are then conditioned by the application of heat using steam, and then sent to mechanical expellers where kernels are converted into oil-in-foot (mixture of oil extract and debris) and shea cake. The oil-in-foot is sent through primary and secondary filtration processes to remove solid matter and finer particles respectively. The shea cake is sent through solvent extraction to further extract residual fat, which is then sent for secondary filtration. The primary filtration process removes, large particles or debris whiles the secondary filtration is done to remove tiny solid particles from the oil. The oil so obtained is allowed to congeal into the final

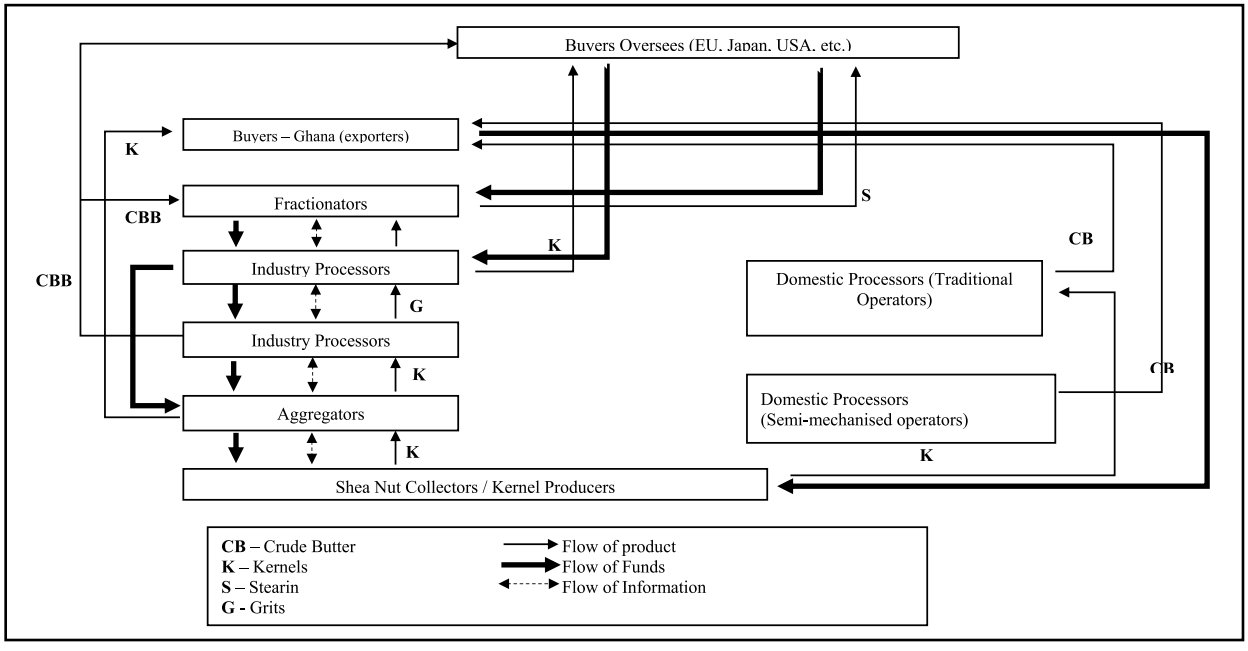


Fig. 3. Value Chain Map of Shea Commodity
Authors construction, 2019.

product, shea butter.

In summary, the main functions of industrial shea butter processors include cleaning shea kernels, conditioning shea kernels, mechanical extraction through milling and expelling, primary filtration, secondary filtration, congealing oils into butter, packaging, transport to customers in Ghana, and shipment or export to E.U buyers.

The companies reported that capacity utilization of plant ranged from 40%–85% for PBCSL and up to 90% rate for GNL. Shea butter extraction rate ranged from 40 to 52% depending on the quality of the nuts (Table 2). Industrial processors are the most efficient, effective, and profitable by virtue of the use of mechanical extractors as established by Ref. [11] and Lovett (2009). The value adding activities include sorting, cleaning, efficient extraction of crude shea butter, refining shea butter, and packaging.

3.2. Description of the global shea value chain map (in Ghana)

Through key informants and in-depth interviews with key actors, a value chain map and a schematic representation of complex interaction among industrial processors was generated. The map of the shea value chain (Fig. 3) is complex, given the several actors and various networks involved. The value chain map shows the flow of raw materials, shea products and resources, the state of the product at each stage, and the linkages between actors in the chain. Description of the shea value chain map details the flow of the commodity in various states (raw, semi-processed, processed) among chain actors and among midstream industrial processors and exporters, and flow of information and funds.

3.2.1. Flow of commodity along the chain

The primary commodity of the shea value chain is raw shea nut fruits which are processed into shea kernels by collectors at the rural households using mostly traditional methods. On average the quantity of shea kernels produced by a collector in the season was about 5 bags (425 kg, based on the common industry weight of 85 kg per bag). The most important channel for marketing the kernels is through aggregators; the others are artisanal shea butter processors (Table 2). None of the shea collectors or kernel producers supplied directly to exporters or industrial processors, but did so through aggregators. From the upstream stage, where shea kernels originate, the commodity moves to the middle stream, which is occupied by aggregators (Fig. 3).

Results from the study showed that each of the eighteen aggregators procured on average about 5180 bags (440 MT) of shea kernels in the season. The aggregators from the Northern Region purchased the largest volume of kernels (more than 74%), obviously because the region has more shea tree growing communities as well as the larger share of the sample from that region. Thus, from the aggregation node, shea kernels flow through three main channels to the next actors: (i) industrial processors, who convert shea kernels into shea grits, shea butter and stearin; (ii) exporters of raw kernels; and (iii) artisanal shea butter processors, who convert raw kernels into crude shea butter (Fig. 3).

The two industrial processors interviewed, reportedly procured an estimated 12,560 MT of shea kernels. Shea butter from the industrial processors and artisanal processors flow mainly to buyers and fractionating companies in Ghana and overseas. Industrial processors use solvent extraction methods to extract or expel refined shea butter from shea kernels. Fractionation is the process of converting shea butter into the two main fractions, stearin – which is the creamy solid fat part, and olein – which is the oily liquid part. Two companies, namely Fuji Oil company Ltd located at Techiman and Fats and Oils Specialty Ltd based in Tema, fractionate crude shea butter and export the products (stearin and olein) overseas. Fig. 4, summarizes the network and inter-firm linkages in among industrial processors of the shea value chain in Ghana.

Crude shea butter from the artisanal processors flow either directly to exporters based in Europe or mostly through buyers (either individuals or companies) based in Southern and Northern Ghana, who then export overseas. On average, each of these actors

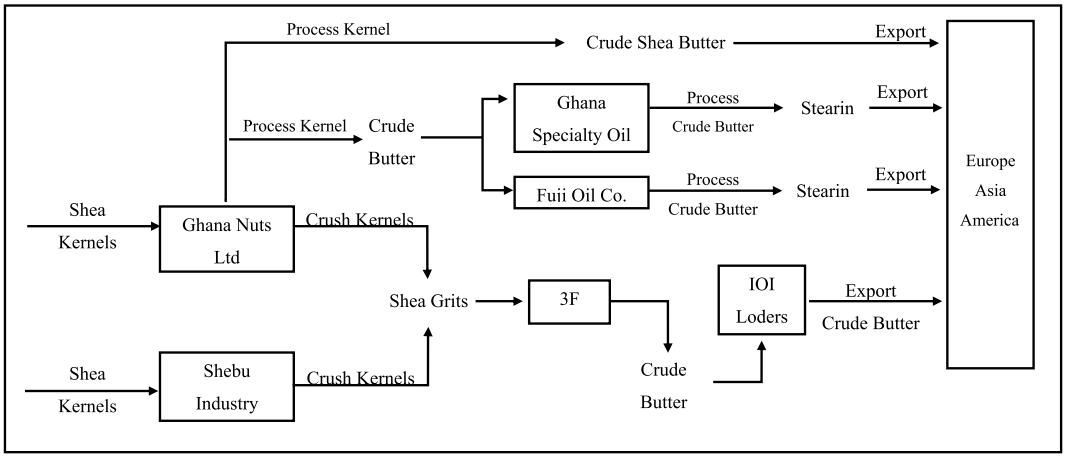


Fig. 4. Schematic representation of flow of shea products among industry players in shea processing and exports from Ghana.
Source: Author's construction, 2019.

produced about 1,600 kg of shea butter per season, out of which an average of 1,546 kg is for export, yielding total of 94 MT for the export market. On the other hand, the processors using traditional methods, were able to produce a total of about 158 MT (and an average of 850 kg per person) of crude butter for the export market. This indicates that the semi-mechanised processors were relatively more efficient as they have higher outputs per head (about twice the quantity of butter produced) compared to the processors who use traditional methods. This results corroborates the reports by Ref. [11]; Al-hassan (2015) and empirical studies [64], that indicates that manual and traditional processing techniques are largerly inefficient.

The final stage of the commodity flow is the exporter node, where the final product flows out from Ghana. Three categories of exporters are identified. These are exporters of raw shea kernels, exporters of crude shea butter, and exporters of stearin (Fig. 3).

In summary, the shea global value chain map in Ghana consists of several upstream actors, mainly women shea collectors, who process shea nuts into kernels and supply to aggregators. Aggregators mobilise huge volumes of raw shea kernels from rural Northern Ghana and transport the commodity to industrial processors and exporters in peri-urban Ghana. Industrial processors add value to raw kernels and convert them to shea grits (crushed shea kernels) and shea butter. Artisanal shea butter operators also produce and supply exporters with crude shea butter produced from the rural and peri-urban areas. Fractionators convert shea butter to stearin and olein. The four main strands of shea products, that is, raw shea kernels, shea grits, crude shea butter, and stearin, are exported from Ghana to overseas buyers across the globe. Findings from this study show that whiles the conventional shea value chain produces crude shea butter and cosmetics as the main end-proucts (Ahassan 2015; [44,65], the shea-GVC distinctively delivers multiple end-products,

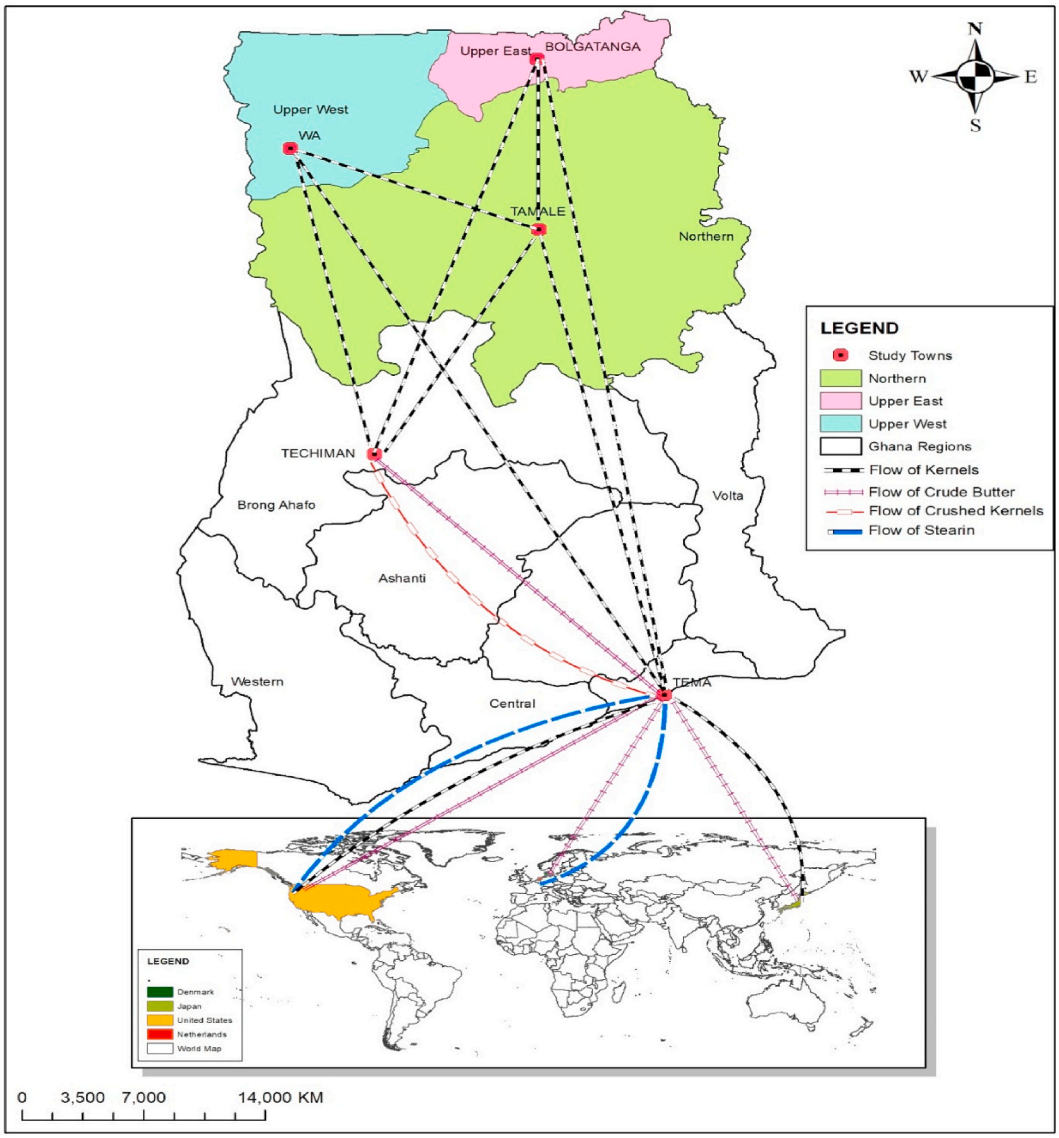


Fig. 5. Inter-country and global flow of shea commodities.
Source: Author's construction, 2019

including stearin and olein for the export market.

There is a strong network of business relationship between a number of local firms and foreign processing multinational companies in the global value chain for the shea products (see Fig. 4). Ghana Nuts Limited (GNL) is one of the largest shea processing firms in West Africa. GNL produces and exports crude shea butter as its main product line. But in addition, the company plays an important role in the value chain through a network of business relationships with some second level midstream actors such as Loders Croklaan, 3F, Fuji Oil, and Ghana Specialty Oil. Loders Croklaan based in Tema, is the third largest shea multinational corporation in Ghana. Loders Croklaan procures shea kernels through aggregators. It then contracts GNL based in Techiman, and Shebu Industry in Tamale to crush shea kernels into shea grits under strict quality specifications. The crushed grits are transported to 3F company (based in Tema), who then processes crushed grits into crude butter, and delivers to Loders Croklaan for final export to the Netherlands. Loders Croklaan thus exports crude butter to the Netherlands by outsourcing some value-adding activities through other processing companies in Ghana. 3F also exports raw shea kernels to Asian countries like Japan, India, and Malaysia. In addition to using its extra capacity to supply shea grits to Loders Croklaan, GNL also supplies crude shea butter to two fractionators: Fuji Oil based in Techiman and to Ghana Specialty Oil, based in Tema. The two fractionators produce stearin for the export market in Europe. Stearin is a high value shea product obtained from refined crude shea butter through the process of fractionation. Fractionation is the process of separating the two components of shea, that is stearin – the white creamy solid part; and olein – the runny oily part. It is valued for its rich source of stearic-oleic-stearic acid and prized for its melting properties which is used as an ingredient in cocoa butter alternatives (CBA) and cocoa butter equivalents (CBE), and also used in baking products, and margarines. A schematic representation showing the flow of shea commodities (raw kernels, crushed kernels or shea grits, crude butter, and stearin) amongst industrial processors and multinational corporations is presented in Fig. 4.

Fig. 5 portrays the flow of the shea commodity through Ghana up to the international markets. Shea kernels from the parkland and farms of rural Ghana are moved to processing centres in Tamale, Buipe, Techiman, and Tema, for value addition. From Techiman and Buipe, crude shea butter, shea grits and stearin are moved to Tema for exports. Tema is the final destination for in-country flow of shea products. From the port of Tema, raw shea kernels, crude shea butter, and stearin are shipped to international market destinations including Netherlands, Denmark, U.K, U.S.A, Japan, and Indonesia (Fig. 5). The study revealed that, less than a third of shea kernels are processed in the country, the bulk of the commodity is shipped out, in their raw state. This signals an opportunity for policy makers to encourage manufacturers (especially Multinational Corporations) with proven technological capabilities and competencies, to establish refineries to produce refined shea butter and high value stearin and olein in-country. Discussions with industry sources and a key informant suggests that Loders Croklaan is most likely to establish a shea refinery in Ghana soon.

3.2.2. Flow of information, funds, technology and knowledge

Well-functioning value chains are characterised by the flow of resources (information, funds, technology), across the vertical and horizontal linkages. Flow of resources in the value chain was analyzed using focus group discussions and key informant interviews. Generally, the flow of information is direct, and between the nearest actors who interfaced with each other in the chain during business transactions.

Fig. 6 depicts the flow of information and funds within the chain. Both one-way and two-way flow of information characterise the value chain. Generally, two-way flow of information is deemed valuable, because it signals stronger relationship and tends to minimise information asymmetry compared to the unidirectional flow of information. There is virtually no direct contact or exchange of information, between shea kernel producers and industrial processors; or between shea kernel producers and exporters. This is not

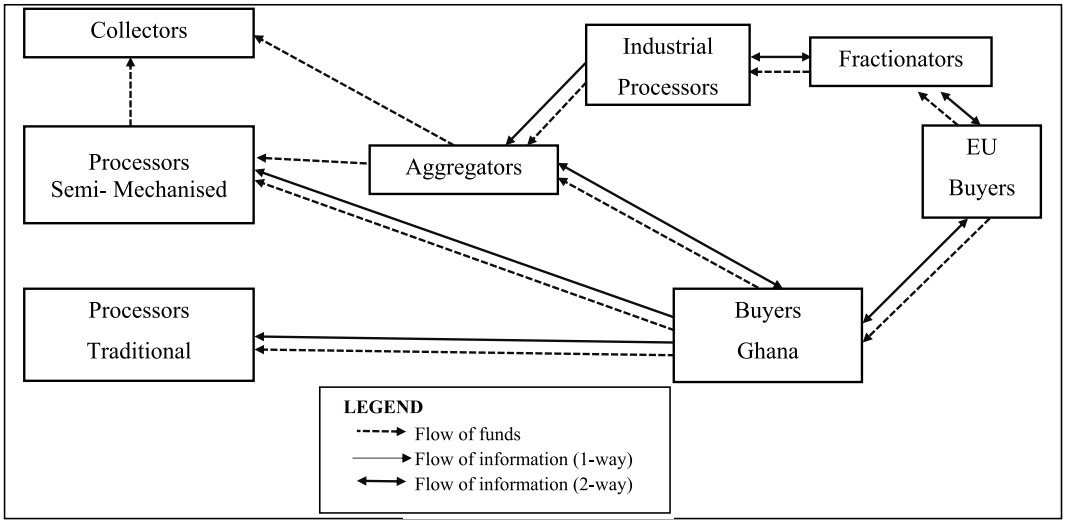


Fig. 6. Schematic description of flow of resources (information and funds) between shea value chain actors in Ghana.
Source: Author's construction, 2019

surprising as it portrays the weak linkage and spot-market oriented transactional arrangement that prevails in segments of the shea value chain [11]; Scholz, 2010). When asked about the specific industrial processors or exporters dealing in the shea kernel business or trade during a focused group discussion, most of the upstream producers of kernels had no idea about them.

> "*We know our products are delivered to big buyers and factories in the city, but for the names of the companies, we don't know"*. (Focus group discussion, Savelugu).

In another focused group discussion at Sagnarigu in the Northern Region, it emerged that shea butter producers did not know the destination of shea products, suggesting plausible level of disconnect in the value chain. In response to that question, the statement gleaned was that:

> "*We know that the shea butter we produced are sold outside Ghana to countries abroad, but we do not know which countries or the companies*". (Women processors at Sagnarigu, during a focused group discussion). The seemingly poor flow of information, especially between the aggregators and shea kernel producers (personal interactions with upstream actors during focus group discussions), signals weak relationship, and information asymmetry, to the disadvantage of upstream actors. In the absence of written formal market contracts, aggregators can exploit kernel producers, in a regime of opaque product demand and price signals. This fuels mistrust and disaffection and further weakens the chain.

Flow of funds and cash is typically unidirectional, from the buyers to suppliers. Funds flow from Europe-based buyers to Ghana-based exporters, either upon delivery of shea products to buyers or through advance payments to producers of crude shea butter. Money also flows directly from exporters to crude shea butter processors; from industrial processors to kernel suppliers (aggregators and collectors) and finally from aggregators to shea collectors (Fig. 6).

Transfer of knowledge, technology, and skills to upstream actors is through training, but this study showed that training is done mainly from outside the chain by value chain supporters, mostly NGOs. Interviews and focus group discussion in communities in the East Gonja, Savelugu, and Tolon districts, revealed that skills or technology transfer from aggregators was absent.

> "*The buyers (aggregators) do not give us any training in shea business. They don't have time. They only buy shea kernels from us. Some local NGOs like Presbyterian Agriculture Services in Tamale and foreign NGOs have taught our members how to parboil shea nuts with little water and wood. And it has reduced the amount of time, and amount of wood and water used"* – (Leader of women's shea group in Tolon in a focused group discussion). Another member of a shea butter processor group in Savelugu stated that:

> "*Training was done in 2016 and 2017 by some NGOs on how to produce quality butter, packaging, and book-keeping. The training is good for us, but we still want good price for the butter that we produce*" (Focused group discussion, Savelugu).

Key informants affirmed the assertions of the upstream actors that, valuable market information and technical knowledge are provided mostly by NGOs. Both local and international agencies including USAID, SNV, Presbyterian Agricultural Services in Tamale, reportedly play a significant role in delivering services such as: processing skills, quality parameters, organic certification, ethical production, entrepreneurship skills, and credit management, which are essential for improved performance of upstream actors. None of such information or knowledge is delivered by the aggregators, even though they interacted directly with the shea kernel producers. The presence and significance of NGOs as value chain supporters, particularly in the shea subsector is worth noting. Unlike the cocoa value chain that has a dominant presence and support from government (Dean, Ros-Tonen and Derkyi, 2018), the shea value chain derives much assistance from NGOs and development agencies [61] as shown in this study.

4. Summary of findings, conclusion and recommendations

4.1. Summary of findings and conclusions

Shea is one of the few food security commodities that is also traded internationally by Ghana as a non-traditional export commodity and potentially holds promise for linking women in typical rural households in Northern Ghana to the global value chain. Literature on shea industry has focused on domestic value chain, but increasing demand for cocoa butter equivalent in recent years by multinational corporations has stimulated global trade in shea products. This study was conducted to get a better understanding of the structure of the shea global value chain by using the global value chain framework as the main analytical tool.

A key message garnered from the findings of the study is that the shea global value chain emanating from Ghana is nascent and still emerging. Specifically, it was revealed that the shea–GVC is a classic example of a value chain that is gendered. Several thousands of mostly rural women and in peri-urban Northern Ghana participate in the shea–GVC as upstream actors. The upstream actors can be categorized into four main groups as: shea kernel producers, shea kernel producers cum shea butter producers, shea butter producers (who use traditional methods), and shea butter producers (who use semi-mechanised methods). All the upstream actors, except the semi-mechanised butter processors, are based mostly in the rural areas, they operate on a small scale basis, production processes are artisanal in nature, production efficiency is still sub-optimal and these actors are typical price-takers. The evidence suggests that like most developing countries, the upstream actors in the shea–GVC are confined to low–skill activities and low value–adding segments of the chain, and thus are unlikely to generate adequate financial rewards or benefits. On the other hand, aggregators (mostly males) are responsible for mobilising and moving shea kernels from rural communities and towns to industrial processors and exporters based in the middle and southern Ghana. Aggregators are well-resourced and play a strategic role in the chain. Without them, the shea–GVC would be grossly affected because of the important market linkage and networking functions they play. Lastly, industrial processing

firms and exporters dominate the value chain in terms of value-adding activities, pricing, and are determiners of quality and volumes supplied. Downstream actors who are responsible for the manufacturing final shea products, branding, distribution, and marketing are located in Europe and Asia.

4.2. Recommendations on policy development in shea value chain

The development, growth, and sustainability of value chains depend on the strength and optimal performance of all actors. Shea is an important non-traditional export commodity and constitutes an integral part of the livelihoods of women in the rural areas of Northern Ghana. Participation of women in the shea global value chain can be enhanced if they are supported to improve on their operations, functions, and activities. Some critical issues that need policy interventions are suggested in these recommendations.

Policies backed by investments are required to enhance productive capacity, technology transfer, and quality output of upstream actors, as a means to make them productive in the shea GVC. The study recommends that secondary midstream actors (particularly industrial butter processors, fractionators, and exporters) should engage more intensely with upstream actors, and supported by government agencies help build the production and market capacity of upstream actors. This can be done through provision of production assets, skills training, capacity building and offering premium price for quality shea products. Policy focus must also be on supporting upstream actors through the provision of improved processing facilities, and community infrastructure. Improved production practices by upstream actors will lead to production of higher volumes and better quality shea product for anticipated improved remuneration, as an incentive for sustainable shea global value chain. Future research should consider as assessment of the operations of downstream actors based in Europe and Asia, since they could not be covered in this study for obvious reasons.

5. Limitations of the study

There are some limitations to this study. First, it is acknowledged that Global Value Chain (GVC) studies and analysis embraces multiple chain participants and stakeholders. This study however focused on and was delimited to the main actors of the shea GVC (shea kernel producers, butter processors, aggregators, exporters and industrial processors). Secondly, although there are a couple of industrial shea processors participating in the export trade, only a handful opted to participate in the study by providing data and information. A much larger sample would have enriched the study. Third, downstream actors of the shea global value chain are multinational corporations based in Europe and Asia, thus these companies could not be reached for in-depth assessment. International collaborations involving researchers from Ghana and those based in Europe, will be needed to conduct an end-to-end comprehensive study at both ends of the shea GVC geography. Fourth, the role of value chain supporters, influencers, and other service providers, were not strongly considered in this current study due to limited resources. Finally, the study did not explore detailed analysis of the enabling environment of GVC.

Author contribution statement

Stephen Opoku-Mensah: Conceived and designed the experiments; Performed the experiments; Analyzed and interpreted the data; Contributed reagents, materials, analysis tools or data; Wrote the paper.

Data availability statement

Data will be made available on request.

Additional information

No additional information is available for this paper.

Declaration of competing interest

The authors declare that they have no known competing financial interests or personal relationships that could have appeared to influence the work reported in this paper.

References

[1] K. Rousseau, D. Gautier, D.A. Wardell, Coping with the upheavals of globalization in the shea value chain: the maintenance and relevance of upstream shea nut supply chain organization in western Burkina Faso, World Dev. 66 (2015) 413–427.
[2] J.A. Yidana, Progress in developing technologies to domesticate the cultivation of shea tree (Vitellaria paradoxa L.) in Ghana Progres realises dans le developpement des technologies pour domestiquel la cultivation du karitier (Vitelleria paradoxa L.) au Ghana, Agric. Food Sci. J. Ghana 3 (1) (2004) 249–268.
[3] E.K. Dogbevi, Shea Nut Has Economic and Environmental Values for Ghana, Sekaf Ghana Ltd. Publication, 2009.
[4] MoFA, Ministry of Food and Agriculture, Food and Agriculture Sector Development Policy. Draft, Ministry of Food and Agriculture, 2007 (Accra).
[5] Ghana Export Promotion Authority, in: Annual Review of Non Traditional Exports, 2010.
[6] USAID, Feed the Future Initiative: Ghana FY 2010 Implementation Plan, sourced from (2010). http://www.usaid.gov/gh/FTF/Ghana%20IP%20508.pdf.
[7] GEPA2019. Ghana Export Promotion Authority (GEPA), Potential Markets Fixed Tomatoes Fats & Oils (Shea/Karite Oil) (2019). https://www.gepaghana.org/cms/wp- content/uploads/2019/04/Sheabutter.

[8] S. Al-hassan, Ghana's Shea Industry: Knowing the Fundamentals, Institute for Continuing Education and Interdisciplinary Research, University for Development Studies, Ghana, 2015. Tamale.
[9] C.D. Deere, A.D. Oduro, H. Swaminathan, C. Doss, Property rights and the gender distribution of wealth in Ecuador, Ghana and India, in: Working Paper Series, 2013. No. 13.
[10] USAID (United States Agency for International Development), Accra, West Africa trade hub technical report, in: Investing in Shea in West Africa: a US Investor's Perspective, 2010. Available at: http://pdf.usaid.gov/pdf_docs/Pnadu686.pdf.
[11] J. Addaquay, The Shea butter value chain, refining in West Africa, in: West Africa Trade Hub (WATH) Technical Report No, 2004, p. 3.
[12] M. Elias, M. Saussey, 'The Gift that keeps on giving': unveiling the paradoxes of fair trade shea butter, Sociol. Rural. 53 (2) (2013) 158–179.
[13] F. Yinug, J. Fetzer, Sub-Saharan Africa: Factors Affecting Trade Patterns of Selected Industries, United States International Trade Commission (USITC), Washington, DC, 2008.
[14] E.T. Masters, J.A. Yidana, P.N. Lovett, Reinforcing sound management through trade: shea tree products in Africa, Unasylva 210 (2004) 46–52.
[15] OECD (The Organisation for Economic Co-operation and Development), Interconnected Economies: Benefiting from Global Value Chains, OECD Publishing, Paris, 2013, https://doi.org/10.1787/9789264189560-en.
[16] N. Foster-McGregor, F. Kaulich, R. Stehrer, Global value chains in Africa research, statistics and industrial policy branch working paper 4/2015, in: Inclusive and Sustainable Industrial Development Working Paer Series Wp O4/2015, 2020.
[17] I. Plazibat, F. Ćejvanović, Z. Vasiljević, Analysis of Fruit and Tomatoes Value Chains Analysis of Fruit and Tomatoes Value Chains, Poslovna Izvrsnost Zagreb, God, 2016, p. X, 2016) Br.2.
[18] J. Swinnen, Global Agricultural Value Chains, Standards, and Development, 2014. EUI Working Paper RSCAS 2014/30.
[19] E.R.T. Challies, Agri-food globalisation and rural transformation in Chile: smallholder livelihoods in the global value chain for raspberries, in: A Thesis Submitted to Victoria University of Wellington in Fulfilment of the Requirements for the Degree of Doctor of Philosophy in Geography, 2010.
[20] C. Dolan, J. Humphrey, Changing governance patterns in the trade in fresh tomatoes between Africa and the United Kingdom, Environ. Plann. 36 (2004) 491–509, https://doi.org/10.1068/a35281.
[21] M. Maertens, J.F. Swinnen, Trade, standards, and poverty: evidence from Senegal, World Dev. 37 (1) (2009) 161–178.
[22] M. Maertens, B. Minten, J. Swinnen, Modern food supply chains and development: evidence from horticulture export sectors in Sub-Saharan Africa, Dev. Pol. Rev. 30 (4) (2012) 473–497.
[23] O. Memedovic (Ed.), Public Goods for Economic Development, United Nations Publications, 2008.
[24] M.A. Awo, K.A. Anaman, Political economy analysis of the production and marketing of shea nut products by women in the northern region of Ghana, Res. World Econ. 6 (4) (2015) 1.
[25] UNIDO, Diagnostics for Industrial Value Chain Development: an Integrated Tool, UNIDO, Vienna, 2011.
[26] M. Prowse, Contract farming in developing countries - a Review, in: A Savoir Collection, AFD, February, 2012. https://www.afd.fr/en/ressources/contract-farming-developing-countries-review.
[27] R. Kaplinsky, M. Morris, A Handbook for Value Chain Research, vol. 113, IDRC, Ottawa, 2001.
[28] J. Humphrey, H. Schmitz, How does insertion in global value chains affect upgrading in industrial clusters? Reg. Stud. 36 (9) (2002) 1017–1027.
[29] G. Gereffi, K. Fernandez-Stark, Global Value Analysis: A Primer. Center on Globalization, Governance and Competitiveness, second ed., Duke University), 2016, pp. 1–34.
[30] J. Donovan, S. Franzel, M. Cunha, A. Gyau, D. Mithöfer, Guides for value chain development: a comparative review, J. Agribus. Dev. Emerg. Econ. 5 (1) (2015) 2–23.
[31] O. Coulibaly, D.D. Arinloye, C. Van Melle, L. Fanou, J. Agbahey, R. Allomasso, T. Nouhoheflin, L. Koumassa, S. Adetonah, Value Chain Analysis: Analytical Toolkit and Approaches to Guide the Development of Sustainable African Agri-Food Chains, 2010.
[32] H. Bammann, Participatory value chain analysis for improved farmer incomes, employment opportunities and food security, Pac. Econ. Bull. 22 (3) (2007) 113–129. Retrieved from, http://www.mtnforum.org/sites/default/files/publication/1 Files/5206.pdf.
[33] V. Hernandez, T. Pedersen, Global value chain configuration: a review and research agenda, Business Research Quarterly 20 (2017) 137–150, 2017.
[34] F. Kruijssen, K. Danielsen, J. Newton, Y. Braaten, Gendered aquaculture value chain analysis and development: an analytical framework. Penang, Malaysia, in: CGIAR Research Program on Fish Agri-Food Systems, 2021. Manual: FISH-2021-27.
[35] G. Gereffi, The organization of buyer-driven global commodity chains: how U.S. retailers shape overseas production networks. Pages 95-122, in: G. Gereffi, M. Korzeniewicz (Eds.), Commodity Chains and Global Capitalism, Praeger, Westport, Connecticut, USA, 1994.
[36] P. Gibbon, Upgrading primary production: a global commodity chain approach, World Dev. 29 (2) (2001) 345–363.
[37] G. Gereffi, K. Fernandez-Stark, Duke university: center on globalization, governance and competitiveness (duke CGGC), in: Skills for Upgrading: Workforce Development and Global Value Chains in Developing Countries, RTI International, 2011.
[38] UNCTAD, Economic Development in Africa Report 2013, United Nations Conference on Trade and Development, United Nations Publication, Geneva, 2013, 978-92-1-112866-6.
[39] OECD (The Organisation for Economic Co-operation and Development), Global Production Networks and Employment: A Developing Country Perspective, Paris Organisation for Economic Co-operation and Employment, 2012.
[40] DFID and SDC, A Synthesis of the Making Markets Works for the Poor (M4P) Approach, Department for International Development and Swiss Agency for Development and Cooperation, London and Berne, 2008.
[41] J. Humphrey, L. Navas-Alemán, Value chains, donor interventions and poverty reduction: a review of donor practice, IDS Research Reports (63) (2010) 1–106, 2010.
[42] N.M. Coe, H.W.C. Yeung, Global production networks: mapping recent conceptual developments, J. Econ. Geogr. 19 (4) (2019) 775–801.
[43] L.M.C. International, Socio-economic Impact of Shea Exports, USAID–Global Shea Alliance, 2017.
[44] P.N. Lovett, 'The Shea Butter Value Chain. Production, Transformation and Marketing in West-Africa', WATH Technical Report No. 2, United States Agency for International Development (USAID), 2004.
[45] P.N. Lovett, Sourcing shea butter in: a sustainability check, in: Global Ingredients and Formulation Guide 2010 the Green Book of Cosmetics, Verlag für chemische Industrie, H. Ziolkowsky GmbH: Augsburg, Germany, 2010, pp. 62–68, 2010.
[46] D.A. Wardell, N. Fold, Globalisations in a nutshell: historical perspectives on the changing governance of the shea commodity chain in northern Ghana, Int. J. Commons 7 (2 August 2013) (2013) 367–405.
[47] J. Bello-Bravo, P.N. Lovett, B.R. Pittendrigh, The evolution of shea butter's "paradox of paradoxa" and the potential opportunity for information and communication technology (ICT) to improve quality, market access and women's livelihoods across rural Africa, Sustainability 7 (5) (2015) 5752–5772.
[48] Ghana Statistical Service (GSS), Non-monetary Poverty in Ghana, Ghana Statistical Service, 2013.
[49] Y.A. Zereyesus, A. Shanoyan, K.L. Ross, V. Amanor-Boadu, The determinants of household-level well-being in Northern Ghana, Development Studies Research 3 (1) (2016) 1–10.
[50] K. Kaplinsky, Global value chains, where they came from, where they are going and why this is important, in: IKD Working Paper No. 68. Development Policy and Practice, The Open University, 2013.
[51] J. Neilson, Value chains, neoliberalism and development practice: the Indonesian experience, Rev. Int. Polit. Econ. 21 (1) (2014) 38–69, https://doi.org/10.1080/09692290.2013.809782.
[52] H. Bernstein, L. Campling, "Commodity studies and commodity, Fetishism I" Journal of Agrarian Change 6 (2) (2006) 239–264.
[53] J.H. Trienekens, Agricultural value chains in developing countries; A framework for analysis, Int. Food Agribus. Manag. Rev. 14 (2) (2011) 51–83.
[54] B. Minten, S. Tamru, E. Engida, T. Kuma, Transforming staple food value chains in Africa: the case of teff in Ethiopia, J. Dev. Stud. 52 (2016) 627–645.
[55] J.W. Creswell, J.D. Creswell, Research Design: Qualitative, Quantitative, and Mixed Methods Approaches, Sage Publications, Thousand Oaks, CA, USA, 2017, 2017.

[56] M. Gibbert, W. Ruigrok, B. Wicki, What passes as a rigorous case study? Strat. Manag. J. 29 (13) (2008) 1465–1474, https://doi.org/10.1002/smj.722.
[57] K. Fernandez-Stark, P. Bamber, G. Gereffi, Inclusion of Small and Medium Sized Producers in High-Value Agro-Food Value Chains, Duke Center on Globalization, Governance and Competitiveness, Durham, N.C., 2012.
[58] L.G. Bellu, Value Chain Analysis for Policy Making. *Methodologies, Guidelines* and Country Cases for a Quantitative Approach, Food and Agricultural Organization of the United Nations, FAO, 2013.
[59] J.H. Trienekens, Value chain in developing countries; a framework for analysis, in: M.P. van Dijk, J. Trienekens (Eds.), Global Value Chains: Linking Local Producers from Developing Countries to International Markets, University Press, Amsterdam, 2012.
[60] T. Chagomoka, V. Afari-Sefa, R. Pitoro, Value chain analysis of traditional tomatoes from Malawi and Mozambique, Int. Food Agribus. Manag. Rev. 7 (4) (2014) 59–86.
[61] W. Laube, Global shea nut commodity chains and poverty eradication in Northern Ghana: myth or reality? UDS International Journal of Development [UDSIJD] 2 (1) (2015).
[62] H. Issahaku, R. Al-Hassan, D.B. Sarpong, An analysis of allocative efficiency of shea butter processing methods in the northern region of Ghana, J. Dev. Agric. Econ. 3 (4) (2011) 165–173. April 2011.
[63] T. Swetman, L. Hammond, A. Gray, Improved Processing of Shea Nuts in Northern Ghana, 1997. Final Technical Report.
[64] E.O. Ajala, F. Aberuagba, A.M. Olaniyan, M.A. Ajala, O.B. Okedere, Mechanical extraction of shea butter: optimisation and characterisation studies with comparison to other methods of extraction Songklanakarin, J. Sci. Technol. 41 (4) (2019) 879–886.
[65] G.S. Jasaw, O. Saito, K. Takeuchi, Shea (Vitellaria paradoxa) butter production and resource use by urban and rural processors in Northern Ghana, Sustainability 7 (4) (2015) 3592–3614.