Value Chain Interventions for Satisfying Urban High-Quality Rice Demand in the Ashanti Region of Ghana

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Abstract

Rice has become a staple food in most countries including Ghana where consumption has increased by more than 100% in the past 15 years due to urbanization and population growth, especially in urban areas. Urban consumers, who account for about 76% of the total rice consumption in Ghana, prefer imported rice to local rice due to its intrinsic (white and long grain, taste and aroma) and extrinsic (safety) attributes. The local rice is of low-quality and uncompetitive due to an underdeveloped value chain. This study therefore aimed to understand the rice value chain from input provision to farmers through retailing to the consumers in the Ashanti Region of Ghana, and identify how the local rice value chain can be improved through interventions to deliver high-quality rice for urban consumers and compete against imported rice.

Face to face interviews were conducted using a semi-structured questionnaire to collect data. This was complemented by field observations and document collation. The data were analyzed using a qualitative approach.

Four key areas in the value chain were identified as barriers to delivering high-quality rice. They include; input supply (farmers' inability to get access to high-quality seeds), production and post-harvest activities (harvesting and threshing constraints), processing (use of low standard or inappropriate machines), and retailing (inadequate packaging).

Interventions to improve the local rice value chain require collective efforts of the chain actors, government in general, and Ministry of Food and Agriculture (MoFA) in particular. The interventions include the adoption of good agricultural practices (GAPs) by farmers, use of appropriate machinery and storage by processors and government supporting them in the form of joint ventures to ensure the local production and distribution of high-quality rice. Also, regular education and training for farmers by MoFA can help them to improve the quality and yield of local rice through adoption of better technology.

This study has contributed to the understanding of rice value chain and proposed intervention strategies which, if implemented, will improve the local rice value chain and deliver higher-quality local rice for urban consumers and compete against imported rice.

Keywords: High-quality rice, value chain interventions, smallholder farmers, Ghana.

Table of Contents

List of Tables

List of Figures

List of Acronyms

GDP	Gross Domestic Product
CARD	Coalition for Africa Rice Development
DFID	Department for International Development
FFI	Food Fortification Initiative
GAIN	Global Alliance for Improved Nutrition
GMet	Ghana Meteorological Agency
IFPRI	International Food Policy Research Institute
MoFA	Ministry of Food and Agriculture
PPRSD	Plant Protection Regulatory Services Directorate
QDA	Quality Data Analysis
GHS	Ghanaian Cedi
VCA	Value Chain Analysis
GAP	Good Agricultural Practices
Global-GAP	Global Good Agriculture Practices
USAID	The United States Agency for International Development
FAO	Food and Agriculture Organization
USA	United States of America
EU	European Union
NRDP	Nerica Rice Dissemination Project
NRDS	National Rice Development Strategy
IVRDP	Inland Valley Rice Development Project
RSSP	Rice Sector Support Project
MUHTC	Massey University Human Ethic Committee
GSS	Ghana Statistical Service
MT	Metric Tonnes
NGO	Non-Governmental Organization

Chapter 1: Introduction

1.1 Background information

Agriculture continues to play a strategic role in the economic development of most developing countries, including Ghana (Diao, Hazell, Resnick, & Thurlow, 2007). According to the International Food Policy Research Institute (IFPRI), agriculture employs approximately 40% of the active labour force worldwide. More than 60% of people in sub-Saharan Africa, Asia, and the Pacific depend on agriculture, compared to 4% in higher-income countries (IFPRI, 2017).

In Ghana, the agriculture sector plays a key role in socio-economic development. The sector is the major source of employment and the backbone of the Ghanaian economy. It employed 44.7% of the population in 2016 and accounted for approximately 20% of the national GDP (FAO, 2015; MoFA, 2016). There are five main sub-sectors namely; crop, cocoa, forestry, livestock and fishery. Crop production contributes about 67.7% to the agricultural GDP, followed by cocoa (8.8%), forestry and logging (11.2%), livestock (6.2%) and fishing (6.1%) (MoFA, 2016). The agricultural sector utilizes about 57% (6,341,930 ha) of Ghana's land, of which approximately 28% is used for arable crops and, 5% of the 28% is used in cereal crops cultivation especially maize, rice and sorghum (MoFA, 2013, 2016). The sector is dominated by smallholder farmers who constitute approximately 90% (5,276,514 farmers) of the farming population in the country with an average landholding size of 2 hectares (Anang, 2017; MoFA, 2015).

Rice is one of the most consumed crops worldwide. Rice has helped a lot of people for a longer time than any other crop, first domesticated about 8000 to 10000 years ago (Fairhurst & Dobermann, 2002). Currently, it serves as a staple food crop for more than half of the world's population and it is grown by more than half of the world's farmers (Boakye Danquah & Egyir, 2014; Gebey, Berhe, Hoekstra, & Alemu, 2012). In Ghana, it is one of the major food commodities and is considered the second most important grain food after maize (Boansi & Favour, 2015; MoFA, 2015). As such, rice cultivation in Ghana covers a land area of 236,000 ha with an annual production of 688,000 MT of paddy rice (MoFA, 2016).

The consumption of rice in Africa has increased over the years, for example, in 2010, the rate was 18.40% (AfricaRice, 2014). In Ghana, from 2005 to 2015, the per capita consumption increased from 15.1kg to 32kg (Ayeduvor, 2018; MoFA, 2015). The swift shift to rice consumption in

Ghana is mainly due to the increasing rate of urbanization, change in consumers' tastes and preferences, ease of cooking, long storage life and the rapid population growth in urban areas (Ayeduvor, 2018).

A high percentage of rice consumed in Africa is imported since demand outweighs domestic supply. Over the years, the share of imported rice consumption in Africa has been increasing by 2% annually, reaching 43% in 2009 (Nasrin et al., 2015). Approximately, one-third of rice traded on the world market was imported by African countries, 11.8 million tonnes in 2011, compared to 0.6 million tonnes in 1961. The annual cost of rice imports for Africa is about US $4.3 billion. West African countries including Ghana are known to be the largest importers of rice (Nasrin et al., 2015). For instance, about 50% of rice consumed in Ghana is met through imports with current demand of more than 1 million MT per annum, which is estimated to increase in the future (Ayeduvor, 2018; Kranjac-Berisavljevic', 2000). The average import bill of Ghana for rice is USD 450 million annually (Angelucci, Asante-Pok, & Anaadumba, 2019).

Due to the important role rice plays in poverty minimization and improvement in food security in Ghana, the rice industry has been given much focus in the agricultural policies of Ghana. Increasing the quality and quantity of the local rice has therefore become a concern. In this regard, many initiatives and policies have been implemented since 2001 by the Governments of Ghana.

 Some of the policies are;

- Nerica Rice Dissemination Project (NRDP)
- The National Rice Development Strategy (NRDS)- (2005-2010)
- The Inland Valley Rice Development Project (IVRDP)- (2001-2009)
- The Rice Sector Support Project (RSSP)- (2008-2014)
- The Sustainable Development of Rain-fed Lowland Rice Production Project- (2009-2014)
- Planting for Food and Jobs Programme- (2017 to date).

Even though, as at 2017, the average rice yield was only 2.5 MT/ha, as against the achievable yield of 6.5 MT/ha, there has been a continuous improvement in rice production in Ghana. For example, the annual growth rate from 2001 to 2010 for area harvested was 3.04%, yield increased by 2.29% and production by 4.86% (AfricaRice, 2014). Output from 2013 to 2017 increased by 27% (FAO, 2019). Part of the increase in rice production may be attributed to the initiation of the above

policies. Despite the increase in rice production, the rice value chain in Ghana is underdeveloped (DFID, 2015).

Urban regions (particularly Ashanti and Greater Accra Regions) account for about 76% of the total rice consumption, and the Ashanti Region is the largest rice consuming region in Ghana (CARD, 2010; Gates-Foundation, 2012). Urban dwellers preference for imported rice over local rice may be due to attributes such as aroma, long-grain, white colour, taste, price, tenderness, cooking time, convenience and availability (Alhassan, Frimpong, & Mohammed, 2015; Andam, Ragasa, Asante, & Amewu, 2019; DFID, 2015). Local rice normally has more impurities mixed with it and it is of low-quality (Stryker, 2013). As such, consumers are willing to pay 16-30% more for imported rice compared to locally produced rice (Andam et al., 2019; Ayeduvor, 2018). Local rice remains uncompetitive even though imported rice has higher price, and an import tariff of 20% as at 2016, probably because of urban dwellers preference (Andam et al., 2019; FFI & GAIN, 2016). To get a particular kind of rice to meet consumers demands, all processes such as milling, cleaning, packaging, and branding should be taken into consideration (Ayeduvor, 2018). Making sure that the local rice is produced and processed in a manner that meets the quality attributes preferred by consumers will help improve the demand for local rice, ensure its competitiveness and a reliable market for local rice producers (Ayeduvor, 2018).

Local rice value chains need to be enhanced for a country to improve its rice production (Arouna, Lokossou, Wopereis, Bruce-Oliver, & Roy-Macauley, 2017). This is because, all activities from input supply to rice consumption need to be taken into consideration and enhanced (value creation/addition). Most businesses have used and continue to use a value chain approach to develop and execute competitive strategies. It has been used in guiding agribusinesses to develop or improve value-added products that consumers prefer. It focuses on value creation, product development and marketing. It is centered on maximizing the various activities which add value to the production and sale of a product (Webber & Labaste, 2007). This indicates that, these approaches can be applied to the rice value chain to improve the quality of rice for urban consumers.

In Ghana, the value chain has been identified as an important approach to agricultural development, since it clearly identifies the duties of the private sector, related institutions and agricultural markets that do not function well. Although research has indicated ways for

intervention, it is not fully clear as to what the interventions ought to be (Addison, Sarfo-Mensah, & Edusah, 2015). This could be the reason why rice value chain in Ghana is underdeveloped and not competitive. To compete against imported rice requires a comprehensive solution to the challenges faced by the local rice value chain from farm-to-fork (Arouna et al., 2017). This study therefore seeks to get a better understanding of the rice value chain from input provision to farmers through retailing to the consumers in the Ashanti Region of Ghana, and identify how the local rice value chain can be improved through interventions to deliver high-quality rice for urban consumers and compete against imported rice.

1.2 Research Question

What are the value chain interventions that could develop the local rice value chain to meet the urban high-quality rice demand in the Ashanti Region of Ghana?

1.3 Research Objectives

1. To identify the quality attributes preferred by urban consumers in Ashanti Region.
2. To map the rice value chain in Ashanti Region.
3. To identify the major constraints and opportunities of the local rice value chain in Ashanti Region.
4. To identify interventions to improve the local rice value chain in Ashanti Region.

Chapter 2: Study Country

2.1 An Overview of Ghana

Republic of Ghana is found in the subregion of West Africa and shares borders with Burkina Faso to the north, Gulf of Guinea to the south, Togo to the East and Cote D'ivoire to the west (Figure 2.1). The area is 238,533 km^2 with a population of 30,417,856 in 2020 World-Atlas (2020) at a population growth rate of 2.3% per annum (MoFA, 2016).

Figure 2.1: Map of Africa; Source*: (World-Atlas, 2020)*

Ghana was the first Sub-Saharan African country to gain independence from the British colonial rule in 1957. The country is rich in terms of mineral resources such as petroleum, gold, bauxite, manganese oil and diamond but relies heavily on the export of gold as the main mineral resource. There are eight major ethnic groups along with sub-diverse groups who speak more than 10

languages. The country is divided into 16 administrative regions. The capital city is Accra, and the largest city is Kumasi (World-Atlas, 2020).

Ghana has two major seasons including rainy and dry seasons. The rainy season is between March and October while the dry season is normally between November and February (MoFA, 2013). It is a tropical country which is warm and relatively dry along southeast coast, hot and dry in north and hot and humid in southwest. The annual average temperature ranges from 26.1°C in areas around the coast to 28.9 °C in the north (MoFA, 2013).

Ghana is a middle-income country with an estimated GDP of about $66.98 billion World-Atlas (2020), and annual GDP growth rate of 5.7 (World-Bank, 2019). About 43.9% of the population stay in rural areas while the remaining 56.1% dwell in the urban centres. The major occupation for most rural dwellers is agriculture (FAOSTAT, 2018).

There are five agro-ecological zones in Ghana (Table 2.1) and each zone has different natural vegetation, climatic condition, and soil characteristics. The rain forest, deciduous forest, transitional and coastal savannah zones make up the southern half of the country. These zones have a bimodal rainfall pattern, which enables two growing seasons (major and minor seasons) annually (Table 2.1). Guinea Savannah and Sudan Savannah which are found in the Northern Savannah have only one growing season attached with hot and dry winds.

Table 2.1: Rainfall distribution and growing seasons in Ghana by agro-ecological zones

Agro-ecological Zone	Mean Annual Rain (mm)	Growing Period (Days)	
		Major season	Minor season
Rain Forest	2,200	150-160	100
Deciduous Forest	1500	150-160	90
Transitional	1300	200-220	60
Coastal Savannah	800	100-110	50
Northern Savannah:			
Guinea Savannah	1100	180-200	N/A
Sudan Savannah	1000	150-160	N/A

Source: (GMet, 2016)

2.2 Agriculture in Ghana

2.2.1 Ghanaian Agricultural Sector

In Ghana, the agricultural sector serves as the backbone of the economy and plays a key role in the economic development as it contributes to rural development, food security, GDP and employment creation (Anang, Bäckman, & Sipiläinen, 2016). Most rural households depend on agriculture for their livelihood (Diao et al., 2007). Aside from the agricultural sector, other sectors such as service (employs 40.9%) and industry (employs 14.4%) also contribute greatly to GDP. The contribution of the agricultural sector to GDP has been declining over time (Figure 2.2).
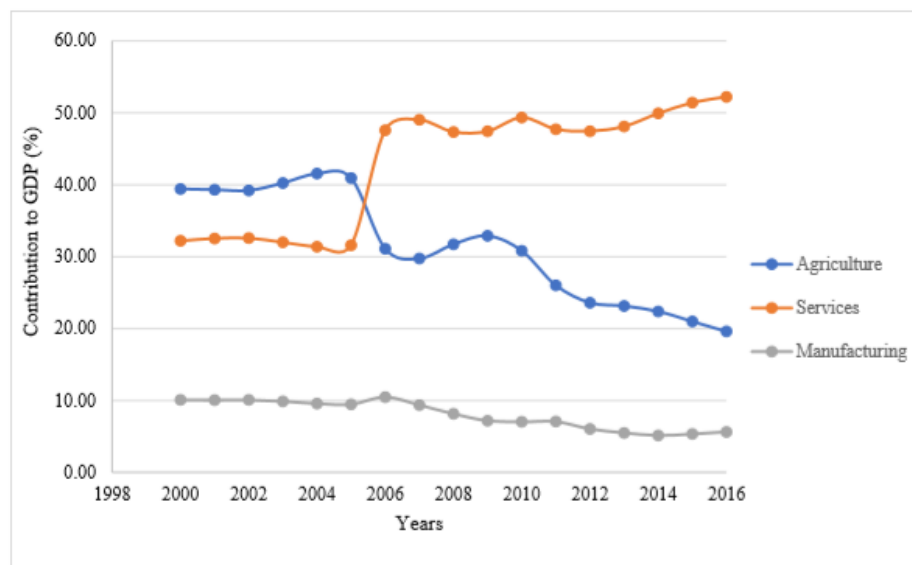
Figure 2.2: Sector contribution to GDP in Ghana from 1998-2016; Source: (FAO, 2017).

There are five main sub-sectors in the Ghanaian agricultural sector namely; crop, cocoa, livestock, fishery, and forestry. Figure 2.3 shows the sector contribution to GDP (MoFA, 2016).
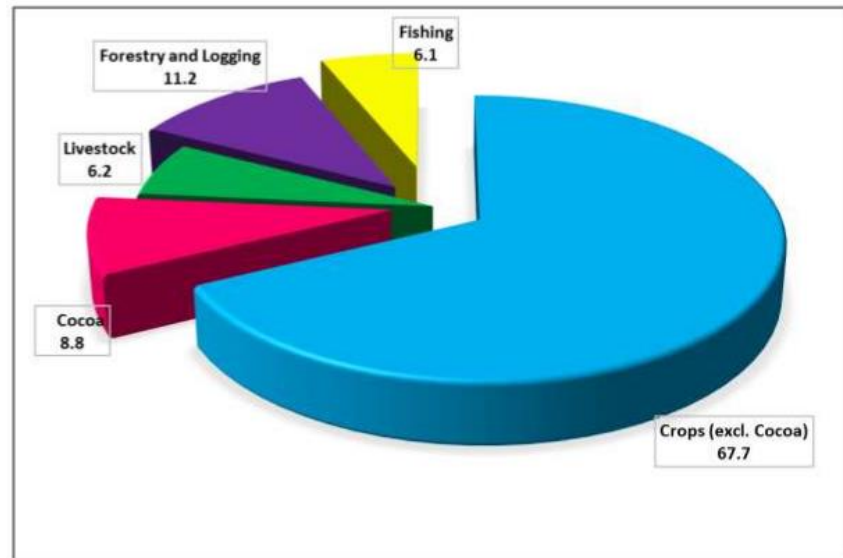
Figure 2.3: Sub-sectors in the Ghanaian agricultural sector; Source: (MoFA, 2016)

2.3 Ghanaian Rice Sector

2.3.1 Rice Sector Development Policies/Projects in Ghana

The following policies and projects have been initiated by the Governments of Ghana and other local and foreign organizations due to the growing demand of rice in the country.

Nerica Rice Dissemination Project (NRDP): This project was implemented in 2003 and lasted for 5 years with the support of African Development Bank. The aim was to reduce poverty and promote food security through better access to high yielding NERICA upland rice varieties. It was implemented in Northern, Ashanti and Volta Regions (MoFA, 2017). The project produced and distributed 1128.07MT certified NERICA seeds among 875 farmers, established feeder roads and standard rice mills.

The National Rice Development Strategy (NRDS): This project was implemented by the government in 2008 with the aim of doubling local rice output, reducing imports by 50% (by 2018) and enhancing local rice quality to increase its demand (Boansi, 2013; MoFA, 2017). Extension services were provided and stabilized prices were set for rice by the government through the national buffer stock company (MoFA, 2017).

The Inland Valley Rice Development Project (IVRDP): The aim of the project was to promote food security, decrease rice importation and increase incomes of smallholder rice farmers, traders and processors through the production of high-quality rice. The implementation took place in 21 districts in 5 regions namely; Ashanti, Brong Ahafo, Central, Eastern and Western Regions (MoFA, 2017). Actors were given inputs and processing equipment by the government. Farmer associations, marketing and processor groups were also formed (MoFA, 2017).

The Rice Sector Support Project (RSSP): This project was implemented by MoFA and Agence Francaise de Development of France in 2009 to improve the livelihoods of poor farmers in the Northern part of Ghana through sustainable economic activity development. It focused on enhancing the rice value chain like capacity building where more than 15,000 farmers and other actors benefited (Boansi, 2013; MoFA, 2017).

The Sustainable Development of Rain-fed Lowland Rice Production Project: It was implemented by Crop Service Directorate and MoFA in 2009-2014. The goal was to enhance the productivity and profitability of rice farmers in Northern (three districts) and Ashanti Regions (four districts). About 1000 farmers benefited from the project. Additional measures to improve local rice production were national fertiliser input subsidy for cereal producers and provision of extension services support for farmers (MoFA, 2017).

Planting for Food and Jobs Programme: This was initiated by the government in 2017. The project focuses on providing improved seeds, fertiliser, extension services, marketing and e-agriculture and monitoring. The aim of the programme is to increase the yield of cereals and legumes. It sought to increase rice yield by 49%. As part of the programme, farmers get subsidized (40%) fertilisers (MoFA, 2017).

2.3.2 Rice Production in Ghana

Rice is produced in all the regions, but the Northern part of Ghana accounts for about 80% of rice produced in the country (World-Bank, 2013). The regions in the Northern part of Ghana are Northern region (around Tamale), Upper East region and Volta region (around Hohoe and Kpandu). The Northern part of Ghana covers about 41.84% of the land area in Ghana. Although they experience a unimodal rainfall pattern, factors such as irrigation schemes, cheap labour, climatic (warm or hot) and land conditions support rice production thereby making them have a

comparative advantage in rice production (DFID, 2015). Production takes place in the southern part including Ashanti, Eastern and Greater Accra Regions with bimodal system of cultivation - major and minor seasons, but their contribution to the national output is low (World-Bank, 2013). The top 5 rice producing regions and their share of production in Ghana are illustrated in Figure 2.4 and Table 2.3.
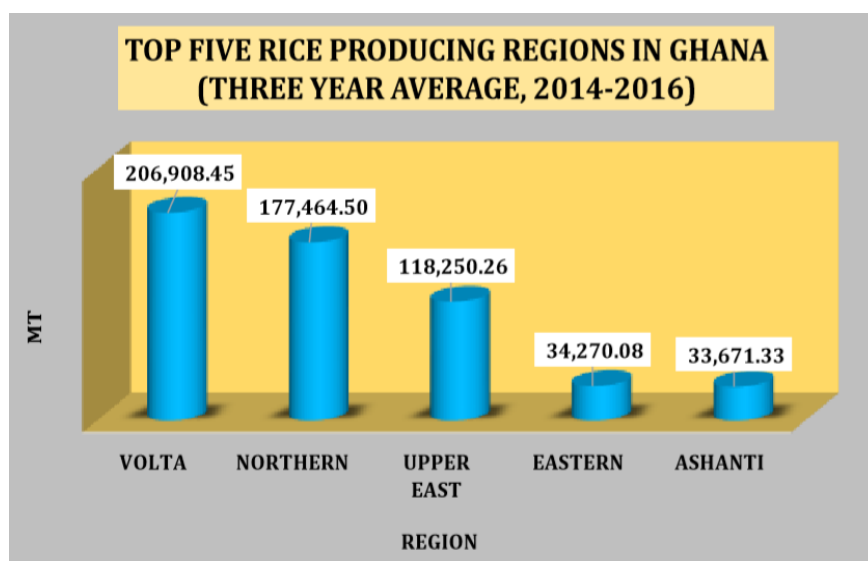
Figure 2.4: Top five rice producing regions in Ghana -Metric Tons (MT); Source: (MoFA, 2016)

Table 2.2: Rice Production (MT) Statistics

Top 5 Regions	3-year average	Share of sub-total (%)	Share of overall total (%)
Volta	206,908.45	36.26	32.11
Northern	177,464.50	31.10	27.54
Upper East	118,250.26	20.73	18.35
Eastern	34,270.08	6.01	5.32
Ashanti	33,671.33	5.90	5.23
Sub total	570,564.62		88.54

Source: (MoFA, 2016)

2.3.3 Rice Farming Systems in Ghana

There are three major rice farming systems which are categorized under agro-ecology depending on adaptive mechanism characterized by the supply of water in Ghana namely; upland, lowland and irrigated rice farming systems (Bawuah, 2015). About 78% of the arable land area is attributed to lowland rain-fed ecology, 16% constitutes irrigated ecology and 6% from the upland rain-fed ecology (MoFA, 2009). The higher percentage of the lowland rice farming may be attributed to its higher possibility of presenting two or more times cultivation annually, even with inadequate rain (Bawuah, 2015). Rain-fed rice production accounts for 84% of the total production with an average yield of 1.0-2.4 MT/ha. Irrigated production accounts for only 16% of the total production but generates the highest yield of 4.5 MT/ha (Angelucci et al., 2019). There are 22 public irrigation schemes in the country which covers about 19,000 of farmlands but 10,900 is ran by the Government of Ghana with the help from donor countries and organizations like Russia, FAO among others (Angelucci et al., 2019; CARD, 2010).

2.3.4 Rice Varieties in Ghana

The main rice species grown in Ghana are *Oryza sativa* and *Oryza glabertima* (MoFA, 2015). Rice varieties cultivated are identified by specific names and differ according to the area of production (regions) and their geographical content. In the northern part of Ghana, local white rice varieties cultivated are Jasmine and AGRA. Other varieties used are TOX 3018 and Mandi due to their tolerance to drought and rice blast and good for milling although it is quite difficult to thresh and non-aromatic. Likewise, in the southern part of Ghana, white *Oryza sativa* varieties like AGRA (Figure 2.5), *Sikamo* (6 MT/ha), Jasmine 85 (*Lapes*) (4.5-8 MT/ha), Marshall (*Amankwatia*) (6-8 MT/ha) are cultivated. These varieties are long grain and aromatic and mostly cultivated in rain-fed lowland ecology (Amponsah, Addo, Dzisi, Moreira, & Ndindeng, 2017; Moro, Nuhu, & Martin, 2016). Aside from these white varieties, there are brown rice varieties cultivated in the top five rice producing regions though in small quantity (Figure 2.5).

Figure 2.5: Rice varieties in Ghana; Source: Photos were taken during data collection stage.

As already stated, the average rice yield in Ghana is 2.5 MT/ha as against an achievable yield of 6.5 MT/ha MoFA (2017) indicating that the average rice yield is less than 50% of the achievable yield. Nevertheless, rice production has been increasing since 2007 (Figure 2.6) which may be attributed to the rice policies/projects (Angelucci et al., 2019). Despite the rice production increase, low-quality seeds are normally used. Low-quality seeds refer to mixed rice varieties, less shiny and dark colour. Cultivating such seeds leads to uneven maturity during harvest coupled with variations in size and shape of the grains. This has created a gap between the imported and the local rice, in terms of quality (Angelucci et al., 2019). The level of improved technology adoption by rice farmers is very low as most farmers continue to use low-yielding varieties coupled with poor agricultural practices (Wiredu et al., 2010).
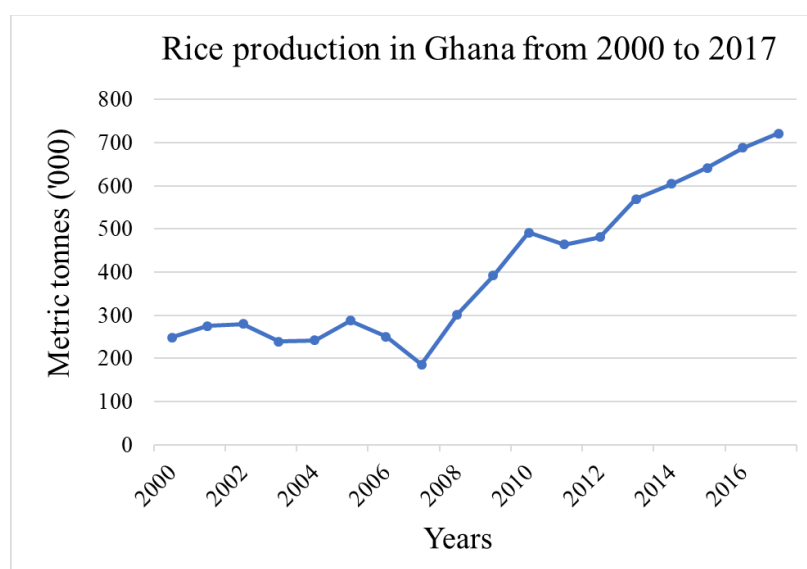
Figure 2.6: Rice production in Ghana; Source: (FAO, 2019)

12

2.3.5 Rice Processing/Milling

Local rice is parboiled and/or milled directly depending on the place of production. Rice processors in the northern part of Ghana purchase paddy rice, parboil (giving the grains a yellowish colour) and mill unlike in the southern part of Ghana where processors either purchase and mill, or only provide a service by milling (Ayeduvor, 2018). Rice processing in Ghana is not the best due to poor quality of local processing (Angelucci et al., 2019). It is mostly done manually especially by the small rice producers in villages Campbell et al. (2009) which allows foreign materials to get into the processed rice (Angelucci et al., 2019). Nevertheless, rice processing in other places is done on commercial bases where payment is made based on the quantity of rice processed. Inappropriate machines that do not have de-stoners, colour separator functions and produce broken rice are used leading to low-quality rice production (Osei-Asare, 2010). Most of the milled local rice has more than 25% broken kernel which is identified to be of low quality (Ayeduvor, 2018).

2.3.6 Rice Marketing and Distribution

Rice Market Situation in Ghana

Rice markets in Ghana are quite segmented. Rice is sold in traditional open markets, supermarkets (big registered shops that sell food and household items), mini supermarkets (unregistered shops that sell food and household items), and shopping malls (big registered enclosed area where food and household items are sold) (Ayeduvor, 2018). The supermarkets and malls normally sell imported and branded local rice while unbranded local rice is sold in the traditional open markets. Different types of unbranded local rice sold in the open market are differentiated by source, colour and size of the grain (Figure 2.7). The types of rice sold in such markets are mostly medium-size grains, yellowish grains and high percentage of broken grains. The open market is in the high-end urban, low-end urban and rural towns. On the other hand, most of the imported rice is well packaged and sold in different sizes and quantities, thus, 50kg, 5kg and 1kg in all markets (Ayeduvor, 2018).

Figure 2.7: Types of unbranded rice in Ghanaian markets; Source: (Ayeduvor, 2018)

Rice Marketing and Distribution Channels

Rice comes in two forms during marketing; paddy rice or milled rice. Paddy rice refers to unprocessed rice at the farm gate. Milled rice can either be processed paddy rice or parboiled rice. Parboiled rice refers to rice that has been partially boiled, but in the husk after which it is milled. Nevertheless, most retailers purchase only milled rice and distribute to their customers/consumers in the open market (Osei-Asare, 2010). Some of the retailers in the organized traditional market purchase 50kg bags of rice and sell to consumers in small quantities using the locally accepted measurement container named "*Olonca*" or "*margarine tin*". There are two main distribution channels of rice in Ghana, thus, the local and the imported chains.

As indicated in Figure 2.8, local rice farmers acquire inputs such as seeds, fertilisers and agrochemicals from the input suppliers who are mostly in the urban and peri-urban centers. Most farmers sell to the middlemen to avoid or reduce any additional transaction costs. Middlemen sell the paddy rice to the processors. Other times, processors purchase the paddy rice from the farmers directly. After milling, they sell to either the wholesalers or the retailers who then sell to consumers in both urban and rural areas. Some retailers are also supplied with milled rice by the wholesalers.
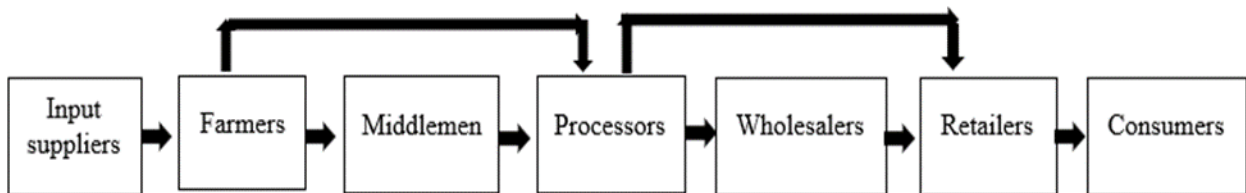
Figure 2.8: Local rice marketing chain; Source: (Adu, 2018)

The imported rice marketing and distribution channel is quite efficient and well organized as compared to the local channel. Rice importers in Ghana purchase the products from the exporting country (Figure 2.9). Distribution is done through wholesalers (on a large scale) who then sell to the urban and local retailers. Other times, importers trade with retailers directly, especially when the retailer has a large customer base or market share. Consumers normally purchase imported rice at the supermarkets, small shops and the open traditional markets.
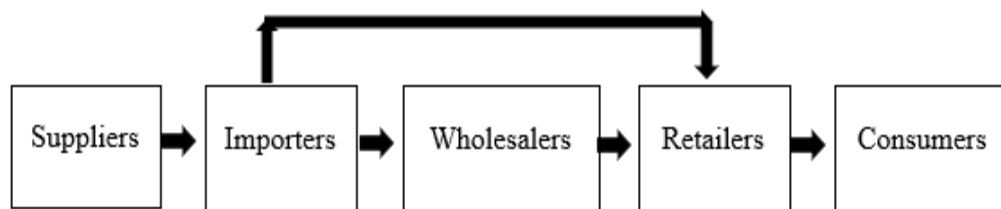
Figure 2.9: Imported rice marketing; Source; (Adu, 2018)

2.3.7 Rice Consumption and Quality Attributes

In Ghana, rice is mainly for food consumption Bawuah (2015) with about 76% of the total consumption accounted by those in the urban areas (CARD, 2010). Approximately 22% of rice consumption is from the Ashanti Region (Gates-Foundation, 2012). Those in the urban areas prefer rice to other Ghanaian staple foods because it is easy and convenient to cook. Nevertheless, consumers in the urban areas prefer high-quality rice. Due to this, only 20% of the local rice is

consumed in the urban centres (DFID, 2015). The standard measure of rice quality is based on percentage of broken kernel, organoleptic properties (smell, taste, and sight), co-mingled varieties and the share of chalky kernels. However, these quality attributes are dependent on the varietal features and environmental conditions during rice production, harvesting, processing and handling (Ayeduvor, 2018). Quality attributes preferred by the consumers are aroma, long-grain, white colour, taste, price, tenderness, cooking time, convenience and availability (Alhassan et al., 2015; Andam et al., 2019; DFID, 2015).

As illustrated in Figure 2.10, rice consumption increased steadily from 2005 to 2010 by approximately 113%. This is due to factors such as population growth, urbanization, a change in consumer diet, ease of cooking and the non-perishability nature of rice (Ayeduvor, 2018). The increase from 2011 to 2017 has been quite slow and this may be due to change in consumer habits.
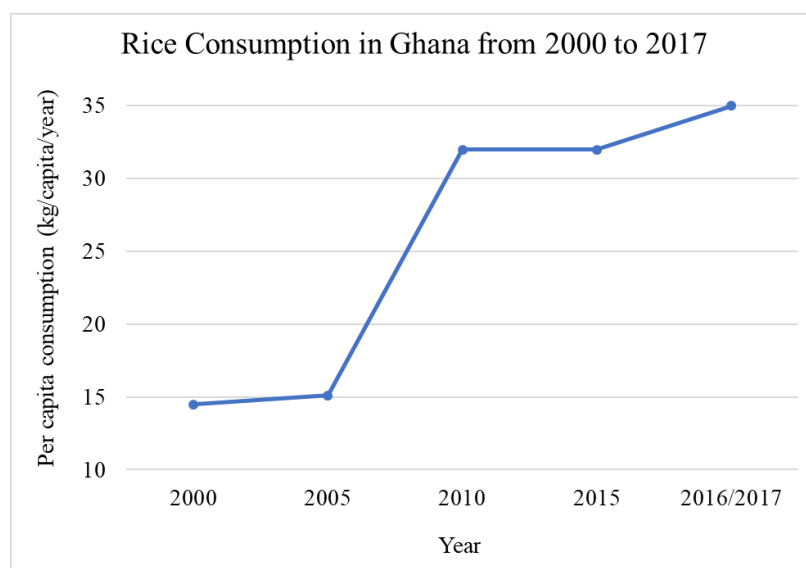
Figure 2.10: Rice Consumption in Ghana; Source: (MoFA, 2015)

Most Ghanaians consume rice more than once in week whether in the house or at the restaurant (Table 2.4).

Table 2.3: Frequency of Consumption

Frequency of consumption	At home (%)	Outside home (%)
At least once a day	20	11
More than once a week	55	36
About once a week	16	17
A few times a month	3	13
About once a month	4	6
A few times a year	1	10
Never	0	8

Source: (Andam et al., 2019)

2.3.8 Rice Imports

Ghana is a net importer of rice where between 2000 and 2017, import increased from 38,000 MT to 820,000 MT (Figure 2.11). Moreover, there was a vast increase in rice imports between 2000 and 2003 because the world market price for rice was exceptionally low leading to import surges mostly, in West African countries including Ghana. This happened because there was a high supply of rice in the world market, partly due to the massive support for production, processing and export of rice in developed countries like USA (Paasch, Garbers, & Hirsch, 2007). Most of the rice imported into the country come from the USA, Thailand, Vietnam, China, Pakistan, and India. Although 37% tax and levies are charged on imported rice, it has flooded the local market compared to the local rice (DFID, 2015; FFI & GAIN, 2016).

Figure 2.11: Rice imports into Ghana; Source: (UNComtrade, 2019)

2.3.9 Rice Price Trends

The imported rice generally gains a 16-30% premium compared to the locally produced rice. The price variation and consumers' willingness to pay is due to the quality attributes, origin, type of rice and location of the market. The retail price range for the local branded white rice is GHS5-GHS8 per kg compared to the imported rice which is between GHS7 and GHS10 (Ayeduvor, 2018). As seen in Figure 2.12, the price of paddy and milled rice was close from 2006 to 2010. However, the gap between the prices of imported, milled and paddy rice widened up after 2011 due to the increased demand of imported rice.

Considering the comparative advantage in rice production, processing and trading, the current import duty is 20% of Free On Board (FOB) price. The price of the imported high-grade rice is about US$ 650 per tonne and low-grade rice sells at US$ 530 per tonne. Relatively, the price of local milled rice sells at US$ 563 per tonne and then sold at about US$ 626 per tonne after considering other distribution costs (CARD & MoFA, 2009; FFI & GAIN, 2016).

18
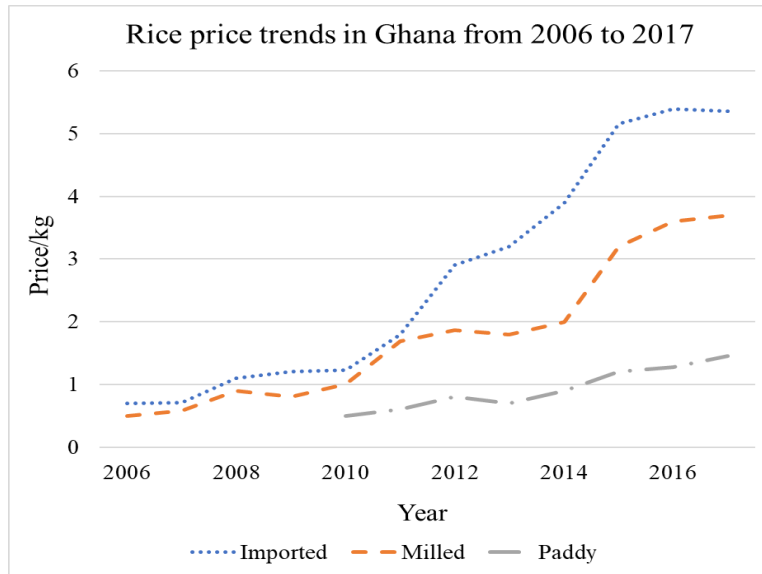
Figure 2.12: Wholesale prices of rice per kg; Source: (Adu, 2018)

2.3.10 Costs of Production: Local Rice Against Imported Rice

Although the price of local rice in Ghana is lower than imported rice, interestingly, the cost of production, marketing and milling in Ghana is rather higher than the cost incurred in the major rice supplying countries (Andam et al., 2019). A survey was done in 2013 by World-Bank (2013) where the cost of production in Ghana was compared with that of Senegal and Thailand. The results showed that, the cost of rice production in Ghana was higher than that of Senegal and Thailand (Figure 2.13). Andam et al. (2019) did a further study on this survey by considering the price and other specific costs incurred in the three countries (Table 2.5).
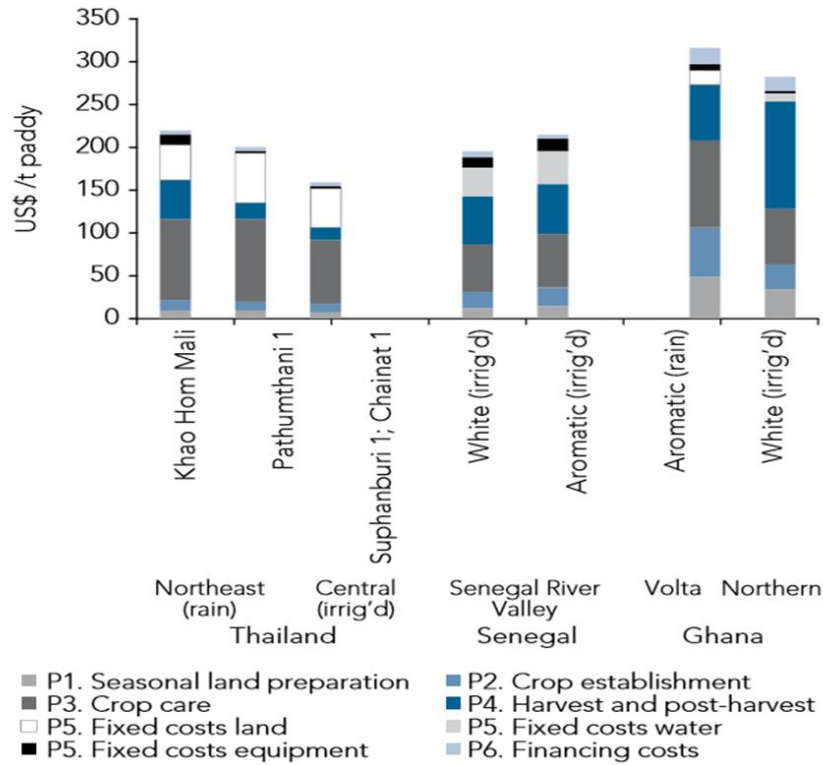
Figure 2.13: Production costs for rice in Ghana and Senegal benchmarked to Thailand; Source: (World-Bank, 2013)

Table 2.4: Comparison of costs to bring rice to retail markets in Ghana and Senegal and to the port in Thailand, 2011.

	Ghana		Senegal		Thailand		
	Volta	Northern			Northeast (rainfed)	Central (irrigated)	
	Aromatic (rainfed)	Non-aromatic white (irrigated)	White (irrigated)	Aromatic (irrigated)	Khao Hom Mali	Pathum thani 1	Suphanburi 1 Chainat 1
Total production costs (USD/MTpaddy)	316	283	194	216	220	201	159
Milling yield, percent	60	55	65	65	62	62	62
Total production costs (USD MT milled rice)	527	515	299	332	355	325	256
Farm-gate price	1111	548	444	1076	753	500	376
Total milling costs (USD MT milled rice)	296	98	63	63	87	95	93
Total marketing costs (USD MT milled rice)	154	130	83	83	136	74	66
Calculated value at retail (USD MT milled rice)	1562	777	591	1222			N/A
Calculated FOB price at port (USD MT milled rice)			N/A	1113	763		537

Source: (Andam et al., 2019)

Chapter 3: Literature Review

3.1 Introduction

The purpose of this chapter is to review relevant literature related to consumer trends, value chains and its approach, analysis upgrading options and value chain interventions for smallholder farmers or developing economies. This will help explore and provide more insights on value chains and relevant intervention strategies that developing countries apply to get quality products to compete against imported products and improve the life of smallholder farmers. The chapter is grouped into six main sections with subsections. The first section explains the concept of value chain and its related subtopics. Value chain constraints are highlighted in section two. Section three describes the theory of value chain analysis upgrading options with related subsections. Value chain performance is explained in section four while section five explains value chain intervention strategies that are applied especially, in developing countries in order to produce quality products for consumers. The chapter ends with a conceptual framework that has been employed for this study.

3.2 The Concept of Value Chain

The concept of value chain was developed in the 1960s and 1970s to help the analysis of mineral exporting countries but was first introduced by Michael Porter in 1985 to show a set linked of value-adding activities (Addison et al., 2015; Soosay, Fearne, & Dent, 2012). The concept serves as a business tool in analyzing and assessing the improvement of technologies and processes in single firms before being applied generally to supply chains and distributions (Addison et al., 2015).

Value chain is defined as the set of value adding activities that are interlinked from the supply of inputs through to the final end-use product, and delivered to the final consumer (Dekker, 2003). Value is the unique addition of attributes in a product or service that are significant to the consumer (Ensign, 2001). The activities comprise of production (integration of physical transformation and producer services/skills input), delivery, use and disposal by final consumers (Kaplinsky & Morris, 2000). For the purpose of this study, value chain is defined as a chain of activities (input, production, processing, marketing, distribution and consumption) linking producers and consumers where value is created, sustained or added to obtain the final product. The value chain approach helps to scrutinize the interrelationships between the actors involved in the marketing

22

channel. It also places emphasis on the significance of coordinating the linkages between the activities (Kaplinsky, 2000). The primary actors of the value chain are made up of the input suppliers, producers, traders, processors, transporters, wholesalers, retailers and final consumers, directly involved in the production of the products. Aside them, there are secondary actors like regulatory institutions that provide services to assist the primary actors (Addison et al., 2015; Trienekens, 2011).

According to Cucagna and Goldsmith (2018), the duties of the primary actors in agri-food sector is grouped into four main stages which are; inputs, production, processing and manufacturing, and delivery to the end user -consumer (Figure 3.1). Stage 1 entails the suppliers of agricultural products and services to farmers. Examples of such products and services are seeds, agro-chemicals and fertilisers, equipment, animal health and breeding. Value addition in this stage may be relatively low. Stage 2 consists of all activities involved in the production of raw materials such as crop and livestock products. At this stage, some firms either perform value added activities or sustain the value to earn additional revenue. Some of the production firms enter higher levels of vertical coordination such as contracts or vertical integration to improve efficiency and create more value. The third stage is the process of converting raw agricultural outputs into both branded or unbranded food and beverage products. Although the process or activities involved lead to an alteration of the appearance, nutritional value and contents of the raw commodities, value is added, and consumers also prefer higher quality and premium food products as their income increases. Companies at this stage therefore focus on the production of high-quality and differentiated products to gain a competitive advantage. The final stage involves the distribution, retail and food services serve to the customer. In this stage, one of the key drivers of innovation for the companies involved is by differentiating through service and retail brands to meet consumer preferences.
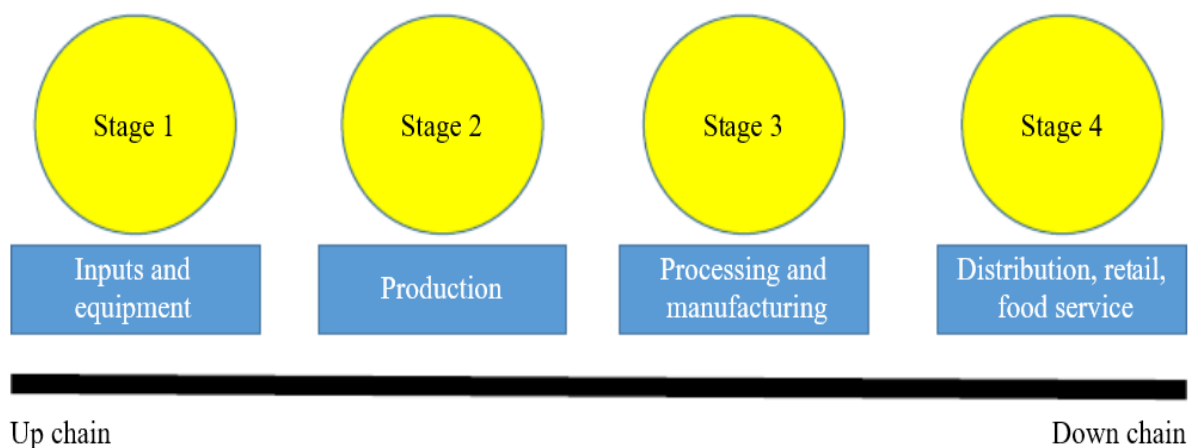
Figure 3.1: The four stages of the food and agribusiness value chain; Source: Cucagna and Goldsmith (2018).

3.2.1 Trends in Consumer Demand

It is vital to understand consumer value preferences in developing agri-food industries from all angles. This is because consumer value preferences change over time due to globalization, change in lifestyle and income growth. According to Badar, Ariyawardana, and Collins (2015), consumer value is mostly described as the net perceived benefits a consumer gains from using a product. Consumers have become quality conscious and have increased their standards as they consider many attributes when purchasing a product (Mitchell, Coles, & Keane, 2009). Attributes consumers consider before purchasing a product can be grouped into intrinsic and extrinsic quality attributes. Intrinsic attributes which can be measured on the product relate to the physical attributes of the products such as freshness, colour, and taste. On the other hand, extrinsic attributes which cannot be measured also relate to the safety of the product including food safety, ethics in production, provenance and marketing (Badar et al., 2015; Trienekens, 2011; Trienekens, Wognum, Beulens, & Van der Vorst, 2012). For companies to engage in the market opportunity of high-quality produce, produce preferred by consumers must be delivered since low-quality products attract low prices and are less competitive in the market (Fiamohe, Demont, Saito, Roy-Macauley, & Tollens, 2018; Stryker, 2013).

3.2.2 Trends in Consumer Demand for Rice

Before trade liberalization, rice consumers purchased only local rice. For instance, in the 1960s and 1970s, Ghanaians had access to only local rice but got exposed to different high-quality rice

products during the time of trade liberalization in the 1980s, making them prefer imported rice to local rice (Boansi & Favour, 2015). Factors that define urban consumers purchase decisions for imported rice are based on demographic factors and rice quality attributes.

3.2.2.1 Demographic Factors

Factors that determine the purchasing behavior of rice consumers are different irrespective of their location. Some of the factors are marital status, gender, age, employment, occupational status and household number (Alhassan et al., 2015; Musa, Othman, & Fatah, 2011).

3.2.2.2 Rice Quality Attributes

Consumer preference for rice differs from country to country. Rice consumers in USA prefer rice with specific cooking types and processing features whereas Europeans prefer long grain rice with no aroma. Yet, those in the Middle East prefer long grain rice with extremely strong aromatic well-milled rice. The Japanese prefer well-milled and fresh short-grain Japonica rice, but consumers in Thailand prefer well-milled and long grain Indica rice (Musa et al., 2011).

Studies on consumer preferences in West Africa showed that more than 70% of rice consumers at the urban centers prefer imported rice to local rice due to low-quality attributes of the latter. The attributes preferred by most consumers are white color, flavour, aroma, cleanliness and swelling capacity, taste, price, location, availability, grain shape, stickiness, hardness, cooking time and packaging (Suwansri, Meullenet, Hankins, & Griffin, 2002). For example, studies in Togo, Nigeria and Ghana showed that consumers consider the above attributes (especially cleanliness, whiteness, taste, swelling capacity, availability and grain shape) when making purchasing decisions (Alhassan et al., 2015; Fiamohe, Nakelse, Diagne, & Seck, 2015).

Though the price of imported rice is higher than the local rice due to high import duties on imported rice FFI and GAIN (2016), consumers do not purchase local rice because of poor post-handling, generally perceived poor quality and its scarcity (Diako, Sakyi-Dawson, Bediako-Amoa, Saalia, & Manful, 2010). Nevertheless, rice consumers were willing to pay a premium as high as 46% of the actual price for cleanliness and 53% for whiteness for the locally produced rice (Fiamohe et al., 2015). Interestingly, rice consumers purchase local rice more than imported rice in countries like Malaysia because it is of high-quality, better nutritional qualities and inexpensive (Musa et al., 2011).

25

3.2.3 Mapping Value Chains

To understand the physical flow of commodities along the chain from producers to consumers, there is the need to map the value chains. The theory of value chain mapping is described to be simple in theory, but very complex in reality. Mapping the value chains shows the activities that are necessary for an existing product or service, from conception stage, through to the various stages of production until delivery to the final consumer (Kaplinsky & Morris, 2000). As illustrated in Figure 3.2, the rice value chain in Africa consist of many actors namely; input suppliers, farmers, processors/millers, traders, wholesalers, retailers and consumers (Diakité, Cook, White, & Jaeger, 2012).
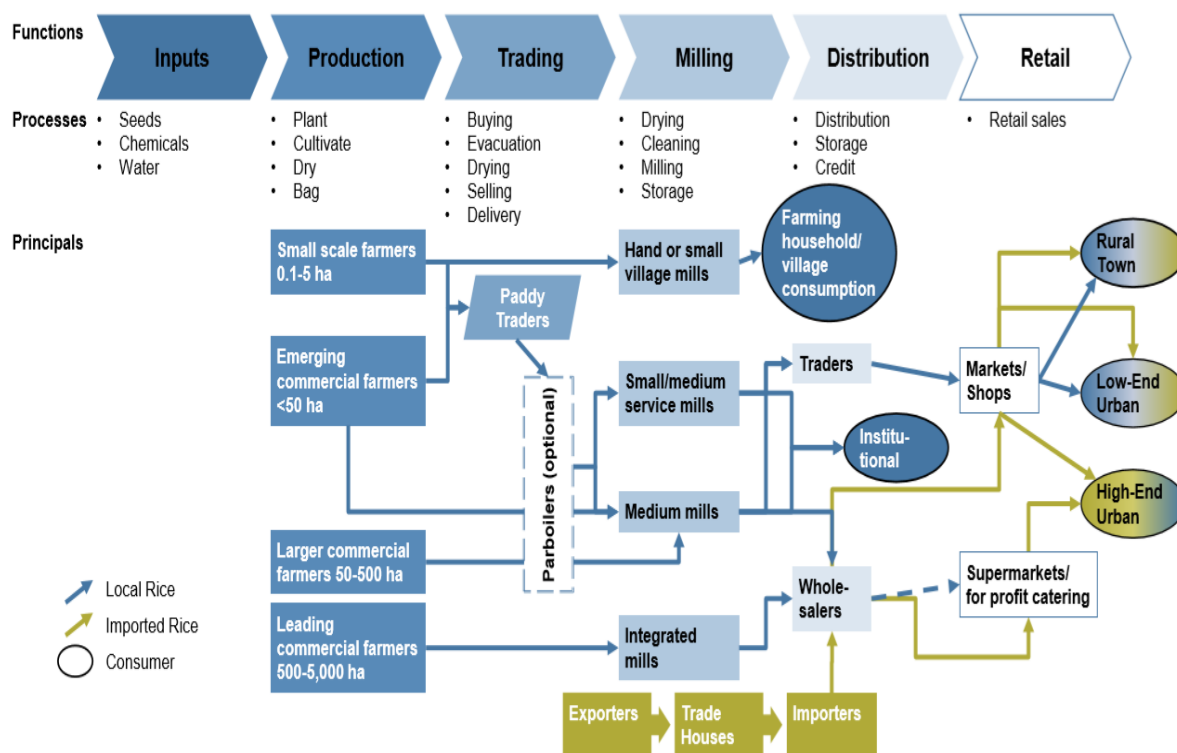
Figure 3.2: A map of generalized rice value chain in Africa; Source: (Diakité et al., 2012)

According to Trienekens (2011), after mapping the chains in the value chain framework, the value chain constraints are examined and the opportunities are redefined. The final stage is to identify areas where value chain interventions can be used based on the constraints and opportunities ascertained. The author also suggested three key components of value chain analysis/upgrading options including: value-added/created, network structure and governance structure (Figure 3.3).
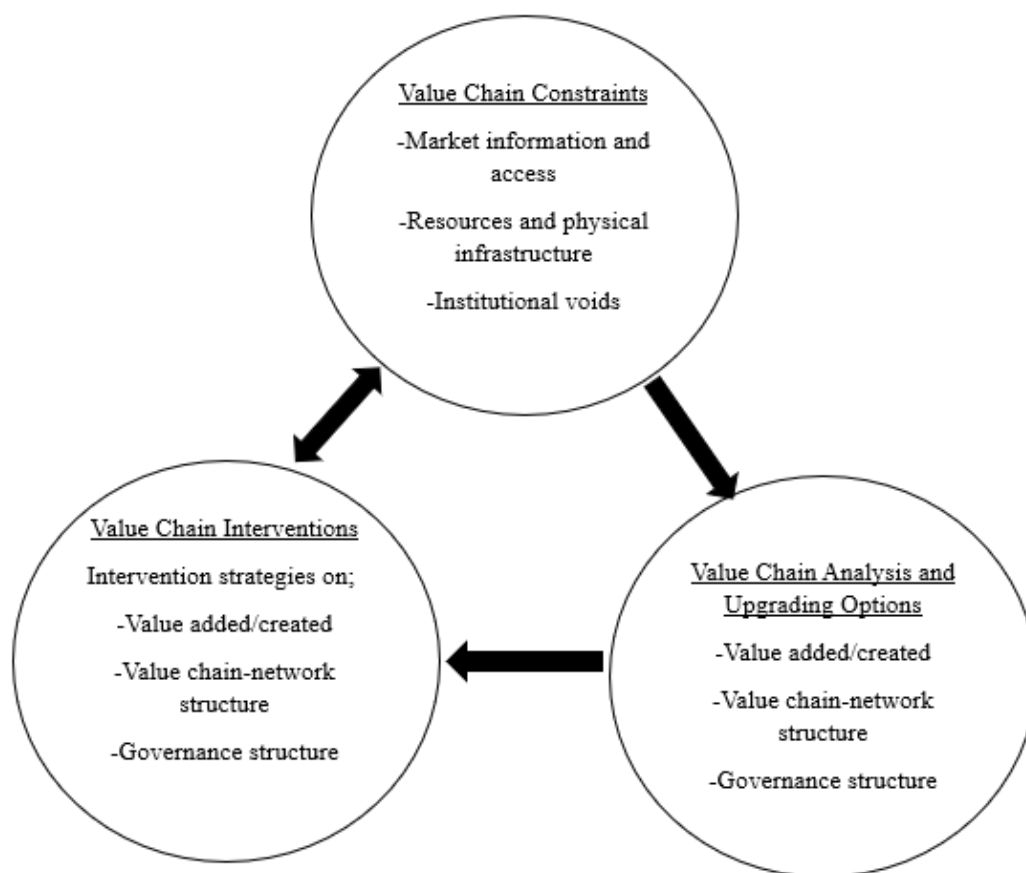
Figure 3.3: Value Chain Analysis Framework; Source: Modified based on Trienekens (2011)

3.3 Value Chain Constraints in Developing Countries

The major constraints for value chain development relates to market access (local, regional, international), available resources and physical infrastructures and institutions (regulative, cognitive and normative) (Trienekens, 2011).

3.3.1. Market Information and Access

Market access is one of the key constraints for smallholder farmers that have low output as it is difficult to meet quality requirements and frequent supply required by the market. Due to this, many smallholder farmers normally sell their produce using the traditional market instead of the modern markets (modern food retail and wholesale markets) which may have offered them high profit or income (Maspaitella, Garnevska, Siddique, & Shadbolt, 2018). Market access is influenced by market orientation and market knowledge. Therefore, producers ability to translate

market information to market intelligence can make them have differentiated market channels and deliver what consumers want (Trienekens, 2011).

Many studies have documented that difficulty in securing market information is partly a reason of the market constraint. For example, A study in Tanzania revealed that lack of market information, quality demand and mistrust by farmers reduced farmers full access to the market (Marijani, 2018). Likewise, a survey in Nigeria by Asogwa, Abu, and Onkpe (2014) indicated that, 74.63% of the respondents faced a major constraint in their quest to access marketing information due to the high cost involved in accessing information. Aside market information, other market constraints that value chain actors face include their inability to meet key requirements such as price, quality and safety preferred by consumers.

3.3.2 Resources and Physical Infrastructure

In developing countries, value chain actors ability to sell their products partly depends on supporting infrastructures and resources (Trienekens, 2011). Many companies in developing countries lack specialized skills, difficulty in accessing technology, information, market, inputs and credit facilities which constrain value chain development (Giuliani, Pietrobelli, & Rabellotti, 2005). In Ghana, smallholder farmers access to loans and credit facilities is limited because the financial institutions perceive agriculture production to be a risky venture. There is also high interest rate and collateral equipment demanded by the financial institutions (Osei-Asare, 2010).

Resources and physical infrastructure constraints can be grouped into four levels:

Firstly, low level constraint is related to inadequate availability supply of input materials for production and post-production stage (Trienekens, 2011). The input materials include access to seeds, storage facilities and processing equipment. It has been reported that rice farmers in Nigeria, Ghana, Tanzania and Burkina Faso are faced with insufficient supply of good seeds and inadequate availability of better processing equipment (Osei-Asare, 2010; Rogers, 2012). This has led to the production of low-quality local rice compared to imported rice, enhancing consumers' preference for imported rice. Second level constraint relates to the geographic position of value chain companies. Companies far from high-value or targeted market, may not be able to compete efficiently in the market (Trienekens, 2011). Studies on user-producer interaction indicates that as the distance between producers and consumers widen up, the amount of information shared

between them decreases (Cornish, 1997). Value chain actors proximity to markets and clients may contribute to enhancing the development of design capabilities (Giuliani et al., 2005).

Thirdly, limited educated labor and knowledge at production, distribution, and marketing levels are among the major constraints farmers in developing countries face. The fourth category relates to the level and unavailability of technology that may be used for production and distribution operations in the value chain (Kumar & Roy, 2014).

3.3.3 Institutional Voids

Institutional voids is defined as "situations where institutional arrangements that support markets are absent, weak or fail to accomplish the role expected from them" (Mair & Marti, 2009, p. 1). The institutions comprise of regulative, normative and cognitive (Trienekens, 2011). Regulative focuses on government regulations, legislations and policies that firms must follow. These institutions can constrain value chain development by ignoring infrastructural development, setting trade barriers for production materials and imposing unfavourable taxes. Normative institutions relate to the practices, policies and ethical standards of businesses. They have a significant effect on the chain through limiting the value-adding and profit orientation in the chains (Markelova, Meinzen-Dick, Hellin, & Dohrn, 2009). Value addition in value chain can be improved or reduced based on the practices and relationship characteristics of the firms. Cognitive institutions relate to how people interpret things happening around them based on rules. Their ineffectiveness can prevent the use of innovation strategies in processes and/or products, limit the free flow of information and knowledge along with good relationships between firms (Trienekens, 2011).

In most developing countries, farmers are unable to engage fully in market participation due to weak or lack of supportive institutions (Mair & Marti, 2009). For instance, rice farmers in Ghana have limited knowledge on good modern practices in rice production due to weak agricultural extension services. This therefore makes some farmers unable to participate fully in the market because they produce low-quality rice (Addison et al., 2015).

3.4 The Theory of Value Chain Analysis (VCA) and Upgrading Options

Value chain analysis is a diagnostic tool used to identify opportunities along the value chain which draw the attention of stakeholders, and ensure continuous improvement in the chain (Soosay et al., 2012). It helps in understanding the policy environment that enables the efficient allocation of resources within a country and it is mostly useful for new producers and developing countries aiming to attain a sustainable income growth in the global market (Kaplinsky & Morris, 2000). Upgrading value chains on the other hand is defined as "the shift from lower- to higher-value economic activities by using local innovative capacities to make continuous improvements in processes, products and functions" (McDermott, 2007 p. 104). It is where value chain actors engage in activities that improve their performance and position in the chain consequently increasing their benefits and decreasing their exposure to risk (Bolwig, Ponte, Riisgaard, du Toit, & Halberg, 2013). Upgrading becomes successful when economic, social, institutional and geographic resources or capabilities are organized at the local, regional and national levels (Murphy, 2007).

According to the value chain analysis framework developed by Trienekens (2011), value chain analysis and upgrading are divided into three components namely; value added, chain-network structure, and governance structure.

3.4.1 Value-Added/Created

Value addition focuses on the creation and flow of value at each level in the chain by channeling investments and resources from unprofitable activities to critical activities (Morris & Kaplinsky, 2001; Soosay et al., 2012). Value addition considers intrinsic and extrinsic characteristics which have been discussed earlier. Opportunities that could drive a company to add value to their produce may depend on market size, market diversity and technological capabilities. Upgrades in value addition of products are mostly related to consumer preferences and the amount of value added is reliant on the final consumer's willingness to pay (Trienekens, 2011). Upgrading of value-added production centres on upgrading of processes, products, functional and inter-sectoral or the chain.

3.4.1.1 Process

Process upgrading is where inputs are transformed into outputs in an efficient way by either re-organizing the production system or introducing better or new technologies. It relates to doing the same thing but efficiently (Humphrey & Schmitz, 2000). It is driven by competition, cost reduction and increasing output to improve production efficiency. For example, meeting delivery schedule times and increasing production volumes (Pietrobelli & Staritz, 2013). This enables firms to gain a competitive advantage to meet consumers preferences (Zokaei & Simons, 2006). In the agri-food sector, a form of process upgrading is the practice of Global-GAP, which promotes production standards and storage. Good agricultural practices involve using pesticides, post-harvest handling, transportation and sanitation to ensure the sustainability of agricultural practices and support food safety and security (FAO, 2003).

3.4.1.2 Product

Product upgrading is where a company either introduces new products or improves existing products in a more effective and efficient way than its competitors (Morris & Kaplinsky, 2001). It is normally motivated by changes in the requirements of lead firms and consumer preferences in relation to product quality and standards (Pietrobelli & Staritz, 2013). Therefore, it considers that consumers' requirements for attributes such as product quality, packaging and food safety standards are delivered in both the local and international markets (Bolwig et al., 2013; Neilson & Pritchard, 2011). A study on consumer preference for mango in Pakistan indicated that consumers consider taste, value and safety standards when purchasing mangoes (Badar et al., 2015). Therefore, it is prudent that agricultural producers maintain their market access through product upgrading.

3.4.1.3 Functional

Functions in the value chain include upstream activities, middle-end activities and downstream activities. This form of upgrading is where a new function within the value chain is added. Upstream functions relate to activities that involve design and research, provision of inputs, finance and services (Mitchell et al., 2009). Middle-end functions involve activities that are related to manufacturing and logistics. Downstream functions focus on activities that add value to the product for the final consumer, either through production or customization such as marketing, branding and advertising (Hernandez & Pedersen, 2017). This form of upgrading

31

mostly leads to vertical integration consequently, increasing coordination (Bolwig et al., 2013). Functional form of upgrading is rarely applied in developing countries since most producers are commodity suppliers for western value chain partners. Nevertheless, market-oriented activities must be applied across the chain because the demand for agricultural products in the market has become more dynamic (Trienekens, 2011).

3.4.1.4 Intersectoral

This form of upgrading is where a firm enters a completely different value chain or business using knowledge and skills gained from producing other products or services (Rabellod, 2014). They introduce value adding activities from a different sector to offer new products or services. For example, a farmer who engages in tourism activities (Trienekens, 2011). Notwithstanding, to be successful in the new industry or business, firms may require multiple upgrading strategies at the same time or in sequence (Rabellod, 2014).

3.4.2 Value Chain-Network Structure

The structure of the network normally depends on the market channel(s) chosen by the different parties (Trienekens, 2011). There are sets of activities within each of the value chain link. The activities are mostly indicated as a vertical chain, but intra-chain linkages are normally of a two-way nature. Hence, firms are not only affected by the nature of the production process and marketing, but are in turn controlled by the limitations in these downstream links in the chain (Kaplinsky & Morris, 2000). The chain-network structure has vertical and horizontal dimensions and their upgrade deals with improving horizontal and vertical relationships to ensure the participation in the right market channel. The vertical chain relates to the flow of goods and services from the farmer/producer to the final consumer. Improvement of vertical chain leads to vertical coordination. Examples of vertical coordination are when smallholder farmers enter into contractual agreements with downstream buyers to reduce transaction costs and gain other benefits associated with using contracts (Abdul-Rahaman & Abdulai, 2018; Bolwig et al., 2013).

On the other hand, the horizontal chain shows the relationships between the actors in the same stage of the value chain (example, relationships between processors, between farmers, etc.) (Coltrain, Barton, & Boland, 2000; Trienekens, 2011). In most developing countries, improving horizontal relationships are done by forming farmer groups, cooperatives or producer

associations where members engage in joint purchasing of production inputs, facilities usage and marketing (Trienekens, 2011). They can also get access to information and knowledge on modern practices and have a higher bargaining power with middlemen (agents) (Roy & Thorat, 2008). Farmers who engage in collective action can also build a competitive advantage, enhance production capacity and product quality. It also enables actors to capture potential value along the chain since the number of intermediaries decreases when actors work together and may build trust among actors (Ahmad, 2017). The chain network could make the value chain development slow if not upgraded (Trienekens & Willems, 2007).

Figure 3.4 illustrates the interrelationships between the vertical and horizontal dimensions in value chain. Vertical relationships either show all or part of the stages in the chain while horizontal relationships between chain actors could be different forms such as farmer cooperatives or price agreements between traders (Lazzarini, Chaddad, & Cook, 2001).
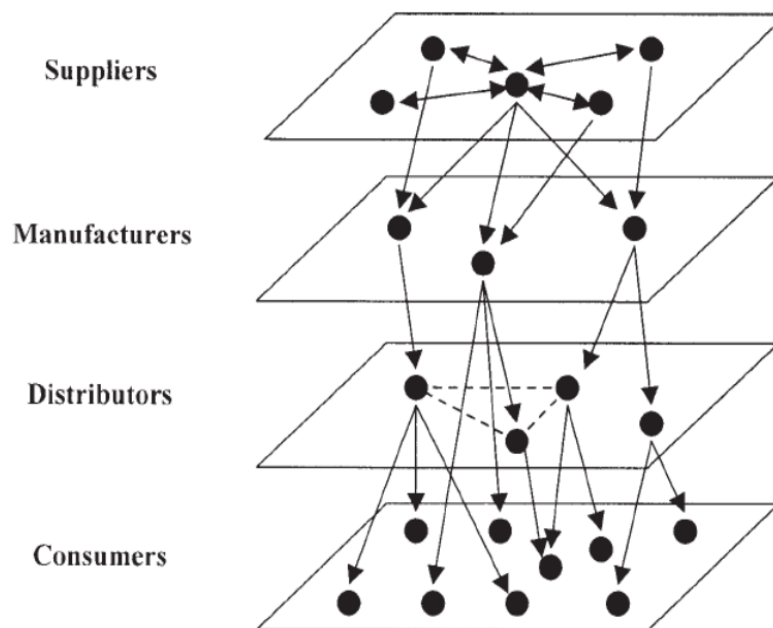
Figure 3.4: An example of a generic net chain; Source: (Lazzarini et al., 2001)

3.4.3 Governance Structure

Governance is defined as "authority and power relationships that determine how financial, material, and human resources are allocated and flow within a value chain" (Hernandez &

Pedersen, 2017 p. 140). Governance includes relationships among chain actors which may be institutions, rules, policies or processes that may influence the management and control of a supply/value chain (Simatupang, Piboonrungroj, & Williams, 2017). Governance structure describes institutional arrangements where transactions are bargained, implemented and performance is improved in an uncertain environment. Efficient governance structure is seen when businesses are able to reduce production and transaction costs considering the institutional environment (Kataike, Molnar, De Steur, & Gellynck, 2019). Governance structures can be categorized into three forms, namely, spot market, vertical integration and a combination of the two forms such as contract and partial ownership (Kataike et al., 2019; Phoo, 2019). Upgrading of governance structures focus on the ability of value chain actors to build relationships and reduce transaction costs. In food chains, key aspects considered to build business relationships are quality standards and certification which are mostly included in contracts (Trienekens, 2011).

Value chain governance is also a key concept to value chain analysis since it indicates the level of power between the value chain actors and can be defined as a non-market coordination of economic activity where direct exchanges of information between businesses take place (Gereffi & Kaplinsky, 2001; Humphrey & Memedovic, 2006). The control over key resources needed in the chain, decisions about entry to and exit from the chain, and monitoring of suppliers by the lead firms can influence the products that need to be produced. Chains differ significantly based on how strong governance is exercised and the concentration of governance in the hands of either single firms or lead firms (Gereffi & Kaplinsky, 2001).

3.5 Value Chain Performance

One key component of VCA is to indicate the level of performance of the value chain, and how it can be improved. Factors that show performance of a value chain are efficiency, flexibility, responsiveness, quality and safety. All these can be realized if governance structures of the chain are managed well (Kataike et al., 2019). Ensuring good performance of the chain requires the effort of the chain actors and those external to the chain (Macfadyen et al., 2012). Chain actors can improve performance of the chain by improving the quality of their produce and being more efficient to enable cost reduction (Riisgaard et al., 2010). Factors such as policy, institutions and infrastructure have effect on the ability of producers to engage in their primary

activities such as acquiring inputs, producing and marketing of their products. Governments and other parties outside the value chain can support to improve the performance of the value chain through their influence on policies, subsidies, transport infrastructure and enforcement of regulations (Singh & Zhao, 2016).

3.6 Value Chain Interventions (VCI) - Empirical literature

Value chain intervention also known as value chain development is defined as "an effort to strengthen mutually beneficial linkages among firms so that they work together to take the advantage of market opportunities" (Hainzer, Best, & Brown, 2019 p. 370). Interventions centre on developing the value chain to address constraints, create and distribute value for the poor producers (McKague & Siddiquee, 2014). The primary aim of VCI is to develop upgrading strategies based on mapping the value chains and identifying the value chain drivers, governance structures, constraints and opportunities (Pietrobelli & Staritz, 2013).

Value chain intervention is key to developing economic and social issues. Therefore, it has become significant in developing strategies for governments, donors and NGOs. It has been reported that, VCI has yielded positive results within development contexts to improve economic growth, enhanced industry competitiveness and reduced poverty (Hainzer et al., 2019). It focuses on either global value chains (aims at developing distribution chains into the global market) or local value chains (dominated by only smaller chain actors without global links). However, literature centres more on global value chain interventions specifically on; reconfiguring value chains to assist smallholders, innovation creation and upgrading in developing countries (Hainzer et al., 2019). Nevertheless, local value chain interventions place emphasis on improving producers' capacity, increasing the flow of knowledge and resources and developing opportunities in the market (Humphrey & Navas-Alemán, 2010). For the purpose of this study, the focus would be on local value chains. Characterization of strategies in value chain is either done by type Mitchell et al. (2009) or by the components of the chain they aim to develop. Classifying strategies by type describes its rationale from the general point of view of value chains whether local or global markets (Hainzer et al., 2019).

Based on the value added and upgrading options in the previous section, the sections below give evidence of intervention strategies that could be applied to develop a value chain. Value added/created strategies centre on process, product, functional and intersectoral.

3.6.1 Value-Added/Created

3.6.1.1 Process

Intervention strategies applied in most developing countries in process upgrading focused on the use of improved technologies and management to develop the production and post-harvest stage of the value chain (Bolwig et al., 2013). Interventions on GAPs at the production level include using improved planting techniques, harvesting materials on time and appropriate investments like irrigation infrastructure. Likewise, interventions at post-harvest handling include threshing, sorting and cleaning. These interventions have shown an increase in farmers yield and quality (Mitchell et al., 2009). HpA study on adoption of rice technologies and GAPs in Philippine showed that, adoption of certified seed technology and use of machines by farmers improved rice yield which led to an increase in income (Mariano, Villano, & Fleming, 2012). A similar observation was made by Gebey et al. (2012) in Ethiopia. Farmers in Ethiopia used to produce poor quality rice due to poor agricultural practices and post-harvest handling. However, using quality seeds and ensuring GAPs such as weed control, pest and disease control by rice farmers led to an increase in yield.

Another study on upgrading coffee production in Brazil indicated that farmers earn high productivity and high-quality coffee products after adopting certification standards on good agricultural and management practices such as pest control, fertiliser usage. In addition, they ensured post-harvest handling such as storage and drying of the coffee (Piao, Fonseca, Carvalho, Saes, & de Almeida, 2019). Apart from the role of farmers to deliver quality produce, support from the government or NGOs can contribute to the development of the production and post-harvest stage of the value chain. For example, an establishment of a warehouse in the Northern Region of Ghana by an NGO helped rice and maize farmers to improve the quality of their grains and reduced post-harvest losses (Kolavalli, Mensah-Bonsu, & Zaman, 2015).

3.6.1.2 Product

Strategies to upgrade a product are based on improving the quality and standard of a product in order to meet consumer preferences and market requirements. It focuses on enhancing intrinsic and extrinsic attributes such as producing a quality product, packaging and ensuring safety of the product through cleanliness. Hence, product upgrading deals with processing and market-related activities in the value chain such as using high-standard machines and improved technologies (Bolwig et al., 2013; Pietrobelli & Staritz, 2013). For example, to deliver high-quality rice, the government of Rwanda and other investors replaced hullers/hand pounding with modern equipment consequently, improving the quality of the local rice (Stryker, 2013). Additionally, to improve the quality of milled rice in Ethiopia, different sieve sizes of grading machines with the aim of separating the fractured grains from the full grain were introduced. This resulted in high demand for rice by restaurant owners and individual consumers (Gebey et al., 2012).

Product upgrading is critical because there is ascendency of competition in the rapidly changing markets. As such, for products to stay in the market, the products must meet market requirements (Nutz & Sievers, 2015). This can be done by testing new varieties of products to meet consumer preferences (Horton et al., 2010). Also, policy makers should aim at creating enabling environment by establishing post-harvest technologies to improve drying, storage, processing, cleaning and sorting (Demont, Fiamohe, & Kinkpe, 2017).

3.6.1.3 Functional

Strategies under this form of upgrading option cut across the whole value chain from input supply to retailing. Applying strategies under this form of upgrading help producers or companies to add value to their produce as actors engage in high value activities than low value activities (Staritz, Gereffi, & Cattaneo, 2011). This therefore brings improvement to companies' or actors' position in the chain (Mitchell et al., 2009). For example, in developing capacity for agricultural market chain in Uganda, product innovations were made to develop downstream activities to improve the quality of potato products. As such, potato processing enterprises were able to improve the quality, packaging and labelling of the products leading to a significant increase in sales (Horton et al., 2010). Another issue of concern is production and markets' failure which can be addressed through vertical integration into the market chain as had been

observed by most farmers in developed countries like USA, Germany, Japan, France and the Netherlands (Phoo, 2019).

3.6.1.4 Intersectoral

Here, strategies focus on value chain actors' ability to use acquired knowledge and skills gained in production in another or a different value chain. A typical example was seen in Taiwan where in the early stages of specializing in labour-intensive clothing, they had a structural transformation towards electronics and electrical machinery in 1980. In 1988, they were ranked third in the world for computer production (Guerrieri & Pietrobell, 2004).

3.6.2 Value Chain-network Structure

As indicated in the previous section, interventions under this form are based on developing the horizontal and vertical relationships. One way to build chain network is for farmers to work closely with extension officers. That way, they would be trained on specialized skills, educated on GAPs and networking to improve production. As such, the performance of the value chain can be improved through the stimulation of the mindset of the farmers and building relationships along the chain. This has been successful in rice production in Ethiopia Gebey et al. (2012) and maize production in Nigeria (Ladele, Akinwale, & Oyelami, 2016). Nonetheless, lack of trust which is indicated to be a barrier to relationship development among actors can be tackled by enhancing linkages and engaging in forward-buying contracts to farmer groups. This strategy has been successful in Liberia where rice production and quality was improved (Rutherford, Burke, Cheung, & Field, 2016).

Again, relationship could be developed among chain actors when they work closely by forming farmer groups, cooperatives or producer associations. Through that, members can engage in joint purchasing of production inputs, facilities usage and marketing (Trienekens, 2011). Building strong relationships enable actors to secure contracts which in turn reduce their transaction costs and increase income. All these improved the performance of the chain. In the Northern part of Ghana, smallholder rice farmers who engaged in written contractual terms with downstream buyers reduced transaction costs and significantly increased their net farm income by 8.10% (Abdul-Rahaman & Abdulai, 2018).

3.6.3 Governance Structure

Interventions on upgrading governance structures used by most developing countries focus on efficient resource flow and allocation within the chain to reduce production and transaction costs (Hernandez & Pedersen, 2017). These interventions enabled companies to reduce their cost of production and improve performance. An empirical study by Ji, de Felipe, Briz, and Trienekens (2012) in China showed that industries engaged in long-term contract and vertical integration and built stable relationships helped actors to reduce transaction costs. At the same time, through collaboration, they improved mutual advantages regarding quality management, logistics and technological renovation.

Apart from that, in the case of Ghanaian pineapples and South Africa grapes, building long-term relationships among chain actors led to creating stronger governance structure which also helped them to acquire capital to support their businesses. Moreover, it helped the actors to acquire internationally recognized certification for their products (Trienekens & Willems, 2007).

3.7 Conceptual Framework

A conceptual framework is defined as the interrelation of concepts to explain or predict a phenomenon which is under an investigation (Berman, 2013). It also gives a concept map for investigating a research problem by linking all the relevant concepts (Leavy, 2017).

According to literature, the trends in consumer demands and preferences depend on a lot of factors which inform their decisions when purchasing a product (Badar et al., 2015; Trienekens et al., 2012). This means that, for producers to meet the market requirements of consumers, they must ensure their products meet such requirements. Consumers consider both intrinsic and extrinsic features when purchasing rice. As already discussed, the intrinsic attributes (physical attributes) consumers consider are freshness, variety, colour, taste, size and tenderness whereas the extrinsic factors are food safety, provenance, ethics in production and attributes that relate to marketing along the entire value chain (Badar et al., 2015; Trienekens et al., 2012). In the case of rice, urban consumers prefer high-quality rice which constitutes both intrinsic and extrinsic attributes. The intrinsic attributes they prefer are taste, aroma, grain shape, cooking time and cooking quality whereas the extrinsic factor is cleanliness, which is categorized under food safety (Alhassan et al.,

2015; Asante et al., 2013; Ayeduvor, 2018; Fiamohe et al., 2015; Musa et al., 2011; Suwansri et al., 2002). This shows that, for chain actors to meet the high-quality demand of urban rice consumers, they must deliver rice that meet both intrinsic and extrinsic attributes preferred by the consumers. These attributes are attained based on the activities of the chain actors such as the type of inputs (seeds) used, how production and processing are done and trading.

Value chain interventions that can be used to improve a product and deliver both intrinsic and extrinsic attributes mainly base on process and product upgrading. The interventions focus on input supply, production interventions such as using high-quality variety for planting and GAPs, processing interventions including the use of advanced post-harvest and processing technologies such as the use of high-standard processing machine (Fiamohe et al., 2018; Gebey et al., 2012; Mariano et al., 2012; Stryker, 2013). Also, upgrading of value chain-network structure and governance structure will develop both horizontal and vertical relationships to create enabling environment for the chain actors to deliver quality products to urban consumers (Gebey et al., 2012).

Based on this, the following research conceptual framework is developed, as illustrated in Figure 3.5.
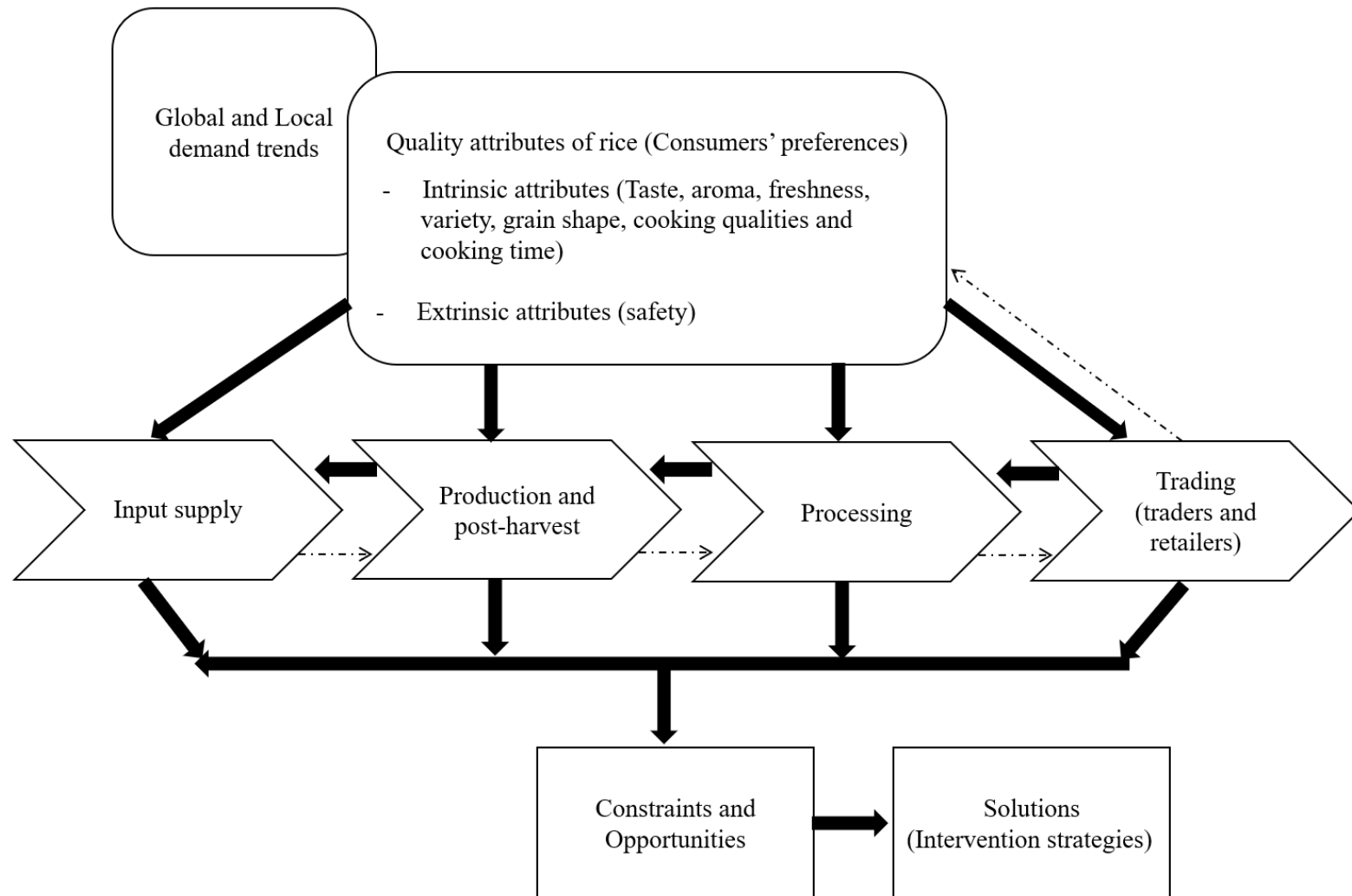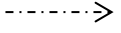
Figure 3.5: Framework adopted for the study

Note: ⟩ = Functions/Generic value chain

➤ = Value flow

--·--·--> = Commodity flow

☐ = Rice demand and attributes

☐ = Key constrains and opportunities along the chain, and its related intervention strategies.

3.8 Chapter Summary

The chapter provided a comprehensive review on value chain development. The review covered the concept of value chain, VCA, constraints and opportunities, value chain upgrading options and the related intervention strategies that have been applied and proved successful in most developing countries. It can be deduced from the literature that value chain can be developed to deliver high-quality produce based on several factors. These factors focus on identifying the quality attributes for global and local demands, identifying the constraints and opportunities along the value chain and developing intervention strategies to address the challenges. A conceptual framework is also presented in this chapter to guide the empirical analysis of the study.

Chapter 4: Research Methodology

4.1 Introduction

This chapter presents the research methods employed in the study. The chapter starts with the research approach, followed by the research method. It then describes the specific study area in Ghana where the research took place as well as the rationale behind its selection. The sampling approach and participants selected for the study are presented along with the tools that was used for data collection, data analysis techniques and the proposed steps for the study. Lastly, ethics that needed to be considered in the study are highlighted.

4.2 Research Approach

Depending on the purpose of a study, research can be grouped into three categories: explanatory, exploratory or descriptive (Saunders, Lewis, & Thornhill, 2012). The authors further explained that, the aim of descriptive research is to observe and give detailed documentation on a phenomenon. In addition, it describes social systems, relationships that exist between events and give background information about the problem that is being addressed. Explanatory research describes a phenomenon and explains why it is so. It attempts to find explanations of a phenomenon or problem under study. Lastly, exploratory research, as the name implies, intends to explore a phenomenon or problem to know and understand the nature of the problem and gather some initial ideas, since it is mostly used when little or no research has been done on the study. This study can be classified as an exploratory study, since it involves collecting data on how the local rice value chain functions and how it can be improved to meet urban high-quality rice demand through value chain interventions in the Ashanti Region of Ghana. An exploratory approach was used in a similar study on rice value chain development in Ghana (Addison et al., 2015).

4.3 Research Method

The two main types of research methods that are widely used for data collection are quantitative and qualitative (Kumar, 2019). Bhattacherjee (2012) argued that, researchers may either adopt a quantitative, qualitative, or mixed methods strategy. According to Clark and Creswell (2014), the choice of research design is dependent on the research objectives, the expertise of the researcher and the intended audience for the study. The quantitative method is associated with a deductive approach that tests a theory and mostly deals with numbers or facts. However, the qualitative method is mostly associated with an inductive approach to build a theory. In addition, it allows the

43

existence of multiple subjective perspectives and seeks to construct knowledge rather than trying to "find" it in "reality" (Bhattacherjee, 2012; Greener, 2008). According to Martin and Bridgmon (2012), the quantitative approach is more subjective compared to the qualitative approach. However, Wilson, Kenny, and Dickson-Swift (2018) argued that the quantitative method is more restrictive and does not allow the research participants to express their opinions.

Many studies on value chain development used the qualitative approach to gather enough information on the various actors in the value chain, analyze and map the value chains (Addison et al., 2015; Mutebi Kalibwani et al., 2018; Phoo, 2019 ; Wang, Somogyi, & Charlebois, 2019). The approach gave the researchers an explanation and in-depth knowledge on what really happened, rather than a generalization. It enabled the researchers to gain a deeper understanding of the value chains by closely engaging with the chain actors.

After considering the value chain studies indicated above, a qualitative approach was employed for this study. The goals were, to identify the quality attributes preferred by urban consumers, map the current rice value chain, and identify the major constraints and opportunities; along with identifying interventions that can improve the local rice value chain to meet the urban high-quality rice demand in the Ashanti Region of Ghana.

4.4 Study Area

The study was conducted in the Ashanti Region of Ghana. The region lies in the southern half of the country and occupies 24,389 sq. km representing 10.2% of the total land area of Ghana. It is the third largest region and shares boundaries with the Central, Eastern, Western and Brong-Ahafo Regions (GSS, 2013). More than half of the region, the south-western part, is in the semi-equatorial forest zone and the remaining, the north-eastern part lies in the savanna zone. These zones are characterized by a bi-modal rainfall pattern, the major season is from April to mid-August while the minor season begins in September and ends in November (GSS, 2013). The annual rainfall ranges between 1500 mm and 1600 mm with an average of 1550 mm per annum. The major food crops cultivated in the zone are rice, roots and tuber crops, such as cassava, yam, cocoyam, plantain and sweet potatoes. Rice cultivation is basically in inland valleys (MoFA, 2016). A high percentage of rice cultivation in the region is rain-fed due to its bi-modal rainfall pattern (Bawuah, 2015). In addition, Cocoa (*Theobroma cacao*) and oil palm (*Elaeisguineensis*) are common tree crops that form an integral part of the people's livelihood (Asante et al., 2013; MoFA, 2016).

Among the 16 regions in Ghana, Ashanti is the most populous with 4,780,380 in number, representing 19.4% of the total population, of which 2,897,290 are urban, representing 60.6%. The region has a population growth rate of 2.7%. As at 2012, the region had 30 administrative districts (Figure 4.1) (GSS, 2013). Ashanti Region is among the top five rice producing regions in Ghana (MoFA, 2016). In addition, it is one of the two main regions in the country that consume a high percentage of rice, 20% of rice consumption takes place in the region (Gates-Foundation, 2012). Therefore, this region was suitable for the study because all the key actors (from production to consumption) were needed to understand the entire value chain.
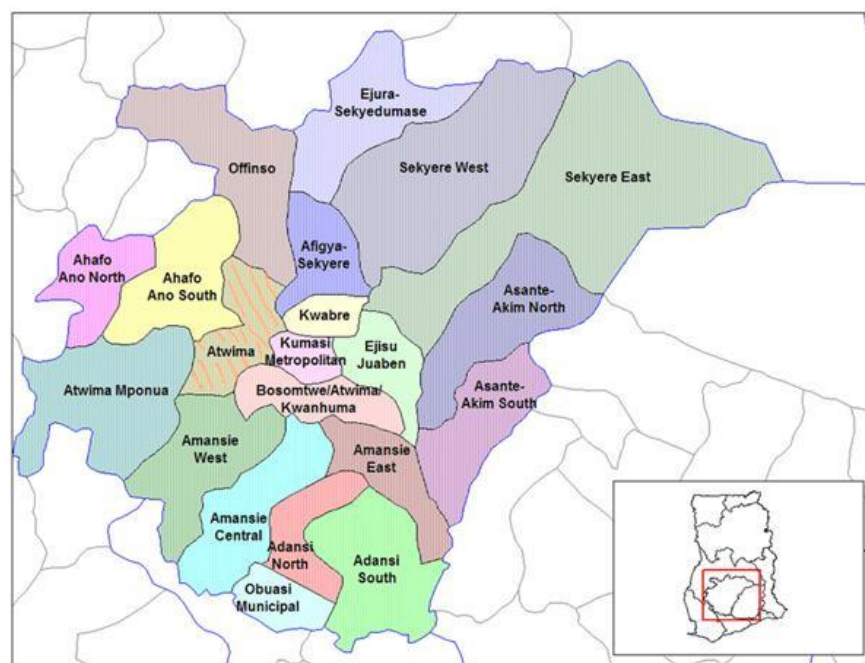
Figure 4.1: The map of the Ashanti Region of Ghana; Source: (Ghana-Quest, 2019)

4.5 Research Sampling Approach

According to Harrell and Bradley (2009), sampling is a critical component in research, especially when using the qualitative method, because it prevents the research from either over-representing or under-representing a section of the population. A sample represents a selection made from a population, whereas the population is the full set of cases (Bhattacherjee, 2012). In this study, the participants involved were from the Ashanti Region of Ghana. As indicated in Phoo (2019) study, most researchers who applied the qualitative approach used purposive sampling. In addition, purposive sampling approach was used in a study on rice value chain development in Ghana in

2015 (Addison et al., 2015). According to Tongco (2007), purposive sampling is a type of non-probability sampling that can give reliable data, which may be used in both qualitative and quantitative methods. In this study, purposive sampling was used to ensure that certain types of individuals showing certain attributes and suitable for the study were included.

Among the major districts that previous researchers focused on in their studies on rice production in Ashanti region are Ahafo Ano North, Ejura Sekyeredumasi and Atwima Nwabiagya districts (Addison et al., 2015; Asante et al., 2013; Bawuah, 2015). As indicated by Asante et al. (2013), communities in these districts are among the major rice growing communities in the region. Moreover, a high percentage of rice consumption also takes place there. Based on this, purposive sampling was used to select Atwima Nwabiagya district.

Participant selection was in two phases. In phase 1, the researcher identified the stakeholders of the value chain. This was done through an interview using a semi-structured questionnaire with an extension officer at MoFA who is involved in the government's rice projects, and an officer at Plant Protection Regulatory Services Directorate (PPRSD). The chain actors that needed to be interviewed were selected based on the information that was given by the extension officer at MoFA.

In phase 2, the selected actors were interviewed using semi-structured questionnaires. To get a deeper understanding about the right value chain map, the specific actors needed to be identified. For that reason, five retailers of which three were dominant and two operated on small scale were selected within the district, though the retailers also sell in other districts within the region and beyond. The selection was based on those who sell either high- or low-quality local rice, and/or imported rice. These chain actors were selected purposively to help the researcher to get a deeper understanding of the various grades of rice, how they get high-quality local rice to sell, the processors they buy local rice from, the criteria they use to purchase rice from their suppliers, whether local or imported, and the quality attributes their consumers consider before purchasing rice from them.

The three key processors in the district recommended by the retailers were interviewed. The processors included those who process high and/or low-quality rice. Through the processors, three rice traders and fifteen farmers who mill their paddy rice at their milling centres were identified and interviewed. The farmers were selected based on the diversity of the rice farmers in the district,

with factors including the type of seeds used (either high- or low-quality seeds) and either the farmer has irrigation facilities or not. The farmers included both those who produce high- and low-quality rice to enable the researcher to gather more information on what enables some farmers to produce high-quality rice. Farmers were selected purposively to gather data on rice production practices, post-harvest management, market access and their relationships with other actors in the chain, as well as the constraints and opportunities the farmers experience. Actors views on interventions that can help farmers produce quality rice to meet customer demand were also taken (interventions are explained in the Discussion Section). This method was used by Asante et al. (2013) on a study on farmer and consumer preferences for rice in Ghana.

4.6 Data Collection Method

Data were collected from two main sources, primary and secondary (Figure 4.2). Primary data was collected through interviews. Secondary data was collected from documents such as papers put out by Food and Agriculture Organization of the United Nations (FAO), International Rice Research Institute Publication (IFPRI), Africa Rice Center, Ministry of Food and Agriculture (MoFA) in Ghana, journal articles, technical reports, conference papers, textbooks and other relevant documents or publications (Kumar, 2019).
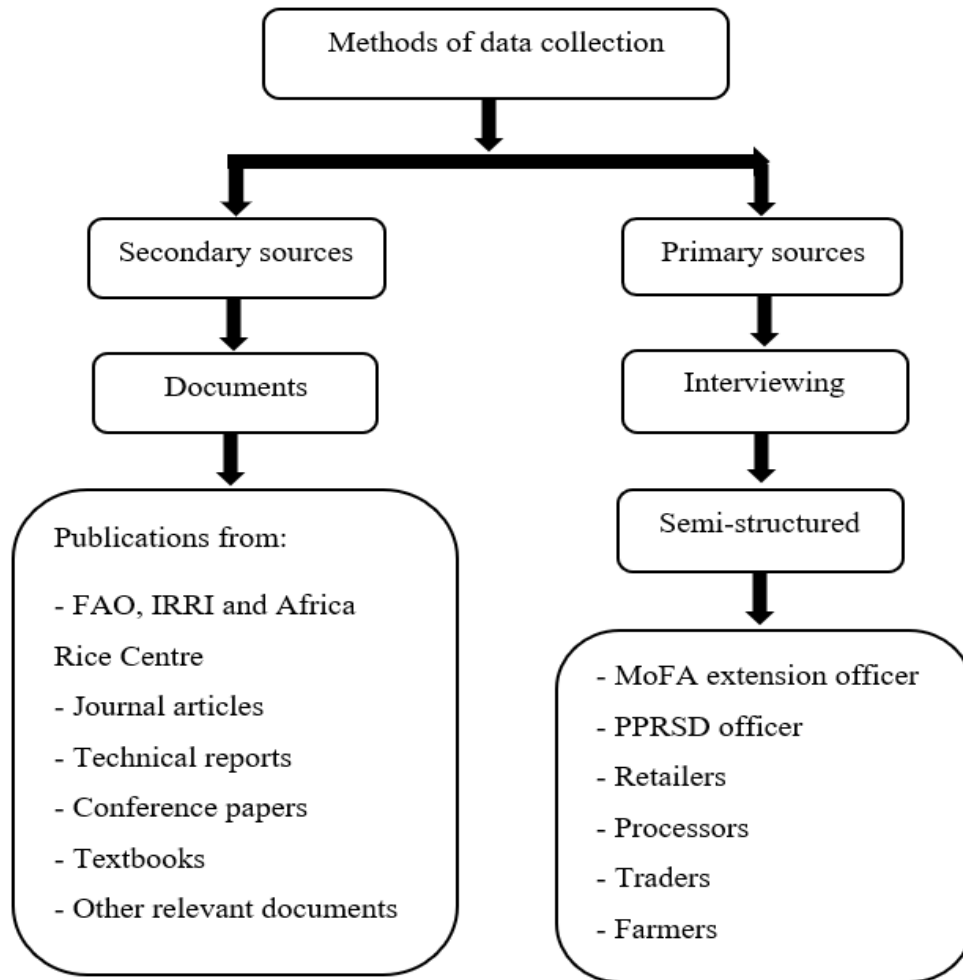
Figure 4.2: Data collection method adopted for the study

4.6.1 Semi-structured Interview

Semi-structured interviews comprise of many key questions which assist the researcher (interviewer) to explore. In addition, it enables either the interviewer or the interviewees to probe further on an idea or response in more detail than in a questionnaire. Moreover, the interview gives a deeper understanding of social phenomenon compared to a purely quantitative method (Gill, Stewart, Treasure, & Chadwick, 2008). Such interviews have a number of predetermined questions which are mostly open-ended and special topics, however, the interviewer is free to diverge. The interviewer can go far beyond the answers of the initial or the prepared standardized questions (Berg, 2001). Some studies on rice value chain development used a semi-structured interview approach to collect primary data from facilitators (Addison et al., 2015; Ahmad, 2017). Hence, a semi-structured interview approach was used in this study.

4.6.2 Document Collection

Through document collection, secondary data on rice, such as production area and quantity, variety yield, and production volume were taken from MoFA's published reports. Other relevant data on rice value chain development and intervention strategies were also taken from them.

4.7 Data Analysis

According to Dey (1993), data analysis involves breaking down the data into themes and categories. Moreover, one key thing about data analysis is that the researcher tells a story about a situation and then moves to constructing a map of major elements and variables within the story and finally into building a theory or a model. In this study, data collected from the various actors along the rice value chain, from producers to retailers, were analyzed using qualitative data analysis (QDA) technique to achieve the objectives and to answer the research question (Ahmad, 2017). Qualitative data analysis involves three main stages in a circular way as illustrated in Figure 4.3 (Dey, 1993).
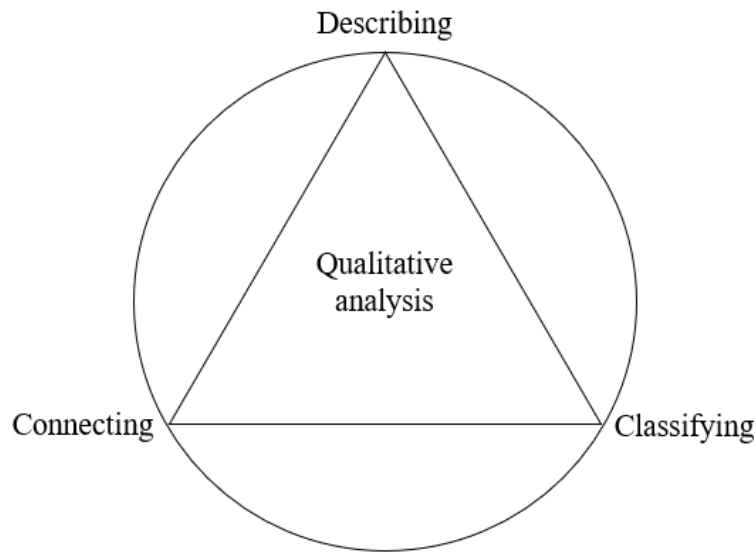
Figure 4.3: Circular way of qualitative data analysis; Source: (Dey, 1993)

The three main stages in QDA has been explained (Gray, n.d). In Figure 4.3, the first step is description, which is the basis of the analysis. It is an overview of the raw data, such as interview transcripts, that is obtained from the field observations. The main purpose of the description is to describe key aspects of the phenomena while maintaining the holism of the data. This stage involves the context of an act, the intentions of the actor, and the process in which action is

embedded. The second step is classification, which aims to categorize the raw data and compared for similarities and differences. Classifying the data into categories is an integral part of the analysis, since it is a conceptual foundation on which interpretation and explanation are focused. Here, similar data were put under the same category, which was then named and defined (Gray, n.d). The final step involves connection of the classified data. Here, the researcher needs to identify the key relationships between categories. It was advisable that the researcher conduct the three stages a number of times, to help gain a deeper and clearer understanding of the essential information which is key to answering the research question and achieving the research objectives (Gray, n.d).

Value chain analysis approach was also applied. According to Kaplinsky and Morris (2000), there are four basic steps when using the value chain approach for analysis. However, since this study was on developing rice value chains through interventions to meet urban high-quality rice demand, additional two steps were added. The proposed steps for the study therefore included:

- Identifying the quality attributes preferred by urban consumers. This information was obtained from the retailers, about their consumer preferences when buying rice.

- Mapping the various activities in the existing rice value chain, as well as describing the roles/activities of all the chain actors. Based on the data collected, the flow of the rice product from the farm to the urban market was also assessed.

- Identifying the value developed at each stage by the chain actors and the distribution of benefits to actors in the chain.

- An assessment of the constraints and opportunities in the rice value chain in the Ashanti region of Ghana.

- Identifying the role of governance which supports the chain actors. This involves the structure of relationships and coordination mechanisms among the chain actors.

- Identifying the interventions that could be used to improve rice value chain to enable chain actors to deliver what urban consumers prefer.

4.8 Ethical Considerations

In qualitative research, ethical considerations involve knowing the ethical means and goals of the research explicitly and implicitly. It is important especially, in research that deals with human participants, that they do not experience any physical or mental harm, and not suffer any discomfort or embarrassment due to loss of privacy (Orb, Eisenhauer, & Wynaden, 2001). The researcher explained to the participants whether the result would be published or not. However, even when there is publication, their personal identity would not be made available to anyone.

As indicated by Massey University Human Ethics Committee (MUHTC) (2015), the major ethical principles are; "respect the person; minimization of harm to participants, researcher, institutions and groups; informed and voluntary consent; respect for privacy and confidentiality; the avoidance of unnecessary deception; avoidance of conflict of interest; social and cultural sensitivity to the age, gender, culture, religion, social class of the participants; and justice".

In addition, under the Massey University guidelines for research students, the academic research with human participants must take risk assessment from MUHTC. Postgraduate students doing research that involve humans must go through the process below to get it approved;

- The researcher must discuss it with their supervisors.
- The risk assessment is in two parts thus, a risk assessment and a full application (for review by an ethics committee). The researcher must complete and submit the risk assessment questions. If the research is considered to be low risk, the second part of the risk assessment may not be required.
- Low risk notification is sent to the researcher.
- A full application of the risk assessment is done when the research is deemed not to be low risk.

Based on this, this study was assessed and classified as low risk to the participants by the Massey University Human Ethics Committee (**see Appendix 11**). Regarding human ethics, the researcher followed the major ethical principles. Participants were given an information sheet and consent form (**see Appendix 12 & 13**) before participating in the interview. They were informed clearly about the research including the purpose of the study, duration, content and the potential risks and benefits associated with participation. Participation in the interview was voluntary and participants

had the right to opt out during the interview and recording was by consent. Moreover, the researcher gave the participants detailed information confirming that their personal identity would not be published or made available to anyone. Therefore, the anonymity of the participants was maintained in this research. Data on sensitive personal information such as income and farm size were analyzed on average.

Chapter 5: Results

5.1 Introduction

This chapter presents results from the analysis of information obtained from the study area. The chapter is grouped into six sections. The first section describes the general information of the participants who were interviewed in the study area. Section two describes the activities undertaken by the actors, objective one which was to identify the quality attributes preferred by urban consumers in Ashanti Region is also explained in this section. The margin and benefit shares of the actors are explained in section three. Section four describes the map of the rice value chain in the study area, which is objective 2. The last two sections describe objective 3, which consist of the constraints and opportunities found along the rice value chain in the study area.

5.2 General Information about Participants

General information on the value chain participants, such as gender distribution and education level, is shown in Table 5.1. Regarding gender distribution, more than 90% of the farmers were males. The average age of the participants was 42 years. Approximately 47% of the farmers have less than 5 years' experience in the rice production business and ~53% have 6-30 years' experience. For the traders and processors, more than 60% have more than 4 years' experience while most retailers have more than 7 years' experience.

Table 5.1: General information of the value chain participants who were interviewed.

Description	Attributes	Farmers	Traders	Processors	Retailers	PPRSD	MoFA
Number		15	3	3	5	1	1
Gender distribution	Male	13	1	2	2	1	
	Female	2	2	1	3		1
Education level	Tertiary	1		1	1	1	1
	SHS	2		1	2		
	JHS	5	2				
	Basic	4		1			
	None	3	1		2		

Remark: Tertiary= University graduate, SHS= Senior High School, JHS= Junior High School, Basic= Primary school, None= No formal education.

5.3 Activities/Roles of the Value Chain Actors

5.3.1 Rice Production

Rice production is comprised of medium and smallholder farmers in Atwima Nwabiagya district. With respect to land size, about 50% of farmers grow rice on less than 1 hectare, while the remaining work on a farm size bigger than a hectare but less than 5 ha. There are two seasons in rice production in the Ashanti Region. The first season goes from late March to October, and the second season (dry season) goes from late September to February. Farmers always depend on rain since rice needs a lot of water to grow well. The rainy season starts in March and continues until mid-November, the dry season runs from December to February. Farmers mostly get long grain in the first season but broken rice in the second season because of the sun. Farmers' motivation for producing rice was higher income compared to other crops. Activities undertaken in rice production in the Atwima Nwabiagya district and their timelines are explained below and shown in Table 5.2.

Seed Selection

Initially all farmers buy seeds the first time they start rice production, either from MoFA or other farmers. About 60% of farmers select seeds from the previous harvest for ongoing production, however, the remaining 40% of farmers continue to buy seeds from MoFA because they believe MoFA sells high-quality seeds. Farmers who use their own seeds select seeds from a part of the field that has grown well, looks healthy, and has fewer male plants. They harvest that area before or after harvesting the remainder of the field. Farmers consider paddy rice to be of high quality when it is a high yielding variety, big, yellowish, bright or shiny and not over-dried or infected by any diseases.

Common varieties found in the district are *Amankwaatia* which is tolerant to drought, AGRA which gives high yield and looks attractive, *Lapes* which is very white and *Asantebroni*. More than 80% of farmers use AGRA and only a few use *Lapes* and *Amankwaatia*. Farmers' decision to change variety was driven by 3 reasons: i) when there is a new variety developed by CSIR, ii) what is accepted by retailers and iii) high yielding variety.

Seed Treatment

Farmers who do seed treatment mostly get high-quality rice. Some treat it by putting raw eggs, salt and paddy rice into water. Any paddy rice that floats on the water is thrown away because it is seen as low-quality seed and will yield low-quality rice. Some farmers also put the paddy rice in only water, throw the ones that float away and dry the paddy that settles (seen as quality paddy) and use it when needed (**see Appendix 4**). One farmer who consistently gets high-quality rice, also does a germination trial of the seeds by planting a handful where only seeds with about 80-90% germination success are used. Other farmers do not have any idea about seed treatment or have decided to stick to their old method of farming due to the size of their farms. Those farmers sometimes get low-quality rice. A farmer mentioned that,

"I do not do seed treatment because I had no idea about it. After I heard about it from the MoFA Extension officers, I still do not treat all my seeds because my farm is big, and it makes it difficult". Another farmer added that, *"Farmers do not have time to treat the seeds and that lead us to get low-quality rice for the second season".*

Land Preparation, Cultivation and Fertiliser Application

Land preparation for growing rice in the major season is done in March to April prior to the onset of the major rains (Table 5.2). Most farmers do not prepare the land again during the minor season since they plant right after harvesting of the main season. Depending on soil type and capacity of investment, some farmers plough their land prior to cultivation. Good agricultural practices such as fertiliser application and weed control are done from May to June in season one, and October to November for season two. Disease control only takes place when farmers notice that on the farm. However, most farmers do not bother to treat diseases because it normally occurs on a small portion of the farm.

Most farmers do direct planting using 7-30 seeds per hole because it is easier and cheaper compared to transplanting. Mostly, transplanting of seedlings is done in waterlogged areas because the seeds do not germinate when planted directly. The farmers put the seeds in a sack and place in water for about 2 days and then plant the seeds on a seed bed to get seedlings for transplanting. Farmers were aware that using seedlings and planting in rows make the plants grow well, which can help them to get high yield, but it is time consuming and costly. Some farmers argued that the way of planting does not have effect on the quality of the rice. Farmers who normally get high-

quality rice, plant in sections to prevent the entire farm from maturing together. As already mentioned, there are two main seasons for rice production, but all the farmers mostly focus on the first season. Most farmers do not invest in the second season because they think some of the paddy rice from the first season is left on the field which will germinate. Planting in season one is from late March to ending of May whiles season two is within September and October (Table 5.2). However, such paddy rice when harvested and milled produce brownish/reddish rice known as "male plants" which retailers do not purchase. Some farmers mentioned that,

"In the second season, we just broadcast the seeds without investing in it because many seeds are left on the farm during the first season, so they germinate after it rains. We then broadcast seeds at the areas where the rice seedlings are not enough. We see that season as bonus. The effect is a lot of brownish/reddish paddy rice known as the male plants are seen in the second season harvest which the retailers do not want.

Fertilisers commonly used by farmers were NPK 15-15-15, urea and compound fertiliser. The NPK is applied 2 weeks after planting the seedlings to ensure successful growth in the beginning. Urea is applied when the seedlings show a spot on a part of the plant which indicates that "it is pregnant". Urea plays a key role because it helps to increase the yield. One farmer indicated that, "*I mistakenly did not apply urea at a small portion of the land, hence I did not get any harvest from that place".*

More than 90% of farmers interviewed use chemicals to control diseases and contact herbicides for weeds before and after planting. Other farmers mix the chemicals with the idea of burning all kinds of weeds at a time that they claim works best. Most farmers have adopted the practice of spraying herbicides due to its low cost and effectiveness compared to the cost of hand weeding. Most of the chemicals used by farmers were distributed in Nkawie and Kumasi Metropolis by retail shops who deal in imported agrochemicals. The fertilisers are bought from MoFA due to a 40% input subsidy provided by the government. Depending on farmers financial capacity, they use 1-3 bags of NPK 15-15-15 and 1-2 bags of urea.

Table 5.2: Rice crop calendar practiced by the farmers in the study area:

Activities	Mar	April	May	June	July	Aug	Sept	Oct	Nov	Dec	Jan	Feb
Land preparation (spraying and weeding)		←→										
Nursery and bed preparation		←→										
Planting		←——→					←——→					
Weeding (spraying herbicides)			←——→					←——→				
Fertilizer Application			←——→					←——→				
Harvesting					←——→				←————————————→			
Threshing					←——→				←————————————→			
Drying					←——→				←————————————→			

57

Harvesting

Rice farmers in Ashanti Region harvest rice from July to August in season one and November to February in season two, depending on the time seeds were sown (Table 5.2). Harvesting of the paddy rice plays an important role in getting either high- or low-quality rice. Farmers who wait for their paddy rice to ripe completely on the field mostly get broken rice because the paddy rice over dries when left on the field for a long period, especially in the season two due to the sun. In contrast, farmers who harvest their paddy rice when the tip of the tassel is fully ripe, with a greenish colour at the base of the tassel mostly get high-quality rice. Again, farmers who get high-quality rice plant in sections and start harvesting from where the planting (and maturity) began. Therefore, they do not normally face challenges in terms of delay in harvesting. One of the farmers who normally gets high-quality rice mentioned that, *"I do not allow the plants to ripe all at once. I plant in sections. I check what I can harvest and plant according to that. When I transplant about 25kg of seedlings, I wait for about 2 weeks before I plant the remaining so that all will not be ripped at the same time. Therefore, I have never experienced challenges in terms of harvesting except in my first 2 years when I did other jobs and could not focus fully on the rice production".* The average yield of rice in the study area is 2 t/ha, which represents 31% of the achievable yield of 6.5 t/ha. Farmers who follow GAPs advised by MoFA often get high yield/quality rice (almost double of that of those who do not). Less than 40% of farmers with long years of experience (8 years or more) get high yield/quality, as some of them are reluctant to change. Farmers who follow the same agricultural practices in both seasons get high yield unlike those who invest in only season one. One other advantage in season two is that farmers are not affected by a lot of birds. Figure 5.1 shows harvesting of rice in the dry season.

Figure 5.1: Harvesting of paddy rice by a farmer

5.3.2 Post-Harvest Management

Threshing

Threshing of paddy rice (Figure 5.2), which is the next activity after harvesting plays a key role in whether a farmer will get high- or low-quality rice. Farmers thresh using a wooden structure or a metal tank where the paddy rice is beaten on the wood or tank continuously to separate the paddy rice from the stalks. One key input that is needed for threshing is a tarpaulin. However, due to financial constraints, some farmers only have a small one, or none. Threshing should be done within 3 days of harvest in order to get high-quality rice. But as a result of having to wait for other farmers to finish, so that they can borrow a tarpaulin, threshing is delayed more than a week. One farmer who does not have a tarpaulin mentioned that,

"Last year, I ran at a loss because I did not have tarpaulin and it rained as well. I threshed it when it was 3 weeks, so I had low-quality rice- not white, and broken- so the retailers did not buy. I brought it home for my daughter to sieve it and sell it for me. The retailers did not even ask for a reduction and all of them left without buying".

Only 5% of farmers hire a threshing machine due to high cost. However, farmers who have large farms, but still get high-quality rice, hire a threshing machine instead of labourers to prevent delay

as paddy rice generates heat when left for a long time. The heat leads to broken rice and changes the colour from white to milky or brownish.

Although a threshing machine is hired, the farmers do not gather the entire harvested paddy at one place in the farm until they are sure the threshing machine is acquired, as they sometimes do not get the machine at the right time. One farmer mentioned that, *"One key challenge I had some time ago was when I did not get the threshing machine on time because the owner accepted another contract. I had gathered the harvested plants which made it generate heat. I did not get broken rice but the colour changed so the retailers did not buy"*.

Figure 5.2: Threshing of paddy rice by the farmers

Drying

Drying of the paddy rice is done on a tarpaulin after threshing to prevent it from breaking during milling (Figure 5.3). The number of days required to dry the paddy rice depends on the season. In dry season, most farmers dry their paddy rice for only 2 days but during the rainy season it takes about a week before it is ready for milling. One challenge faced by farmers in the rainy season was, those who have large farms do not get their paddy rice fully dried due to rain in September. They therefore dry it for about three days and store it but dry it again for an additional three days in December before milling. Farmers can determine the dryness of paddy rice by the sound it makes when chewed. Farmers mentioned that, *"We chew some of the paddy rice to know if it is dried. When it makes a sound when we chew it, it means it is dried"*. Although most farmers have

the experience to know whether it is dried or not, sometimes they do not get the accurate drying percentage of 12%, which produces broken rice, when the paddy rice is not dried well or over dried. Farmers who get high-quality rice use wellington boots to mix the rice from time to time during the drying process. However, those who sometimes get low-quality rice use their bare feet which result in little stones/sand getting into it. The little stones/sand mix with the milled rice because the processing machine can remove only big stones.

Figure 5.3: Drying of paddy rice by farmers

Transportation

Farmers use tricycle motorbikes to transport inputs (fertiliser, chemicals and seeds) to the farm and harvested paddy from the farm (Figure 5.4). Transportation cost depends on the amount of inputs or paddy rice to be transported.

Figure 5.4: Transportation facilities used by the farmers in study area

Storage

Most farmers put their paddy rice in sacks after it is dried and put them on wooden pallets, otherwise cold on the floor will spoil the rice. Farmers store their paddy rice either at the farm, milling centre or their houses (Figure 5.5). Local rice can be stored for about two years when it is well dried. However, most farmers store it for a short period of time to prevent getting low-quality rice. One farmer indicated that, *"I mill everything because if there are rains, it breaks and becomes difficult to sell so I prefer to mill, sell and keep the money instead".*

Storage at the farm   Storage at the milling centre

Storage at the premises of the milling centre

Figure 5.5: Storage facilities used by farmers in the study area

Gross margin of production per acre

On average, farmers earn almost 100% profit from their investment. Farmers who invest more by engaging in activities such as transplanting, and row planting earn almost double profit on their investment. Most farmers do not hire labour for land preparation as they believe that they would not earn more if they pay for every work to be done on the farm (Table 5.3). Likewise, about 90% of farmers do not treat diseases on the farm as only a small portion of the farm is mostly affected. The various costs incurred in rice production and profit per acre of land are calculated based on data collected (Table 5.3).

Table 5.3: Typical gross margin of production per acre (0.4 hectare) of milled rice.

Items/Cost	Quantity	Unit	Rate per unit (GHS)	Total (GHS)
Seeds	1	Bag (25 Kg)	80	80
Fertiliser	1.5	Bag	73.30	~110
Spraying diseases*	1	Litre	50	50*
Renting of land	1	Acre	50	50
Land preparation *	4	Per day	25	100*
Planting	4	Per day	25	100
Herbicides	3.5	Litre	50	175
Spraying herbicides	2	Per day	25	50
Harvesting	4	Per day	25	100
Threshing & Drying	6	Per day	25	150
Transportation of paddy rice from farm to house	8	Bag	5	40
Transportation from house to milling centre	8	Bag	3	24
Milling cost	20	Tin	10	200
Total cost				**1229**
Income from selling	20	Tin	120	**2400**
Gross margin from rice production				**1171**

1 Tin=35 kg of milled rice. Tin is a local word for a 35kg sack of milled rice used by Ghanaian rice farmers.

GHS= Ghanaian Cedi

Remark: *The calculation in Table 5.3 was based on data collected in the 2019-2020 rice season. Cost and benefit could change every year depending on the price of inputs and local rice value.*

5.3.3 Rice Trading

Rice Trading Business

Traders buy rice from villages in Ashanti region and the Northern part of Ghana. They spend 1-4 weeks at the purchasing centre depending on the abundance or scarcity of paddy rice. After purchasing, traders dry the paddy before transporting to reduce transportation cost and damage. Paddy rice is sold to them at GHS 170 per bag (150 kg per bag). Millers support traders to pay for their transportation cost and are paid back within a month after the rice is milled and sold. Traders sometimes get broken content of 50% when the paddy rice is milled. However, in the major season, traders get only 10-20% broken rice since farmers are not affected by the sun. Some traders support farmers by lending capital during production season.

Traders travel with lot of money on them, hence, they are frequently attacked by armed robbers. Another challenge was that, traders must dry about 100-200 bags because there are no dryers. As a result, some traders are not able to dry the paddy rice well, causing colour changes during milling.

Quality Attributes for Paddy Rice Purchase

Traders can determine the quality of the paddy rice by checking the heaviness and the brightness of it. The traders mentioned that, *"For us to know the paddy rice will not be broken when it is milled, we rub some in our palms and if it breaks easily, it means it is of low quality".* Traders again check the variety to make sure that it is one that that retailers will buy. They aim to purchase rice with less than 30% breakage. Although traders check the quality of the paddy rice during purchasing, they cannot refuse purchase of low-quality paddy rice especially when the farmers are their customers. One trader indicated that, *"When the paddy rice is of low quality, we cannot stop buying since they are our customers so they will reduce the price a little and we also reduce the price when we mill so that no one will run at a loss".*

5.3.4 Rice Processing

In Atwima Nwabiagya district, there are three main milling centres farmers mill their paddy rice. The milling centres are in Nkawie, Atwima Mim and Afari. Millers at these three milling centres were interviewed. It was found that, millers receive paddy rice from farmers and traders mostly from the northern part of Ghana and Ashanti Region. Millers motivation for engaging in the milling business is higher income or market for local rice. They also support farmers in the sale of their rice produce. Millers play 4 key roles in the rice value chain for farmers.

Rice Milling

The key role of rice processors is to mill the paddy rice for farmers and traders to sell. Millers charge farmers GHS 10 per Tin (35kilos) but GHS 8 per Tin (35kilos) of milled rice for traders. The difference is because traders incur higher transportation costs from the Northern part of Ghana to the Southern (~585km to the study area) and because traders bring a larger volume. Farmers' paddy rice is milled on a "first come, first served" basis. All the milling machines within the district are of moderate standard, none is of high standard. The key functions of most of the milling machines are dehusking or dehulling (removing the husk/brown layer of the paddy rice and the chaff), and removing some of the stones or pebbles, by means of a rotation belt and a roller. Other milling machines do not have the capacity to remove the stones or pebbles that may have been mixed with the paddy rice. Although there is another machine that can remove stones, which can be used at a charge of GHS 1, some farmers after paying the set charge of GHS 10 for milling their rice, do not make additional payment to use the destoning machine but sell to consumers or retailers.

The milling machine only mills the paddy rice and removes the stones but does not have a polish function to make the rice very white, like imported rice. However, the millers use rollers to polish the milled rice (especially when there are brownish/reddish grains in the paddy rice) to appear white and appealing to retailers. Consequently, this leads to high level of broken rice.

One miller mentioned that, *"The milling machine removes only the brown layer- husk. Since most retailers want white rice, I adjust the roller of the machine to polish the reddish rice a bit so that it will change the colour. The rice gets broken if the machine is too tight. I check within time to know if I must tighten or loosen the machine. When the machine is too tight, farmers who did not dry it fully or dried on the field and rains got onto the paddy, their rice get broken. My machine is not able to polish and grade the paddy. In this district, we do not have that type of machine that can polish rice".*

Sometimes, the rice gets broken by the fault of the millers when key parts, especially the roller, are old, and not replaced on time. The miller indicated that, *"The machine breaks the milled rice a lot if the roller is old since it squeezes the paddy. So, when the roller is not old and not too tight, but the paddy rice still gets broken, it means that the paddy is of low quality and not the fault of the miller. About 10-20% gets broken because the milling machine is not of a high standard".*

Although tightening of the roller in the milling machine causes some of the rice to get broken, it was indicated that most millers regularly change the key parts of the machine and check often within time to see if the machine must be tightened or loosened to prevent rice breakage. Therefore, rice breakage mostly depends on the paddy whether it was too dried on the field or rain got onto it.

Most of the time, millers do not measure the moisture content of the paddy rice before milling as they are able to detect from experience. Millers get quality milled rice but not like that of the imported rice. They do not normally get complaints from their customers unless their machine develops a fault where the stones are not removed during the milling process and mix with the milled rice. However, they fix it once they get a few complaints.

Marketing

Millers also serve as middlemen between farmers and retailers. They market milled rice on farmers' behalf without a charge but with the aim of getting paid on time. They communicate with retailers about the availability and quality of the milled rice. One processor mentioned that, "*After the milled rice is weighed, I make sure all of it is sold before the farmer pays me unless the farmer has a customer already*". Millers consider rice to be of high-quality when it has attributes such as taste, aroma, long grain and whiteness. The texture of the milled rice should not be hard. There should not be any reddish grain, these often have a round shape. This happens when the farmers have used their own seeds for several seasons. When there are a lot of reddish grains in it, cooked rice becomes hard the following day and such rice is considered low-quality. Although most retailers prefer white rice, some millers try to convince them to buy the tasty rice instead because some of the varieties are white but tasteless. Varieties such as *Lapes,* AGRA and *Amankwatia* are white and tasty unlike *Asantebroni* which is white but tasteless.

Marketing Related Issues

Many millers get many complaints about the type of milled rice they sell to retailers, and from consumers about the taste. When asked about whether they get complaints from their customers, the millers said that, "*Yes, a lot. Some customers bring the remaining milled rice after they have cooked some and they did not like the taste. In such a case, we compensate them with high-quality rice, or we assure them we would get them high-quality rice the next time*". Millers who take the tasteless rice back from their customers/consumers mix it with tasty rice and sell it to other

67

customers. The latter customers do not bring it back because the tasteless rice is normally mixed with a higher quantity of tasty rice. Low-quality rice was not marketed by millers because no retailer buys such rice. Therefore, farmers take it home for consumption. One miller mentioned that, *"When the quality of the rice is very low, I tell the farmers I will not get anyone to buy that type of rice and such farmers take it home for consumption. Some bring their paddy rice to the milling centre even when it is not dried. Sometimes, we tell farmers to dry it well before they mill but if they insist, we mill it for them, and it leads to them getting broken rice. After that, we do not sell for such farmers since the retailers do not want broken rice".*

Price

A new leaders' group which is authorized by MoFA is set for managing the affairs of the rice industry in the district. The group which consists of each of the actors set the price (based on market trends) and communicate it to their members. The price is adjusted by the group to boost farmers' willingness to bring their stored paddy rice out when demand increases.

Although there is a fixed price set for milled rice, the retailers sometimes play a key role in pricing the milled rice, since the sale of rice is done individually. Therefore, it depends on how the marketing system is at a moment. One of the millers explained that, *"The price of rice is set at the milling centre. The price depends on the retailers. When retailers demand for more, it means there is rice shortage. Millers could help with the price, but the farmers do not reason with us. Instead of some of the farmers to wait for the already milled rice at the milling centre to be sold first, the rest of the farmers mill theirs making it be in abundance".* Farmers therefore reduce the price so that the retailers buy for them. Moreover, farmers allow millers to reduce the price when their rice is of low quality and may give customers 1-2 months or more on credit, depending on the quantity. Unfortunately, retailers do not always follow the set agreement for the payment. The millers mentioned that, *"The disadvantage is that some do not pay or not on time. The only thing we benefit is to get the amount we charge for milling and the farmers get their money back".*

Storage

Millers support farmers in terms of rice storage. Most farmers and traders do not have adequate storage for their paddy rice; therefore, they keep it at the milling centres. Farmers who are not able to sell all their milled rice also keep it at the milling centres for the millers to sell or take care of it

for them. The millers indicated that, *"Farmers keep their paddy here and we are responsible to taking care of them because they claim of not having storage facilities".*

Educate Farmers on Good Agricultural Practices (GAPs)

Millers teach farmers about good agricultural and postharvest practices they must follow to get high-quality rice, especially harvesting and threshing on time. Millers are educated by MoFA on GAPS in order to educate farmers MoFA do not have contact with. They also serve as an intermediary between farmers who produce high- and low-quality rice. Farmers who mostly get high-quality rice are motivated to sell some of their paddy rice to those who get low-quality rice. They encourage the farmers to produce high-quality paddy rice although some of the farmers do not comply.

Aside from the above roles performed by millers, some millers support farmers with inputs like fertilisers and seeds and small loans during production time.

5.3.5 Rice Retailing/Sales

Rice Business Characteristics

In the rice business, rice comes in two forms, paddy and milled rice. Paddy rice refers to rice that is in the husk, the unprocessed rice at the farm gate. Milled rice can either be processed paddy rice, or parboiled rice. Parboiled rice refers to rice that has been partially boiled, but in the husk after which it is milled.

Five retailers (three dominant and two operated on small scale) were interviewed, 4 of them sell only local rice and one sells both local and imported rice, only 5% of her sales are local rice. Approximately, 80% of retailers who sell local rice do not sell imported rice since they focus on one or either of them. Milled rice is purchased from the farmers and traders. Retailers can also purchase milled rice from millers, who sell on behalf of the farmers at the milling centres within Atwima Nwabiagya district. The retailers preferred milled rice produced in Ashanti region during the major season, as it is of high quality, but they opt for the other sources when there is shortage. About 80% of retailers buy milled rice from the milling centres and it is transported using tricycle motorbikes or vans. Most retailers preferred purchasing milled rice rather than the paddy rice for two reasons. Firstly, they do not have time to go to the various villages to buy the rice. Secondly, they see it to be risky since they do not know how the paddy rice was handled, whether or not it

was subjected to heat or rains after it was harvested. For this reason, retailers fear they might get low-quality rice after milling and that would be difficult to sell. Among the five retailers that were interviewed, only one buys paddy rice from the Northern part of Ghana because they produce in high quantity. The retailers interviewed sell in the Kumasi Metropolis; which is the capital of Ashanti Region, Atwima Nwabiagya District, Greater Accra Region and Central Region.

Market Requirements

Based on the data gathered from the retailers, approximately 90% of their consumers desire rice with both intrinsic and extrinsic attributes. The intrinsic attributes they consider include long grain rice that is white in colour, tasty and aromatic. The extrinsic attribute they consider is safety for consumption, mainly whether the environment where the rice is sold is clean. Based on this, consumers prefer imported rice most of the time as only 10% of the local rice is packaged.

Quality Attributes (Criteria for Rice Purchase)

Retailers only focus on purchasing high-quality rice since that is what their consumers want, and it takes a longer time to sell low-quality rice. The retailers, especially the few who package before selling believe they should purchase only high-quality rice to prevent the possibility of sending a bad product to the market. They have set a standard and that is to make their product appealing to customers because a satisfied customer becomes a delighted customer and a loyal customer forever. The retailers mentioned that, "*We buy high-quality rice from the farmers/millers at the milling centre. We check from one milling centre to the other until we get high-quality rice. We do not compromise on the quality of the produce we buy so we do not buy at all when only low-quality rice is available*".

All the retailers interviewed indicated that, "*We consider rice with qualities such as white colour, long grain with a maximum of 5% broken content, taste and aroma because that is what our consumers prefer*". However, the milling machine does not deliver that often, so they purchase milled rice with a broken content up to 15% and sieve it to get the broken content down to 5% to suit consumers preference. One of the retailers who sells at the roadside mentioned that, "*Customers who buy rice from me say they prefer white rice even if is tasteless to tasty milky coloured rice*". It was observed that retailers purchase imported rice based on brand because more than 95% of the imported rice is already of high-quality. Moreover, customers/consumers are brand specific.

Retailers as indicated above consider white colour as a priority, yet some white rice is tasteless, which can affect its marketability. Retailers and consumers get to know the taste by chewing some of the milled rice and if it is tasty, they know it will be tasty when cooked. One of the retailers mentioned that, "*I remember I bought rice at the milling centre. It was white and nice but the mistake I made was I did not taste some and when I cooked some, it was tasteless so I returned it to the farmer and took my money because that could affect my market".*

Retailers who buy paddy rice can determine the quality of it by rubbing a portion in their palm. If it breaks easily, it means it is over-dried and when milled, the broken content will be high. When asked about why they prefer only the long grain rice, the retailer who sells both local and imported rice mentioned that, "*I do not buy broken rice because there are a lot of stones in it. I used to buy some but after a customer bought some from me to the village, she returned it. However, the imported broken rice is of high-quality".*

Sieving

The broken content of milled rice is mostly higher than the 5% needed by the retailers. As such, about 80% of the retailers sieve the milled rice in order to decrease the broken content to 5% and remove the small stones the milling machine could not remove and "eye of the paddy" which gets hard and looks like stones when mixed with the milled rice and cooked (Figure 5.6). One retailer who sells at the roadside indicated that, *"People complained there are stones in the local rice, so I sieve it before I sell. The machine is not able to remove all the stones, especially the smaller ones as some of the stones get broken".* Since retailers do not have a grading machine (Figure 5.7), sand gets into the milled rice during the sieving process especially when it is done carelessly.

Figure 5.6: Sieving of local rice by retailers.

Figure 5.7: Grading machine used by only one retailer at the study area.

Grading and Sorting

Grading of local rice is done differently based on whether it is packaged before selling or sold in a pan at the market or roadside (Table 5.4) by retailers. Those who package focus on three grades. The grading categories are Grade "A" (also known as long grain rice), the broken content must be a maximum of 5%, 25% for Grade "B" (also known as broken rice) and 40-60% or more for Grade "C". Grade "A" is considered as high-quality rice and Grade "B" as moderate. Grade "B" is normally sold to food vendors or serves as farm household consumption. However, Grade "C" is seen as low-quality rice which is used to prepare some local dishes or feed animals, like sheep,

pigs etc. Interestingly, most retailers do not have knowledge about grading. One retailer hinted that, *"I do not know about the grades; my focus is on the high-quality rice with the qualities I have mentioned earlier on. If the rice is appealing to my eyes, I buy it from the milling centre, and my consumers buy too"*.

The grading categories of those who sell unpackaged local rice at the market and roadside are Grade "A" and "C". They normally focus on Grade "A" since Grade "C" is considered as low-quality rice which is sold at a lower price. The imported rice has 3 grades, long grain (same as Grade "A"), short grain (same as grade "B") and broken rice (grains are a little bigger than Grade "C" rice). Consumers purchase them all because they are of high quality unlike the local rice. However, the price of the imported rice varies based on the brand. One retailer indicated that, *"The market for local rice is slow compared to the imported rice. I bought 10 mini bags (35 kilos per bag) and it's almost a month but I have sold only half of it. Most people do not like it and as I said earlier, if I cook some for my husband, he does not eat it because he said there are stones in it since they do not work on it well"*.

The price of Grade "B" local rice per kg, both packaged and unpackaged is half the price of Grade "A" rice, whereas the average price difference between packaged and unpackaged local rice is GHS 1.50 based on the data collected on February 2020 (Table 5.4). The price difference between the grades of imported rice is GHS 1.50. For Grade "A" rice, the price of the imported rice is 25% higher than the packaged local rice and approximately 88% higher than the unpackaged rice sold at the local market (Table 5.4). All rice consumers, especially those who live in the urban centres like Kumasi Metropolis and Accra, prefer Grade "A" rice to the other grades. Retailers do not purchase Grade "C" rice seeing that it is of low quality and their consumers would not buy it. One retailer mentioned that, *"I run at a loss sometime when I bought broken rice. I only have to buy high-quality rice from the milling centre otherwise, it will be difficult to sell"*.

Table 5.4: Rice grades and their characteristics in the local market.

Grades	Characteristics	Retail price in Nkawie Market (per kg) as of February 2020 (Ghanaian Cedi)			Photo record	
	Local/imported rice	Local rice (Packaged)	Local rice (unpackaged)	Imported rice	Local rice	Imported rice
Grade "A"	(i) Long grain (ii) Maximum of 5% broken content (iii) Aromatic (iv) Tasty (v) Stones (No stones in the imported rice but few stones in the local rice)	6.00	4.00	7.5		
Grade "B"	(i) Short grains (ii) Broken content of about 25% (iii) Aromatic (iv) Tasty (v) More stones compared to Grade "A" for the local rice.	3.00	2.00	6.00		

Grade					
Grade "C"	(i) Broken rice	-	-	4.5	
	(ii) Broken content of 40-60%				
	(iii) Less aroma				
	(iv) Less tasty				
	(v) Many stones or sand				

Packaging

Approximately 90% of the local rice is sold either at the local market, or at the roadside (Figure 5.8) so about 10% of the local rice is packaged (Figure 5.9). Retailers who package before selling are the ones with formal education. The packaged rice is sold in a few areas in Ashanti Region, a few customers in Greater Accra Region and a hospital in Central Region.

Figure 5.8: Selling of local rice at the roadside (left) and the local market (right).

Figure 5.9: Packaged local rice (left) and imported rice (right) on the market

5.3.6 Supportive Role of the Ministry of Food and Agriculture (MoFA)

Ministry of Food and Agriculture is responsible for educating farmers on GAPs to enable them to produce high-quality agricultural products. Since the study was done at Nkawie, MoFA officer who works with rice farmers at Nkawie was interviewed. An officer at Plant Protection Regulatory Services Directorate (PPRSD) was also interviewed as they are responsible for ensuring only high-quality produce (including rice) are imported into the country. Ministry of Food and Agriculture has helped rice farmers since 2010 by educating farmers on technologies to improve rice production. They educate farmers on how to produce stone-free rice (high-quality rice) to help them to sell their produce on time. They do this through demonstrations on roll planting, transplanting and winnowing. Also, they teach farmers how to select seeds from the field, when to harvest those seeds to get high-quality seeds for planting and how to use a tarpaulin. Millers are educated as well to help educate the farmers not reached by MoFA.

Moreover, seeing most farmers face financial challenges during the production season, MoFA provides financial support for farmers. This is done by linking farmers to the processors to get agricultural inputs on credit which can be paid for after the rice is milled. In 2018, MoFA supported farmers with inputs, including seeds and fertiliser on credit, but some farmers refused to pay therefore, they have stopped. The Extension officer indicated that, "*It is difficult to arrest farmers when they default payment because they are our clients. We tried them with inputs (NPK, urea and seeds) but some did not pay. Now, no credit is given, it is just subsidy.*" The Plant Protection Regulatory Services Directorate also ensures that only high-quality rice is imported into the country. For example, it must not be infested with pests.

5.4 Margin and Benefit Shares of the Actors

The local rice value chain comprises of a few actors and the profit obtained by each actor is different depending on their position and level of investment. In addition, the production area and major markets are in different regions and towns, indicating that handling fees will vary. Normally, 50kg of paddy rice is required to get 35kg of milled rice, with the remaining 15kg being a potential by-product (waste). Retailers get free 1kg of milled rice from the farmers/traders to cater for any possible loss either through transportation or selling. The price of rice increases at each stage when value is added (Figure 5.10). Traders purchase paddy rice at GHS 1.14/kg but sell it at GHS 3.43/kg after milling. Farmers also sell their milled rice at GHS 3.43/kg but sell it at GHS 2.57-2.86/kg

when it is of low quality. Retailers who do not package their rice receive only GHS 0.57/kg price margin. Those who package their milled rice receive the highest price of GHS 6.00/kg. They earn GHS 2.57/kg price margin and GHS 2.00/kg more than those who do not engage in packaging. Retailers receive almost double compared to what farmers receive. However, it does not mean they receive the highest profit because other costs related to transportation, packaging and operational cost are incurred.
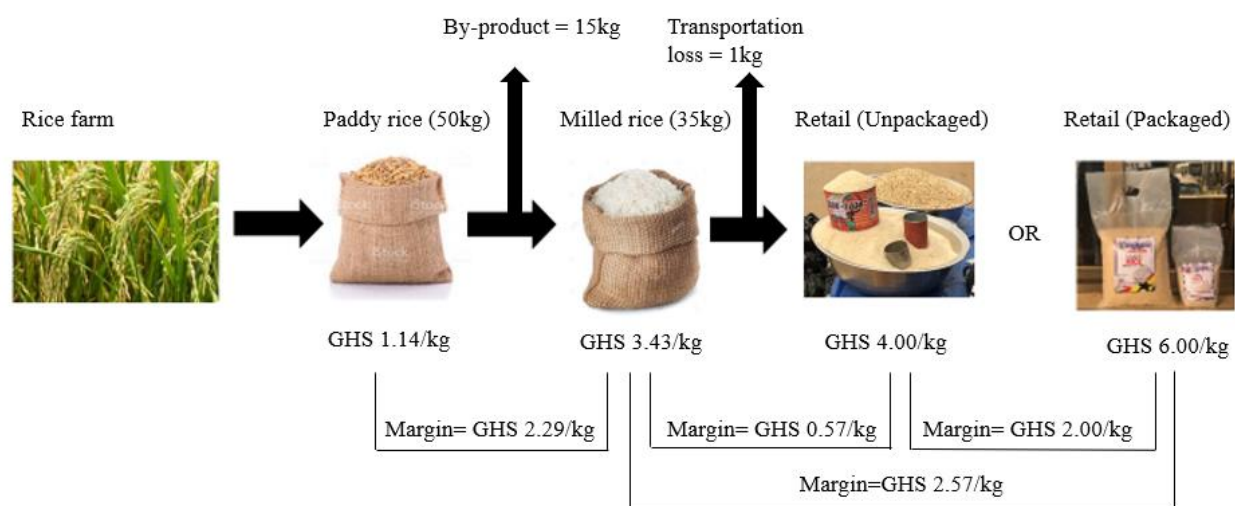
Figure 5.10: Price margin per 1kg of local rice received by different actors as at February 2020 in the Ashanti Region of Ghana.

5.5 Mapping of Ashanti Region Rice Value Chain

There are seven stages in the rice value chain map in the Ashanti Region of Ghana, actors include input suppliers, farmers (producers), traders, processors, retailers and consumers. However, the key actors in the chain are farmers, processors and retailers. Farmers purchase inputs such as seeds and fertiliser (NPK and Urea) from MoFA because of a 40% input subsidy provided by the Government of Ghana (Figure 5.11). The seeds needed by MoFA to sell to farmers are sourced from Anipa Seed Distribution Company on contract. Imported chemicals such as herbicides and pesticides are bought from either local agrochemical shops in Nkawie to support local supply and purchasing on credit, or at Kumasi Metropolis due to its lower prices. Farmers who buy from one

shop in Nkawie do so on credit when need be. Farmers also get support from MoFA through demonstrations, training, and education on GAPs.

Farmers, after engaging in production and post-harvest activities, transport the paddy rice to the milling centre. Traders purchase paddy rice from Ashanti Region and a larger amount from the Northern part of Ghana since they produce on a large scale. Both farmers and traders retain ownership of their paddy rice and sell to retailers after it is milled. Sometimes, the milled rice is sold by the millers who act as middlemen between farmers/traders and the retailers. Millers provide milling service, charging farmers a higher milling fee, but offer traders relatively low-cost milling due to the higher volume they bring in. However, the millers stated that it is due to the higher transportation cost the traders incur. More than 70% of traders dry their paddy rice at the milling centre before it is milled.

For the distribution of local rice, 20% of it is consumed at the high-end urban markets such as Kumasi Metropolis and Accra. Low-end urban markets which are areas within Atwima Nwabiagya District and Cape Coast, account for about 50%, and the rest (30%) is consumed in the rural towns. Approximately 10% of local rice is packaged and sold at shops, offices and a hospital. Out of the 10%, 3% is consumed at the low-end urban and 7%, at the high-end urban. The unpackaged rice (90%) is placed in containers and sold at the local market (either low- or high-end urban) and roadside. Out of the 90%, 47% of the local rice is consumed at the low-end urban, 13% at the high-urban and the remaining (30%) at the rural towns.
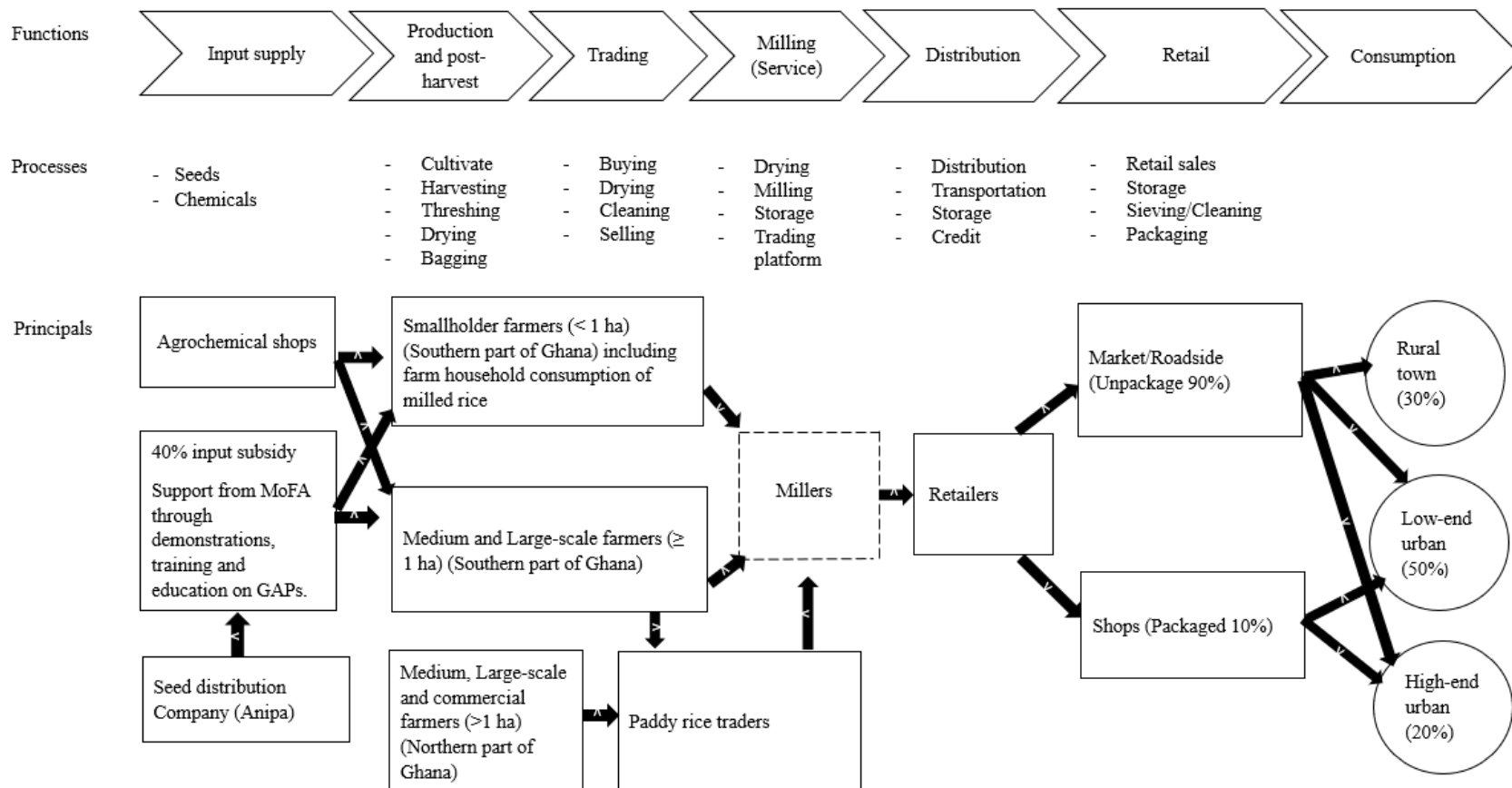
Figure 5.11: Map of local rice value chain in Ashanti Region of Ghana

Imported rice in Ghana is mostly purchased from exporting companies in Vietnam, and Thailand (Figure 5.12). Rice importers are in the Greater Accra Region and Kumasi metropolis. Wholesalers purchase from the importing companies, sometimes on credit, and sell to retailers who sell at shops and the local market. Some of the retailers who sell at shops purchase imported rice from the importing

companies directly to enable them to make more profit. Most institutions like schools and food services also buy from the wholesalers. Since malls and supermarkets operate on a large scale, they import the rice directly from the exporting countries. Consumption of imported rice is at a higher percentage at all places in the region including the rural towns, low-end urban and high-end urban markets.
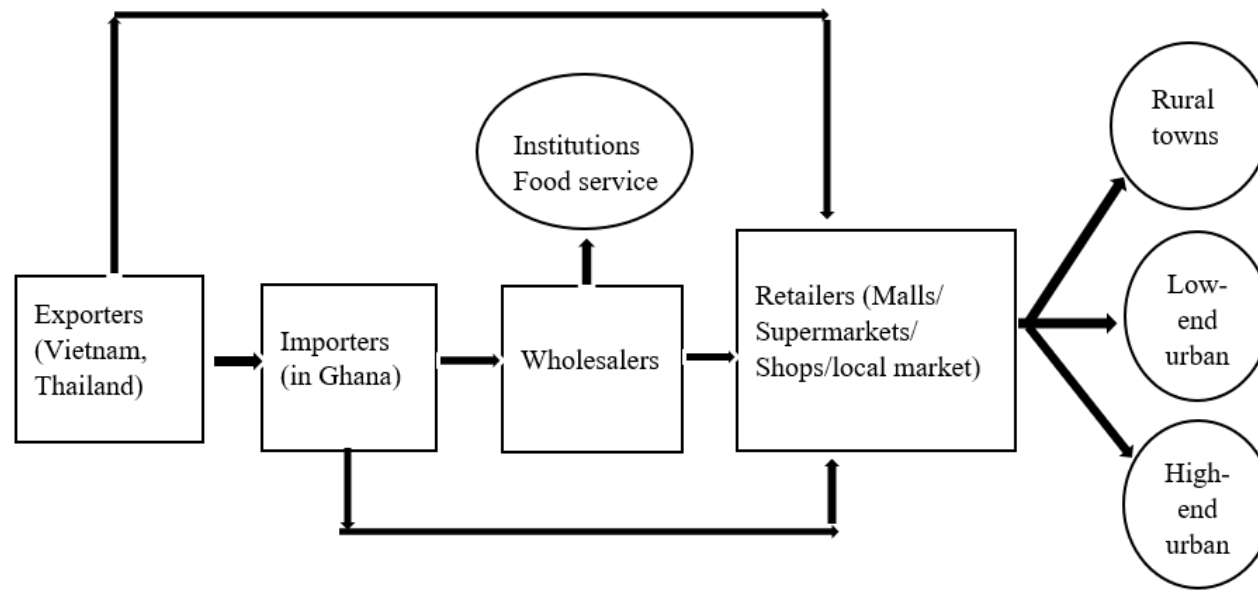
Figure 5.12: Imported rice value chain in Ashanti Region of Ghana

Based on the rice value-chain map, challenges including opportunities and constraints were identified. The identified constraints are explained in the next section.

5.6 Constraints Faced by Actors in Ashanti Region Rice Value Chains

5.6.1 Input Supply

Supply of inputs, especially quality seeds by MoFA to farmers has not been consistent. Sometimes, high-quality seeds are supplied to farmers, but low-quality seeds are also given at other times. In 2018, Anipa seed distribution company that was contracted by the Government to supply MoFA with seeds delivered low-quality seeds. This happened because the seed growers they worked with could not meet the target. As a result, the company added paddy rice meant to be milled for consumption to the seeds to enable them to meet the specified quantity agreed in the contract. Though some of the seeds did not germinate due to its low-quality, farmers who had used the seeds already had paid for it. Most of the farmers interviewed indicated that, "*We bought seeds from MoFA where the first one was good but the second one was of low-quality since there were brown seeds mixed with them*". Due to the bad experience farmers had with MoFA in 2018, some have been discouraged from buying seeds from them. However, some farmers buy seeds every year from MoFA because using their own seeds for several years tends to produce poorer harvest. Another challenge farmers face relates to the delay in input supply by MoFA since they also must wait on the government to receive the inputs for farmers. This affects farmers as they must buy them in the local market at a higher cost.

5.6.2 Production and Post-Harvest Constraints

Human Resource and Technical Constraints

Most farmers face the challenge of getting labourers to work on their farms during the harvesting period because farmers who work as labourers on their neighbour's farms must harvest their own paddy rice during the same time. One major reason that makes some farmers get broken rice is lack of labourers, one of the farmers mentioned that, *"Sometimes, rains affect me, especially when labourers disappoint me. Again, it is sometimes difficult to get labourers and that make me get low-quality rice. I have to reduce the price of my milled rice when selling".* Again, there is high labour cost. More than 90% of farmers face challenges with threshing, because it is done manually which is very demanding and, which makes most farmers unable to thresh on time leading to low-

quality rice. Those who use a threshing machine also find it costly, with a hire fee, fuel and arrangements for collecting the machine on time.

Again, since the milling centres are only 3 in number with small structures, they are overcrowded because most farmers mill their paddy rice immediately after drying. This makes most farmers spend the night at the milling centre (using their bags of paddy rice at bedding) to enable them to get their paddy rice milled on time in the morning.

Financial Constraints

One key challenge the rice value chain actors face is related to finances. Some farmers are not able to harvest their paddy rice on time because they do not have enough money to hire labourers or buy essential inputs such as tarpaulin which affect them in getting high-quality rice to meet market requirements. One farmer indicated that, *"I had to wait for so long for another farmer to finish with his tarpaulin before I could use it since I did not have money to buy a tarpaulin. I lost some grains due to termite attacks because the paddy rice was left on the field".* Again, most farmers do not have net to cover the paddy rice on the field to prevent birds from feeding on them since it is very expensive. Farmers believe it contributes to their inability to get high yield.

Also, processors use low standard milling machines due to financial challenges. Most retailers do not have enough funds to expand their business or engage in packaging.

Climatic Conditions-Weather/Rains

Rains often affect farmers, especially during the major season, which makes them get broken rice. Farmers who have their farms very close to rivers lose some of their paddy rice when it rains heavily and floods their farms. Other times, the floods or running water from rain carry off their harvested paddy rice that has not been threshed yet or not gathered.

One of the farmers mentioned that, *"... there is a river nearby and it destroyed my rice the last time".* Likewise, rains affect the threshed paddy rice when not covered well, and this normally affects farmers who do not have enough tarpaulins. One farmer indicated that, *"Rains affected me last year since my tarpaulin is small. I got broken rice and as a result of that it took me some days to sell the rice after milling".*

Aside the above challenges, farmers sometimes face the issue of theft. Farmers who are willing to expand their production area do not have access to land, and those who rent the land pay a high charge for it.

Farm Location and Transportation Constraints

Most farmers at the study area have their farms close to their houses so they do not have issues relating to transportation. However, those who have their farms at faraway places, and where there are water bodies, do face transportation challenges. At times, farmers need to carry all their paddy rice to the roadside, or a place where the tricycle can transport them. One farmer mentioned that, *"One challenge is, we have to carry the paddy rice to a place that is close to the tarred road where the tricycle can transport them due to poor agricultural roads".*

Some retailers also incur high cost in transporting milled rice since they live far away from the milling centres. Traders and retailers lose more than 5% of their produce per year due to poor packing, or when a part of the vehicle pierces the sack during transportation.

Storage

Most farmers keep their paddy rice on the field in tarpaulin or in sacks, or at the milling centre due to lack of storage facilities. One of the farmers mentioned that, *"I left the paddy rice I got from the last season on the field on the tarpaulin because I do not have a place to store them".* Only about 15% of farmers have rooms in their houses for storage, some put it on the floor for about 1-2 months but dry it again before milling. Some farmers lose their paddy rice when it is stored at the milling centre. The sacks get mixed up as the place is small and it becomes difficult when farmers need to search for their own paddy rice when they want to mill it. Other farmers also keep their paddy rice outside the premises of the milling centre because there is not enough space in the building. However, one key challenge associated with that is, farmers get broken rice when it rains, especially when it is not covered well (Figure 5.13). One farmer mentioned that, *"I keep my paddy rice at the milling centre when dried but outside the premises because there is not enough space in the building. One problem is when it rains. It happened to me last year where it got wet and had to dry it, but some got broken when it was milled".* Figure 5.13 shows local rice which was affected by rains (turning into about 80% broken) due to lack of storage facilities at the milling centre on February 2020.

Figure 5.13: Rain damage of local rice

Lack of Credit Facilities

Value chain actors are not able to take loans from financial institutions due to their high interest rate. Even when one has property for collateral, loan processing takes time. For example, taking a loan of GHS 30,000 can take more than a month to be processed with an interest rate of almost 20%. Due to that, some of the actors refuse to take loans from those financial institutions. In addition, the financial institutions are not willing to give loans to startup businesses. One retailer mentioned that, *"The interest and terms and conditions of the loan are too much. I wanted to take a loan of GHS 10,000 from where I saved. They asked for my car documents as collateral meanwhile, I had savings of GHS 40,000. I stopped taking the loan and withdrew all my savings from the financial institution".*

5.6.3 Marketing Constraints

Most rice farmers in Ashanti Region can access market information, specifically for price and quality from other farmers, retailers or at the milling centres. This is because all the actors trade at the milling centre, and that is where the price and quality of milled rice are determined. Although there has been improvement in technology, retailers sometimes face network challenges in pursuit of quality rice from their customers. Retailers get market information, particularly price, from other retailers because they use a set price.

Although farmers are aware of the market requirements and know that high-quality rice is one that is white, long grain, tasty and aromatic, some farmers do not get full market access due to their inability to meet the quality attributes required by retailers.

85

The lack of an instrument to help farmers measure the moisture content of their paddy causes the paddy rice to be either less or over dried which results in broken rice, consequently making it difficult to sell

Some of the farmers indicated that, *"One challenge of farmers is, since we use the teeth to determine whether the paddy is dried or not without any instrument to know the exact moisture content of the paddy, sometimes the paddy is less or over dried. This happens especially in the dry season and we get more broken rice making it difficult to sell"*. Farmers who sometimes get low-quality rice mentioned that, *"When we get broken rice and/or rice with brownish/milky colour, we have to give it to the miller to sell it on our behalf or we have to reduce the price from GHS 120 to GHS 100 so the retailers can buy from us"*. Retailers sometimes wait for some farmers' paddy rice to be milled when they see the paddy is of high quality, and some even fight over it, but they do not pay more for it.

5.6.4 Institutional Voids

Access to Extension Services

Although rice is among the government's priority crops, farmers at the study area feel that the government focuses more on the Northern part of Ghana as they produce higher quantity. Farmers in the northern part of Ghana have been provided with machines for production, unlike those in the southern part of Ghana. Some farmers are not able to participate actively in the value chains, partly due to weak institutional voids. Some farmers have limited access to extension services which discourage them from working with MoFA. Some of the farmers who were interviewed mentioned that, *"MoFA officers promise to visit us but they never honor their promise. They do not help us because no one has ever been to our farm or visited all of us"*.

Membership of Association or Group

Farmers have an association where members are educated on GAPs, but there is no togetherness or sense of unity among the farmers. Some farmers are not trustworthy, and they steal paddy rice from their colleagues. Some farmers believe that this is partly caused by MoFA. One farmer indicated that, *"MoFA does not also help because they need to act as liaison officers to create togetherness. Example, they gave seeds to some people in the group instead of all of us"*.

Relationships between value chain actors is not the best because retailers only buy quality rice, and that creates misunderstanding between the actors, especially when farmers get low-quality rice. One farmer mentioned that, *"I do not want to work with retailers/customers anymore because my customers would not agree for other retailers to buy the rice if it is of high quality but, the last time my paddy rice was affected by yellow wilt disease on the field and I could not get high-quality rice, I had 16 bags but my then customer bought only 7 bags claiming it would be difficult for her to sell and so, I should look for someone to buy the rest.*

5.7 Opportunities of Local Rice in Ashanti Region

Based on the data collected, opportunities of local rice in Ashanti Region focus on three categories which are described below;

5.7.1 Growing Demand for Rice as a Staple Food

Although there are traditional dishes in Ghana, rice is the second most consumed food after maize due to urbanization and its ease and quickness of preparation. Due to this, there is a growing demand for rice and its consumption will continue to increase, especially in the urban centres. This is an opportunity for all those in the rice business to earn a higher income once they produce high-quality rice. Rice production also serves as food for farmers and this makes engaging in rice production a good investment.

5.7.2 High Income (Strong Margins) in Rice Business

The farmers interviewed indicated that they always get high profit when they produce high-quality rice. Local farmers and traders do not pay tax, while retailers and millers pay a small fixed tax of GHS 300 per year to Ghana Revenue Authority. Farmers who produce high-quality rice get almost double on their investment, but millers and retailers get more than that. Millers indicated that they are able to get money daily, better than their previous jobs especially at a place where there are many rice farmers. Since most farmers work with their children on the farm, it helps them to get high income because they do not pay them.

5.7.3 Government Support

Agriculture plays a key role in the development of the country, as such, the government has initiated policies to develop four crops, of which rice is one. Due to that, the government has given 40% input subsidy on seeds and fertiliser to support farmers. This has helped to increase yield for

farmers and increased productivity as they are able to buy more inputs compared to when the inputs are purchased at the market. Ministry of Food and Agriculture also supports farmers through education and training on GAPs of rice production and post-harvest activities with the aim of delivering high-quality rice.

Again, the Government of Ghana campaigns for Ghanaians to purchase local products on the agenda "Eat what you grow" (Figure 5.14). This has helped to create awareness of local rice consumption and increased the demand for local rice.

Aside from government support, farmers education on rice production by millers and other farmers could help them to produce high-quality rice to meet the market requirement. Financial assistance to farmers by millers and retailers during the production season could support them in their farming business.

Figure 5.14: Fliers used in local rice campaign

Based on the framework adopted for this study, challenges and opportunities that are found along the rice value chain is illustrated in Figure 5.15. Notwithstanding, value chain interventions that could be applied for actors to deliver high-quality rice for urban consumers are explained in the next chapter.
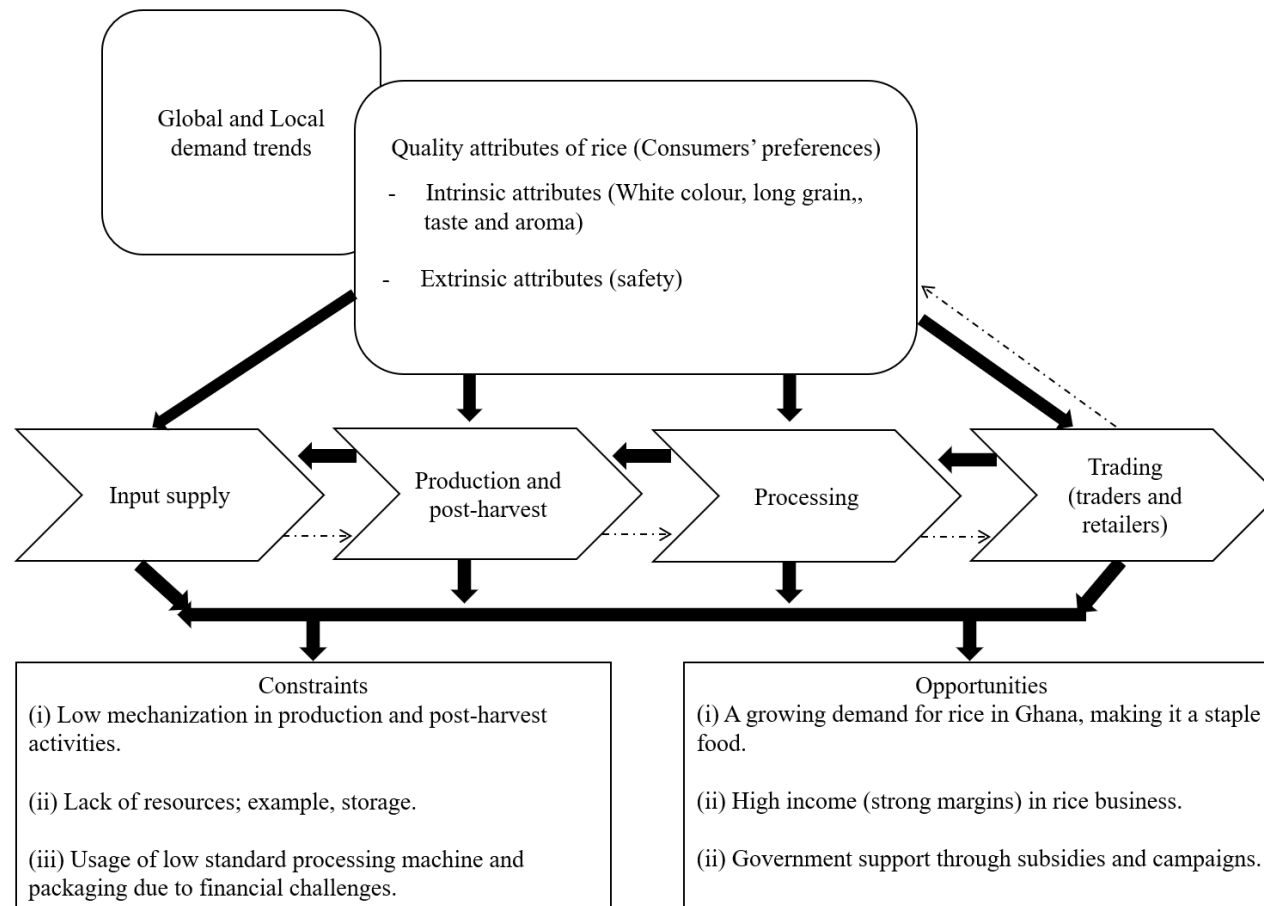
Figure 5.15: Illustration of rice quality attributes, constraints and opportunities along the rice value chain in the Ashanti Region of Ghana

Chapter 6- Discussion

6.1 Introduction

This chapter describes consumer requirements, opportunities, constraints, and value chain interventions in conjunction with the value chain map. This aim to develop the local rice value chain in the Ashanti Region of Ghana to enable the chain actors to deliver high-quality rice to the urban consumers. In that regard, the chapter is based on the information from the previous chapters, bringing together the results of the study and comparing these with reviewed literature.

6.2 Mapping Rice Value Chains

In a general food value chain, the actors involved are input suppliers, producers, traders, processors, transporters, wholesalers, retailers, final consumers and regulatory institutions such as government and NGOs that are not involved directly in the chain (Trienekens, 2011). In this study, all the primary actors in the rice value chain and the role of the government (MoFA) are shown in the map (Figure 5.11). The rice value chain map in Ashanti Region of Ghana is found to be similar to the generalized rice value chain derived in 2012 from a study on the overview of the rice value chain in Burkina Faso, Ghana, Mali, Nigeria, Ethiopia, Tanzania and Uganda (Diakité et al., 2012). However, contrary to the generalized model, leading and larger commercial farmers and integrated mills with milling machines that operate on a large-scale and owned by farmers, were not found in the study area. This could be due to the predominance of smallholder farmers and low volume of rice production in the area compared to other parts of Ghana. The findings support an observation made in Mali where most farmers were smallholders with mini rice-mills, but contradicts that of Tanzania where larger commercial farmers and large integrated mills were found (Diakité et al., 2012).

As illustrated in the value chain map, smallholder farmers and traders maintain ownership and ensure that paddy rice is milled and sold to the retailers. A similar study conducted by Addison et al. (2015) in a different district of the same region in Ghana, also revealed a similar picture. However, the traders in Addison et al. (2015) study buy only milled rice. The performance of the local rice value chain is quite weak when compared to the performance of agri-products value chains in some developing countries. For example, there is a lack of togetherness and trust between farmers and among actors, because some farmers do not honour their promise when retailers or

processors support them during the production season. Likewise, retailers do not pay at the agreed time when they purchase milled rice on credit. This suggests that the chain is not strong, indicating that there are challenges along the chain, and most farmers are unable to deliver high-quality rice all the time.

6.3 Value Chain Interventions to Develop Local Rice Value Chain

Developing interventions that could improve the rice value chain to enable the delivery of high-quality rice to urban consumers should focus on strategies on the key areas along the chain. The areas are input supply, production and postharvest activities, processing, marketing, and the role of key stakeholders such as the government and MoFA.

6.3.1 Input Supply

Access to quality inputs plays a key role for farmers to deliver high-quality produce. Major constraints most companies in developing countries face relate to inadequate supply of quality inputs among other factors like specialized skills, difficulty in accessing technology, information, markets, and credit facilities and these factors either enable or constrain value chain development (Giuliani et al., 2005). This is similar in the Ashanti Region of Ghana where rice farmers face the challenge of inconsistent supply of quality seeds by MoFA, due to limited seed growers and lack of input suppliers consistent with other studies (Obianefo, 2019; Rogers, 2012; Sugri, Maalekuu, Gaveh, & Kusi, 2017; Wang'ombe & van Dijk, 2013).

To tackle this issue, farmers need to have access to quality seeds, and on time through MoFA which may also prevent farmers from purchasing inputs at a higher cost in the market. This could be done through the provision of incentives and subsidies on foundation seeds to help increase the number of seed growers where farmers may also purchase some to get high-quality seeds consequently, leading to high-quality rice (Stryker, 2013). Moreover, government should make sure that the decentralization system is enforced so that ANIPA can supply the seeds directly to MoFA Regional offices instead of passing through the head office so farmers could get the seeds on time. Additionally, apart from project officers ensuring the success of the various rice policies, they could link input suppliers to supply smallholder farmers with quality seeds, and on time, which may be through contracts. For example, in Liberia, project officers worked with input suppliers and buyers to supply inputs. This enhanced linkages between farmers and input suppliers, as well as forward-buying contracts for farmer groups to deal with farmers' inability

to get quality inputs. In addition, farmers were again trained on input quality and use. All these helped to improve how farmers use and manage inputs such as seeds, fertilisers and agrochemicals (Rutherford et al., 2016). In the same way, an increase in access to credit and inputs such as seeds, led to improved productivity in Madagascar (Seville, Buxton, & Vorley, 2011).

6.3.2 Production and Post-Harvest Activities

As indicated by Trienekens (2011), farmers face constraints such as limited educated labor, knowledge, the level and availability of technology used at the production stage. In this study, the major constraints faced by farmers under production and post-harvest activities relate to human resources, low mechanization, storage, finance, climatic conditions (rains) and birds attack. Hence, developing intervention strategies to improve the production stage of the chain are necessary. However, this depends on the roles of farmers and the government.

Role of Farmers

In agricultural production, interventions such as using improved planting techniques (such as planting in rows and transplanting seedlings), planting materials, or investments in irrigation facilities and nets for birds control can be instituted to increase yield (Mitchell et al., 2009). Farmers are also encouraged to adopt GAPs like seed treatment and use new seeds after every 3 seasons. In addition, post-harvest activities should be done well especially harvesting and threshing on time to prevent the paddy from being over-dried to avoid getting broken rice. These interventions have shown good results in projects in some developing countries Piao et al. (2019) observed that good agricultural practices such as pest control and fertiliser usage helped farmers to improve coffee production process and got high-quality coffee products in Brazil. In like manner, ensuring good agricultural practices like weed control and reducing insect attacks by rice farmers increased yield in Ethiopia (Gebey et al., 2012). Moreover, in Central America, ignoring fertiliser usage by Nicaraguan coffee growers showed a decrease in productivity for organic producers (Donovan & Poole, 2014). Climatic conditions also play a key role in attaining high-quality rice. Consistent with other studies, Schiller et al. (2001) showed that farmers in this study got broken rice, and even lost part of their paddy rice due to floods. Farmers could provide shade when drying paddy rice especially during the major season. Another key intervention to enable farmers get access to machines to reduce drudgery, and increase efficiency, is to acquire

and maintain machines as a group or cooperative. In addition, collective action has proven to be a way farmers can work together and enjoy benefits such as improvement in their production capacity, capabilities, bargaining power and product quality (Ahmad, 2017).

Role of Government

(i) Machinery

The literature identifies the role of the government in supporting farmers to get access to modern technologies/machines such as a combined harvester and rice transplanter (Sims & Kienzle, 2016). Rice production in the Ashanti Region of Ghana is characterized by low level of mechanization indicating that most of the farming operations are carried out manually making rice production more labour intensive.

The farmers do not have access to machinery because it is very expensive. Therefore, rice production will be improved when the government supports investment into machines. This result is consistent with a study done on mechanization which showed that simple tools such as cutlass and hoes are used by most smallholder farmers in Sub-Saharan Africa (Sims & Kienzle, 2016). Harvesting and threshing are key challenges in the study area, as knifes are used for harvesting, and metal tanks or wooden boxes are used for threshing which is time consuming and leading to producing low quality rice consistent with the study by Rugumamu (2014) in Tanzania. Consequently, farmers reduce the price of their produce which leads to a reduction in profit, as was faced by rice farmers in India (Shetty, Hegde, & Mahadevappa, 2013). Access to machinery by smallholder farmers can be improved to enhance land productivity, reduce drudgery, production cost/cost of ploughing at waterlog areas on the field, increase efficiency and quality. Therefore, support by the government to enable smallholder farmers to get access to machines can help solve the issue of threshing, birds attack (mechanical devices that generate noise to scare birds away), limited access to labour, and high labour costs faced by rice farmers in Ashanti Region. This can be done by supporting a group of farmers with public sector incentives to purchase the necessary machines. In addition, private sector mechanization services providers may be given incentives and training to sell the machines at a lower price which will motivate farmers to purchase, as seen in China (Sims & Kienzle, 2016).

(ii) Storage

Access to storage facilities plays a key role in attaining high-quality products. Most farmers in the study area do not have storage facilities which contribute to their inability to get quality rice to meet the market requirement. A similar observation was made in a study of sweet potato value chain analysis in Ghana (Sugri et al., 2017). This was also seen in India and Nigeria, thus affecting the production of quality rice (Matanmi, Adesiji, Owawusi, & Oladipo, 2011; Shetty et al., 2013). A provision of warehouses by government or international organizations would help to reduce post-harvest loses and sustain the quality of the stored rice, either paddy or milled rice. The warehouse can be managed by an agricultural expert and maintained with the fee paid by the users. An establishment of a warehouse in the Northern Region of Ghana by Ghana Grains Council, a private nonprofit organization helped smallholder farmers there to improve the quality of rice and maize grains and reduced postharvest losses (Kolavalli et al., 2015).

(iii) Finance

Aside from quality seeds and fertiliser, the production of high-quality rice also requires key inputs such as nets and tarpaulins. However, some farmers cannot afford to buy them because they are financially constrained resulting in low quality rice. Other farmers in Ashanti Region also feel reluctant to take loans due to high interest rate, high collateral requirement, and bad experiences. In addition, due to uncertainties in agriculture, most financial institutions are not willing to grant loans to smallholder farmers. It has been reported that rice farmers in East Africa specifically in Kenya, Tanzania and Ethiopia face similar constraints (Msangya & Yihuan, 2016; Salami, Kamara, & Brixiova, 2010).

The literature indicates that this issue can be tackled by the government providing support for farmers with soft loans or through microfinance. Credit facilities can help farmers to expand their acreage, use productive inputs, enhance processing and marketing (Msangya & Yihuan, 2016). Therefore, this will enable farmers to purchase and use quality equipment from production to marketing, thus, improving rice quality accordingly. This initiative was taken by the Government of Mozambique where a bank was established to provide agricultural credit to smallholder farmers (Manganhele, 2010). However, such projects can only be successful when there is no political interference by government, appropriate lending policies and institutional capacity to enforce strategies for timely loan repayments.

6.3.3 Rice Processing

Rice processing plays an integral role in producing high-quality rice. Millers are not able to get high-quality rice after processing because their milling machines are of low standard which leads to high broken content of 5-20% of the milled rice. As such, retailers need to sieve the milled rice to at most 5% to suit consumers' preference. Apart from this, millers use these machines purposely made for only milling for polishing the milled rice leading to rice of low quality. The findings from this study support the work of Addison et al. (2015) done in a different district where the use of inappropriate equipment (low standard equipment) for local rice processing was seen as a key cause of producing low quality rice.

To deliver high-quality rice, millers should use the right machines for their intended purpose. Periodic maintenance should also be done on the processing machines to avoid rice breakage to meet consumers' preference for quality rice (Gebey et al., 2012). The literature identifies how governments can support millers to acquire a high-standard milling machine that can remove stones and polish the rice like that of the imported rice. The inadequate availability of better processing equipment in Ghana has led to the low quality of local rice vis-a-vis imported rice, leading to consumers' preference for imported rice (Osei-Asare, 2010). Hence, the government could support by investing in the rice processing sector, either to assist millers or operate as a solely private business or joint venture in order to deliver high-quality rice, as has been done in Rwanda. The government of Rwanda invested in medium-sized mills by replacing the hand pounding and hullers with more modern equipment, as a joint venture between co-operatives and investors. The initiative led to the production of a better quality rice than the small hullers (Stryker, 2013). Likewise, the Indonesian Coffee and Cocoa Research Institute (ICCRI), and the local government implemented, farmer-managed, coffee processing units/equipment in some communities, which run as essentially private businesses. This significantly improved coffee quality which attracted foreign and domestic roasters more than the other areas (Vicol, Neilson, Hartatri, & Cooper, 2018). Aside from these interventions, processors can also be trained on better processing techniques to deliver high-quality products as was done for cassava processors in Nigeria (Ope-Ewe et al., 2011).

6.3.4 Rice Trading/Retailing

Marketing of the milled rice plays a significant role in the value chain. Most farmers in the Ashanti Region of Ghana have limited market access due to their inability to meet the key market requirements, as observed in Indonesia where vegetable farmers faced similar constraint (Maspaitella et al., 2018). Other studies done in other parts of Africa, like Marijani (2018) in Tanzania and Asogwa et al. (2014) in Nigeria, observed that farmers had limited access to the market due to their inability to meet quality demand. Due to this, consumers tend to prefer imported rice to the local rice which is seen as a pressing issue in developing countries (Ayeduvor, 2018; Fiamohe et al., 2015). Consumers however are willing to patronize local rice if the quality is enhanced. A typical example is in Malaysia where it was observed that consumers preferred local rice to imported rice due to its higher quality (Musa et al., 2011). In addition, consumers prefer rice which is well packaged because it is safe for consumption. But only about 10% of the local rice is packaged in the study area. Quality in this study means milled rice that has intrinsic (white colour, long grain, taste and aromatic) and extrinsic (safety) attributes. These attributes define consumers purchase decisions (Alhassan et al., 2015). Notwithstanding, in terms of price, most of the chain actors get access to information at the milling centres since price and quality are determined at the milling centres or, from other farmers and retailers.

Aside from producing high-quality rice by farmers, improving the marketing stage of the chain depends on the retailers and the government. Retailers should package the milled rice well before selling because consumers consider their safety before purchasing a product. This may be done by grading local rice based on grain sizes like that of the imported rice to create convenience for consumers and increase patronage. A typical observation was made in Ethiopia where the use of a grading machine to separate long grains from the broken rice led to an increase in demand of local rice by restaurant owners and individual consumers (Gebey et al., 2012). In Uganda, the quality of potato was improved after actors focused on packaging and labelling resulting in a significant increase in sales (Horton et al., 2010). Packaging of the milled rice can also help retailers to sell most of their products at the supermarket at a higher price compared to the local market. A study in Kenya on the comparison of local traditional-market channels and local supermarket showed that, a greater share of the marketing margin was gained when products were sold at the supermarkets (Neven, Odera, Reardon, & Wang, 2009). Most retailers are not able to package the local rice, because they are financially constrained. It has been reported

that, small medium and enterprises (SMEs) in developing countries are faced by more financial constraints than larger firms (Nichter & Goldmark, 2009). As such, it could be beneficial if the government could support them with soft loans to expand their business to add packaging. For instance, in Indonesia, small and medium enterprises urged the government to dedicate more efforts on areas such as good financing policy and development programmes to solve problems SMEs were facing (Irjayanti & Azis, 2012).

6.3.5 Role of the Ministry of Food and Agriculture

Institutional factors such as provision of extension services help farmers to deliver high-quality rice. Developing the value chain partly depends on MoFA extension officers because they need to educate and train the farmers consistently on GAPs, post-harvest activities, capacity building, and monitor their activities to enable them to get high-quality rice. To maximize rice production in Ethiopia, extension officers educated farmers on improved agricultural practices practical training, knowledge and skill development (Gebey et al., 2012). Extensive support for farmers and supervision programs helped bean farmers to meet quality requirement in Madagascar (Seville et al., 2011). Educating the public on the value of the local rice by MoFA would contribute to development of the chain. Apart from that, all the chain actors must ensure that good relationships exist between themselves. Farmers in this regard must be trustworthy, as most of them do not fulfil their part on contracts. For instance, the work of Ladele et al. (2016) indicated that extension officers in Nigeria educated and built interaction among maize value chain actors which improved the coordination of the chain and farmers linkage to the market. However, lack of trust was indicated to be a major constraint. Notwithstanding, the literature identifies that contracts between input suppliers and farmers where an intermediary like a project officer is involved, help to build trust among the actors (Rutherford et al., 2016).

Aside from the constraints that affect the development of the rice value chain in the Ashanti Region of Ghana, there are opportunities that could be tapped into to help develop the chain. Opportunities identified along the rice value chain in the Ashanti Region of Ghana include i) Growing demand for rice as a staple food, ii) High income (strong margins) in rice business and iii) Government input subsidies show a growing potential for the rice industry. Import tax (20%) also increases the price of imported rice which gives the local producers advantage since they do not pay this tax. This is similar to an observation in Rwanda where aside from import tax, the government provided

97

subsidies on transporting fertiliser and paying for irrigation infrastructure which amounted to about 30% of the production cost (Stryker, 2013). All these opportunities coupled with the implementation of the above strategies will develop the local rice value chain and enable the actors to deliver high-quality rice. Furthermore, creating an enabling environment by focusing policies on factors such as production, subsidies, regulations and investment incentives would enable the local rice to compete with the imported rice in the local market (Stryker, 2013).

6.4 Chapter Summary

This chapter consisted of two sections with subsections. The first section introduced the chapter while section two describes the various value chain interventions that could develop the local rice value chain. In summary, the local rice value chain could be developed based on the roles of the actors, the government and MoFA extension officers. Farmers are advised to engage in good agricultural practices such as sowing good quality seeds, timely harvesting and threshing to prevent white rice from changing to milky colour. They can also acquire machines through as a cooperative. Farmers and traders should also ensure that their paddy rice is well dried before milling to avoid rice breakage. Processors must use the appropriate milling machines for the intended purpose to avoid rice breakage. The retailers should engage in activities such as packaging to ensure that both intrinsic and extrinsic attributes are maintained in order to meet consumers' requirement. The role of MoFA extension officers is to give advice on good agricultural practices, provide quality inputs, and on time. The government plays a key role to the development of the chain. Government support could be by assisting farmers with machines to reduce drudgery and by investing in the milling sector by partnering with millers to acquire high standard milling machine. Moreover, government can provide or partner to establish a warehouse for rice storage and microfinance for actors since most of them were financially constrained. In addition, all the actors need to be loyal among themselves and work collectively as this will help them to benefit from the opportunities found along the chain. The opportunities, such as government subsidies and growing demand for rice and, actors' ability to play their roles diligently could help develop the local rice value chain in order to meet consumers requirements.

Chapter 7: Conclusions, Implications and Recommendations

7.1 Conclusions

It has been predicted that the demand for rice will be increasing in Ghana in the foreseeable future due to the shift to rice consumption. Approximately 76% of the total rice consumption takes place in the urban centres, but with preference for high-quality imported rice due to its attributes including white and long grain, taste and aroma. The local rice is of low quality and uncompetitive due to an underdeveloped value chain. However, key interventions to develop the chain in order to deliver high-quality rice are not yet clearly identified. Therefore, this study was carried out to determine how the local rice value chain can be improved to satisfy urban high-quality rice demand through appropriate interventions.

Face-to-face interviews were conducted using a semi-structured questionnaire to solicit for the relevant information. The participants were selected in two phases by using a purposive sampling method. In phase one, an extension officer from MoFA who is involved in the government's rice projects was interviewed to know which chain actors needed to be interviewed. Actors including farmers, traders, millers, retailers and a policy officer at PPRSD were interviewed in phase two in order to obtain in-depth knowledge and a deeper understanding of rice value chain. In addition, field observations and document collation were done to support the primary data.

Four key areas including input supply, production and post-harvest, processing and retailing (packaging) were identified to be barriers to producing high-quality local rice. However, improving the whole chain requires the concerted efforts of the chain stakeholders including the actors and government including MoFA extension officers. Most of the farmers along the chain face difficulties in accessing quality inputs due to MoFA's inability to deliver inputs on time and limited seed growers. Therefore, provision of incentives to produce foundation seeds by the government and supplying quality seeds to MoFA in the regional offices will alleviate this problem.

The challenges in the production and post-harvest stage can be solved by practicing GAPs such as using improved planting techniques, timely harvesting and threshing to improve the yield and quality of the local rice. Government could also assist farmers to get access to machinery and soft loans in order to reduce the drudgery and improve post-harvest management. Moreover, provision of a warehouse will cater for the lack of storage facilities faced by actors. Alternatively, farmers

could acquire machines, warehousing and inputs through farmer groups and associations with support from government to get them established.

Rice processors were found to have been using low standard milling machines for polishing, leading to rice breakage resulting in low-quality rice hence, low patronage by consumers. As such, the government could support processors through a joint venture to acquire a high standard milling machine.

Rice retailing, with respect to packaging is not a key challenge but would benefit retailers, and it is very important from the consumers' point of view. Retailers are advised to engage in attractive packaging because consumers' purchasing decision is partially based on the attractiveness of the product, whether local or imported. In addition, packaging of the local rice would provide food safety and reduce waste to benefit the retailers.

The local rice value chain can be improved to deliver high-quality rice to satisfy urban rice consumers and compete against imported rice if these four key areas are addressed.

7.2 Implications

In Ghana, there is lower import substitution for rice because of the demand and supply challenges to the local rice competitiveness. Nevertheless, this research has provided evidence that value chain interventions could be applied to deliver high-quality local rice. Implementing these strategies will improve the yield and quality of the local rice thereby making the local rice competitive on the market and, ensure food security.

In addition, the Ashanti Region of Ghana is considered as an essential hub for rice consumption (>35% of rice consumption). It is also among the top five regions in the country that produce rice in high quantities. This implies that, the research will help to improve the yield and quality of the local rice to meet the market requirements. It will also be useful for organizations who engage in smallholder farmers' development programs, like NGOs and MoFA.

Moreover, this study will be beneficial to policymakers and development agencies who are keen on improving the competitiveness of local products (including rice). This will generate revenue for both government (through taxes and joint venture) and local producers, while delivering high-quality produce to the market.

Finally, this research has improved the understanding of the existing knowledge on value chain interventions that can be applied to develop value chains.

7.3 Recommendations

Based on the key findings from this study, some recommendations to policymakers/government, MoFA, and actors to improve the local rice value chain in the Ashanti Region of Ghana are as follows:

Policymakers/ Government

It is recommended that public education be provided to create awareness that the high-quality local rice meet both intrinsic (aromatic, white colour, tasty and long grains) and extrinsic attributes (safety). This research also revealed that there are nutritional benefits of consuming local rice. Local rice is rich in fibre content which aids in digestion. It can help fight colon cancer and protect the heart from diseases due to the presence of magnesium and selenium. Local rice (especially, the brown rice) can help to reduce the possibility of diabetes unlike polished white rice.

Moreover, government should target investments on key stages of the rice value chain such as production, post-harvest and processing stages as major challenges to delivering high-quality rice are found in those areas.

Ministry of Food and Agriculture (MoFA)

Some of the farmers had limited knowledge on GAPs because MoFA extension officers do not visit them frequently and only work with them during the production season. It is recommended that the officers educate and train farmers frequently on GAPs and make follow-up visits to ensure farmers follow the GAPs. Moreover, MoFA should ensure they receive only a high-quality seed from seed distribution companies and deliver on time to the farmers since cultivation depends on the rains hence, it is time bound.

Retailers

Retailers should package the local rice before selling since it is one of the key attributes' consumers consider when purchasing rice. Again, they should make prompt payment to farmers and processors when they purchase milled rice from them or follow the agreed terms for payment to build trust among themselves. They are encouraged to invest in rice production and milling because that will enable them to get high-quality rice for their customers.

Processors

Processors should use their milling machine for purpose-specific and not use it for polishing the rice because that leads to breakage. Nevertheless, high standard machines can be used to get whiter/polished and long grain rice, thereby meeting consumers preference for long grain rice to broken rice.

Farmers

This research suggests, based on literature that farmers can work collectively through farmer associations. This could help them to access credit, inputs/machines and other support services which can help them to benefit from higher prices since this can give them higher bargaining power. In addition, one key issue identified was the issue of trust among farmers. Farmers should make prompt payment of small loans they take from their fellow farmers, retailers and processors during the production season right after selling their milled rice.

7.4 Study Limitations

Although Ashanti Region is part of the top 5 regions that produce rice in high quantity, the researcher acknowledges that rice is intensively produced in the top 3 regions: Upper East, Northern and Volta Regions. The research focused on only Ashanti Region due to time and budget constraints. Hence, the rice value chains in those areas might differ from what was found in Ashanti Region. Similarly, for local rice packaging, this study primarily focused on the Ashanti Region, so it may not be applicable to high-quality local rice in other rice-producing regions. Lastly, the study focused on just urban rice consumers.

7.5 Future Research

Given resource and time constraints, this study focused on only Ashanti Region and, it would be beneficial for further studies to be carried out in other rice-growing regions. The research framework could also be adopted to study the demand of high-quality rice in rural areas in relation to local and imported rice. A further study can also be done on how the identified value chain interventions can be implemented.

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APPENDIX 1: HERBICIDES USED BY THE RICE FARMERS WHOM INTERVIEWED

APPENDIX 2: PADDY FIELD IN NKAWIE

APPENDIX 3: STORAGE OF PADDY RICE IN A TARPAULIN ON THE FARM

APPENDIX 4: TREATED PADDY RICE PUT IN A SACK AND WATER FOR 2 DAYS BEFORE IT COULD BE PLANTED ON THE FIELD OR SEED BED

APPENDIX 5: MILLING MACHINE USED IN ATWIMA MIM (STUDY AREA)

APPENDIX 6: INTERVIEW QUESTIONS TO MOFA, EXTENSION OFFICER

Participants' General Information

Name ….

Educational level….

Contact details…

I. Support and constraints in rice production

1. Who are the key players in the local rice value chain? b. How does it function?

2. What kind of problems do the rice farmers face? (E.g. pests, diseases, variety, market, quality, transportation, post-harvest etc.)

3. Has MoFA by any means helped the farmers to overcome those challenges?

4. How does MoFA support rice farmers? (e.g. extension services)

5. To what extent has your support helped the farmers? Any impact yet?

6. How often does MoFA communicate with the farmers?

7. Have you collaborated with NGOs or other organizations to support rice activities in Ashanti Region?

8. If yes, what are the pros and cons of collaborating with these institutions?

9. What are the challenges in supporting rice farmers (e.g. financial constraints, transportation etc.)?

II. Future Plans

10. Do you plan to support/ continue to support rice activities (or actors)?

11. If yes, how will you do so? And when will you start?

12. What would be the possible major challenges to do so? b. How will you manage them?

13. In your opinion, how can the local rice value chains in Ashanti Region be improved?

14. How can those interventions be implemented?

APPENDIX 7: INTERVIEW QUESTIONS TO PLANT PROTECTION AND REGULATORY SERVICES DIRECTORATE OFFICER

I. Participants' General Information

Name ….

Educational level….

Contact details…

II. General questions on rice importation

1. What are the rules for rice importation (Quotas, trade barriers)? b. Why those rules?
2. How do you set the rules?
3. How does it affect the local rice value chain actors? (Advantages and disadvantages)
4. Do you plan to revise the rules? Why/Why not?
5. What are the specifications of the imported rice?
6. What challenges do you face? b. How do you manage them?

APPENDIX 8: INTERVIEW QUESTIONS TO TRADERS/RETAILERS

I. Participants' General Information

Name …

Educational background…

Contact details ….

II. Rice Business Characteristics

1. How do you do your business? b. What is the motivation?
2. What type of rice do you buy from your suppliers (paddy, processed, graded or sorted, packaged)? Why/why not?
3. What does success look like for you?
4. What is your target profit margin? b. Do you have turnover?

III. Market Access

5. How do you receive market information? (price, quality)
6. Are you aware of the market requirements? (E.g. quality, grade, package etc.)
7. What is your definition for "high-quality rice"?
8. How many grades do you make and what are the specific criteria for each grade?
9. What criteria do you consider before buying from your source and why?
10. How do you know what your consumers want?
11. How do you know what to buy, in terms quality and packaging?
12. How do you buy/sell your products? (premium price, stable price, negotiation)

IV. Relationship with the actors

13. How do you select your suppliers? b. How often do you change your source?
14. Do you have any agreements with them? Please explain why/why not.
15. If yes, please explain the terms and conditions as well as the pros and cons of the agreement?
16. Do you face any challenges in communicating with your buyers/suppliers? Please explain why/why not.

V. Resources and Infrastructure

17. How do you transport your products? Any difficulties?

18. How do you store rice? (E.g. Storage technologies and facilities used) b. Why do you do it that way?

19. Do you face any challenges on how you store your products? Please explain why/why not.

20. How long does it take to store local rice and imported rice and you able to sell all your products within the timeframe?

21. What percentage of rice has been wasted per year due to improper transportation and storage facilities? How did you manage it?

22. How do you get access to credit facilities?

23. Do you pay tax? If yes, at what percentage?

VI. Institutional Support and policies

24. How do you get support from the government, NGOs or other associations to get better market access, better quality product etc.?

25. How does it help your business?

26. How have government rice policies impacted your business?

27. How have tax policies on imported rice impacted your business?

VII. Future Plans and Interventions

28. Do you have plans to expand your rice business? Looking forward, what are the opportunities for you?

29. What would be the major challenges to do so? b. How will you manage it?

30. In your opinion, how can the local rice value chains can be improved to get quality rice?

31. How can you deliver/continue to deliver high-quality rice to your consumers all year-round? (e.g. training, support from government)

32. In your opinion, what interventions could be applied in the Ashanti Region's rice value chain to make it improved? b. How can it be done?

VIII. Additional interview questions to wholesalers and retailers

1. How do you measure the rice you sell (both local and imported rice)? Why?
2. How do you set the price for your products?
3. What type of local rice and/or imported rice do you sell (long grain, broken, short grain)?
4. Which countries do you buy the imported rice from and why?
5. Comparing local and imported rice, which one do consumers prefer the most and why do you think it is so?

APPENDIX 9: INTERVIEW QUESTIONS FOR PROCESSORS

I. Participants' General Information

Name ….

Educational level…

Contact details…

II. Rice Processing Information

1. How do you do your business? b. What is your motivation?
2. How does your processing machine function? (Grading, sorting, polishing)?
3. What is your definition for "high-quality rice"?
4. What do you do in your processing to get high-quality rice? Or How are you able to get high-quality rice? (Question to high-quality rice processors)
5. Do you get highly polished and/or long grain rice after processing?
6. If no, about what percentage of broken rice do you normally get?
7. Do you get complains from your wholesalers/retailers about the quality level of rice you process? If yes, how did you improve upon it?
8. What is the target profit margin of your business?

III. Market Access

9. How do you get market information (on price, quality, volume etc.?)
10. Are you aware of the market requirements? (E.g quality, long grain, etc.)
11. How do you determine high-quality rice and how do you pay or get paid for it? (e.g. premium)
12. How do you pay for the people you buy from and how are you paid for it by the people you sell to? (e.g. negotiation)
13. How do you use the ones that turn out to be of low quality after processing (e.g. broken)?

IV. Relationship with the actors

14. How do you sell rice (their suppliers/ buyers)?

15. Do you make any agreements with your suppliers and/or buyers?

16. If yes, what are the terms and conditions and the pros and cons of the agreement?

V. Future Plans and interventions

17. Do you have any plan to expand your rice business in the future? What are the opportunities?

18. What would be the major challenges you are likely to face? b. How will you manage it?

19. In your opinion, how can the local rice value chain be improved?

20. In your opinion, what interventions need to be done in the rice processing business to make you get high-quality rice?

21. How can the interventions be implemented?

APPENDIX 10: INTERVIEW QUESTIONS TO FARMERS

I. Participants' General Information

Name …

Educational level…

Contact details …

II. Farming and post-harvest management

1. How do you grow rice? (Inputs, varieties, irrigation, costs of production) b. What is your motivation?

2. How do you select a variety for cultivation? (e.g. criteria for selection)

3. How often do you change the variety? Why?

4. Are you aware of the different rice varieties in the region?

5. How do you determine high-quality rice varieties?

6. Do you spray agrochemicals? b. Which ones? c. What are the advantages and disadvantages of its usage?

7. How do you harvest your rice? b. What challenges do you face? (E.g. labour, weather, rain, etc.)

8. How do you store rice after harvesting? Please explain why/why not. b. For how long do you store it before selling it?

III. Market Information and Access

9. How do you get market information? (E.g price, quality etc.) Any challenges?

10. What is your definition for "high-quality rice"?

11. Are you aware of the market requirement? b. Are you able to deliver the quality your buyers require? c. How are you able to do it?

12. How do you sell your rice? (premium price, fixed price)

IV. Resources and Infrastructures

13. How do you transport your inputs to the farm?

14. How do you get access to infrastructure for storage during the season?

15. How do you transport paddy rice to the buyer? (E.g. processor, middlemen).

V. Relationship with other actors

16. How do you get your inputs? Why that place?

17. Do you have an agreement with the buyers/input suppliers? (E.g contract)

18. If yes, what are the terms and conditions of the contract? (E.g price, quality, interest rate, volume etc.)

19. Are you a member of an association/group?

20. If yes, please explain what kind of association/group and the pros and cons of being a member?

21. Have you been part of collective selling of paddy rice and/or joint purchasing of inputs such as fertiliser and seeds (quality) with other rice farmers? Please explain why/why not.

22. If yes, what are the pros and cons of them?

VI. Institutional Support/opportunities

23. How do you get support, e.g. from your buyers, government or NGOs or any other associations to get better quality, higher yield? (Technical training, providing quality seeds and fertiliser for free or at a reduced price, etc.)

24. How does it impact your rice business (e.g. quality, yield etc.)?

VII. Drivers in local rice value chains

25. Who are the leaders of rice value chains in Ashanti Region?

26. What is your opinion of the whole chain? (E.g. too many actors, relationship of the actors along the chain etc.)

VIII. Future plans and interventions

27. Do you have plans to expand your rice business (What are the opportunities)? Please explain why/why not.

28. If yes, how are you going to expand it? b. What would be the major challenges to do so? c. How will you manage it?

29. In your opinion, how can the rice industry be better?

30. What factors can help you (or rice farmers) to improve rice business by producing high-quality rice?

APPENDIX 11: ETHICS APPROVAL FORM

MASSEY UNIVERSITY
TE KUNENGA KI PŪREHUROA
UNIVERSITY OF NEW ZEALAND

Date: 15 January 2020

Dear Abena Konadu Oppong

Re: Ethics Notification - 4000022106 - Value chain interventions for satisfying urban high-quality rice demand in the Ashanti region of Ghana.

Thank you for your notification which you have assessed as Low Risk.

Your project has been recorded in our system which is reported in the Annual Report of the Massey University Human Ethics Committee.

The low risk notification for this project is valid for a maximum of three years.

If situations subsequently occur which cause you to reconsider your ethical analysis, please contact a Research Ethics Administrator.

Please note that travel undertaken by students must be approved by the supervisor and the relevant Pro Vice-Chancellor and be in accordance with the Policy and Procedures for Course-Related Student Travel Overseas. In addition, the supervisor must advise the University's Insurance Officer.

A reminder to include the following statement on all public documents:
"This project has been evaluated by peer review and judged to be low risk. Consequently, it has not been reviewed by one of the University's Human Ethics Committees. The researcher(s) named in this document are responsible for the ethical conduct of this research.

If you have any concerns about the conduct of this research that you want to raise with someone other than the researcher(s), please contact Professor Craig Johnson, Director - Ethics, telephone 06 3569099 ext 85271, email humanethics@massey.ac.nz."

Please note, if a sponsoring organisation, funding authority or a journal in which you wish to publish requires evidence of committee approval (with an approval number), you will have to complete the application form again, answering "yes" to the publication question to provide more information for one of the University's Human Ethics Committees. You should also note that such an approval can only be provided prior to the commencement of the research.

Yours sincerely

Professor Craig Johnson
Chair, Human Ethics Chairs' Committee and Director (Research Ethics)

APPENDIX 12: INFORMATION SHEET

MASSEY UNIVERSITY
COLLEGE OF SCIENCES
TE WĀHANGA PŪTAIAO

Value chain interventions for satisfying urban high-quality rice demand in the Ashanti Region of Ghana.

INFORMATION SHEET

Dear Sir/Madam,

My name is Abena Konadu Oppong and I am from Kumasi, Ghana. I am a Master student at Massey University, Palmerston North, New Zealand.

Research Description and Invitation

The aim of this research is to identify how the local rice value chain can be developed through value chain interventions to meet urban high-quality rice demand to be able to compete against imported rice in the Ashanti Region of Ghana.

To achieve the aim of this study, I intend to interview the stakeholders along the local rice value chain in Ashanti Region. I will also conduct personal interviews with an extension officer at the Ministry of Food and Agriculture (MoFA) and Self Help International (NGO) in Ashanti Region.

I am therefore inviting you to participate in this research. You will be asked to sign a consent form if you decide to participate in the interview. The interview will take approximately one hour and with your permission, I would like to audio tape the interview session.

Participant's Rights

If you decide to take part in this interview, you have the right to;

- Decline to answer any particular question.
- Withdraw from the study at any time during participation.
- Ask any questions about the study at any time during the interview session.
- Provide information on the understanding that your name will not be acknowledged unless you give permission to the researcher.
- Ask for the voice recorder to be turned off at any time during the interview.
- Be given access to a summary of the project findings when it is concluded.

Data management

Data obtained will be analysed and used for the thesis completion in Master in Agribusiness degree and for other related academic publication. All data will be kept safely by Massey University and as required, pseudonyms will be used to ensure confidentiality. The completed thesis will be accessed through the Massey University Library.

Project contacts

For your convenience, contact details of me and my two supervisors have been provided below:

Researcher	Chief Supervisor	Second Supervisor
Abena Konadu Oppong	Professor Nicola Shadbolt	Thiagarajah, Ramilan
6 Otira Place	Senior lecturer, Agribusiness	Senior lecturer, Agribusiness
Palmerston North	Department, School of	Department, School of
New Zealand	Agriculture & Environment,	Agriculture & Environment,
	College of Sciences	College of Sciences
	Massey University	Massey University
	Palmerston North	Palmerston North
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Nanaabenakonadu1@gmail.com	N.M.Shadbolt@massey.ac.nz	T.Ramilan@massey.ac.nz

This project has been evaluated by peer review and judged to be low risk. Consequently, it has not been reviewed by one of the University's Human Ethics Committees. The researcher(s) named in this document are responsible for the ethical conduct of this research. If you have any concerns about the conduct of this research that you want to raise with someone other than the researcher(s), please contact Professor Craig Johnson, Director (Research Ethics), email humanethics@massey.ac.nz. "

I thank you in advance for your participation.

Abena Konadu Oppong

APPENDIX 13: CONSENT FORM

MASSEY UNIVERSITY
COLLEGE OF SCIENCES
TE WĀHANGA PŪTAIAO

Value chain interventions in the Ashanti Region for satisfying urban high-quality rice demand

PARTICIPANT CONSENT FORM

I have read the information sheet and have had the details of the study explained to me. My questions have been answered to my satisfaction, and I understand that I may be asked further questions at any time.

I agree/do not agree to the interview being sound recorded.

I agree to participate in this study under the conditions and participant rights set out in the information sheet.

Full name…….................
Signature……………….
Date………………………