FACTORS AFFECTING SMALLHOLDER PADDY RICE FARMER'S CHOICE OF MARKETING CHANNEL IN THE NORTHERN REGION OF GHANA

A thesis submitted in partial fulfilment of the requirements for the degree

of

Master of AgriCommerce

at

Massey University, Palmerston North, New Zealand

EUNICE ADU

2018

ABSTRACT

The scientific community advocates that enhancing smallholder farmers' access to reliable, ready and direct market channel is a prerequisite to the attainment of sustainable food supply and poverty reduction in the developing world including Ghana.

However, the smallholder farmers' access to direct marketing channels in Ghana has been a critical challenge; therefore, this study aims to analyse the factors that influence smallholder paddy rice farmers' decision to participate in either the direct marketing channel specifically processors or the indirect marketing channel specifically, middlemen in the Northern Region of Ghana. Purposive sampling was used to select farmers from three rice growing districts in the Northern Region of Ghana. The study employed the Binary Logit regression model in the analysis of the factors affecting farmers' choices of marketing channel. A t-test was also used to compare the mean yields and revenues generated by farmers who marketed their paddy rice outputs in the direct and indirect marketing channels. A five-point Likert scale was used to rank the constraints that affect the production and marketing of rice output among rice farmers. The study revealed that a lower percentage of farmers sold their paddy rice output to processors (direct channel). The Logit model showed that farm size, the price of paddy rice output per 85kg bag, access to market information and access to credit increased the farmers' participation in the direct marketing channel whereas payment period and ownership of bicycle reduced farmers' their participation. The t-test result revealed that the participation in the direct marketing channel raised farmers' revenue. The study further showed that limited access to credit, poor climatic condition, the high cost of labour, the high cost of farm inputs and low mechanisation were the top five production challenges they encountered in their rice production. Low market prices, post-harvest losses, the high cost of transportation, limited market option and low demand for local rice were the top-ranked marketing constraints reported by farmers. The study concludes that it is more profitable for farmers to sell their paddy rice output to processors instead of middlemen. Therefore, policymakers need to incorporate the significant factors of farmers' choices of marketing channels in the formulation of agricultural policy that seeks to promote farmers' access to direct marketing channels in developing countries including Ghana.

DEDICATION

I dedicate this thesis to my fiancé, Emmanuel Kwame Donkor, for his encouragement, support, patience and love and my beloved mum, Madam Hannah Takyiwaa, for all the spiritual support and advice. Their constant motivation has contributed significantly to all this success. I love them very much, and I pray God's abundant blessings upon their lives.

ACKNOWLEDGEMENT

List of Tables

List of Figures

Chapter One: Introduction

1.1 Background

A large number of people directly or indirectly rely on agriculture for their livelihoods. Most of these people are smallholder farmers who operate on parcels of land that are, on an average, less than 2ha Alliance for a Green Revolution in Africa (2017); (Fischer & Qaim, 2012; International Food Policy Research Institute, 2018). Alliance for a Green Revolution in Africa (2017) strongly argued that agriculture is a proven path to prosperity. The report further maintained that no country in the world had developed a diverse, modern economy without first establishing a robust and fruitful foundation in agriculture. This suggests that agriculture remains the sure way for growing inclusive economies and creating decent employment, notably for the growing youth population. More importantly, about 500 million farms around the world provide sources of livelihoods for more than 2 billion people(International Food Policy Research Institute, 2018). A recent report by Alliance for a Green Revolution in Africa (2017) revealed that smallholder farmers constitute about 70% of the population in Africa. These smallholder farmers account for about 80% of the food supply in the sub-African region (International Food Policy Research Institute, 2018). Despite the contribution of smallholder farmers to sustainable supply, the issues of food security and poverty are more prevalent among smallholder farmers, particularly in the rural areas of developing countries including Ghana.

It is estimated that about 20.6% of the population in Africa is food insecure or malnourished while the majority tend to live on less than US$ 2 a day (Food and Agriculture Organization, 2017a; Food Security Information Network, 2017). The growing population in Africa tends to worsen the issues of food security and poverty. The current population in Africa is 1.2 billion people, constituting about 17.17% of the world current population and it is projected to double by 2030(Alliance for a Green Revolution in Africa, 2017; International Food Policy Research Institute, 2018). This high population growth suggests a higher demand for food. World Bank estimates show that the African food market continues to grow. The current worth of the African food market is US$ 300 billion which is anticipated to increase to US$ 1 trillion by 2030 (Alliance for a Green Revolution in Africa, 2017). Demand for food is projected to at least double by 2050. These tend to combine with Africa's food import

1

expenditure of US$ 30-50 billion; this suggests a considerable market opportunity for smallholders, Africa's most significant entrepreneurs(Alliance for a Green Revolution in Africa, 2017; International Food Policy Research Institute, 2017, 2018).

One of the food commodities widely consumed in Africa is rice. Rice is the most important source of calories for humans(Nasrin et al., 2015). The demand for rice has increased considerably in sub-Saharan Africa (SSA) since 1995 (Demont, 2013; Mohanty, 2013). The driving forces for this high rice consumption can be traced a combination of population growth, increasing rate of urbanization, changing consumer preferences and economic development (Balasubramanian, Sie, Hijmans, & Otsuka, 2007; Hossain, 2006; Mohanty, 2013). Although rice production in SSA has risen significantly over the past 50 years, demand has outweighed domestic supply resulting in increasing imports. The share of import in African rice consumption has increased by 2% per year over the past 50 years and reached 43% in 2009. Nasrin et al. (2015) revealed that African countries imported almost 33% (11.8 million tonnes) of the total rice traded on the world market in 2011. West African countries including Ghana tend to be the largest importers of rice (Nasrin et al., 2015). A recent estimate shows that African spends more than US$ 4.3 billion on rice imports annually (Nasrin et al., 2015). For example, in Ghana, 60% of the total supply of rice comes from imports which amounted to over US$ 600 million per annum (USDA, 2018). This reveals that there are substantial market opportunities for rice. Surprisingly, smallholder farmers' access to these markets, particularly direct and higher-value markets remain a significant challenge in Africa (Akramov & Malek, 2012).

1.2 Problem Statement

Ghana is very dependent on agriculture; therefore, the marketing of agricultural produce plays an essential role in the economy, especially in the northern parts where there are higher rates of rural poverty and the highest number of people who are food insecure (Breisinger, Diao, Thurlow, & Al-Hassan, 2008). Research evidence shows that the overall goal of food security and poverty reduction among smallholder farmers in developing countries can be minimized through marketing (Barrett, 2008; Donkor, Onakuse, Bogue, & De Los, 2018). In the marketing of agricultural goods, the decision on which channel to be used is critical to smallholder farmers in Ghana. This is because the choice of marketing channel tends to affect farmers production and marketing opportunities (Barrett, 2008).

Marketing channel choice is one of the critical components to successful marketing for the rural rice producers, as different channels are characterized by different costs and profit margins (Soe, Moritaka, & Fukuda, 2015). Studies have shown that selling to middlemen or brokers or collectors at the farm gate is often less remunerative(Amanor-Boadu, 2012; Cazzuffi & McKay, 2012). However, this may be the only option for farmers who cannot transport their farm output to the rice processing mills in a nearby town, district capital or regional capital. It may also be the only option for farmers who are time and financially constrained, thus, prefer to perform a single transaction at the farm gate, instead of several transactions by incurring transportation costs to convey the rice output to the nearest processing centers.

The majority of rice farmers in Ghana are smallholders with their rice farm size of less than 2 hectares and are faced with numerous challenges (Amanor-Boadu, 2012). Access to reliable and affordable transportation, as well as proper storage facilities are some of the challenges these farmers encounter (Anang, Bäckman, & Sipiläinen, 2016). This suggests that the farmers cannot store their rice output for long. The lack of storage facility coupled with immediate financial needs compel the farmers to sell their rice output immediately after harvesting. This enables them to cater to their immediate financial responsibilities. During the period of bumper harvest, the price of rice is generally low at the farm gate which suggests that the farmers tend to receive low prices for their rice output. Therefore, the profit margins of the farmers tend to be low, and their standard of living continues to be low. Hence, rural poverty keeps rising. The choice of a marketing channel is essential factor farmers have to consider if they aim to make profit and improve upon their economic welfare. Literature acknowledges that the marketing of agricultural commodities is an essential component in the food supply chain (Barrett, 2008; Fischer & Qaim, 2012). Therefore, a number of studies have been conducted in the developing world including Ghana to analyse the determinants of farmers' participation in different agricultural markets(Alene et al., 2008; Anteneh, Muradian, & Ruben, 2011; Arinloye et al., 2012; Barrett, 2008; Donkor et al., 2018; Fischer & Qaim, 2012; Jagwe, Machethe, & Ouma, 2010; Martey, Annin, Wiredu, & Attoh, 2012; Maspaitella, Garnevska, Siddique, & Shadbolt, 2018; Mmbando, Wale, Baiyegunhi, & Darroch, 2016). However, it is observed that there is a dearth of literature on the analysis of the determinants of rice farmers' decisions to participate in different marketing channel in Northern Ghana. In contrast, there is an extensive literature addressing production issues such as technology adoption(deGraft-Johnson, Suzuki, Sakurai, & Otsuka, 2014; Donkor, 2016b,

2014; Owusu Coffie , Burton, Gibson, & Hailu, 2016) and productivity and efficiency of rice production (Addison, Sarfo-Mensah, & Edusah, 2015; Amanor-Boadu, 2012; Anang et al., 2016; Donkor, 2016b, 2016c; Faltermeier & Abdulai, 2009; Owusu, Donkor, & Owusu-Sekyere, 2017). Therefore, there is a dearth of information to rice farmers' choice of marketing channel, and as a result, farmers end up selling their rice to channel that offer low prices, and this does not help them to increase their goal of higher incomes. Therefore, this study aimed to identify and analyse the factors that affect smallholder rice farmers choice of existing marketing channels in the Northern region of Ghana.

1.3 Research Questions

To address the problem stated above, the following research questions was considered;

1. What are the factors that affect smallholder paddy rice farmers' choice of marketing channel decision in the Northern region of Ghana?
2. What are the effect of marketing channel choice on smallholder paddy rice farmers' income in the Northern region of Ghana?
3. What are the primary production and marketing challenges faced by smallholder rice farmers in the Northern region of Ghana?

1.4 Research Objectives

The primary objective of the research is to find out and analyse the relevant factors that influence paddy rice farmers' choices of marketing channels for their rice products. To address the main research goal, some specific objectives are set:

1. To identify and analyse the factors that affect smallholder paddy rice farmers' choice of marketing channel decision in the Northern region of Ghana;

2. To analyse and discuss the effect of marketing channel choice on smallholder paddy rice farmers' revenue in the Northern region of Ghana;

3. To identify and rank the significant production and marketing challenges faced by smallholder paddy rice farmers in the Northern Region of Ghana.

1.5 The Significance of the Study

A study on the marketing channel choices of smallholder farmers in Ghana is vital for many reasons. First, the rice sector provides employment opportunities through input supply, production, processing, marketing, and logistics for about 10% of Ghanaian households

4

(Anang, 2017). The northern part of Ghana is regarded as an essential hub of rice production which contributes the largest to the national rice output (Anang, 2017; Asuming-Brempong & Osei-Asare, 2007). Most of the rice supply in Northern Ghana come from the smallholder farmers who are located in rural areas characterized by low level of infrastructural development (Ministry of Food and Agriculture, 2013). The rural areas of Northern Ghana are associated with more prevalence of food insecurity and poverty (Faltermeier & Abdulai, 2009). A recent study suggested that the majority of the farming households in rural northern Ghana are food insecure and live below an income of US$ 2 a day (Anang, 2017). Rice is considered as an important cash crop for smallholder farmers in Northern Ghana. Therefore, conducting a study to promote the farmers' access to profitable marketing channel would stimulate them to increase their investment in productive inputs which, in turn, trigger higher yields. This would accordingly raise their income levels to improve their standard of living as well as transforming the rural economy in Northern Ghana. With increased incomes, the farmers can access better health care in the urban areas, provide better and quality education to their children.

Secondly, the current agricultural policy seeks to promote agro-industrialization agenda through the One District One Factory (1D1F) Presidential Initiatives in Ghana (Ministry of Food and Agriculture, 2017a). The study is aligned with this agricultural intervention. The findings generated from this study will provide a fundamental policy direction on which component of the rice supply chain needs critical attention.

Finally, is noted in the literature that there is a dearth of empirical studies on the factors affecting smallholder rice farmer's choice of marketing channel in Ghana and sub-Saharan Africa as a whole. This study tends to narrow the knowledge gap and add up to existing knowledge on the factors influencing farmers choice of marketing channel.

1.6 Outline of the Thesis

This thesis is organized into seven chapters. It commences with an introductory chapter, which presents the background of the study, the research problem, the research questions, the objectives and the significance of the study. Chapter 2 of the thesis presents information on the country of study, Ghana. The chapter also describes the agricultural sector of Ghana as well as the rice industry in the country.

In Chapter 3, the review of literature related to the theme of the study is provided. Specifically, the literature review focuses on the concept and theories of decision making as documented in the management literature and how they have been applied to explain the decision-making process in the context of agriculture. In the same chapter, the concept of agricultural marketing and its importance are presented. More specifically, the concept of marketing channel; empirical studies on smallholder farmers' choices of marketing channel as well as the factors that influence the farmers' choices of marketing channel in the developing countries are outlined in Chapter 3. Besides, the challenges facing smallholder farmers in the participation of agricultural markets are delineated in Chapter 3. Chapter 3 ends with the presentation of a conceptual framework based on extant literature. The conceptual framework tends to provide a guide to the empirical analysis of the study.

Chapter 4 presents a systematic and scientific research methodology employed to achieve the research objectives. The chapter describes the study area and outlines the sampling technique, data collection methods, and methods used in the analysis of the primary data set collected from the participants.

Chapter 5 presents the result of the primary data set. It presents explicitly results related to the characteristics of the participants of the study, the empirical result on the factors affecting farmers choice of marketing channel as well as the results of the challenges faced by the farmers. In chapter 6, the key findings from the study are discussed in a broader context and relation to existing empirical studies. The last chapter outlines the main conclusions drawn from the study and delineates relevant policy implications and suggestion for future research.

<center>**Chapter Two: Ghanaian Agriculture and Rice Sector**</center>

2.1 Introduction

This chapter provides background information on the agricultural sector as well as the rice industry in Ghana. The chapter is organised into four sections. The first section provides a general overview of Ghana. The second section describes the agricultural sector of Ghana and its contribution to the gross domestic product (GDP). In the third section, the rice sector of Ghana is presented while the last section outlines the summary of the chapter.

2.2 An Overview of Ghana

Ghana which was formerly known as Gold Coast is situated on the Western Coast of Africa and it shares borders with Burkina Faso to the north, Cote d'Ivoire to the west, Togo to the east and the south with the Gulf of Guinea as shown in Figure 2.1 (World Atlas, 2015).

Figure 2.1. The map of Ghana(Ghana Quest, 2017).

Ghana is astronomically located on Latitude 4° 44'N and 11^o11'N; Longitude 3^o11' W and 1° 11'E (World Atlas, 2015). It has a total land area of 238,533km^2 and is the 82nd largest nation

<center>7</center>

in the world(World Atlas, 2015). Ghana has two distinct seasons: wet (rainy) and dry. The wet season usually is between March and October while the dry season occurs between November and February(Ministry of Food and Agriculture, 2013). Annual average temperatures range from 26.1^{o}C in places near the coast to 28.9^{o}C in the extreme North (Ministry of Food and Agriculture, 2013). Ghana was the first country to gain independence in Sub-Saharan Africa in 1957 from its British colonies. For administrative purpose, Ghana is divided into ten regions, namely: Greater Accra (the capital city), Western, Eastern, Volta, Ashanti, Brong Ahafo, Northern, Upper East, and Upper West.

The 2010 Population and Housing Census (PHC) shows that Ghana has a total population of about 24.7 million with a life expectancy of about 61 years (Ghana Statistical Service, 2012; World Bank, 2016). Females constitute 51.2% of the population while the remaining 48.8% are males. Ghana's population increased by 30.4% over the 2000 population of 18.9 million (Ghana Statistical Service, 2012). Ashanti and Greater Accra regions have the greatest shares of 19.5% and 16.3% of the population respectively. However, the Upper East and Upper West account for the smallest shares of 4.2% and 2.8%, respectively(Ghana Statistical Service, 2012). The final census results also show that the working class, made up of people within the age range of 15-64, constitutes the largest population of 14 million, followed by children in the 0-14 age bracket with a population of 9.5 million, with the age of 65 years and above constituting 1.2 million(Ghana Statistical Service, 2012; World Bank, 2016). The adult population, which comprises people above 18 years, stands at 13.6 million, while the dependent population, consisting of people less than 15 years and above 65 years, is pegged at 10.6 million (Ghana Statistical Service, 2012).

Ghana is a lower middle-income country with its gross domestic product (GDP) estimated around $38.62 billion, an annual GDP growth rate of 5.7 and a national poverty ratio of 24.2% of the total population (World Bank, 2016). The Food and Agriculture Organization (2015) indicates that about 45% of the population dwell in rural areas while the remaining 55% live in the urban areas. The major occupation for most rural dwellers is agriculture.

2.3 Agriculture in Ghana

2.3.1 An Overview of the Ghanaian Agricultural Sector

Agriculture continues to be a strategic sector in the economic development of most low-income countries including Ghana (Diao, Hazell, Resnick, & Thurlow, 2007; Omiti, Otieno, Nyanamba, & McCullough, 2009).International Food Policy Research Institute (2017) report that agriculture employs about 40% of the active labour force globally. In sub-Saharan Africa, Asia, and the Pacific, the agriculture-dependent population is over 60%, while in Latin America and high-income economies the proportions are estimated at 18% and 4%, respectively (International Food Policy Research Institute, 2017). In Ghana, the sector plays an important role in socio-economic development through its contribution to GDP, food security, employment creation, rural development by linking the sector to other sectors both through forward and backward integration (Anang, 2017). The sector is the backbone of the economy serving as the largest source of employment; employing about 35.95% of the active labour force (Ghana Statistical Service, 2017). In 2016, the sector accounted for about 19.60 % of the national GDP (Food and Agriculture Organization, 2015). The development of the agriculture sector is, therefore, a declared priority for the Ghanaian government.

In the past, the economy of Ghana has relied heavily on the export of cocoa as the main agricultural product and gold as the main mineral resource. However, the economy has experienced some developments in the mineral sector by the recent discovery of oil while the manufacturing and service sectors continue to play crucial roles in the country's socio-economic development (Anang, 2017). The share of Ghana's agriculture in the gross domestic product (GDP) has been declining over time while that of the services sector has been gradually increasing. Agriculture's contribution to GDP dropped from 31.12% in 2006 to 19.60% in 2016 as shown in Figure 2.2 below. Conversely, during the same period, the service sector's (banking and insurance, tourism, marketing, etc.) contribution rose from 47.60% to 52.24% (Food and Agriculture Organization, 2017a)
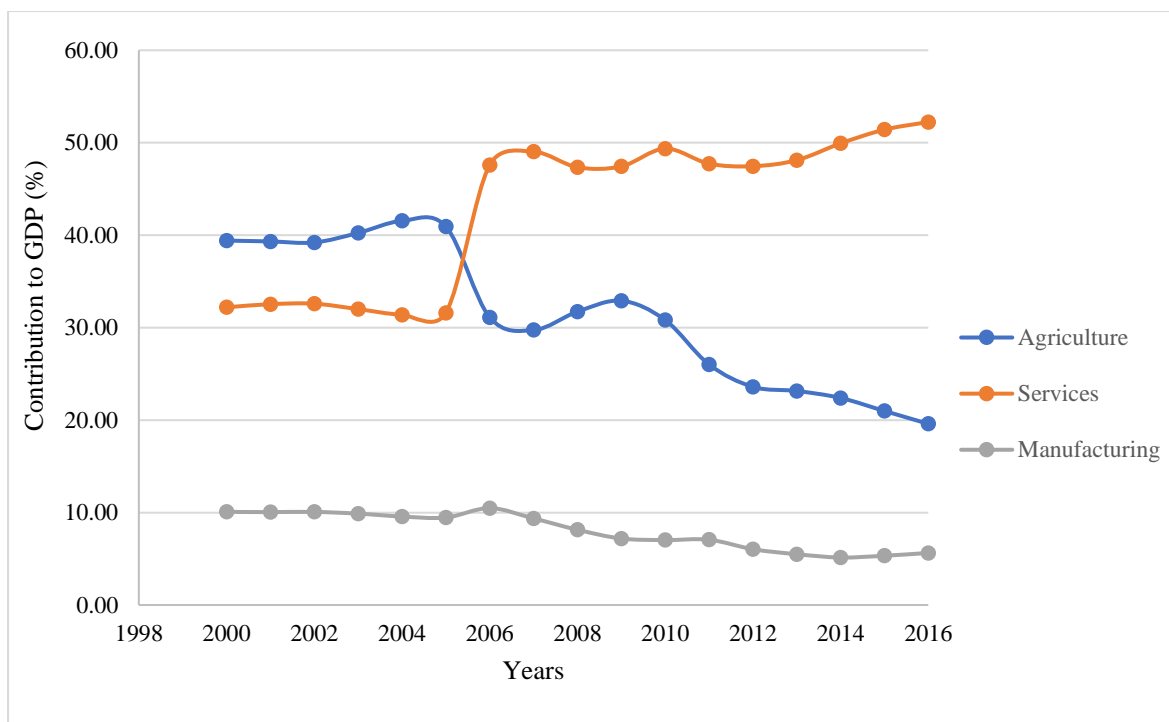
Figure 2.2. Sector contribution to GDP in Ghana from 1998-2016 (Food and Agriculture Organization, 2017a)

The agricultural sector in Ghana is dominated by smallholder farmers with an average land size of about 2 hectares or less (Anang, 2017). The Ministry of Food and Agriculture (2017a) indicates that the smallholder farmers constitute about 90% of the farming population in Ghana. These farmers and their families reside in the rural part of Ghana where poverty is high as compared to the urban areas. The development of the agricultural sector could reduce poverty and food insecurity in rural areas where agriculture is the major source of livelihoods (Anang, 2017). However, a myriad of problems impedes the development of the agricultural sector in Ghana. The challenges include over-reliance on the rainfall, low adoption of improved production technologies, high input prices, low product prices and low crop yields. Other institutional challenges include inadequate extension services, difficulty in accessing credit couples with high-interest rate, insufficient supply of infrastructure, and land ownership among others (Anang, 2017)

The Ghanaian agricultural sector comprises five main sub-sectors, namely: crop, cocoa, livestock, fishery, and forestry. Crop production is the largest contributor to the agricultural GDP with an estimate of 61.3%, followed by cocoa (13.3%), forestry and logging (11.1%),

10

livestock (7.5%) and fishing (6.9%) (Ministry of Food and Agriculture, 2013). Ghana's major exports include cocoa, timber, horticultural products, fish/seafood, game and wildlife and its principal mineral resources are petroleum, gold, bauxite, manganese, and diamond (Ministry of Food and Agriculture, 2013).

More than half (57.6%) of Ghana's land is employed by the agricultural sector of which 55% is under cultivation (Ministry of Food and Agriculture, 2013). About 27.6% of the agricultural land is arable land while 5% of the arable land is being used for cereal crop production, mainly maize, rice and sorghum (Ministry of Food and Agriculture, 2013). Crop production accounts for the largest proportion of the agricultural GDP as already indicated. The crop subsector comprises the production of cereals (maize, rice, sorghum, millet), legumes (cowpea, groundnut, Bambara groundnut), starchy (cassava, yam, cocoyam, potato, plantain).

2.3.2 Starchy Crops

The most important starchy crops grown in Ghana include cassava, yam, cocoyam, and plantain. Cassava is an important tuber crop grown by many farmers in Ghana, particularly those in the southern part. Ghana is the second largest producer of cassava in Africa after Nigeria (Ministry of Food and Agriculture, 2017a). Cassava alone contributes to about 22% of the agricultural GDP of Ghana (Ministry of Food and Agriculture, 2017a). Cassava provides employment opportunities for many people in Ghana. The crop can grow in marginalized soil and withstand harsh weather condition.

Ghana is also the second largest producer of yam in Africa (IITA & GOG, 2012). Yam is one of the primary agricultural commodity and major staple crop in Africa. The overall performance of Ghana's yam production is poor due to unfavourable climatic conditions. Yam production contracted by 1.8% in 2011. The total average yield was 14.50 metric tonnes per hectare in 2011. Since 2009, the yam yield has been decreasing due to intensive cultivation thereby depleting soil fertility (IITA & GOG, 2012).

Table 2.1 presents the production of selected starchy crops from 2005 to 2014. Between 2000 and 2014, cassava production increased by 73.8%, and yam rose by 81.5%, plantain increased by 35.6% (Table 2.1). However, there was a reduction in cocoyam production by 22.9%

11

between 2000 and 2009 (Table 2.1). It was obvious that cassava, yam, and plantain have experienced improvement regarding their production. Over the years, there have been root and tuber programmes to promote the production of these crops. However, there has been limited research on cocoyam, so it is not surprising that there was a reduction in its production.

Table 2.1. Production of selected starchy crops ('000 mt)

Crop	2005	2006	2007	2008	2009	2010	2011	2012	2013	2014
Cassava	9567	9638	10218	11351	12231	13504	14241	14547	15990	16624
Yam	3923	4288	4376	4895	5778	5960	6295	6639	7075	7120
Cocoyam	1686	1660	1690	1668	1504	1355	1300	1270	1261	1300
Plantain	2792	2900	3234	3338	3563	3538	3620	3557	3675	3786

Source: (Food and Agriculture Organization, 2017b; Ministry of Food and Agriculture, 2012)
Note: Data from 2015-2017 was unavailable.

2.3.3 Cereal Crops

Maize is an important food crop in Ghana, accounting for more than 50% of the country's total cereal production (Ragasa et al., 2013). The Ghana Grains Project (1979 - 1997) and Food Crop Development (2000-2008) made major investments to improve maize yield. Despite these efforts, the average yield of maize remained one of the lowest in the world. Maize yield has been increasing by 1.1% per annum in Ghana. In 2012, maize yields in Ghana averaged 1.2-1.8 mt/ha which was far below the potential yield of 4-6 mt/ha in on-station trials (Akramov & Malek, 2012). An empirical finding showed that the low yield of maize was attributed to low technology adoption, inadequate market, and policies (Ragasa et al., 2013). However, the growing population, urbanization and growing poultry and fish sectors in Ghana have contributed to increased demand for maize. Per capita consumption, mainly white maize, grew only marginally from 38.4kg in 1980 to 43.8kg in 2011 (Ministry of Food and Agriculture, 2010, 2012). The poultry industry's demand for maize used as feed was estimated to have grown by 10% annually between 2000 and 2009 (Hurelbrink & Boohene, 2011).

Table 2.2 presents the production values of some cereal crops such as maize, millet, and sorghum. The production of maize increased from 1,171 ('000mt) in 2005 to 1,762 ('000mt)

in 2014, which suggested about 50.4% increment in maize production between 2005 and 2014 (Table 2.2). Similarly, millet rose from 185 ('000mt) in 2005 to 245.6 ('000mt) in 2009 and then production dropped to 155 ('000mt) in 2014 (Table 2.2). Millet production reduced by 16% from 2005 to 2014. In the case of sorghum, the production level increased from 305 ('000mt) in 2005 to 350 ('000mt) in 2009 and also dropped to 259 ('000mt) in 2014. Between 2005 and 2014, sorghum production only decreased by 15%. Maize production only experienced an increase in production whereas millet and sorghum had a decrease in production. The possible reason was that the maize sector had received considerable attention and development over the years. New improved maize varieties have been developed and distributed to farmers. Farmers have also increased the application of fertiliser in maize production (Ragasa et al., 2013). These developments may have contributed significantly to the increase in the maize production in Ghana. Another important cereal crop grown by farmers as a cash crop is rice. The rice sector in Ghana is comprehensively discussed in Section 2.3.

Table 2.2. Production of cereal crops ('000 mt)

Crop	2005	2006	2007	2008	2009	2010	2011	2012	2013	2014
Maize	1171	1189	1219.6	1470.1	1619.6	1871.7	1684	1949.9	1768	1762
Millet	185	165	113.	193.8	245.6	219	184	179.7	155.1	155
Sorghum	305	315	154.8	330.9	350.6	324.4	287	280	256.7	259

Source: (Food and Agriculture Organization, 2017b; Ministry of Food and Agriculture, 2012)
Note: Data from 2015-2017 was unavailable.

2.4 Ghanaian Rice Sector

2.4.1 The Rice Sector Development Policies in Ghana

The Food and Agriculture Sector Development Policy (FASDEP II) is a national food and agriculture sector policy framework that aims at modernizing agriculture to generate employment opportunities, reduce food insecurity and poverty to achieve economic development in Ghana (Ministry of Food and Agriculture, 2017a). This policy framework was formulated in 2007, and it targeted crops such as (maize, rice, yam, cassava, and cowpea). Since rice is an important component in Ghanaian diet, the Government of Ghana and other local and foreign organization have initiated some projects that can help increase rice output, to help reduce rice import bills, create employment for the youth and mitigate the

hardship faced by local rice farmers. The projects include the Nerica Rice Dissemination Project (NRDP), the National Rice Development Strategy (NRDS), the Rice Sector Support Project (RSSP), the Inland Valley Rice Development Project (IVRDP), the Sustainable Development of Rain-fed Lowland Rice Production Project (Ministry of Food and Agriculture, 2017b)

Nerica Rice Dissemination Project (NRDP) was implemented in 2003 and lasted for five years. The project was supported by the African Development Bank (AfBD). The main goal of the project was to reduce poverty and promote food security through enhanced access to high yielding NERICA upland rice varieties. The NRDP was implemented in some districts in Northern (Tolon-Kumbungu, Savelugu-Nanton, Central Gonja, and West Gonga), Brong Ahafo (Atebubu-Amantin), Ashanti (Ejura-Sekyedumasi) and Volta (Kpando, Jasikan, Kadjebi) regions (Ministry of Food and Agriculture, 2017b). The NRDP had four components: technology transfer, production support, capacity building and project coordination. The project achieved the following outcomes:

- Production and distribution of 1128.07mt of certified Nerica seeds to rice growers in the aforementioned districts;
- Development and dissemination of improved rice technology such as optimal fertiliser use across the three agro-ecologies (Savannah, transitional and forest), weed management regimes, plant density and spacing;
- Estimated 56,400mt of Nerica rice was produced, and about 875 farmers benefited from the project;
- Establishment of standard rice mills comprising a store, mill house, a 1500-1700kg per hour capacity milling equipment, standby generators, and drying floors in Ejura, Hohoe, and Kumbungu;
- Rehabilitation of about 20km of feeder roads in three project districts to enhance transportation of rice from rice fields to the market centres.

The National Rice Development Strategy (NRDS) was initiated in 2008 with primary goals of doubling the output of local rice and reducing imports by 50% (latest by the year 2018) and improving quality to increase demand for domestic rice (Boansi, 2013; Ministry of Food and Agriculture, 2017b). The government provided extension services, stabilised prices through the National Buffer Stock Company, which the government formed to intervene in

staple markets such as maize and rice to set minimum prices at the beginning of the growing season (Ministry of Food and Agriculture, 2017b).

The Inland Valley Rice Development Project (IVRDP) was established with the goal of enhancing food security and reducing imports of rice and increase the incomes of smallholder rice producers, processors, and marketers. The project was implemented in 21 districts from five regions of Ghana, namely Ashanti, Brong Ahafo, Central, Eastern and Western regions (Ministry of Food and Agriculture, 2017b). Through the project, a total area of 914ha inland valleys (Ashanti-100ha, Brong Ahafo-277ha, Central-43ha, Eastern-40ha, and Western-354ha) has been developed and put into rice production. Also, US$ 1 million was given to rice farmers, traders, and processors in the form of farm inputs (fertiliser, improved seeds, farm implements) and processing equipment (Ministry of Food and Agriculture, 2017b). Three hundred farmer associations, 37 marketing groups, and 10 miller/processor groups were formed through the project. The project supported 15 seed growers were supported with credit to produce estimated 45.5mt of rice seed (Jasmine 85 and Sikamo) from 15ha in Ashanti, Brong Ahafo and Western region (Ministry of Food and Agriculture, 2017b).

The Rice Sector Support Project (RSSP) was initiated in 2009 with an overall objective to improve the livelihoods of poor farmers in the Northern, Upper East, Upper West, and northern parts of Volta region. The project sought to support the rice value chain in the selected regions through land development based on the reclamation of 75 valley bottoms; facilitate access to credit for the stakeholders involved in the rice value chain; and building capacity for the stakeholders through support to farmer-based organizations and Apex organizations. Over 15,000 farmers benefited from the project and other actors in the rice value chain (Boansi, 2013; Ministry of Food and Agriculture, 2017b).

The Sustainable Development of Rain-fed Lowland Rice Production Project was implemented between 2009 and 2014 to improve the productivity and profitability of rice farmers in the project areas (Northern and Ashanti Regions). The projected was implemented in four districts in Ashanti and three districts in the Northern region. A thousand farmers benefited from the project. Other measures to improve domestic rice cultivation are a national fertilizer input subsidy for cereal producers, investments in irrigation infrastructures, and

provision of agricultural mechanization and extension services to producers across the country (Ministry of Food and Agriculture, 2017b)

Planting for Food and Jobs Programme was implemented in 2017 with five (5) key pillars; provision of improved seeds, the supply of fertilizer, provision of dedicated extension services, marketing and e-agriculture and monitoring. The programme aims to increase production yields of maize by 30%, rice by 49%, soybean by 25% and sorghum by 28%. Under this programme, farmers are supplied with subsidized fertilizer on credit. Farmer makes an initial 50% payment, and the remaining 50% is paid after harvesting(Ministry of Food and Agriculture, 2017b).

2.4.2 Rice Production

Ghana primarily grows the *Oryza sativa* and *Oryza glabertima* rice varieties (Ministry of Food and Agriculture, 2012). Rice is produced in all the ten regions in Ghana, but its production is more concentrated in the Northern part of Ghana, namely Upper East Region mostly around the border with Burkina Faso, the Northern Region near Tamale and the Volta Region around Hohoe and Kpandu. Ashanti Region, Brong Ahafo Region and some parts of the Greater Accra Region produce rice mainly under irrigation schemes, but their contribution to the national outputs are low (Byerlee, García, Giertz, Palmade, & Gurcanlar, 2013). About 80% of country's rice production comes from the Northern Region, Upper East and the Volta Region (Amanor-Boadu, 2012; Byerlee et al., 2013). The Northern Region, Upper East, and the Volta Region fall in three of the six agro-ecological zones in Ghana: Guinea Savanna, Sahel Savanna, and Coastal Savanna. This suggested that each of these regions has different geographic, climatic and land conditions, all of which support rice production.

Ghana has three main rice farming systems which are classified under agro-ecology: lowland rainfed which includes the inland valley systems (78% of production), upland rainfed (6% of production), and irrigated (16% of production) (Osei-Asare, 2010). The average yields of rain-fed paddy were 1.0–2.4 tonnes per hectare and irrigated rice yields average 4.5 tonnes per hectare (Ministry of Food and Agriculture, 2017b). The average rice yield in Ghana was 2.5 tonnes per hectare as against an achievable yield of 6.5 tonnes per hectare(Ministry of Food and Agriculture, 2017b). This meant that the average rice yield in Ghana was only 38.5% of the achievable yields. The gross production of paddy rice in the 2012/2013 season was estimated at around 569,524 tonnes while that of milled rice for the same season was approximately 380,000 tonnes.

Figure 2.3 shows that the trend of imported milled rice keeps increasing at a very fast rate as compared to domestic production. Ghana is a net importer of rice and between 2000 and 2013, import increase from 166,828 metric tonnes to 644,328 metric tonnes representing about a 286% increase in import. Imported rice is perceived to have better quality, aroma, and taste and therefore has higher prices than the locally produced ones(Boansi, 2013). The majority of the rice imported into the country come from the US, Thailand, Vietnam, China, Pakistan, and India.
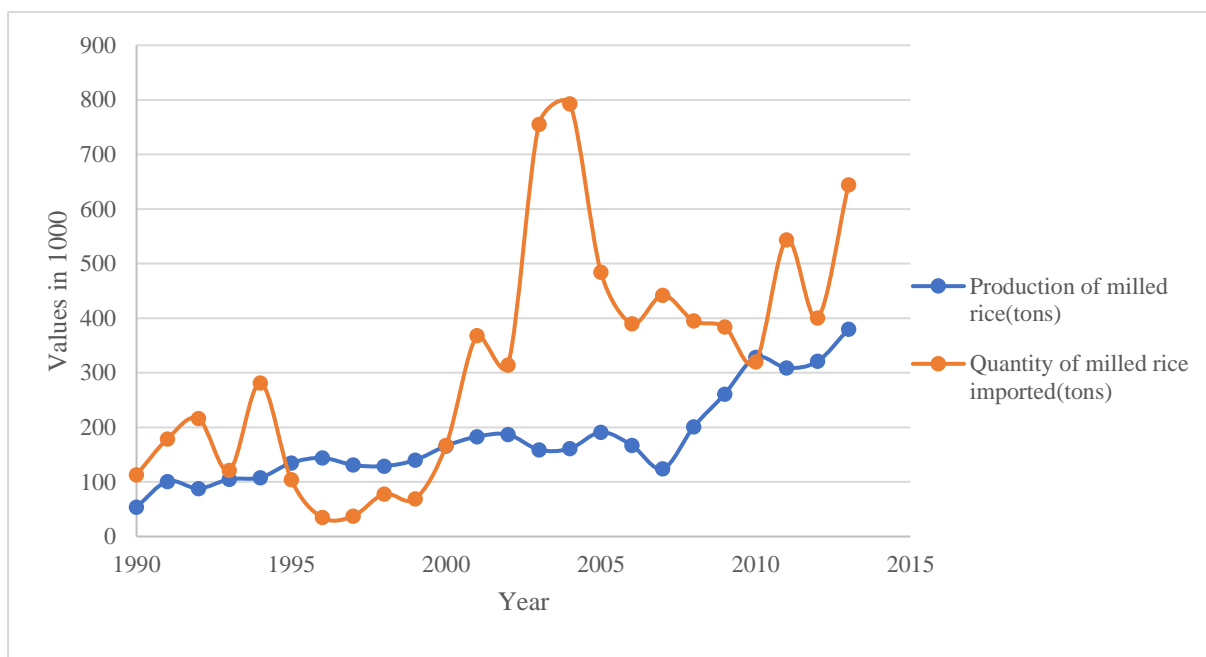
Figure 2.3. Milled rice production and importation from 1990-2014 (Food and Agriculture Organization, 2017a)

Figure 2.4 shows the total land area harvested for paddy rice and the output derived from that area from 1990-2014. In 2014, the total area cropped to rice was 224,000 hectares, with an average rice land holding of 0.6 hectares per household. With the total area cropped, the paddy rice harvested was around 604,000 tonnes. There has been an increase in rice production from 185,340 metric tonnes in 2007 to 604,000 metric tonnes 2015 which represent an increase of 225.8%. Over the same period, the area under rice cultivation increased from 108,940 hectares to 224,000 hectares which represent an increase of 105.6%.

17
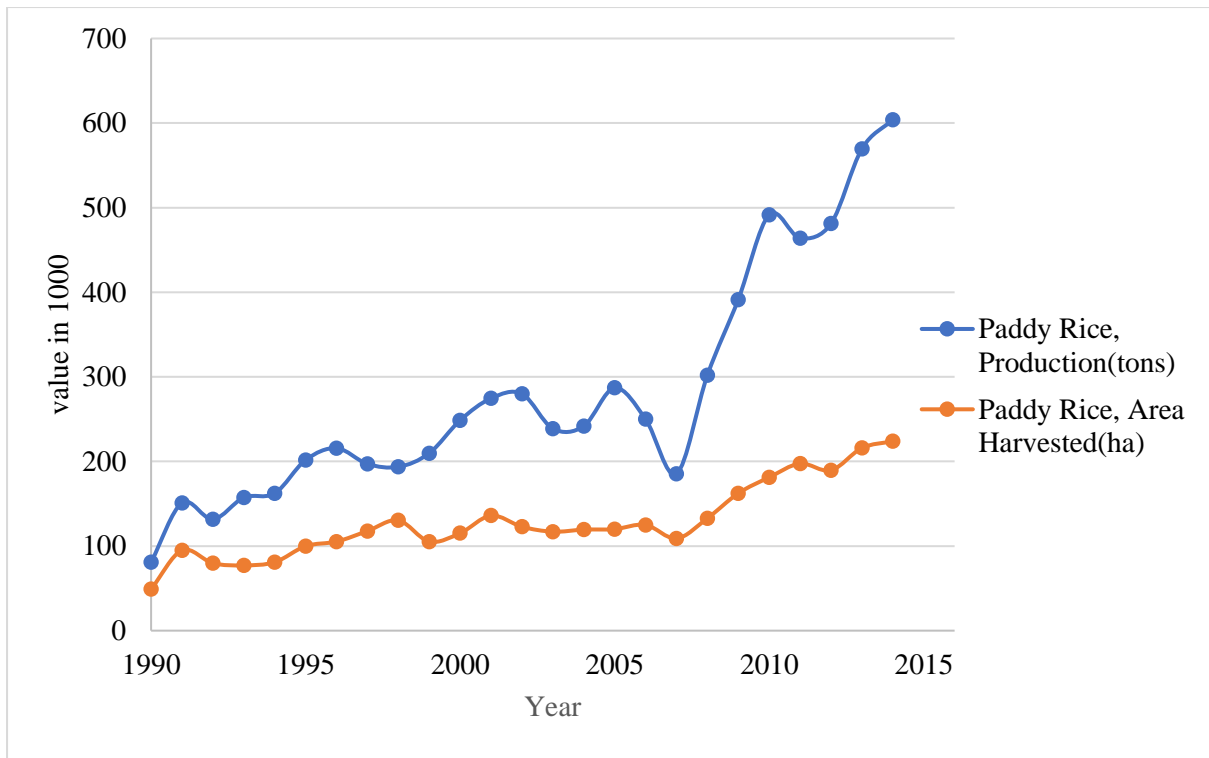
Figure 2.4. Production output and area harvested for paddy rice (Food and Agriculture Organization, 2017a)

2.4.3 Consumption and Marketing of Rice

Per capita consumption of rice in Ghana increased from 10.97kg per annum in 1990 to 16.01kg in 2000. From 2000 to 2010, the per capita rice consumption increased by 51.2%. As at 2013, the figured reached 32.03kg and this figure is expected to increase due to rapid population growth and urbanization (Figure 2.5). The majority (70%) of rice is consumed in the urban areas mainly in Accra, Kumasi, and Takoradi (Ministry of Food and Agriculture, 2013, 2017b) Like other West African countries, Ghana which was virtually self-sufficient in rice during the mid-1970s now accounts for approximately 40% of its domestic rice supply and consumption needs, with the gap between demand and domestic production widening since the late 1990s (Boansi, 2013). Population increase, urbanization and a change in consumer diet are some of the factors that have contributed largely to the consumption of rice in Africa (Martey et al., 2013). According to (Byerlee et al., 2013), improved incomes, the non-perishability nature of rice and its easy preparation have increased its consumption in Africa over the traditional grains, roots, and tubers.
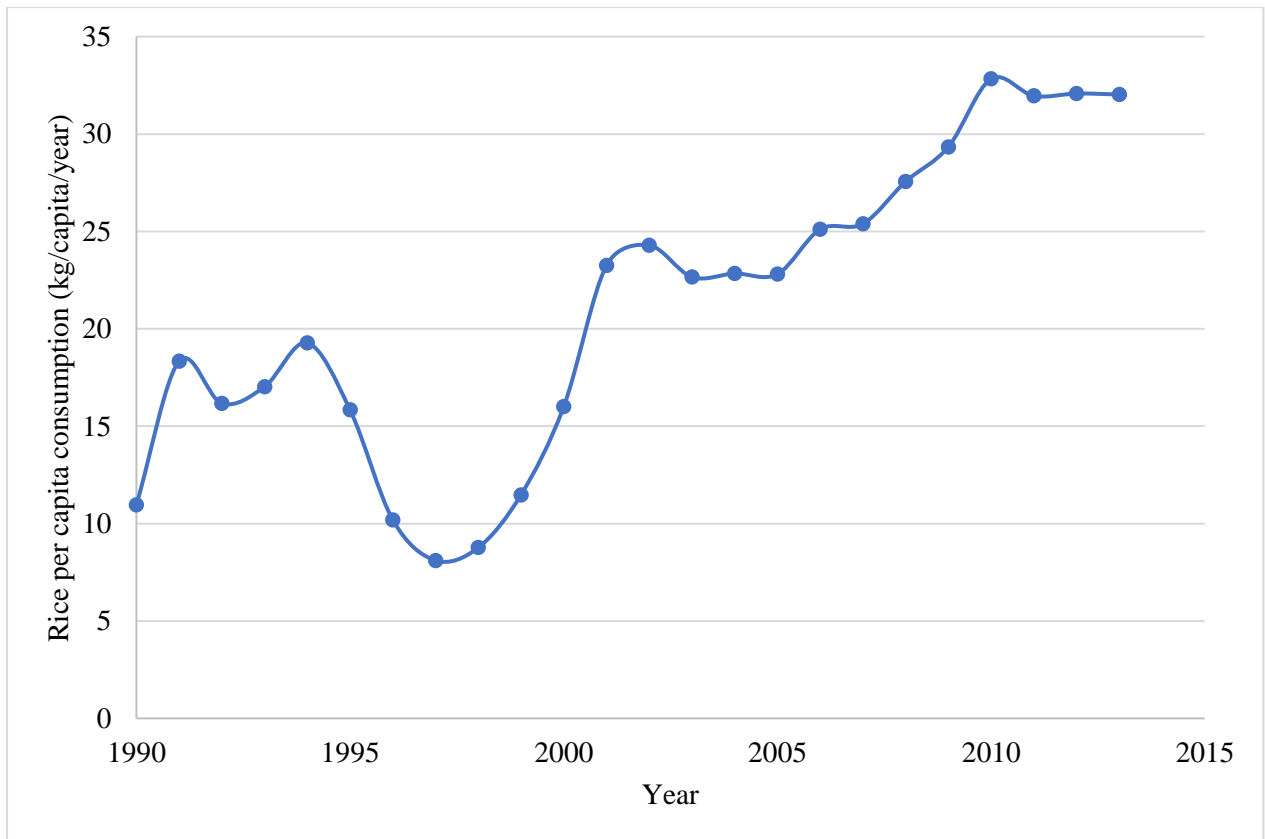
Figure 2.5. Rice per capita consumption (Food and Agriculture Organization, 2017a)

2.4.4 Rice Distribution Network in Ghana.

There are two main rice distribution networks in Ghana, namely the domestic (local) rice channel and the imported rice channel. Figure 2.6 presents the distribution chain of local rice in Ghana. The domestic rice channel constitutes the input suppliers, local producers, middlemen /aggregators, processors/millers, wholesalers (processors-middlemen/aggregators), rural/ urban retailer and rural/ urban consumers. The local producers usually are made up of small-scale farmers, although there are emerging medium and large-scale producers.
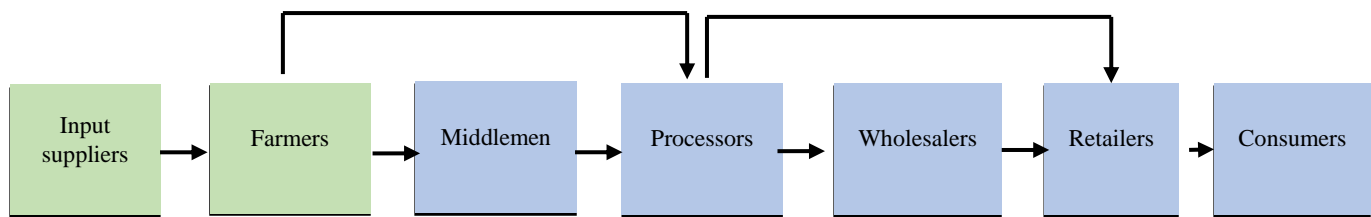
Figure 2.6.The local rice marketing in Ghana (modified based on (Amanor-Boadu, 2012))

The local producers secure inputs such as seeds, fertilizers, and insecticides from the input suppliers who are usually located in the urban or peri-urban market. The producers after production may choose to either to sell their paddy rice directly to middlemen (aggregators) or processors. The majority of the farmers prefer selling paddy rice to middlemen to avoid going through a series of processes and to cut down transaction costs. These middlemen travel from urban areas to rice-producing communities to purchase paddy rice from local producers. The middlemen sell the paddy rice to processors who add value to the paddy rice through milling. Sometimes the owners of processing mills maybe serve as middlemen /aggregators and buy from producers. The processors sell the milled rice either to wholesalers or retailers. The retailers trade with urban and rural consumers. Some of the retailers depend on the wholesalers for the supply of milled rice.

Figure 2.7 shows the marketing chain of imported rice in Ghana. The imported channel holds a major ground in the urban markets and accounts for about 66% of the total rice consumption in the country (Amanor-Boadu, 2012; Boansi, 2013)). Key players for the imported channel includes the importers, wholesalers, retailers, and consumers. The importers may distribute their products through wholesalers who sell to the urban and local retailers, or the importers may distribute the retailers themselves depending on the size of the retailer. Unlike the importers who deal with only imported rice, wholesalers and retailers may choose to trade both in imported and/or local rice. The distribution chain is quite coordinated as compare to the domestic chain and information on price, and other attributes of rice are symmetrical that is all players in the chain have information on the price and other attributes.
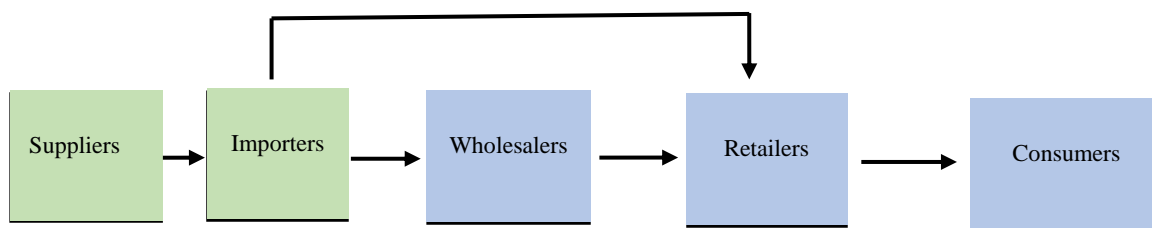
Figure 2.7. The imported rice marketing in Ghana (modified based on (Amanor-Boadu, 2012))

2.4.5 Price Trends

Figure 2.8 presents the wholesale prices of paddy, milled and imported rice from 2006 to 2017. It is observed from Figure 2.8 that prices of paddy, milled and imported rice have been increasing since 2006. It is noted that from 2006 to 2010, the gap between the prices of imported and milled rice was quite close. However, beyond 2010, the gap between prices of imported and milled/paddy sharply began to widen.
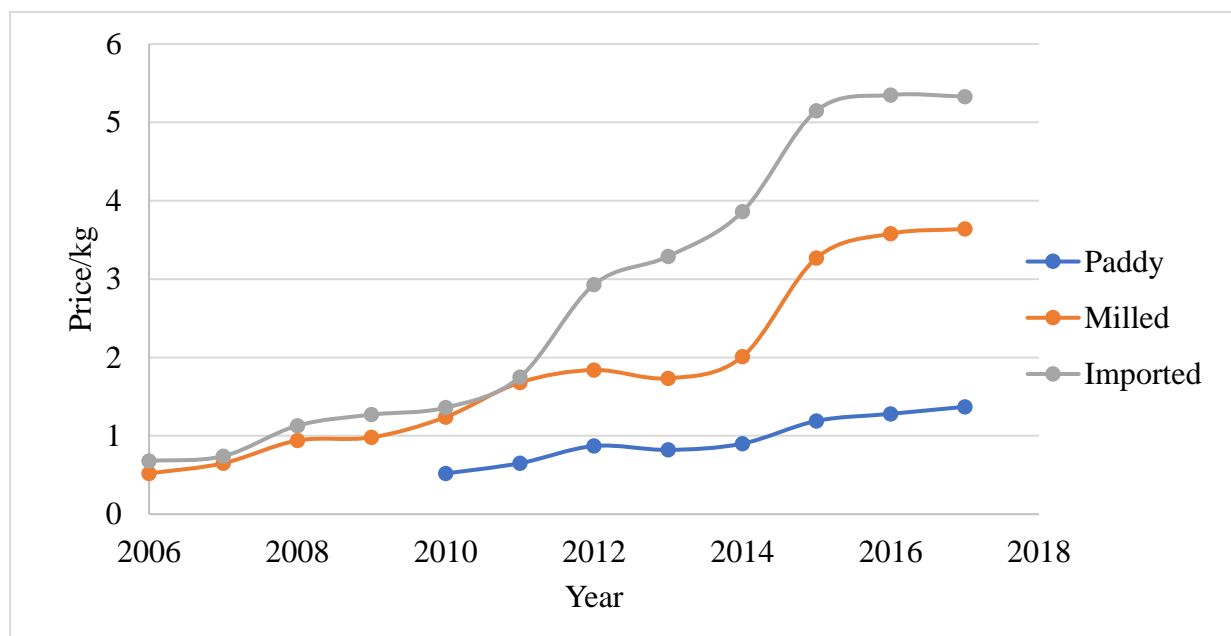
Figure 2.8. Prices of rice per kg (Food and Agriculture Organization, 2017a)

2.5 Summary

This chapter provided a detailed background on the agricultural sector of Ghana. The chapter revealed that the Ghanaian agriculture is operating below its potential and its contribution to the national GDP has been declining. However, the sector remains the backbone of the economic development of the country. The chapter revealed that the consumption of rice keeps increasing and that there is a huge potential for the rice industry in Ghana; however, production of rice has not been able to meet demand, and this has created a huge deficit. Although the environmental condition favours rice production in Ghana, the country is still a net importer of rice. The chapter further suggested the rice sector of Ghana is faced with a number of challenges which has contributed to the poor performance of the sector. Various government and non-governmental agencies have implemented policies to help increase production; however, the challenge is prevalent. Research has revealed that the choice of marketing channel has an effect on farmer profitability and productivity. This study, therefore, seeks to find out the factors which influence rice farmers choice of marketing channels in the Northern Region of Ghana. The next chapter provides a review of the literature on the theme of the study.

Chapter Three: Literature Review

3.1 Introduction

The purpose of this chapter is to review the relevant literature related to the marketing of agricultural commodities. This will help to identify and understand the important factors that influence a farmer's choice of marketing channels in general and in the rice sector of Ghana in particular. The chapter is structured into six main sections. The first section discusses the concept and theories of decision making and how the decisions are taken in agriculture. The second section presents the concept of marketing and marketing channel choice. The third section outlines the challenges of smallholder farmers in the participation of the markets. The fourth section presents the empirical studies on the factors that determine the farmer's choice of marketing channels in agribusiness enterprises. Section five looks at the various factors that influence farmers' choice of marketing channels. The chapter ends with the conceptual framework that that has been employed in this study.

3.2 The Concept and Theories of Decision Making

Many researchers have defined and explained the concept of decision making in the context of business management. The reason is that decision making is generally considered as a critical element of the management process in a firm (Kinicki & Williams, 2013; Lewis, 2006; Robbins, 2011). Decision making is also related to all levels of an organisation (Chiamjinnawat, 2017; Schermerhorn, 2013). Decision making is defined as *"the study of identifying and choosing alternatives based on the values and preference of the decision maker"* (Fülöp, 2005). Similarly, Hastie and Dawes (2010, p. 24) explained the decision in the scientific context as "*response in a situation that is composed of three parts; first, there is more than one possible course of action under consideration in the choice set. Second, the decision maker can form expectations concerning future events and outcomes following each course of action. Finally, the consequences associated with the possible outcomes can be assessed on an evaluative continuum determined by current goals and personal values*". Griffin and Moorhead (2010, p. 208) indicated that "*a decision maker's action has a goal, evaluates the outcomes of an alternative course of action in terms of the goal, and select one alternative to be implemented.*" All the above definitions of decision or decision-making focus on a few most important elements of making a rational decision which is the basic reason for decision making. The elements comprise identifying the decision situation, identifying two or more alternatives, and selecting the best possible alternatives.

23

The management literature classified decision making into two main types based on the rate of the repetition of a decision and they include programmed and non-programmed decisions (Griffin & Moorhead, 2010; Robbins & Coulter, 2012). A programmed decision recurs often enough for decision rules to be developed (Griffin & Moorhead, 2010). The decision rule informs decision makers on which alternative to choose once they have predefined information about the situation (Griffin & Moorhead, 2010). Programmed decisions are usually structured, the decision procedure already is established, and sources and channels of information are clearly defined (Robbins & Coulter, 2012). A non-programmed decision is unique and non-recurring and requires custom-made solutions (Robbins & Coulter, 2012). This decision infrequently recurs, therefore; there are no previous established decision rules. A non-programmed decision is poorly structured because information is ambiguous. There is no clear procedure for making decisions and goals are usually vague (Griffin & Moorhead, 2010).

3.2.1 Decision-Making Theories

Decision theory has its roots in economic theory with the assumption that people make a decision to maximize their utility on the basis of self-interest and rationality (Haidar, 2016). Decision making about human behaviour has evolved over time in the areas of psychology and sociology (Fitzgerald, 2002). There is a broad knowledge of literature that has explored the behaviour of individual and how they make decisions and react to certain conditions (Roy, 2016; Suhonen, 2007). Different theories and models have been used to explain how individuals make decisions under risk and uncertainty. Decision making under risk means the outcomes of the decision is known whereas decision under uncertainty has a probability of unknown outcomes (Suhonen, 2007). The literature suggests that there are two main theories of decision making: descriptive theory and normative theory (Roy, 2016).

3.2.1.1 The Descriptive Approach

The descriptive approach is concerned with how people make decisions (either rational or non-rational) in real life (Haidar, 2016). Descriptive theories are based on empirical observation and on experimental studies of choice behaviours (Roy, 2016). Descriptive theories assume that people make a decision by selecting ways to satisfy their most vital needs even if they do not have the required information and the choices are not optimal (Haidar, 2016). Thus, people simplify challenges by relying on heuristics or rule of thumb that are largely rooted in acquired knowledge and past experiences when making decisions under uncertainty (Dillon, 1998).

Under descriptive theories, individuals make decisions which are not based on an analysis of results with other alternatives and expected outcome, but the decision-maker relies on their judgement and experience (Hastie & Dawes, 2010). Example of a descriptive approach includes Aspinwall's approach, straight qualitative judgement, weighted factor scores and distribution costing (Rosenbloom, 2012).

3.2.1.2 The Normative Approach

Normative decision-making theories are based on the assumption that a rational decision-maker follows a well-defined preference for behaviours and the decision maker also obeys certain axioms of rational processes (Suhonen, 2007). By its definition, normative relates to an ideal standard of a model or is based on what is considered to be a normal or correct way of doing something. It expresses how people should behave when they are confronted with risky decisions. The theories are used by economists, political and social scientists or philosophers and statisticians to explain the rational decision behaviour of a person (Siddique, 2015). The basic axiom in the normative approach is that a decision maker tends to select a choice that maximises his/her utility. The rational decision maker needs a complete knowledge of all the possible alternatives and total expectation of the future outcomes of these alternatives (Chiamjinnawat, 2017). Thus, the decision maker is expected to have full access to complete and unambiguous information and also perfect computational capabilities (Secchi, 2011). These strong assumptions have been strongly criticised due to the limited capacities of human beings to process a large volume of information (Rosenbloom, 2012). Despite this criticism, the extant literature on marketing has applied normative decision-making theories. The most common normative approaches applied in the literature include the rational choice theory, the game theory, the expected utility theory, and the rational bound theory.

3.2.2 Application of decision making theories in Agriculture

The extant literature demonstrates that the normative decision-making theories are mostly applied in the context of agriculture to analyse farmers' decision on production and marketing of their farm outputs(Donkor, 2016a; Kleemann & Abdulai, 2013; Kleemann, Abdulai, & Buss, 2014; Yu & Zhou, 2017). For instance, the expected utility theory or game theory has been applied in several agricultural problems such as production decision under free competition, the development of vertical and horizontal integration, production under climatic uncertainty,

decisions on whether or not to adopt a new production technology and trading or bargaining activities(Yu & Zhou, 2017). A number of studies have applied the rational choice theory to investigate farmers' adoption behaviour regarding agricultural innovations (Donkor, 2016c; Kleemann & Abdulai, 2013; Kleemann et al., 2014). Kleemann et al. (2014) and Kleemann and Abdulai (2013) indicated that farmers' decision to adopt organic-certified pineapple farming in Ghana was based on the expected utility from the innovation. The researchers further assumed the farmers were likely to adopt the innovation if they perceived the innovation to be profitable. In the rice sector of Ghana, (Donkor, 2016b, 2016c) regarded rice farmers as rational economic agent and the farmers' decision to adopt farm innovations such as fertiliser, row-planting was based on the expected yields obtained from the adoption of the innovations. The researchers postulated that a rational farmer tended to adopt the innovations if they generated yields higher than the traditional innovations. The underpinning theoretical foundation of the study was based on the rational choice theory. Other studies applied the rational choice theory to analyse farmers' or households' decision to participate in agricultural programmes in developing countries (Bahta, Strydom, & Donkor, 2017; Donkor, 2016a). Donkor (2016a) conducted a study to analyse the saving behaviour of citrus farmers in Ghana. The researchers conceptualised the farmers' decision process on savings as a binary choice, thus, either the farmers saved some of their incomes or consumed the income. The saving decision was explained using the rational decision theory, where the farmer considered the expected benefit from savings compared to the utility from the spending the money. Donkor (2016a) anticipated that the farmers were likely to save a proportion of their income if the accumulated interest in the future exceeded the current consumption. Bahta et al. (2017) applied the rational choice theory in the analysis of household decision to participate in a home garden programme in South Africa. The researchers assumed in their study that a household tended to participate in the programme if the expected benefit from the participation is greater than non-participation.

Existing studies on agricultural marketing have employed the transaction cost theory and the rational choice theory in explaining marketing decision behaviour of farmers (Ali, Abdulai, & Rahut, 2017; Donkor et al., 2018; Ma & Abdulai, 2016). In the analysis of apple farmers' decision making on whether to choose an oral contract or written contract or no contract in the marketing of their apple in China, Ma and Abdulai (2016) conceptualised this decision process using the rational decision theory. First, the researchers conceptualised the farmers' decision whether to engage in contract marketing or not. The researchers assumed that the farmers

tended to participate in the marketing contract if the profit generated from the contract farming was higher than participating in the spot marketing channel. In the second stage, the researchers further considered the farmers' decision whether to engage in oral marketing contract or verbal marketing contract. This choice problem was also conceptualised using the rational choice theory. In Pakistan, Ali et al. (2017) analysed farmers' decision to either sell in the market or at the farm gate. The theoretical foundation of this binary choice problem was based on the rational choice theory. The researchers explained that the probability of the farmers to sell their cotton in the market was based on the marketing margin generated. The farmers were more likely to sell in the market rather than at the farm gate if the expected margin market exceeded the margin generated from the sales at the farm gate. Donkor et al. (2018) combined the transaction cost theory and the rational decision theory to provide a theoretical framework for the analysis of cassava farmers' participation in the direct marketing channel in Nigeria. The researchers postulated that the rational farmer was likely to sell their cassava output directly to processors if the profit, taking into consideration the associated transaction costs, was greater than selling at the farm gate.

It was obvious from these empirical studies that farmers' decision-making process on innovation adoption, participation in agricultural programme and marketing decision was conceptualised using the rational choice theory. For this reason, the present study tends to apply the rational choice theory to conceptualise the rice farmers' marketing decision in Northern Ghana.

3.3 The Concept of Agricultural Marketing

Agriculture continues to play a significant role in the economic development in developing countries including Ghana (International Food Policy Research Institute, 2018). The marketing of the agricultural commodities remains an important strategy to increase to farmers' income and alleviate rural poverty in Africa (Barrett, 2008). It provides numerous employment opportunities to the actors in the food supply chain (International Food Policy Research Institute, 2017). Agricultural marketing involves all the activities, agencies and policies involved in the procurement of farm inputs by the farmers and the movement of agricultural products from the farms to the consumers (International Food Policy Research Institute, 2017). The marketing relationship between agricultural products is an important component in the agricultural value chain. The value chain analysis gives a better understanding of markets, the

participation of different actors, and the constraints that limit production and eventually the competitiveness of the smallholder farmers (Barrett, 2008; International Food Policy Research Institute, 2017).Agricultural marketing plays a basic role in managing risk which is associated with the demand and supply by regulating net export flows across space and in storage over time, thereby reducing the price variability faced by consumers and producers (Barrett, 2008; Donkor et al., 2018; International Food Policy Research Institute, 2017). Agricultural marketing tends to contribute to the attainment of the sustainable development goals of reducing hunger, minimising poverty and improving the overall well-being of people, especially farmers in the developing world(International Food Policy Research Institute, 2017, 2018; Soe et al., 2015). Therefore, the efficient marketing system is essential for poor rural households. This is because it serves as a requirement for enhancing economic growth by improving the competitiveness of farming businesses and enhancing the rural incomes and welfare (Ohen, Etuk, & Onoja, 2013; Ouma, Jagwe, Obare, & Abele, 2010).

An efficient agricultural marketing system bridges the space gap between the production site and consumers in the peri-urban and urban areas(Reddy, Ram, Sastry, & Devi, 2004; Rhodes, 2007). Narrowing the space gap tends to make the farm products more available to consumers thereby stimulating a higher demand which in turn assures a higher income for the producers. In addition, access to reliable and ready agricultural markets serves as an incentive for producers to increase the scale of production (Barrett, 2008). It also provides a wide range of food products for consumers, and this increases their welfare. Agricultural marketing also tends to create employment opportunities through activities such as sorting, grading, processing, packaging, storage, transportation among other. This reduces unemployment and increases economic growth (Barrett, 2008; Reddy et al., 2004). A well-functioning marketing system minimises exploitation through asymmetric information in the market. Exploitation such as manipulation of weights and measures, which is prevalent in the marketing of agricultural produce in developing countries (Reddy et al., 2004).

3.3.1 Marketing Channel and their Roles

An important integral part of any marketer's activities is the channel (Chalwe, 2011). According to Coughlan, Anderson, Stern, and El-Ansary (2006), the channel is an important asset in a company's marketing strategy. Marketing channel is the means through which goods and services are distributed. It gives place and time utility to consumers (Kotler, 2009). Marketing Channel is defined as "*set of independent organisations involved in the process of making a product or services available for consumption or use*" (Coughlan et al., 2006, p. 2). Arinloye et al. (2012) defined marketing channel as "*downstream part of the value chain which consists of numerous chain actors at different outlets, where final products are made available to final consumers.*" Marketing channel in the context of the agri-food sector indicates the various ways through which food products are made available to the end users (Rhodes, 2007). Channel for one commodity may differ from the other commodity, and these channels are designed such that they deliver a level of value to consumers.

3.3.1.1 Types of Marketing Channels
A marketing channel can be grouped into two main categories; direct and indirect marketing channels.

Direct Marketing Channel

The direct marketing channel has no levels of intermediary (Kotler & Armstrong, 2012). This suggests that producers have the opportunity to trade directly with the end users (Kotler & Armstrong, 2012). Kotler and Keller (2016) referred the direct marketing channel as a "zero-level channel." From the producers' perspective, a greater number of channel levels implies less control and increased channel complexity. The direct marketing channel tends to be attractive to producers. The reason is that the producers receive all the profit margins which would have been shared with other intermediaries (Jobber, 2009). In contrast, producers bear the risk of transaction costs to deliver the product directly to the end users and most cases the transaction costs are higher for smallholder farmers (Barrett, 2008). Most of the smallholder farmers avoid this type of marketing channel because they do not want to incur extra transaction cost associated with selling to final users (Barrett, 2008).

Indirect Marketing Channel
The indirect marketing channel is associated with more than one intermediary (Jobber, 2009; Kotler & Armstrong, 2012). A complex marketing channel reduces producers' marketing

margins since many intermediaries are involved in the chain. This suggests that the marketing margins are shared among the intermediaries (Armstrong, Kotler, Harker, & Brennan, 2015). Also, producers may not have the capacity to add more value to their products so that they can trade directly with the final users. Armstrong et al. (2015)developed a typology for the indirect marketing channel. The typology is as follows: producer to retailer to consumer, producer to wholesaler to retailer to consumer and producer to middlemen to wholesaler to retailer to consumer. The typology is illustrated in Figure 3.2. Most farmers in sub-Saharan Africa distribute their products through the indirect marketing channels. They, therefore, have to share the profit among these various actors. Farmers usually get the least profit margin because they mostly sell their products at the farm gate with little or no value addition.
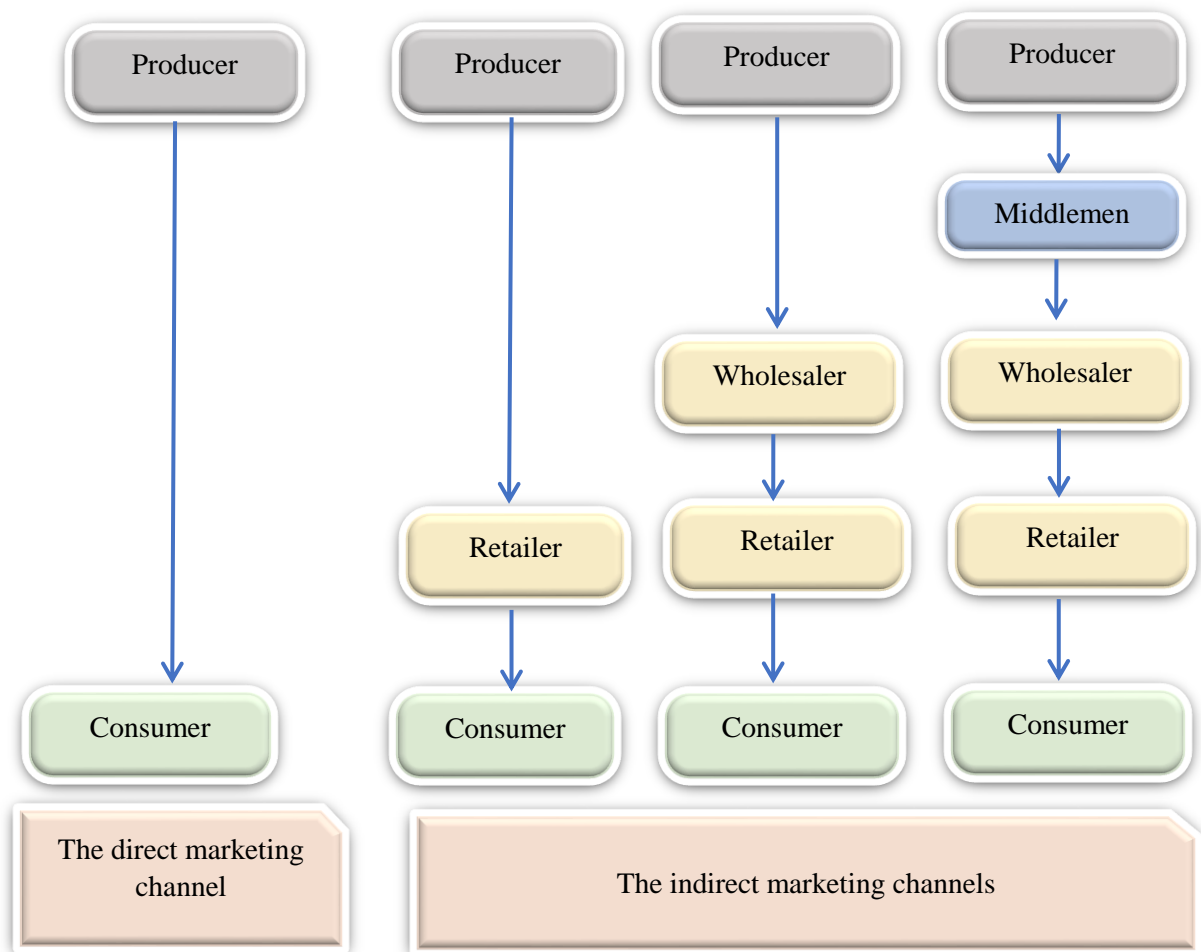
Figure 3.1. Types of marketing channels (Armstrong et al., 2015).

3.3.1.2 Decision Making on Marketing Channel Choice

There has been an increasing trend towards the liberalisation of the domestic market in Sub-Saharan Africa after the implementation of the Economic Adjustment Programmes (ESAP) (Chalwe, 2011; Mmbando, Wale, & Baiyegunhi, 2017). This trend allows smallholder farmers to have alternatives channels through which they can sell their agricultural commodities (Mmbando et al., 2017). As discussed earlier on, decision making is very important when one is faced with two or more alternatives. In the marketing of agricultural commodities, channel decisions are one of the critical decisions a farmer has to take (Jensen, 2010).Different market channels offer different prices and services that eventually have an impact on farmers' income and welfare. Therefore, the choice of a marketing channel is a key consideration for smallholder farmers because different channels affect their profit margins (Chalwe, 2011; Mmbando et al., 2016). Jensen (2010) suggested that farmers can improve their profitability by choosing to sell through a profitable channel, and this affects their investments in productive assets, new agricultural technologies, and improve the welfare of the household. Farmers' understanding of each channel, its benefits, requirement, and limitations is an important starting point for channel selection (LeRoux, Schmit, Roth, & Streeter, 2010). It is also important to know the volume of production required and the average prices paid in order to assess the potential returns of a channel (LeRoux et al., 2010). Assessing different forms of channels is central for exploring the potential to increase production, farm income, and investment (Soe et al., 2015; Tsourgiannis, Eddison, & Warren, 2008).

Most smallholder farmers in Sub-Saharan Africa make a decision of marketing channel based on their judgement and past experiences because they lack inadequate information to make rational decisions (Soe et al., 2015). This means that most of the farmers sell their farm outputs through channels that offer them low prices because they either have little knowledge on the market or they face difficulty in accessing profitable market (Mmbando et al., 2017). Middlemen usually take advantage of the farmers' ignorance of the market price and purchase agricultural output from producers at lower prices and sell at a higher price to cover their transaction costs and profits (Mmbando et al., 2017; Mzyece, 2016).

3.4 Challenges by Smallholder Farmers to Participate in the Market

Despite the personal and economic benefits associated with participating in the market, smallholder farmers in Ghana and other developing countries are faced with some challenges that constrain their participation in the market (Barrett, 2008; Chipasha, Ariyawardana, & Mortlock, 2017; Kherallah & Kirsten, 2002; Ouma et al., 2010). These challenges have effects on smallholder farmers' choices of a marketing channel for their produce.

One of the constraints to farmer market participation is limited access to reliable market information by farmers (Chipasha et al., 2017). Smallholder farmers are located in rural areas which are characterised by limited access to communication networks to enable them to communicate with buyers in the market. However, access to market information enables farmers to identify potential buyers in markets and become aware of prevailing market prices. This tends to strengthen farmers' bargaining power as information asymmetry has been identified to render farmers more vulnerable to price risks in the market (Alene et al., 2008; Muamba, 2011; Ouma et al., 2010). Jari and Fraser (2009) and Chipasha et al. (2017) observed that lack of market information was responsible for the low market participation by smallholder farmers.

Secondly, poor basic infrastructure is another barrier that hinders farmers to participate in the market. Empirical studies (Maertens & Velde, 2017; Muamba, 2011)) have identified that access to the basic infrastructure, specifically roads and market enable farmers to participate in the market. Poor road networks make it difficult for farmers to transport their farm outputs to the market. Poor road networks linking farming communities and marketing centres tend to increase the transport costs which discourages farmers to participate in distant markets. Barrett (2008) explained that transportation cost was a barrier for farmers, especially those in the remote rural areas because geographic isolation through distance created a wedge between farm gates and market prices. Some empirical studies (Alene et al., 2008; Asfaw, Amare, Lipper, & Davis, 2012)indicated that the deplorable nature of roads, as well as inadequate road networks, hindered market participation by farmers. These studies explained that during the rainy seasons most of the roads became inaccessible resulting in high transport cost. This situation forced farmers to sell to buyers at the farm gate at low prices.

Inefficient and weak institutional factors, notably farmer association, agricultural extension services, and access to credit is another factor that hinders smallholder farmers from participating in the market (Aker & Ksoll, 2016; Bahta & Bauer, 2012; Mmbando et al., 2017).

Institutional factors are the services that are rendered to farmers to enhance their agricultural production and marketing systems. Farmer associations and extension services assist farmers with technical support and information on improved production technologies and marketing opportunities (Bahta & Bauer, 2012). Collective action institutions such as producer organisations play an important role in farmers' market access by transmitting information, mediating transactions, reducing transaction costs and improving the efficiency of agricultural marketing through bargaining with customers, and providing inputs and technical assistance (Mmbando et al., 2017). However, a weak institutional arrangement presents a threat to farmers regarding production, marketing, and value addition which tends to affect their profitability levels (Aker & Ksoll, 2016).

Finally, smallholder farmers in developing countries have limited production assets which suggest that they are unable to produce enough; hence, they tend to supply fewer farm outputs to the market. Evidence from Barrett (2008) suggests that improving poor household's access to improved technologies and farm implements (ploughs, ridgers, tractors, knapsack sprayers, among others) are instrumental in stimulating higher participation in the markets among smallholder farmers. Barrett (2008) maintained that household access to production technology influences market participation by improving productivity, and higher productivity implies a higher total output and marketed surplus. The implication is that farmers with a higher output tend to participate in the market since it is less costly to transport the bulk of farm output to the market as compared to a small quantity. However, most farmers in developing countries lack access to adequate production assets and rely heavily on old and quack farm implements which make them inefficient and decrease their productivity and output. Smallholder farmers are faced with high production costs which deter them from entering into a marketing contract because they are unable to meet the quality and quantity requirements of the contract (Schipmann & Qaim, 2011).

3.5 Empirical Literature on the Factors Affecting Smallholder Farmers Choice of Marketing Channel

The review of empirical studies that have been conducted on farmers' choices of marketing channels in developing countries is presented in this section.

Anteneh et al. (2011) investigated the factors that influenced the choices of marketing channels among 1400 coffee farmers in Southern Ethiopia. The study employed the tobit regression model in the empirical analysis. Four main marketing channels: coffee marketing cooperatives, private traders, neighbouring cooperatives and informal traders were identified in this study. The study found that forty-two percent (42%) of the cooperative members sold the coffee to private traders while 46% of non-members sold to cooperatives. The results of the Tobit regression model showed that education, the proportion of land allocated to coffee, the proportion of off-farm income to total income, cooperative performance, satisfaction on cooperative performance, and second payment affected members choice of marketing outlet. On the other hand, variables such as the age of the household head, proportion of off-farm income and access to training had significant effects on non-members market outlet selection.

In Zambia, Chalwe (2011) conducted a study to understand the general characteristics of the smallholder bean producers as well as the factors that influenced the producers' choices of marketing channels. The researcher used a postharvest survey data set by the Central Statistical Office of Zambia, and 1044 smallholder bean producers were sampled from a population of 8000 farmers. The probit regression model was used in the analysis of the dataset. The results generated from the study suggested that the farmers' choices of marketing channels were influenced by the price of beans, scale of production (as measured by the number of beans harvested and quantity sold), distance to market, farm mechanization used and livestock ownership.

Panda and Sreekumar (2012) examined the factors that influenced vegetable farmers' choices of marketing channels viz., formal, informal and non-market marketing channel in India. The researchers employed the multinomial Logit regression model in the empirical analysis because the marketing channel choices were more than two. The results indicated that access to market information, value addition, access to a guaranteed market, availability of good market infrastructure, availability of marketing and road infrastructure and access and ownership of transport were statistically significant variables in determining farmers' choice of marketing channels.

In Ghana, Martey et al. (2012) analysed the effect of yam farmers' access to marketing information on their choices of marketing channel using a sample size of 250 households. This study applied the multinomial Logit model in the empirical analysis because the choices of channels were three, namely the rural market, urban market, and market cooperative. The multinomial Logit regression model showed that farmer age, gender, educational level, distance to tarred roads, access to cell phones, farm size and output price were significant variables that affected yam farmers to choose one channel over the others.

Cazzuffi and McKay (2012) investigated the type of purchaser household use (trader or another household) and the location of sale (farmgate or not) in rural Vietnam using a detailed rural panel survey in 2006, 2008 and 2010. The study revealed that household asset endowments, especially with land and irrigation, union membership and access to extension and training significantly increased farmers' probability of selling rice in the market relative to the farm gate. The study further indicated that large-scale production and low transport costs had significant effects on the farmers' decision to use more than one established channel to sell their farm outputs.

Higuchi, Moritaka, and Fukuda (2012) analysed the socio-economic characteristics that influenced coffee farmers to join a formal organisation against those who distribute their products through intermediaries using a primary survey data set from 60 producers. The Binary Logistic model was used in the study to analyse the data set, and the results showed that farmers who were older and married were keen to receive technical assistance to participate in marketing organisation while farmers with large household size marketed their farm output through the intermediaries' channel.

Zivenge and Karavina (2012) conducted a study in Chinamhora district in Zimbabwe to determine the factors that influenced tomato farmers' choices of market channels. Using a two-stage sampling procedure, 120 tomato farmers were selected, and a structured questionnaire administered to them. The questionnaire gathered information on household characteristics, market channels, vegetable production characteristics, social capital and access to markets and infrastructure. The Binary Logistic model which was used to analyse the determinant of market choices revealed that informal market was more accessible than the formal market. Product price was the major determinant of market channel choice among farmers in the study area. However, other variables, notably farm size, and ownership of mobile phones significantly affected the choice of marketing channel of the farmers.

Arinloye et al. (2014) examined smallholder farmers' selection of high-value markets, such as export and processing-oriented marketing channels in Benin in West Africa. The study investigated four main marketing channels: rural, urban, export of fresh pineapple market and processing-oriented markets using a primary data collected from 285 farmers through a field survey. Farmer demographic characteristics (age and education level), production system features (farm size and varieties), quality attributes (quality measurement and rejection rate) and the type of marketing context (distance from market and the formality-i.e., written contract or not and the duration of the buyer) were used as the main explanatory variables to examine their effects on selection of market channels. The Pearson's chi-square and the multivariate Probit model showed that age of the farmer, farm size, number of varieties of pineapples, product quality, bargaining power and the physical distance from the market were important factors that affected market channel choice.

Zanello, Srinivasan, and Shankar (2014) used the transaction cost framework to examine the impact of information and communication technologies (mobile phones and radios) on market participation of farmers in Ghana. The researchers observed in the study that distance to market, bike ownership, trust in the buyer, quality of products and receiving market information via extension officers were variable which was significant in determining the farmers' choices marketing channels, notably community, district or regional market. Interestingly, the study showed that market information which was a major variable been investigated in the study did not exert any significant effect on farmers' decision to sell at a distant market.

Mmbando et al. (2016) examined the factors affecting choices of marketing channel used by smallholder maize and pigeon pea farmers in Tanzania. Using the multinomial Logit analysis, they used the multistage sampling technique to sample 532 farmers who participated in the maize and pigeon pea markets. The results of the study showed that transaction cost, household wealth, access to credit and extension services and social capital (membership to farmer group), farmer demographic characteristics (age and education) and the price of the products affected the farmers' choices of marketing channels.

Siddique, Garnevska, and Marr (2017) reviewed existing factors affecting the decision making of small size citrus growers in citrus supply chain and analysed the factors that affected their marketing channel decisions. The conjoint analysis employed by the study revealed that sale price per 40 kg, urgent need of money, advance payment mode, mode of payment, certainty of

payment, delay in payment, number of fruits picking, and harvesting fruits loss were the major factors that affected marketing channel choice decisions.

Soe et al. (2015) analysed the factors influencing marketing channel choice by paddy rice farmers in Myanmar using a primary data set from 196 rice farmers. The study employed the multinomial Logit regression model. The study showed that there were generally three marketing channels available to farmers and these marketing channels included selling to brokers/commission men who come and collect at the farm gate, selling to collectors or traders at the farm gate and selling to rice mills in nearby towns. The results of the multinomial Logit regression model showed that distance to market, quantity of rice sold, transport facility, road condition to market, and access to market information were significant factors which influenced farmers choice of either selling to brokers or commission men at farm gate or selling to collectors at the farm gate rather than selling directly to the mills.

Maspaitella et al. (2018) used the Binary Logit regression to analyse the key determinants affecting farmers' participation in high-value markets as compared to traditional markets with a sample size of 126 vegetable farmers in Indonesia. Farmer age, educational level, vegetables cultivated area and membership in farmers groups/cooperatives were the key determinants that had a significant effect on smallholder farmers' decision about marketing channel participation.

The literature review suggests that most of the researchers used a quantitative model, specifically the multinomial and binary Logit to analyse farmers choice of marketing channel. The researchers explain that the Logit model is very simple and the results easy to interpret. However, other authors used the Probit model and the multivariate model. Most of the study employed the use of a structured questionnaire to solicit information through interviews. It was observed in the literature review that the factors that were included in the analysis of the determinants of farmer choice of marketing channels are related to demographic characteristics (specifically, farmer age, gender, educational level, and household size), Farm characteristics and asset endowment factors (namely, farm size, livestock, a TV set, a radio set, an off-farm income, a mobile phone, and), institutional characteristics (particularly, farmer association, access to credit and extension service), transactional cost (mainly, transport cost, distance to nearest market, access to market information), product characteristics (notably, output price and nature of the product), marketing characteristics (access to marketing information, advance

payment mode, mode of payment, certainty of payment, delay in payment) and production factors (quantity of products produced, cost of production).

Furthermore, the literature review on marketing channel showed that most of the studies focused on smallholder farmers who demonstrated the role of smallholder farmers in the development of the agricultural sector in developing countries. In addition, a number of the empirical studies considered perishable agricultural products whereas a few studies were done on non-perishable agricultural products. This suggests that the selection of variables to be included in the empirical analysis may depend on the type of agricultural product under investigation.

Generally, it was noted that in the literature that there was a dearth of empirical studies on factors that influenced rice farmers choices of marketing channels in Ghana. This limited study on farmer choice of marketing channel suggests that little is known regarding the relevant factors that influence rice farmer's choice of marketing in Ghana. The present study tends to contribute to bridging this knowledge gap in the literature by rigorously analysing the determinants of rice farmers' choices of marketing channels in northern Ghana.

3.6 Factors Affecting the Choice of Marketing Channel in Agribusiness

The farm decision process begins with input procurement through to the marketing of the farm output. There are several factors that influence a farmer's decision on what to produce, how much to produce and whether to sell their farm output or not and even where and to whom should they sell to. Farmers choices of marketing channels reflect their decisions on where to or not to sell their farm outputs (Sigei, Hillary, Jonah, & Timothy, 2015). Understanding the drivers of smallholder farmers' choices of marketing channels is a prerequisite for marketing channel development, smallholder inclusion, and increasing farm income and investment. This tends to benefit in the formulation of policies that empowers smallholder farmers to be well integrated into reliable and profitable marketing channels (Mmbando et al., 2016). Some studies have investigated the determinants of farmers' choices of marketing channel in developing countries. However, there are limited empirical studies on rice farmers' choices of marketing channels. Therefore, this literature review would be extended beyond the scope of rice in Ghana to other crops in Africa and beyond. Although rice may differ from other crops in terms of shelf-life, similar factors are likely to influence marketing channel choices of farmers producing rice and that of other crops.

Present studies have suggested that a number of factors affect farmers' choices of marketing channels. In this literature review, the factors have been broadly categorised into farmer demographic characteristics (age, gender, educational level, family size and farming experience), Farm characteristics and asset endowment factors (ownership of livestock, ownership of either a TV set, radio or mobile phone off-farm employment and farm size), institutional characteristics (farmer association, access to credit and extension service), transactional or marketing cost factors (transport cost, distance to nearest market, access to market information, payment period and the output price) (Maspaitella et al., 2018; Mmbando et al., 2016; Mmbando et al., 2017; Randela, Alemu, & Groenewald, 2008).

3.6.1 Farmer Demographics Characteristics

Some studies suggested that demographic characteristics such as farmers' age, education, gender, family size, experience in farming and marketing of farm output influenced their decision on the choices of marketing channels in developing countries (Anteneh et al., 2011; Chirwa, 2009; Girma & Abebaw, 2012; Martey et al., 2012; Maspaitella et al., 2018; Mmbando et al., 2016; Shiimi, Taljaard, & Jordaan, 2012).

Farmer age was found to positively influence the decision whether to sell or not to sell through the formal cattle market in Namibia (Shiimi et al., 2012). This result suggested that as the farmer get old, they tended to lose interest in negotiating with buyers in the informal market. The reason was that it was time-consuming to search for buyers in the informal cattle market. A study in Ghana observed that the age of a household head had a negative effect on farmers' decision to participate in the rural market relative to the urban market (Martey et al., 2012). The study further articulated the participation in the urban market was associated with higher transportation costs; therefore, the older farmers who were risk averse tended to avoid this marketing risk by selling their farm output in the rural market. Consistent with the studies of Martey et al. (2012), Muamba (2011) found that older farmers sold their maize at the farm gate whereas the younger ones traded their maize in the market. The literature generally consented that younger farmers are more receptive to new ideas and risk-takers compared to older farmers who less innovative and risk-averse (Barrett, 2008; Martey et al., 2012; Muamba, 2011). Contrary to the above empirical finding, Chirwa (2009) showed no significant relationship

between farmers' age and their choices of marketing channels in Ethiopia. This finding implied that the age of farmers did not affect their marketing decision.

Education is critical for a better understanding of market information concerning prevailing market prices and available buyers, particularly when selecting an appropriate marketing channel. Education improves cognitive and managerial skills of farmers. Educated farmers are better informed regarding participating in a marketing channel that assures a higher price (Barrett, 2008). Chirwa (2009) showed that the educational level of farmers was significant in determining their marketing channel choice in Ethiopia. The researcher further revealed that educated farmers were likely to sell their maize output to private traders rather than to neighbours/or relatives. A similar finding was reported by Anteneh et al. (2011). The researchers found that farmers with a higher level of education tended to prefer multiple channels as compared to less educated farmers who sold their farm output to only a particular marketing channel. Zivenge and Karavina (2012) explained that farmers with higher education tend to be good negotiators and are more risk takers. The educated farmers can, therefore, gather and understand production and marketing information so that they can adjust their production and marketing systems according to different marketing channels. This finding was similar to the empirical evidence of Girma and Abebaw (2012). Girma and Abebaw (2012) remarked that education increased the ability of farmers to gather and analyse relevant information for their product and choose the market for better prices. (Mmbando et al., 2017) indicated that the education level of household heads exerted a positive effect on maize farmer probability to sell to traders in nearby markets relative to brokers at the farm gate in Tanzania. Contrary to all the above findings, some empirical studies showed that education exerted no effect on farmers' choice of marketing channels (Adejobi & Adeyemo, 2012; Arinloye et al., 2012; Donkor et al., 2018; Muamba, 2011; Osmani & Hossain, 2015; Zivenge & Karavina, 2012).

Gender represents differences in market orientation between male and female heads of households (Omiti et al., 2009). The gender of the farmer was an important determinant of market channel choice between consumers and traders (be it market traders or farm gate buyers) for livestock farmers (Girma & Abebaw, 2012). Martey et al. (2012) found that the male household head was significantly associated with the lower probability to select market cooperatives to the urban market among yam farmers in Ghana. The researchers opined that female household heads have a higher probability of choosing urban markets as compared to

the male counterparts. The research articulated that females tend to have more awareness of marketing channels because they are more networked socially and undertake most agricultural marketing activities. A similar empirical finding was reported by Sigei et al. (2015). The researchers found that male farmers were more likely to sell their produce at the farm gate and local market as compared to female household heads in Kenya. On the contrary, Mmbando et al. (2017)observed that male-headed households were more likely to sell to traders in the nearby market rather than their female counters who were more likely to sell at the farm gate to brokers. Contrary to the above results, other empirical studies observed that gender did not influence farmers' selection of marketing channels (Chirwa, 2009; Omiti et al., 2009; Osmani & Hossain, 2015; Zivenge & Karavina, 2012).

The empirical literature reported that large households provide cheap family labour required to carry out the various farming operations including the transportation of the farm produce to the market (Donkor et al., 2018; Omiti et al., 2009; Osmani & Hossain, 2015; Zivenge & Karavina, 2012). For example, Omiti et al. (2009) observed that large households had a higher probability of participating in the urban market relative to the rural market. A recent study by Donkor et al. (2018)suggested that farmers with a large household tended to increase the supply of their cassava output to middlemen while they reduce the quantity supplied to processors who were located in peri-urban areas in the Oyo State of Nigeria. The researchers explained that the farmers with large household were constrained by financial issues; therefore, they preferred to sell their cassava output to middlemen to generate income to cater for their immediate financial needs. However, other existing empirical demonstrated that there was no statistical relationship between farmers' household size and their choices of market channels (Maspaitella et al., 2018; Neven, Odera, Reardon, & Wang, 2009).

3.6.2 Farm Characteristics and Asset Endowment Factors

Many researchers have found that farm characteristics and asset endowments factors such as farm size (Anteneh et al., 2011; Maspaitella et al., 2018; Neven et al., 2009; Woldie & Nuppenau, 2009), off-farm income/employment (Mmbando et al., 2017),access/ownership mobile phones (Amaya & Alwang, 2011; Martey et al., 2012; Zivenge & Karavina, 2012) and transport ownership (Donkor et al., 2018; Panda & Sreekumar, 2012; Zanello et al., 2014) are some of the factors that are likely to affect the farmer choice of marketing channels.

Farm size serves as a proxy for the scale of production (Donkor et al., 2018). Empirical studies have demonstrated that large farms are associated with higher farm output while small farms are associated with low farm output (Donkor, 2016b, 2014; Owusu et al., 2017). The empirical findings from Woldie and Nuppenau (2009) suggested that the farm size allocated to banana affected the proportion sold to wholesale traders. This was mainly because large farms had more bargaining power in dealing with wholesale traders. The researchers elaborated that most large-scale farmers were wealthy; hence, they had fewer liquidity constraints in the marketing of their banana. (Zivenge & Karavina, 2012)found a positive relationship between farm size and the decision to sell in the formal market. This finding suggested that as farmers' farm size increased, they tended to have a higher probability to participate in the formal market. Other empirical studies reported that farmers with larger farm size exhibited a higher probability of participating in the supermarket channel rather than the traditional marketing channels (Maspaitella et al., 2018; Neven et al., 2009; Rao & Qaim, 2011). On the contrary, empirical evidence from Donkor et al. (2018) indicated that farm size had no significant influence on cassava farmers' choices of marketing channels in the Oyo State of Nigeria.

In general, extant studies suggested that farmers with off-farm employment tended to participate in a better marketing channel. For instance, Mmbando et al. (2016) showed that access to off-farm income and remittances significantly increased the likelihood that pigeon pea farmers would sell to traders in nearby market and wholesalers in nearby town relative to brokers at farm gate in the Northern and Eastern zones of Tanzania. Alene et al. (2008) indicated that the wealth of a household had a positive contribution towards the selection of contract channel in Ethiopia. The researchers elucidated that an increase in the farmers' wealth or assets might have a lower degree of risk aversion and with a lower risk version, farmers would be more willing to adopt new market channel opportunities. Anteneh et al. (2011) showed that the proportion of off-farm income to total income positively influenced the marketing channel choice of smallholder coffee farmers in Ethiopia. Specifically, the researchers found that farmers with a higher proportion of off-farm income tended to participate in the formal market actively. A different result was observed by Donkor et al. (2018), and it showed that farmers' engagement in off-farm employment tended not to affect their decision to participate in either the indirect marketing channel or the direct marketing channel in the Oyo State of Nigeria.

In Ghana, Martey et al. (2012) showed that farmers' access to mobile phones had a positive effect on the probability to sell to traders in the market than at the farm gate. The reason was that the farmers who had access to mobile phones were likely to have better access to reliable market information. This however tended to influence their decision on where to sell the farm products. A similar empirical finding was reported by Zivenge and Karavina (2012)and Amaya and Alwang (2011). The researchers indicated that farmers who owned a mobile phone had a higher probability of selling their farm output in the distant marketing channels. This finding was consistent with the study by Donkor et al. (2018). Donkor et al. (2018) showed that farmers who had a mobile phone tended to have a higher probability of increasing the proportion of cassava tubers sold to processors at the peri-urban markets. The researchers further revealed that the mobile money transfer innovation enabled farmers to conduct business transactions with buyers at distant places. In addition, mobile phone helped farmers to identify potential buyers in distant communities who offered a higher price. Farmers were able to negotiate the price with buyers on the mobile phone. These benefits of mobile phones encouraged the farmers to participate in the distant marketing channel.

Furthermore, the empirical studies on marketing channel have revealed that ownership of transport assets, notably bicycle, motorbike, and vehicle increase their participation in the market. For instance, Zanello et al. (2014) observed that farmers in Ghana who owned bicycles were able to sell their farm output in the distance market than to itinerant traders at the farm gate. Panda and Sreekumar (2012) showed that there was a positive relationship between the choice of a formal market channel and the ownership of a vehicle among vegetable farmers in India. This was because the ownership of the vehicles allowed farmers to freely move without relying on others to sell in the formal market, which is marketing centres located far off. Similarly, Donkor et al. (2018) indicated that cassava farmers who had a motorbike or a vehicle increased the proportion of their farm output sold to processors in the peri-urban centres relative to the middlemen at the farm gate. The researchers articulated that ownership of these transport assets enabled the farmers to overcome transport challenges that discouraged their participation in the distant markets where prices were mostly higher taking into consideration the associated transaction costs.

3.6.3 Transactional/Marketing Costs Factors

The New Institutional Economics (NIE) defines transaction costs as costs related to the searching and gathering of information on agents and goods or services (Bromley, 1991). Transaction costs also include the costs of information, negotiation, monitoring, coordination, and enforcement of contract (Hobbs, 1997). Individuals and businesses face such costs in gathering information about products, inputs; price offers payment and delivery modes, and buyers and sellers. Transaction costs are perceived to be one of the main barriers to market participation by smallholder farmers. High transaction costs have been considered as one of the factors responsible for significant market failure in developing countries (Jagwe et al., 2010). Transaction costs can be used to explain why some farmers participate in the market and others do not (Mmbando et al., 2017). The key argument in most literature on smallholder market participation and choices of marketing channels in developing countries is the effects of transaction costs. Transaction costs tend to hinder market participation because they impose the extra cost burden on the farmers.

Some empirical studies suggested transaction costs to be a significant barrier for smallholder farmer participation in the market (Alene et al., 2008; Asfaw et al., 2012; Barrett, 2008; Jagwe et al., 2010; Muamba, 2011). Specifically, Muamba (2011) argued that transaction costs in the form of access to market information among farmers reduced their likelihood of participating in the markets by raising the costs associated with searching, screening, and bargaining. However, access to market information enabled farmers to identify potential buyers in markets and become aware of prevailing market prices. This tended to strengthened farmers' bargaining power. For that reason, the literature has shown that information asymmetry rendered farmers more vulnerable to price risk in markets (Alene et al., 2008; Muamba, 2011; Ouma et al., 2010). Woldie and Nuppenau (2011) observed that the information related transaction costs could be viewed from the farmers' knowledge of prices in an alternative market. The researchers further indicated that the availability of market information would help farmers to compare the prevailing market prices with the prices offered by the alternative marketing channels so that they could select the market which gave the best prices. However, Zanello et al. (2014) found that the access to information about market prices in more distant markets might not always induce farmers to participate in those markets. The researchers might instead use that information to improve their bargaining power in negotiating prices in closer markets. On the

contrary, (Maspaitella et al., 2018) indicated that market information had no significant effect on the market channel participation.

Access to market and good road networks are expected to encourage market participation by reducing marketing costs. The distance of the farming household to the nearest market has been identified by some researchers to precipitate a significant influence on the choice of marketing channel (Mmbando et al., 2017). (Mmbando et al., 2017) explained that the long market distance implied that farmers needed to incur high transport costs to convey the farm output to the market. Such high transaction costs discouraged farmers from using channels in the market, but they would rather choose to sell at farm gate channels. In contrast, (Maspaitella et al., 2018) did not find any significant relationship between the distance to the market and the choice of marketing channel.

Barrett (2008) indicated that transportation cost was a barrier for farmers, especially those in the remote rural areas because geographic isolation through distance created a wedge between farm gates and market prices. Some researchers observed that the deplorable nature of roads, as well as inadequate road networks, hindered market participation, hence, prevent farmers from choosing profitable channels (Alene et al., 2008; Asfaw et al., 2012; Donkor et al., 2018; Maertens & Velde, 2017). The researchers indicated that during the rainy seasons most of the roads became inaccessible resulting in high transport costs. This situation forced farmers to sell to buyers at the farm gate to at low prices. In addition, Kihoro, Irungu, Nyikal, and Maina (2016)found a negative and significant relationship between transportation costs and the choice of marketing channels. The researchers explained that a higher cost of transport reduced farmers' margins; hence, they did not prefer channels where they would incur high transport costs. Contrary, (Maspaitella et al., 2018) found no significant effect of transportation costs on farmers' market channel choices.

Also, the price of the farm product is considered one of the key element that influences farmers' choice of marketing channel (Barkley & Barkley, 2016; Zivenge & Karavina, 2012). Product price is an important incentive that farmers consider when selecting a marketing channel to trade their commodity. Farmers select marketing channels that offer the best price which is consistent with the theory of supply that states that producers provide more products to the market at a higher price and vice versa (Barkley & Barkley, 2016). Zivenge and Karavina (2012) indicated that vegetable price was a major determinant of market choice among farmers.

45

The researchers explained that vegetable farmers in Zimbabwe received higher prices from the informal market as compared to the formal market. Martey et al. (2012) found that the price of yam determined the choice of the marketing channel by smallholder farmers in Ghana. The researchers revealed that the output price served as an incentive for farmers to produce and also determined the marketing channel choice. The researchers further explained that the urban market channel had higher prices compared to the rural channel; hence, they were more likely to sell to urban channel irrespective of the distance. In contrast, other extant studies (Donkor et al., 2018; Jagwe et al., 2010; Maspaitella et al., 2018; Sigei et al., 2015; Xaba & Masuku, 2012) showed no significant effect of product price on the selection of marketing channel. This evidence indicates that farmers did not consider only product price when deciding on which marketing channel to select. This finding collaborates with an argument raised by (Barrett, 2008)that product price is not the only incentive that influences farmers' selection of a marketing channel.

3.6.4 Institutional Factors.

Institutional factors are the institutional services that are rendered to farmers to enhance their agricultural production and marketing systems (Donkor, 2016b). These factors include farmer association, agricultural extension services, and access to credit. Farmer associations and extension services assist farmers with technical support and information on improved technologies and marketing opportunities (Bahta & Bauer, 2012). However, a weak institutional arrangement presents a threat to farmers regarding production, marketing, and value addition which tends to affect their profitability levels (Aker & Ksoll, 2016).

Aleria Negeri (2017) found that access to credit positively and significantly influences coffee farmers in Ethiopia from choosing an end consumer outlet relative to private traders. The researcher explained that access to formal credit (cash in hand) helped the farmers to hire a transport van in order to supply their coffee to their buyers in the market. Kihoro et al. (2016) illustrated that the access to credit allowed farmers to purchase farm inputs, e.g., seeds, fertilizers which increased their production. A higher production level could increase the marketable surplus. Credit also helps farmers to cater for all their marketing costs. Woldie and Nuppenau (2009) stated that households that had access to credit had marketing channel alternatives to sell their farm output. The farmers, however, had no special commitment of selling to traders (middlemen). Woldie and Nuppenau (2009) also observed that some households were obliged to sell to traders because they satisfied their cash needs in case of

emergencies where they had no formal or microcredit. Once households took money from these traders, they were always liable to them and loyal to them; hence, they sold their commodities to them. However, other existing studies showed that farmers' access to credit did not affect their choices of marketing channel (Donkor et al., 2018; Maspaitella et al., 2018; Rao & Qaim, 2011).

Farmers' access to extension services tended to increase their ability to acquire relevant market information and other agricultural information which enabled them to make an informed decision on the best market outlets for their farm outputs (Aleria Negeri 2017). Mmbando et al. (2016) showed that access to extension services increased the probability of farmers to sell in the market rather than at the farm gate. The researchers explained that extension services increased farmers' access to relevant market price and production information. This helped to enhance farmers' ability to identify a relatively profitable marketing channel. On the contrary, other empirical literature reported that farmers' access to extension services had no significant effect on their choices of marketing channels (Donkor et al., 2018; Martey et al., 2012; Maspaitella et al., 2018; Muamba, 2011; Osmani & Hossain, 2015; Zivenge & Karavina, 2012). Moreover, collective action institutions such as producer organisations play an important role in farmers' market access and market channel choices by sharing market information, mediating transactions, reducing transaction costs and improving the efficiency of agricultural marketing through bargaining with customers, and providing inputs and technical assistance ((Barrett, 2008; Mmbando et al., 2016). Maspaitella et al. (2018) observed that farmer group participation had a significant impact on the choice of marketing channel. The researchers explained that membership of farmer group helped to offer technical support to farmers' need to increase their production and marketable surplus and their choice of the modern market relative to traditional ones. Jari and Fraser (2009) elaborated that members in farmer associations could share market information and broaden social capital within the groups to enable them to participate in a distance marketing channel. In Nigeria, Donkor et al. (2018) that farmers who belonged to farmer associations had a higher probability of selling their cassava tubers to processors who were located in peri-urban communities. The researchers indicated that the farmer associations in the Oyo State of Nigeria had established a good relationship with the processor associations in the communities. This suggested that the farmer associations had secured a better marketing channel for their members. Besides, the farmers undertook collective marketing by bulking their farm outputs together and transport them to the processors. This strategy helped the farmers to reduce the associated transport costs.

3.7 Conceptual Framework

A conceptual framework in research is defined as the interrelation of a number of concepts to explain or predict a phenomenon under investigation (Berman, 2013). It provides a concept map for investigating research problem by linking all the relevant concepts (Leavy, 2017). A conceptual framework also serves as a guide on the selection of variables to be included in an empirical analysis as well as the operationalisation of the variables in the data collection (Creswell & Creswell, 2017). Figure 3.2 presents the conceptual framework of the study. This conceptual framework was synthesised from the literature review. The literature suggested that sets of factors, namely; farmer's demographic characteristics, farm characteristics and asset endowment, institutional factors and transactional/marketing affected the choice of marketing channels among smallholder farmers. In this study, these sets of factors are anticipated to influence smallholder farmers in their marketing channel decisions. The farmer demographics characteristics to be included in the study are age, educational level of the farmer, their household size, farming experience and off-farm employment. Access to credit, access to extension services and membership of farmer group are the institutional factors to be incorporated in the study. The transactional/marketing factors are the price of rice per 85kg, the payment period and access to market information. Farm size, ownership of a bicycle, ownership of motorbike and ownership of mobile phones are considered as farm characteristic and asset endowment factors.
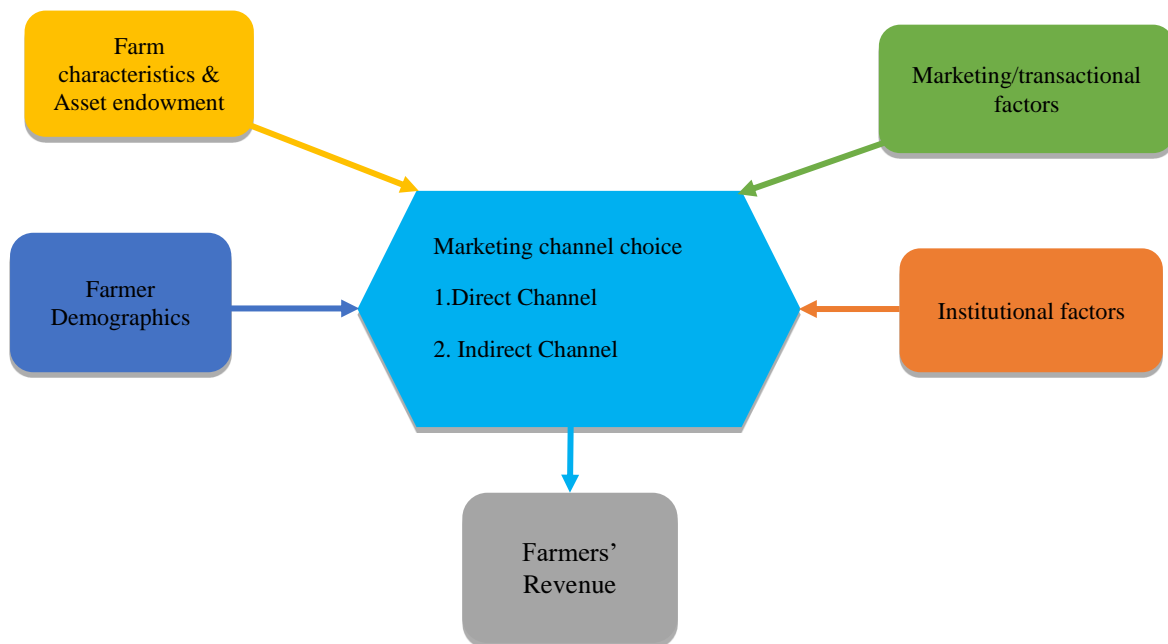
Figure 3.2. Conceptual framework

3.8 Summary

The chapter provided a comprehensive literature review on farmers' marketing channel decision. The literature suggested that the marketing channel choices of farmers were influenced by a number of factors. These factors were categorised into farmer demographics characteristics, institutional factors, transactional/marketing factors and farm characteristics and assets endowment factors. The chapter also presented a conceptual framework to guide the empirical analysis of the study, particularly in the selection of variables to be included in the model specification.

Chapter Four: Research Methodology

4.1 Introduction

This chapter presents the research methodology employed in this study. The chapter is organised as follows. The first section presents the research philosophy and approach. Section 2 highlights the strategy used to achieve the research objectives. The sampling technique employed to select the respondents is explained in the third section. Section 4 outlines how the questionnaire was developed, and the data collection technique whereas the data analysis is presented in Section 5. Section 6 explains ethical considerations and the limitations related to the research. The last section ends with a summary of the chapter.

4.2 Research Philosophy and Approach

Different research philosophy can be applied to the same research topic. According to (Sauders, 2012) there are four types of research philosophies in business and management research; they are pragmatism, positivism, realism, and interpretivism. Pragmatism research philosophy is of the view that the world is external, multiple and to the researcher values play an important role in interpreting result (Sauders, 2012). The positivist paradigm takes the view that the world is external and objective and independent of social actors and relies exclusively on theories that can be directly tested. The researcher is independent of the data and obtains an objective stance (Sauders, 2012). Under the realism paradigm, the researcher views the world as objective and exist independently on human thought and beliefs or knowledge, and he or she is biased by worldviews, cultural experience, and upbringing (Bhattacherjee, 2012; Sauders, 2012). The interpretive paradigm stresses on the view that the world is socially constructed and subjective and the researcher is part of what is being researched. The decision on which philosophical approach to use reflects on the assumption made in the study and the value of the researcher (Bhattacherjee, 2012)This study adopts the positivism approach because the researcher is independent of the data and maintain an objective stance and the theory of factors affecting marketing channel choice can be directly tested.

Research can be grouped as descriptive, explanatory and exploratory based on the purpose of the studies (Bhattacherjee, 2012; Sauders, 2012). Descriptive research has the aim of carefully observing and giving detailed documentation on a phenomenon of (Sauders, 2012). It aims to describe social systems, relationships between events, and provide background information about the issue in question. Explanatory research, however, describes phenomena and attempts

to explain why the behaviour is the way it is. It seeks explanations of observed phenomena, problems or behaviours. Exploratory research is conducted in new areas of inquiry, with the goals of scoping out the extent of a phenomenon or problem, generating some initial ideas about the phenomena and testing the feasibility of undertaking a more extensive study regarding the phenomenon (Sauders, 2012). This study can be classified as a descriptive study because it involves collecting data that describes the factors affecting paddy rice farmers' choice of marketing channel in Ghana.

Scientific research inquiry may be inductive or deductive depending on the researcher's training and interest (Bhattacherjee, 2012). The goal of the inductive research is to infer theoretical concepts and patterns from observed data (Bhattacherjee, 2012). It involves generating and building theory and generalising the findings from the specific. Deductive research, on the other hand, has the goal of testing concepts and pattern known from theory using new empirical data (Bhattacherjee, 2012). A generalisation is made from general to specific. This research is based on a deductive approach because it focuses on using data to test a theory.

4.3 Research Strategy

Clark and Creswell (2014) argue that the choice of research design depends on the research objectives, the expertise of the researcher and the type of audience for the study. Researchers can either adopt the quantitative, qualitative or mixed methods strategy. Most deductive (theory- testing) research are usually associated with quantitative strategy whiles inductive (theory-building) is based on the qualitative approach. Quantitative research examines the relationship between variables, which is measured numerically and analysed using a range of statistical techniques (Bhattacherjee, 2012). Qualitative research, on the other hand, studies participants' meaning and the relationship between them, using a variety of data collection techniques and analytical procedure, to develop a conceptual framework (Bhattacherjee, 2012). Martin and Bridgmon (2012) hold the position that the quantitative approach is more objective as compared to the qualitative method. However, some researchers, specifically Wilson, Kenny, and Dickson-Swift (2018) who support qualitative research methods criticise the quantitative method as being more restrictive. They explain that the quantitative method does not allow participants to express their opinions. However, the research questions and objectives of this study can be adequately addressed using the mixed method strategy. Creswell (2014)explains that using a mixed method, the strength of the study is greater than when using

either the quantitative or qualitative method alone because it incorporates the element of both methods.

Deductive and quantitative research is principally associated with survey research strategies. Leavy (2017) indicates that a survey is the most widely used quantitative design in the social sciences. Survey designs provide a quantitative description of trends, attitudes, opinions of a population by studying a sample of the population (Creswell, 2014). The survey relies on asking people standardized questions that can be analysed statistically using descriptive and/or inferential statistics. It allows researchers to collect a breadth of data from large samples and generalise to the large population from which the sample was drawn (Leavy, 2017). A survey research design specifically quantitative approach would be used to identify the factors affecting paddy rice farmers' choice of marketing channel in Ghana.

A survey research strategy is normally conducted through the use of a questionnaire or structured interviews. The questionnaire may be structured or unstructured. Unstructured questions ask the respondent to provide a response in their own words, while structured questions ask the respondent to select an answer from the given set of choices (Bhattacherjee, 2012). Questionnaire-based surveys can be conducted through face-to-face interviews, postal mail and online based (Bhattacherjee, 2012). Postal and online questionnaires have the advantage of reaching the respondent no matter how dispersed they are. It is also cheaper and less time consuming but has the disadvantage of respondent misunderstanding the questions and low response rate (Creswell, 2014). Face-to-face interview, on the other hand, allows the interviewer to work directly with the respondent to ask the questions and record their responses. It allows the interviewer to explain and clarify questions to the respondent and also to read out questions to the illiterate respondent (Creswell, 2014). Face-to-face also has a high response rate but can be time consuming and expensive. Most of the participants could not read or speak the English language; therefore, the structured questionnaire was administered through a face-to-face interview, and this allowed the interviewer to translate the questionnaire into the local language spoken by the participants.

4.4 The Study Area

The study was conducted in the Northern region of Ghana. The region is noted for the cultivation of rice in Ghana. The Northern Region occupies an area of about 70,383 km^2 which constitutes about two-fifths of the area of Ghana making it the largest region in term of land size (Ghana Statistical Service, 2014). On the contrary, the region is characterised by a high rate of poverty due to the low level of economic activities (Ghana Statistical Service, 2014). It shares boundaries with the Upper East and the Upper West to the north, the Brong Ahafo and the Volta region to the south and two neighbouring counties; the Republic of Togo to the east and Cote d' Ivoire to the west (Ghana Statistical Service, 2014). The region currently has a population of 1,820,806, representing 9.6% of the total population of the country (Ghana Statistical Service, 2014). The region has 20 districts which are shown in Figure 4.1. The vegetation falls into Guinea -Savannah Zone, which is mostly characterized by vast low-lying areas of semi-arid grassland interspersed with savannah woodland. The climate of the region is relatively dry and hot with uni-modal rainfall that begins in May and ends in October. The amount of rainfall recorded annually varies between 750 mm and 1050 mm.
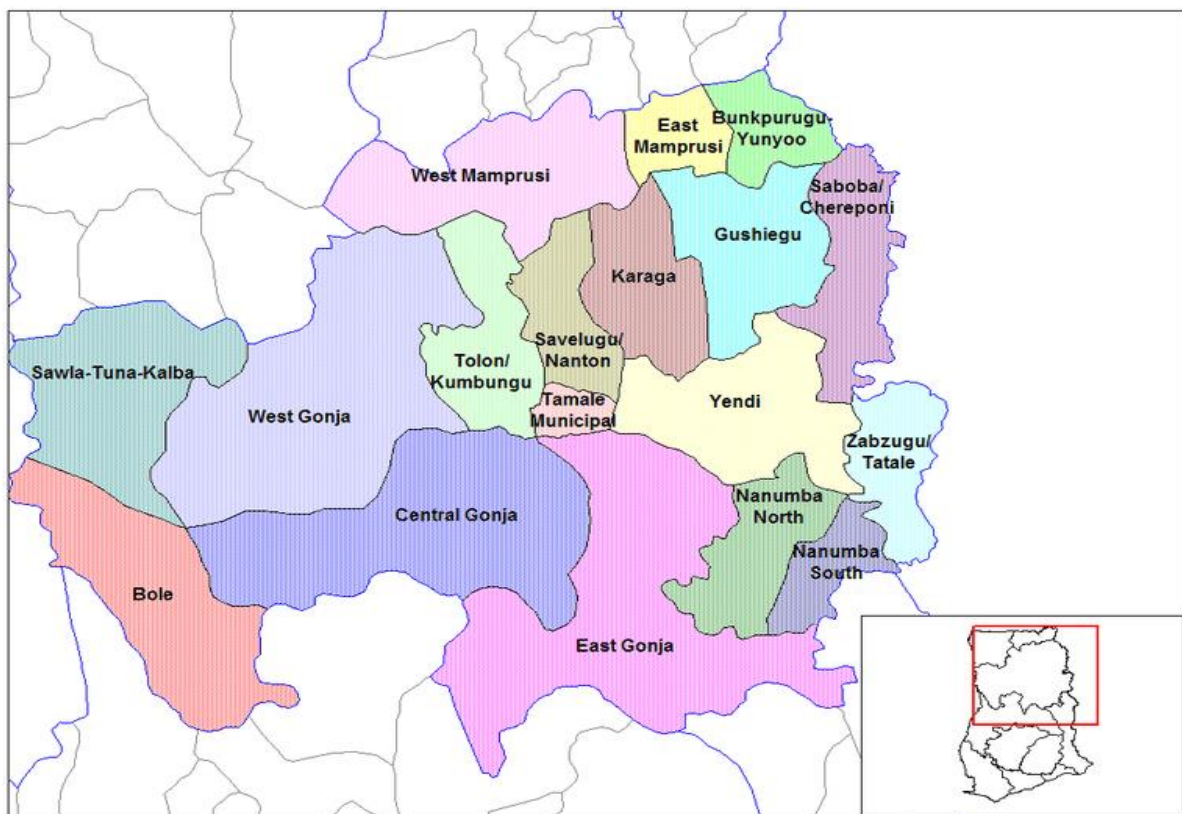
Figure 4.1. The map of the Northern region of Ghana (Ghana Quest, 2017).

Tolon, Kumbungu and Salvalugu districts were selected for the study. The majority of the people in these three districts are smallholder farmers who farm on subsistence basis (small-scale). Agriculture, forestry, and fishery are the main economic activities in the districts contributing about 87.3% towards economic development (Ghana Statistical Service, 2014). The major crops that are grown include rice, yam, groundnut, and maize. In 2015, these districts contributed the highest (40%) to the total rice output in the region (Ghana Statistical Service, 2014).

4.5 Sampling Approach and Sample Size

A sample is a selection of the population, whereas the population is a full set of cases from which sample is selected (Bhattacherjee, 2012). In this study, the target population for the study comprises all smallholder farmers who grow rice as their main source of income in the Northern region of Ghana. Sampling technique can be grouped into probability and non- probability sampling (Bhattacherjee, 2012). Probability sampling such as simple random sampling, systematic sampling or stratified sampling gives each member of the population an equal chance of being selected and gives a fair representation of the population (Bhattacherjee, 2012). However, non-probability sampling such as purposive and convenience sampling has some of the population having a zero chance of selection. Some studies on factors affecting marketing channel choice use probability sampling technique(Alene et al., 2008; Asfaw et al., 2012; Donkor et al., 2018; Martey et al., 2012; Soe et al., 2015; Zivenge & Karavina, 2012), however, this study used the purposive sampling which is non-probability sampling.

Purposive sampling enables the researcher to use his or judgement and available secondary information to select cases that best enable them to answer their research questions and objectives (Bhattacherjee, 2012). The purposive sampling was used to select the final participants because it helps the researcher to find respondents who were suitable for the study. This sampling technique was used because there was no accurate, complete and updated list of rice farmers (population) in the region. However, this approach has the limitation of been bias and not fairly representing the population. The purposive sampling was used in selecting the three districts and the communities within the district. This was followed by the selection of 200 farmers from the selected communities. Farmers included in the sample generated 60% or more of their income from rice production.

4.6 Questionnaire Development

A structured questionnaire was designed and used to solicit a primary data set from the rice producers to achieve the various objectives of the study. Structured questions are mostly closed questions that provide the respondent alternative to select from. Structured questionnaire makes it easy to collect and quantify information. The questionnaire development consisted of three main steps; (1) designing a draft questionnaire, (2) pre-testing the questionnaire through a pilot survey and (3) refining the questionnaire. Using existing literature on factors affecting farmer's choice of marketing channel (Alene et al., 2008; Asfaw et al., 2012; Barrett, 2008; Donkor et al., 2018; Jagwe et al., 2010; Maspaitella et al., 2018; Mmbando et al., 2016) a draft questionnaire was developed.

The draft questionnaire was pre-tested to evaluate its suitability of the questionnaire in addressing the relevant research questions. The data generated from the pre-test was analysed, and necessary adjustment was made to ensure that all the important information required to answer the relevant research questions were captured in the questionnaire. The pre-testing of the questionnaire tends to increase the reliability of the final questionnaire and ensured that the questions being asked were relevant and been understood by the respondent (Ruane, 2005). The questionnaire was first tested with three extension officers and one agricultural district directors to identify if the questionnaire was lacking in any information. Clarification and extra information gather were used to modify the questionnaire. For pilot testing the questionnaire, 13 rice farmers who were not included in the final survey were interviewed, taking into consideration their feedback the final questionnaire was designed **(see Appendix 1).**

The main survey of this study was conducted between 5 February and 10 March 2018. The final questionnaire included the following sections; farmer demographics characteristics, farm characteristics and household assets endowments, institutional factors and transactional/marketing characteristics. Information was also collected on the challenges that farmers encountered was also captured using the five-point Likert scale. Section A captured information on farmers demographics characteristics. Basic information such as the age, gender, level of education, household size, rice farming experience and off-farm employment were captured. Farm characteristics and asset endowment factors were presented in Section B. Variables such as ownership of transport assets such as a motorbike, bicycle or vehicle, ownership of communication assets such as mobile phones, television or radio, livestock ownership and farm size available to the farmers were collected. Section C covered information on marketing and/or transactional factors. The aim of this section was to provide information

on the types of marketing channel available and its associated cost, prices over by each marketing channel, payment period and the availability of marketing information. The purpose of the institutional factors in section D was to capture information on the institutional services available to farmers. Access to credit, access to extension services and farmer group membership were included in this section. Section E captured information on the various production and marketing challenges that smallholder rice farmers are faced with.

4.7 Data Collection

Besides the primary data, secondary data was collected to support the results of the primary data. Secondary data help save time and cost, but the researcher must be careful of the accuracy, relevance, and timeliness of the data (Sekaran & Bougie, 2010). This study employed secondary data from Food and Agriculture Organization of the United Nations (FAO), Ministry of Food and Agriculture in Ghana, journal articles, technical reports, conference papers, textbooks and other unpublished documents.

The primary data collection was done by the researcher and two other enumerators. This is because the researcher was unable to speak and understand some of the local languages which are spoken by the respondents. The two enumerators were recruited and trained to help in the administration of the questionnaires because they were familiar with the local language. In the administration of the questionnaires, the enumerators explained the purpose of the study to the respondents and asked for their voluntary participation. Because most of the respondent has a very low literacy level, the enumerators explained the questions to them in their local language and recorded the response. Respondents spent between 35 to 45 minutes to answer all the questions. One out of the 200 participants decided to quit in the middle of the interview, so the total sample size became 199. The response rate was therefore 99.5%.

4.8 Data Analysis
4.8.1 Data Cleaning, Coding, and Entry
Following, the data have collected, the questionnaire was cleaned to ensure its completeness and validity. This process helps to check for outliers, missing values, and inconsistencies. The data was then coded (that is the data was converted in numeric format). Coding helps to describe each variable in the research; it shows the format for each item (numeric or text, etc.), the response scale of each item (that is whether it is nominal, ordinal, interval or ratio scale)

and how to code each value into numeric (Bhattacherjee, 2012). The questionnaire was entered into the SPSS spreadsheet, and some statistical analysis was run. Some quantitative methods, namely descriptive statistics, binary logit regression model and the standard t-test were used to achieve the research objectives using SPSS and STATA.

4.8.2 Descriptive Analysis

Descriptive statistics such as mean, standard deviation, minimum, maximum, frequencies, and percentages distribution tables were used to describe and analyse the socio-economic characteristics of small-scale paddy rice farmers in the Northern Region of Ghana. To build on the existing literature regarding the constraints that affect rice production in Northern Ghana, the study used a five-point Likert-severity scale (viz., strongly agree = 1, agree = 2, disagree = 3, strongly disagree = 4, neutral = 5) to rank the constraints. A Likert scale commonly has five fixed- alternative expression (Robson & McCartan, 2016). Rice farmers were asked to indicate the level of agreement between the constraints based on the Likert-agreement scale. The mean of each challenge was calculated, and the mean values were used to rank the position of each of the challenge. In this study, the constraints encountered by rice farmers were classified into production and marketing constraints. There were eight challenges under production constraints, and they included the high cost of labour, poor climatic conditions, the high cost of farm inputs, low mechanisation, limited access to credit, limited access to extension services, diseases and pest infestation and low land development. Limited market option, buyer dictating prices, low demand, low market prices, the high cost of transportation, poor storage facilities, poor quality of rice, lack of marketing standards and post-harvest losses were considered as the marketing constraints.

4.8.3 Inferential Analysis

The chi-square test was used to compare the characteristics of farmers who participated in the direct marketing and indirect marketing channels. The chi-square test validates if there is an association between the characteristics of the farmers and their choice of marketing channels. The test of association involves computing the differences between the observed and expected frequencies (Bewick, Cheek, & Ball, 2004). Bewick et al. (2004)suggest that if the differences are large, then it implies that there is an association between one variable and the other. Following Bewick et al. (2004), the chi-square value (χ^2) for a table with r rows and c columns is calculated as:

$$\chi^2 = \sum_{i=1}^{r} \sum_{j=1}^{c} \frac{(O_{ij} - E_{ij})^2}{E_{ij}} \qquad (1a)$$

where O_{ij} is the observed frequency (the actual count of cases in each cell of the table), and E_{ij} is the expected frequency in the cell in row i and column j. If the null hypothesis of independence or no association is true, then the computed chi-square statistic approximately follows a χ^2 distribution with (r -1) x (c -1) degree of freedom, where r and c are the numbers of rows and columns, respectively (Bewick et al., 2004; McHugh, 2013). One of the important assumptions of the chi-square test is that the value of the cell expected should be 5 or more in at least 80% of the cells and no cell should have an expected value of less than 1 (Bewick et al., 2004). If this assumption is violated, it is suggested that the Fisher exact statistic should be reported instead of the chi-square statistic (Bewick et al., 2004; McHugh, 2013).

4.8.3.1 Choice of Model

There are several methods that can be used to explain the relationship between a dependent and independent variable (Mohammed & Ortmann, 2005). A binary choice problem can be addressed using a Linear Probability Model (LPM), or a Probit Model (PM), a Logit Model (LM) and Tobit Model. This study employed the Logit Model to examine the potential factors that affect paddy rice farmer choice of marketing channel. Some studies have applied the Linear Probability Model; however, Amemiya (1981) indicates that the LPM generates inconsistent estimates. This is because some of the predicted probabilities from the LPM are either less than zero or greater than one which is contrary to the probability restriction range of 0 to 1 (Amemiya, 1981). For this reason, most empirical studies apply either The Probit or Logit models (Amemiya, 1981). The main difference between the Probit approach and the Logit approach is related to the assumption of the error term. For example, the Probit model is assumed to be normally distributed whereas that of the Logit Model is logistically distributed (Cameron & Trivedi, 2010). Amemiya (1981) further illustrates that the coefficients obtained from the Logit Model tend to be greater than those of the Probit Model by a scalar of 1.60. The present study purposively selected the Logit Model to analyse the factors influencing farmer decision to participate either the direct or indirect channel. The choice of this model is based on the reason that the Logit Model is easier to interpret, and it computationally requires less time (Cameron & Trivedi, 2010).

4.8.3.2 The Theoretical Model (Binary Logistic Regression)

The theoretical foundation for the analysis of the factors that influence paddy rice farmer's decision to sell his/her rice processors or middlemen is based on the theory of rational choice. The rational choice theory suggests that an economic agent seeks to choose an option that maximises his/her utility (Ward, 1995). The study assumes that for a smallholder paddy rice farmer have to decide whether to sell to processor or middlemen, he/she first compares the net benefit derived from selling rice to processors (U_P) with the net benefit derived the sales of rice middlemen (U_M). It is expected that the smallholder paddy rice farmer is likely to sell to processors if his/her perceived net benefit associated with the sale of rice to processors exceeds that of selling to middlemen. Thus, $U_P - U_{M>} 0$ or $U_P > U_M$. Although the researcher does not know the choice of the rice farmer, the characteristics and attributes of the choices are observed. That is, the decision to sell processors (denoted here as MP_i) is not observable per se and can be expressed as a function of observable elements in a latent variable equation. The latent variable equation is related to a set of farmer demographics characteristics, farm characteristics and asset endowment factors, institutional factors and transactional/marketing factors as in equation (1b):

$$MP_i^* = x_i' \beta + \varepsilon_i \tag{1b}$$

$$\text{where } MP_i = \begin{cases} 1, & \text{if } MP^* > 0 \\ 0, & \text{if } MP^* \leq 0 \end{cases} \tag{1c}$$

and MP^* denotes the latent dependent variable, whereas MP_i is the choice of marketing channels (specifically, direct versus indirect channels). β denotes a vector of parameters to be estimated, ℓ_i is the error term and the subscript i denotes the ith rice farmer.

The coefficients of the Logit Model do not have a direct interpretation; therefore, it is necessary to compute the marginal effects. The marginal effects denote the effect of a unit change in each of the explanatory variables on the dependent variable (decision to participate in direct or indirect channels. The marginal effects are estimated by taking the first partial derivatives of equation (1b) with respect to x_i, where x_i denotes the relevant explanatory variables. The marginal effects are expressed as in equation (1d):

$$\frac{\partial \Pr(MP_i = 1 \mid x_{ij})}{\partial x_{ij}} = \frac{\partial E(MP_i \mid x_{ij})}{\partial x_{ij}} = \Omega(x_i' \beta)[1 - \Omega(x_i' \beta)]\beta_j \qquad (1d)$$

where Ω (.) is the cumulative standard density function of the logistic distribution. Assuming the indirect marketing channel is used as the based category, the probability of a paddy rice farmer to participate in the direct marketing channel is given as:

$$\Pr(MP_i = 1) = \Pr(MP_i^* > 0) = e^{x\beta} / (e^{x\beta} + 1) \qquad (1e)$$

where *Pr* denotes the probability.

4.9 Empirical Model Specification, Variable Description, and Expected Signs

The Logistic regression model was used for the empirical analysis because the probability of farmers is assumed to be a binary choice. The dependent variable measured the paddy rice farmer choice of market channels (either processor or middlemen), while a set of independent variables resulting from farmer demographics characteristics, farm characteristic and assets endowments factors, institutional factors and transactional/marketing characteristics. Therefore, the empirical model for analysis in the research can be specified as in (1f):

$$MC_i = \alpha_0 + \sum_{k=1}^{6} \alpha_k FarmerDemo_{ik} + \sum_{k=7}^{10} \alpha_k Farmxters_{ik} + \sum_{k=11}^{13} \alpha_k Transactional_{ik} + \sum_{k=14}^{16} \alpha_k Institutional_{ik} + \varepsilon_i \quad (1f)$$

where MC_{ij} refers to the different paddy rice market channels (namely, direct and indirect marketing channel). MC_j equals 1 if the farmer participates in the direct channel and 0 if the farmer participates in the indirect market channel. In this study, direct marketing channel refers to sales of paddy rice directly to processors whereas, in the indirect marketing channel, the farmer sells to middlemen who then trade directly with processors. α denotes a vector of parameters to be estimated; ε_i is the error term which is logistically distributed.

$FarmerDemo_{ik}$ represents a set of farmer demographic characteristics related to the paddy rice farmer. The variables under the household characteristics are farmer gender, age, household size, and educational level, farmers experience, and off-farm employment. $Farmxters_{ik}$ is the farm characteristics and asset endowment factors such as farm size, ownership of a mobile phone, ownership of transport assets (specifically, a motorbike, and a bicycle).

60

Transactional$_{ik}$ denotes transactional factors which include the average product price, payment period and farmer access to market information. *Institution$_{ik}$* refers to a set of institutional factors which includes membership of farmer association, farmer access to extension services, and access to credit. The definition of the various variables to be included in the Logit model is presented in Table 4.1. The Stata software (version 13) was used to estimate these parameters as well as the marginal effect. The direct marketing channel was chosen as the based category and used to compare the indirect channel because it is the effective channel.

Table 4.1. Summary description of the variables to be included in the binary Logistic regression model

Variable	Variable type	Description	Expected signs
DEPENDENT VARIABLES			
Choices of Marketing Channels	Categorical	1= Direct marketing channel (if the farmer sells directly to processors)	
		0 = Indirect marketing channel (if the farmer sells to middlemen)	
EXPLANATORY VARIABLES			
Farmer Demographic Characteristics `			
Age	Continuous	Number of years	-
Household size	Continuous	Number people in a household	+
Experience in rice farming	Continuous	Number of years engaged in rice farming	+
Education	Continuous	Number of years of formal education	+
Off-farm employment	Dummy	1= yes and 0= otherwise	+
Farm Characteristics and Assets Endowment factor			
Farm size	Continuous	Land area under the cultivation of rice (ha)	+
Ownership of a mobile phone	Dummy	1 = Farmer ownership of a mobile phone and 0 = otherwise	+
Ownership of motorbike	Dummy	1 = Farmer ownership of a motorbike and 0 = otherwise	+
Ownership of bicycle	Dummy	1 = Farmer ownership of a bicycle and 0 = otherwise	+
Transactional/ Marketing Factors			+
Payment period	Dummy	1= Prompt payment and 0= otherwise	+
Access to market information	Dummy	1 = Farmer access to market information and 0 = otherwise	
Average product price	Continuous	The average price received for 85 kilograms of paddy rice in the direct channel (GH₵)	+
Institutional Variables			
Credit access	Dummy	1 = Farmer access to credit and 0 = otherwise	+
Extension	Dummy	1 = Farmer access to extension service and 0 = otherwise	+
Farmer association	Dummy	1 = Membership of farmer association and 0 = otherwise	+

4.9.1 The A Priori Expectations

4.9.1.1 Farmer Demographic Characteristics

Age was a continuous variable measured in years. It is expected to have a negative effect on farmers' choice of a marketing channel. As farmers get older, they tend to be risk-averse; hence, they are less likely to bear the transaction cost involved in the participation in the direct marketing channel.

Household size is a quantitative variable referring to the total number of members of the household. These studies argue that as family size increases, the more labour available for farm work and hence increase production.

Farming experience is expected to have a positive influence on market channel choice. With increased years of farming experience, a farmer may have accumulated marketing capacity and may be better connected with processors (i.e., a developed trust). According to Shiimi et al. (2012) experience can also reflect the ability to better negotiate marketing transactions to the seller's benefit.

Education was a continuous variable measuring the number of years the household head spent in formal education. A positive sign is hypothesized with more educated farmers being more likely to sell to the direct marketing channel. Anteneh et al. (2011)confirmed that the level of education of the household head significantly influenced coffee market outlet choice.

Off-farm employment was coded as a dummy variable with 1 representing engagement in off-farm activity and 0 otherwise. It was expected to have a positive impact on farmers' choice of direct marketing channel.

4.9.1.2 Farm Characteristics and Household Assets Endowment

Farm size is the measure of the size of cultivated rice land by the household in acres. It was hypothesized to have a positive effect on rice farmers' decision to participate in the direct marketing channel instead of the middlemen. Farmers with larger proportions of cultivated land may have a higher output leading to greater market activities to off-take the surplus. Maertens and

63

Velde (2017) and Zivenge and Karavina (2012) found a positive relationship between farm size and marketing channel selection.

Ownership/ access to mobile phones was coded as a dummy with 1 representing ownership or access to mobile phones and 0 for otherwise. The study expected that farmers' ownership of mobiles tended to have a positive effect on their probability to participate in the direct marketing channel. Access to mobile phones help farmers to get market information on available buyers, prices as well as negotiating the price with processors (Amaya & Alwang, 2011; Martey et al., 2012). With mobile phones, farmers can easily receive payments of their rice output from processors in the distant places through the mobile money transfer innovation. These benefits associated with ownership of mobile motivate farmers to increase their participation in the direct marketing channel.

Ownership of transport assets was set as a dummy variable which took the value of 1 if the household owned either a motorbike or bicycle and 0 for otherwise. This variable was postulated to have a positive effect on rice farmers' decision to participate in the direct marketing channel. Transport assets such as motorbikes enable farmers to overcome challenges associated with conveying their rice outputs to processors in the distant market.

4.9.1.3 Transactional/Marketing Factors
Payment Period was coded as a dummy with 1 representing prompt payment after the supply of produce and 0 for delay payment (with a week or more). It was expected that farmers would sell their rice produce to channel that offered them prompt payment. Farmers will reduce their sell to any channel which delays payment for their produce.

Access to market information was measured through the ability of farmers to obtain information regarding the market. This variable was coded as a dummy with 1 representing access to market information and 0 otherwise. It was expected that farmers' access to market information on prices and buyers would have a positive effect on their participation in the direct marketing channel.

Access to market information on price and buyers help farmers to be well informed on the prevailing market conditions (Shiimi et al., 2012)

Output price (Price) was captured as a continuous variable capturing rice selling price per 85kg bag in Ghana cedis (GH₵). Price of rice output per bag was expected to have a positive effect on farmers' decision to sell their rice output to processors over middlemen. Price serves as an incentive for farmers in choosing between marketing channels. As the price of rice output per bag increases, farmers are motivated to increase to their outputs; they also select marketing channel that offers the highest price (Martey et al., 2012; Maspaitella et al., 2018; Mburu, Wakhungu, & Gitu, 2007). In the context of this study, it is anticipated that the direct marketing channel is more likely to offer a better price than the indirect ones. Hence, farmers are more likely to sell to the direct channel when the price increases.

4.9.1.4 Institutional Factors

Access to credit was coded as a dummy variable measuring whether or not the farmer had access to credit during the previous season. A value of 1 denoted that the farmer had access to credit in the last season and zeroed otherwise. The study hypothesized a positive relationship between credit access and farmers' participation in the direct marketing channel. Farmers who have access to credit can easily acquire more farm inputs and increase their output which will enable them to sell in bulk at the distant market to processors, *ceteris paribus.*

Access to extension services measured as a dummy variable, 1 equals to farmer access to extension services and 0 for otherwise. Access to extension services was expected to increase farmers' participation in the direct marketing channel. Extension agents, as farmers' advisors, help them in their farming decisions including marketing (Aleria Negeri 2017; Mmbando et al., 2016). *Membership of a farmers' association or group* was expected to be positively associated with farmers' decision to participate in the direct marketing channel over the indirect marketing channel. Members of farmer associations tend to share information related to the production and marketing of rice. Such market information exposes farmers to available processors at distant places. In addition, members of farmer association can undertake collective marketing actions

which enable them to reduce transaction cost as well as strengthening their negotiation power (Olwande & Mathenge, 2011).

4.9.2 Effects of marketing channels on farmers' revenues

The study hypothesised that rice farmers who sell their rice directly to processors are likely to generate higher revenue than those who sell to middlemen. This hypothesis was tested using the standard t-test. The t-test was used because the variables involved are continuous. The t-test evaluates whether the mean difference of revenues generated by the participants of the direct and indirect channels is statistically different from zero. The revenues generated by these groups of farmers were computed as the total quantity of rice output multiplied by the unit price. The standard t-test formula is given as:

$$t = \frac{R_P - R_M}{\sqrt{\dfrac{SE_P}{N_P} + \dfrac{SE_M}{N_M}}} \qquad (3)$$

where t is the computed t-statistic, R_P is mean revenue generated by the participants of the direct channel; R_M is mean revenue generated by the participants of the indirect channel, SE_P and SE_m are the estimated standard errors of the revenues for the participants of the direct and indirect marketing channels, respectively. N_P and N_m are the numbers of farmers who participated in the direct and indirect marketing channels, respectively. If the computed t-statistic is approximately equal to or greater than 2, it suggests that the mean difference of revenues generated by the two groups of farmers is statistically different from zero at 5%. This further suggests that rice farmers' choices of marketing channels affect their revenues.

4.10 Ethical Considerations

This research was assessed and approved by the Massey University Human Ethics Committee as low- risk to the participant (**see Appendix 2**). The study will be conducted in accordance with "the Code of Ethical Conduct for Research, Teaching and Evaluation Involving Human Participants" applied at the Massey University. The respondents were given informed consent (**see Appendix 3**) before participating in the survey. The respondents were briefed about the purpose

of the study, content, duration, potential risks, and benefits associated with participation. Participation in the survey was voluntary, and only participants who were willing were interviewed. During the interview process, the participants can decide to opt out. During the whole research and after when reporting the results and publishing the research output, the anonymity of the respondents was maintained. The researcher also gave the participant detailed information confirming that their personal identity would not be published or made available to anyone. Data on sensitive personal information such as income, farm size, prices were to be analysed in aggregate which will not be related to a particular or single household.

4.11 Limitation of the Study

There was a number of limitation in the current study, and these are summarised below;

- The language barrier was a major limitation for this study. Many local languages existed in the study area, and since most of the respondent were illiterate, the researcher had to translate to those local languages. However, the researcher could only speak and understand only a few of them. The researcher, therefore, employed two enumerators to assist in the data collection. Also, in certain cases, the researcher used other members of the family that were educated to do the translation.
- This study applied convenience sampling in which a non-probability sampling technique to select the respondents in the sample. As convenience sampling does not apply a random process on the probability basis, the generalisation of the research results is restricted.

4.12 Summary

The purpose of this chapter is to highlight the methodological approach that was employed to achieve the research objectives. The quantitative strategy was used as the main research strategy to help achieve the objectives of the study. A structured questionnaire was designed and administered through a face-to-face interview with a sample of 199 smallholder rice farmers. The convenience sampling method was used to get the sample size since there was no sampling frame for rice farmers in the study area. The data were processed and analysed using the Statistical

Packages for Social Sciences (SPSS version 23) and Stata (version 13). Statistical analysis such as Binary Logit regression, chi-square, and t-test was used to report the results of the study. Ethical consideration and limitation of the study were also reported in the chapter.

<center>**Chapter Five: Results of the Study**</center>

5.1 Introduction

The aim of this chapter is to present the results of the survey undertaken for this study. The chapter commences with a descriptive analysis of the sample in the study. Then, the inferential analysis of the factors influencing farmers' choice of marketing channels is outlined. The next section provides the result on the effect of marketing channel choices on farmers' revenue. The challenges facing farmers are presented in the last section.

5.2 Descriptive Analysis of the Sample

Descriptive statistics such as frequencies, percentages, maximum, minimum, mean and standard deviation were used for the preliminary data analysis and for describing the sample. The analysis starts with the description of the dependent variable followed by the explanatory variables.

5.3 Dependent Variable

The dependent variable for this study was the marketing channels available to paddy rice farmers in the Northern region of Ghana.

5.3.1 Marketing Channels for Paddy Rice Farmers

Milling of rice paddy involves a series of value-adding activities. For this reason, most farmers prefer to sell the paddy to avoid such numerous activities. The current study focuses on marketing channels for paddy rice. The study identified two main marketing channels for paddy rice, and they included the indirect channel (thus, selling to middlemen or collectors) and the direct channel (selling to the processor) as shown in Figure 5.1. Any of the channels can be adopted for the sale of one's rice. A large proportion of rice is sold just after harvest. This is to enable the farmers to repay their loans; however, some farmers also store their rice and sell at a later date.

<center>69</center>

```
Rice Farmer                          Rice Farmer

                                      Middlemen

Processors                           Processors

Direct marketing channel         Indirect marketing channel
```
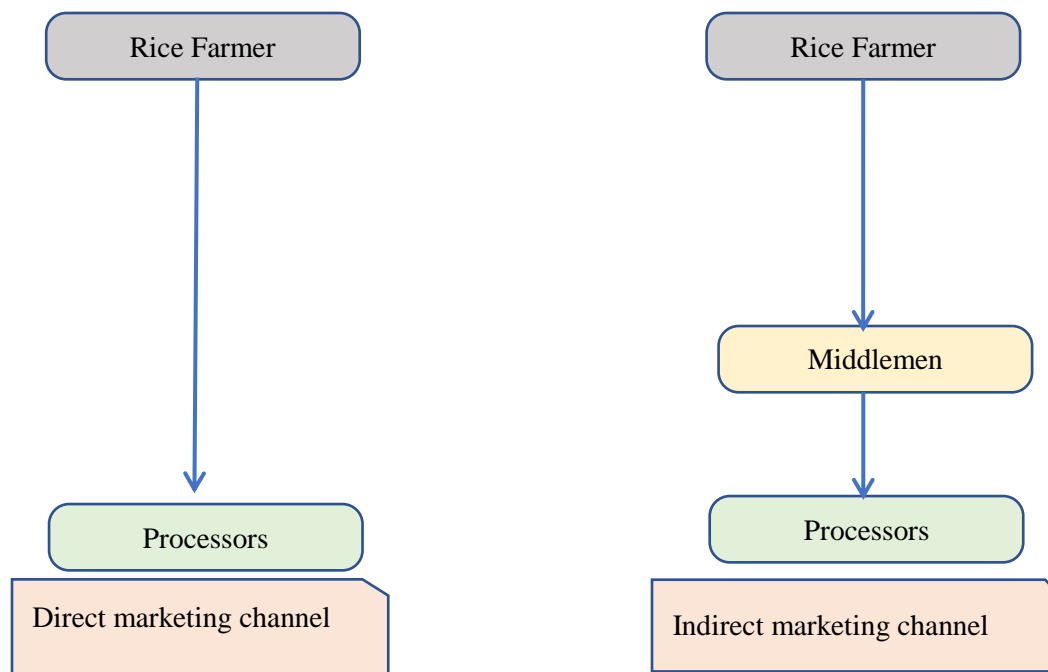
Figure 5.1. Marketing Channel Options Available to Rice Farmers

In the indirect (middlemen) channel, farmers sold their paddy rice to middlemen at the farm gate. These middlemen were women who either lived in the farmers' community or nearby communities. The middlemen aggregate all the paddy purchased and transported them to processing firms which were located in the district or nearby districts. The middlemen or collectors can either sell their rice to the processors or mill it and sell it to other channel members (wholesaler, retailer, consumers). They do not buy rice by weight but rather use volume such as bags as means of measurement. The average weight of the bag is 85kg; however, since they are not weighed, the weight is usually more than that. Because this mode of measurement is not accurate, it leads to exploitation of farmer, and this leaves farmers worse off. The income farmers receive are always less when produce is sold in volumes as compared to when the same quantity of produce is sold by weight. Middlemen offer instant cash payment after buying rice, but a few of them can sometimes also delay payment to a week. The buyers make regular visits to the communities to buy rice, generally on the peak of harvest.

For the direct (processor) channel, farmers sold their paddy rice directly to processing firms without allowing the middlemen to perform the marketing function. Processors also buy rice

from middlemen or collectors. The processors mill the rice and distribute to wholesalers, retailer, institutions, and consumers. The farmers after selling their rice to processors will have to wait for weeks and in some cases months before their money is paid to them.

Table 5.1 shows the distribution of the marketing channels used by the farmers. The result shows that 61.3% of the farmers sold their paddy to middlemen at the farm gate whereas the remaining 38.7% sold their paddy directly to processing firms. This result suggests that majority of the farmers depend on middlemen to perform their marketing functions for them. This also means that profit margins are shared among farmers, and most of the times the middlemen get more profits than the farmers. Some farmers also expressed their interest in dealing directly with processors, but they do not like the bureaucracy associated with dealing with processors.

Table 5.1. Marketing Channels used by Farmers

Marketing Channel	Frequency	Percentage (%)
Collectors at the farm gate	122	61.3
Processors	77	38.7
Total	**199**	**100**

5.4 Explanatory Variables

The explanatory variables included in this study were put into broad categories; farmer demographic factors, farm characteristics and assets endowment, transactional/marketing factors and institutional factors. Variables under each of the category were analysed and compared with the two available marketing channels (dependent variable**).**

5.4.1 Farmer Demographics Factors

This section provides an overview of the demographic characteristics of the respondents. Variables such as age, educational level, gender, household size, farming experience, and off-farm employment of the sampled farmers were analysed.

5.4.1.1 Age of Farmers

The mean age of rice farmers in the study was 38 years with the youngest farmer been 20 years and the oldest 80 years. The results revealed that most of the farmers were relatively young and were within the economically active population. Table 5.2 shows that the majority (55.8%) of the farmers were within the age bracket of 20-35 years while 13.1% are above 50 years. A higher proportion of active economic age group presents an opportunity in terms of active labour and human capital for the development of the rice sector in Northern Region. There was also a similar distribution between the age of the farmers and the market channel used in the sense that majority of the farmers who sold to processors were within the age bracket of 20 to 35 years and this was the same for those who sold to middlemen. The chi-square value (4.151) was not statistically significant even at 10%. This result suggested that there was no association between the choices of marketing channel and farmers' age.

Table 5.2. Age of farmers

Variable	Direct channel		Indirect channel		Total sample	
Age (years)	Frequency	Percentage	Frequency	Percentage	Frequency	Percentage
20-35	36	46.8	75	61.5	111	55.8
36-50	29	37.7	33	27.0	62	31.2
Above 50	12	15.5	14	11.5	26	13.1
Total	**77**	**100**	**122**	**100**	**199**	**100**

$\chi^2 = 4.151$, p = 0.125

5.4.1.2 Educational Level of Farmers

The distribution of rice farmers by their educational background was examined by looking at the levels of formal education attained by the farmers. The educational level was categorised into no formal education, primary, secondary and tertiary. The result in Table 5.3 showed that the majority of the respondents (72.9%) had no formal education, 12.6% had attained primary or basic education (9 years) whereas 9% and 5.5% had obtained secondary (12 years) and tertiary education (16 years or more), respectively. The result also revealed that the majority of both participants of

the direct marketing channel and indirect marketing channel had no formal education. The distribution of the educational levels was similar for both groups.

Table 5.3. Educational level of the farmers

Variable	Direct channel		Indirect channel		Total sample	
Education	Frequency	Percentage	Frequency	Percentage	Frequency	Percentage
No formal Education	55	71.4	90	73.8	145	72.9
Primary (9 years)	10	13.0	15	12.3	25	12.6
Secondary (12 years)	7	9.1	11	9.0	18	9.0
Tertiary (16 years)	5	6.5	6	4.9	11	5.5
Total	**77**	**100**	**122**	**100**	**199**	**100**

$\chi^2 = 0.266$, p $= 0.966$

This result implies that most farmers had a low level of formal education which may influence rice farmers' ability to retrieve and read information related to market conditions and farm innovations.

Table 5.3 suggests that the Pearson chi-square value (0.266) was not statistically significant at 10%, which suggested that there was no association between farmers' decision to participate in direct or indirect marketing channel and their educational level. This result was not surprising seeing that most of the farmers in the region have no formal education.

5.4.1.3 Gender of Farmers

The gender of rice farmers was identified in the literature to be one of the variables that influenced farmer marketing channel decisions. Table 5.4 indicates that 94% of the farmers were males while 6% were females. Similarly, most of the participants of processor and middlemen marketing channels were males. This result shows that rice production is dominated by males.

Women were more involved in farm activities such as planting, weeding, threshing, the winnowing of harvested rice, the processing and marketing of rice.

Table 5.4. Gender of rice farmers

Variable	Direct channel		Indirect channel		Total sample	
Gender	Frequency	Percentage	Frequency	Percentage	Frequency	Percentage
Male	76	98.7	111	91.0	187	94.0
Female	1	1.3	11	9.0	12	6.0
Total	**77**	**100**	**122**	**100**	**199**	**100**

$*\chi^2 = 4.962$, p = 0.026; Fisher exact test, p = 0.031. *1 cells (25%) have expected count less 5.

The result in Table 5.4 shows that the expected frequency in one of the cells was less than 5; therefore, the Fisher exact test was used instead of the chi-square test. The p-value from the Fisher exact test was statistically significant at 5% suggesting that there was an association between farmers' choice of marketing channels and their gender. That is, farmers' gender tended to affect their decision to participate in either the direct or indirect marketing channel.

5.4.1.4 Household Size of Farmers

The average household size of the sampled farmers was nine persons in a household with the minimum of 1 person and a maximum of 21 persons. Regarding the household distribution presented in Table 5.5, the majority of rice farmers (56.3%) had a household size between 5 to 10 persons, followed by those with more than 10 persons. Only 14.1% of the sampled farmers had less than 5 persons in the household. The distribution of household size was similar for the participants of direct and indirect channels.

Table 5.5. Household size of the farmers

Variable	Direct channel		Indirect channel		Total sample	
Household size	Frequency	Percentage	Frequency	Percentage	Frequency	Percentage
1-4	8	10.4	20	16.4	28	14.1
5-10	42	54.5	70	57.4	112	56.3
>10	27	35.1	32	26.2	59	29.6
Total	**77**	**100**	**122**	**100**	**199**	**100**

$\chi^2 = 2.520$, p = 0.284

In each group, the majority of the participants had a household size ranging from 5 to 10 persons. This result indicates the common family system in the Northern Region. The extended family system is more popular than the nucleus type, coupled with the polygamous nature of marriage in the region. This large household size tends to be an important labour source needed to perform the proper farming operations such as land preparation, weeding, disease and pest control, harvesting, bagging, threshing and marketing of rice among others. On the contrary, a large household size suggests a high demand for food and less marketable surplus, particularly if there is a high number of dependants in the household. The Pearson chi-square result ($\chi^2 = 2.520$, p = 0.284) shows no statistical significance even at 10% showing that there was no association between farmer's choice of marketing channels and their household size.

5.4.1.5 Farmers' Experience in Rice Production

The descriptive result of the sampled respondents from Table 5.6 shows that 50.3% of the farmers had been cultivating rice for 1 to 9 years. About 39% had between 10-20 years of experience in rice farming while nearly 11% had greater than 20 years of experience in rice farming. The mean years of experience in rice farming were 11 years with minimum and maximum of 1 year and 44 years, respectively. This result suggests that the majority of the farmers have a considerable rice farming experience; hence, they have accumulated adequate knowledge on rice production.

Table 5.6. Farming Experience

Variable	Direct channel		Indirect channel		Total sample	
Farm Experience	Frequency	Percentage	Frequency	Percentage	Frequency	Percentage
< 10	37	48.1	63	51.6	100	50.3
10-20	29	37.7	49	40.2	78	39.1
>20	11	14.2	10	8.2	21	10.6
Total	**77**	**100**	**122**	**100**	**199**	**100**

$\chi^2 = 1.855$, p = 0.396

The farmers tend to leverage on their accumulated knowledge to complement their low level of formal education to increase their rice yields. The Pearson chi-square result ($\chi^2 = 1.855$, p = 0.396) was not statistically significant at 10%, and this indicated that there was no association between farmers' choice of marketing channel and their experience in rice farming.

5.4.1.6 Participation in an Off-farm Employment

Farmers sometimes engage in off-farm activities to help them to generate additional incomes. Farmers involved in off-farm activities can increase their production and sell their produce at the market that provides higher prices (Mmbando et al., 2016). However, this study revealed that the majority of the farmers (65.8%) were not involved in any form of off-farm activities. This result shows that the respondent's main occupation and source of income were farming. This result also demonstrates that there were limited off-farm employment opportunities in rural areas in the northern region of Ghana. A major advantage is that farmers can allocate all their time to rice farming and raise their output level since rice farming require attention. On the other hand, the farmers may lack additional incomes to acquire productive inputs like fertilizer and improves seeds. Only 34.2% of the farmers were involved in other jobs asides farming as presented in Table 5.7. The Pearson chi-square ($\chi^2 = 2.070$, p = 0.150) was statistically not significant, and this suggested no significant association between farmers' choice of marketing channel and their engagement in off-farm employment.

Table 5.7. Off-farm employment

Variable	Direct channel		Indirect channel		Total sample	
Off-farm employment	Frequency	Percentage	Frequency	Percentage	Frequency	Percentage
Yes	31	40.3	37	30.3	68	34.2
No	46	59.7	85	69.7	131	65.8
Total	**77**	**100**	**122**	**100**	**199**	**100**

$\chi^2 = 2.070$, p = 0.150

Out of the 199 respondents, 68 of them reported that they were involved in off-farm employment. Their jobs areas included civil servants, trading, artisanship, driving among others.

5.4.2 Farm Characteristics and Asset Endowment Factors

This section highlights the various farm characteristics and assets endowment factors of the respondents in the research. Research shows that household asset endowment is a critical factor that influences the choice of the marketing channel by smallholder farmers. Variables such as the size of the farm, transport asset ownership, ownership of communication asset, livestock ownership and were analysed and described.

5.4.2.1 Farm Size
Farm size serves as a proxy to the scale of production. Thus, farmers with a large farm tend to have a large scale of production and vice versa. The mean rice farm size was 1.65 hectares with minimum and maximum of 0.42 hectare and 5.5 hectares, respectively.

Table 5.8. Rice Farm Size

Variable	Direct channel		Indirect channel		Total sample	
Farm Size	Frequency	Percentage	Frequency	Percentage	Frequency	Percentage
< 1	11	14.3	83	68.0	94	47.2
1-2	20	26.0	29	23.7	49	24.6
>2	46	59.7	10	8.3	56	28.2
Total	**77**	**100**	**122**	**100**	**199**	**100**

$\chi^2 = 73.529$, p = 0.000

Table 5.8 further shows that the majority of the farmers (47.2%) were cultivating rice less than 1 hectare. About 25% had their land size between 1 to 2 hectares while 28.2% cultivated a land size greater than 2 hectares. This result indicated that most of the farmers in the Northern Region of Ghana were small-scale farmers. The Ministry of Food and Agriculture in Ghana shows that a smallholder rice farmer in Ghana has the land size of less than 2 hectares. However, these farmers expressed their concern to increase their scale of production if they get the needed support.

Table 5.8 also shows that 68% of the farmers who sold to middlemen have land sizes less than 1-hectare whereas 59.7% of the farmers with more than 2 hectares of rice farm sold their rice to processors. The Pearson chi-square ($\chi^2 = 73.529$, p = 0.000) was statistically significant at 1%. This result showed that there was a strong relationship between farmers' choice of marketing channel and the size of their rice farms. This is because farmers with large farm size are able to produce more rice output; it is cheaper to transport large quantities of rice to processors than smaller volumes.

5.4.2.2 Communication Asset Ownership

The result in Table 5.9 shows that 95% of the sampled rice farmers had a mobile phone, about 60% owned a television set, and nearly 64% had a radio set. This result suggested that at least a farmer had one of these communication assets at their disposal. On the contrary, 5%, 40.2%, and 36.2% owned neither a mobile phone, a television set nor a radio set, respectively. Almost all the participants of both direct and indirect marketing channels owned a mobile phone. The p-value (0.092) was statistically significant at 10% indicating that there was a relationship between

ownership of mobile phone and choice of marketing channels. The result revealed that the majority of the participants of the direct marketing channel did not own a TV set whereas, in the case of indirect marketing channel, a higher percentage owned a TV set. The Pearson Chi-square ($\chi^2 =$ 8.82) was statistically significant at 1% which implied that there is an association between ownership of a TV set and the choice of marketing channels. Table 5.9 also shows that a higher proportion of the participants of direct and indirect marketing channels owned a radio set. However, the Pearson Chi-square ($\chi^2 = 0.119$, p = 0.730) was not statistically significant even at 10%, demonstrating that ownership of a radio set is independent on farmer's choice of marketing channels. The farmers explained that they had no access to electricity, and this served as a constraint to own the communication assets. Ownership of information and communication technology assets such as a mobile phone, a radio set, and a television set has been shown to be other relevant factors that influence farmers' decision on marketing channel choices (Amaya & Alwang, 2011; Martey et al., 2012; Zivenge & Karavina, 2012). These assets enable farmers to access market information regarding existing prices and available buyers.

Table 5.9. Communication assets ownership

Communication assets ownership	Category	Direct channel		Indirect channel		Frequency	Percentage (%)
[*a] Mobile phone	Yes	76	98.70	113	92.62	189	95.0
	No	1	1.30	9	7.38	10	5.0
[b]Television	Yes	36	46.75	83	68.03	119	59.8
	No	41	53.25	39	31.97	80	40.2
[c]Radio	Yes	48	62.34	79	64.75	127	63.8
	No	29	37.66	43	35.25	72	36.2

*a. Fisher exact test, p = 0.092; b. $\chi^2 = 8.82$, p = 0.003; $\chi^2 = 0.119$, p = 0.730

5.4.2.3 Transport Asset Ownership

Table 5.10 shows that majority (87.4%) of the respondents owned a bicycle and nearly 54% owned a motorbike. In the Northern Region of Ghana, the most common means of transportation in the rural areas is motorbike and bicycle. This explains why most of the farmers had either a motorbike or a bicycle. However, these motorbikes and bicycle were not used to transport rice to the market. It was used as a means of traveling to the farm and the input market. Therefore, these transport assets had a direct impact on production rather than marketing. Only a few farmers, 6%, and 1.5%

owned either a tractor or a vehicle which was used to transport rice output from the farm to the house and also to the processing site. The distributions of ownership of transport assets were similar for the two groups of farmers. With the exception of ownership of a bicycle, ownership of motorbike had a strong relationship with farmers' choice of marketing channels, as revealed by the statistical significance of the Pearson chi-square values at 5%. The p-values of the Fisher exact tests for tractor and vehicle were statistically significant at 1% and 10%, respectively. This suggested that the ownership of a tractor or vehicle has a statistical association with farmers' choice of marketing channels.

Table 5.10. Transport asset ownership

Transport asset	Category	Direct channel		Indirect channel		Total sample	
		Frequency	Percent	Frequency	Percent	Frequency	Percent
[*a]Tractor	Yes	10	8.20	2	1.64	12	6.0
	No	67	91.80	120	98.36	187	94.0
[*b] Vehicle	Yes	3	3.90	0	0	3	1.5
	No	74	96.10	122	100	196	98.5
[c] Motorbike/ Tricycle	Yes	51	66.23	57	46.72	108	54.3
	No	26	33.77	65	53.28	91	45.7
[d] Bicycle	Yes	68	88.31	106	86.89	174	87.4
	No	9	11.69	16	13.11	25	12.6

*a. Fisher exact test, p = 0.002; *b. Fisher exact test, p = 0.057. c. χ^2 = 7.242, p = 0.007; d. χ^2 = 0.087, p = 0.767.

5.4.2.4 Livestock Ownership
Ownership of livestock serves as a source of food and extra income to farmers. The results in Table 5.11 shows that 91% of the respondent owned livestock whiles 9% of them did not have any livestock.

Table 5.11. Livestock Ownership

Livestock Ownership	Direct channel		Indirect channel		Total sample	
	Frequency	Percent	Frequency	Percent	Frequency	Percent
Yes	70	90.9	111	91.0	181	91.0
No	7	9.1	11	9.0	18	9.0
Total	**77**	**100**	**122**	**100**	**199**	**100**

χ^2 = 0.0003, p = 0.986

The majority of the participants of processor and middlemen marketing channels had livestock. Raising of livestock in the Northern part of Ghana also serves as a significant source of income for farmers. The Pearson chi-square ($\chi^2 = 0.0003$, p = 0.986) was not statistically significant even at 10%, and this indicated that there was no association between farmers' choice of marketing channels and their ownership of livestock.

5.4.3 Transactional/Marketing Factors

This section summarises some important variables relating to the marketing of rice by the respondents. Variables such as the period of payment, market information, and transportation cost have been analysed and presented.

5.4.3.1 Period of Payment

The period it took for farmers to receive payment for sales of their rice output is one of the relevant variables which affect the choice of marketing channels among farmers (Siddique, 2015). Farmers usually sell their farm output when they urgently need money to cater for household responsibilities. For this reason, farmers are more likely to sell to buyers who pay them instantly irrespective of the price offered. This study indicates 73% of the farmers were paid cash at the delivery of the rice output whereas nearly 27% were paid within one week or more after delivery as shown in Table 5.12. Farmers who sold to processors (milling companies) usually had to wait for a week before they receive payment for their products. This condition tended to deter farmers to trade directly with the processors. Farmers sold their rice output to raise capital for the next production and cater for domestic expenditures, thereby compelling farmers to sell their rice output to middlemen who offered ready cash, even though the price might be lower.

Table 5.12. Period of payment

Variable	Direct channel		Indirect channel		Total sample	
Period of payment	Frequency	Percentage	Frequency	Percentage	Frequency	Percentage
At Delivery	38	49.0	106	86.9	145	72.9
Within a Week or more	39	51.0	16	13.1	54	27.1
Total	**77**	**100**	**122**	**100**	**199**	**100**

$\chi^2 = 31.349$, p = 0.000

The result of the chi-square test ($\chi^2 = 31.349$, p = 0.000) was statistically significant at 1% which implied that there is a relationship association between the payment period and the choice of marketing channels among farmers. The result indicated that 86.9% of the farmers who sold to middlemen received prompt payment while 51% of the farmers who sold to processors received payment within a week or more.

5.4.3.2 Access to Market Information

Farmers' access to adequate and reliable market information plays a critical role in their decision on the marketing channel. Market information enables farmers to explore potential buyers, the quantity, quality and the price at which they can sell their produce. Therefore, farmers' access to market information is expected to increase the probability of selling to processors than to middlemen at the farm gate. Table 5.13 revealed that 37.7% of rice farmers in the Northern Region of Ghana had access to market information as opposed to 62.3% who did not receive any information during the last cropping season. This result showed that there was limited access to market information among rice farmers in the study area, and this is likely to affect their bargaining power when negotiating with buyers.

Table 5.13. Access to market information

Variable	Direct channel		Indirect channel		Total sample	
Access to market information	Frequency	Percentage	Frequency	Percentage	Frequency	Percentage
Yes	61	79.2	14	11.5	75	37.7
No	16	20.8	108	88.5	124	62.3
Total	**77**	**100**	**122**	**100**	**199**	**100**

$\chi^2 = 92.253$, p = 0.000

The issue of lack of market information creates information asymmetric where the buyer takes advantage of the ignorance of producers on the existing market conditions.

Table 5.13 also shows that 88.5% of farmers who sold their rice to middlemen did not receive any market information while 79.2% of farmers who received market information sold to processors. The result of the Pearson chi-square test ($\chi^2 = 92.253$, p = 0.000) was statistically significant at 1%, and this result implied that there was a strong relationship between farmers' access to market information and their choice of marketing channels.

Respondents who had access to market information were asked to indicate the type of market information they received. Majority of the farmers indicated that they had access to price information.

Some of the farmers also received information on buyers. Those farmers who sold to the middlemen got to know when the buyers were coming to the communities and the quantity of rice they might want to buy. The farmers explained most sources of their market information were from their interaction with traders through the use of mobile phones, fellow farmers and a few of them through their farmer groups. None of the farmers interviewed in the study had received any form of market information through a radio set or a television set.

5.4.3.3 Costs of Transportation

Transportation costs were incurred by farmers who sold their rice output to processors. Selling to collectors at the farm gate did not involve any transport cost. Table 5.14 shows that farmers incurred a mean transportation cost of GH₵ 38.96 per the cropping season. However, the average

cost of transporting per 85kg bag of rice to the processing firm was GH₵ 0.83 with the lowest price of GH₵ 0.03, and the highest price was GH₵ 4.35.

Table 5.14. Cost of Transportation

Cost of transportation	Mean (GH₵)	Minimum (GH₵)	Maximum (GH₵)	Standard Deviation (GH₵))
The average cost of Transportation	38.96	5	300	44.92
The average cost of transportation per bag	0.83	0.03	4.35	0.71

Exchange rate as at February 2018 was NZ$ 1 = Gh₵ 3.24.

5.4.4 Institutional Factors

This section discusses some important institutional factors that provide support to farmers in their production and marketing. These factors include access to credit, access to extension services and farmer group membership. Results on these variables are explained below.

5.4.4.1 Farmer Access to Credit

The result shows that rice farmers who had access to credit last farming season were only 14.1%. The majority of the farmers (85.9%) did not receive any form of credit. This result implied that farmers relied on using their own capital for production and marketing. Most of the rice producers are poor, so access to credit enables them to purchase productive inputs such as improved seeds, fertiliser, and pesticides, among others. Farmers can also use credit to purchase communication assets to enhance their access to market information and contact potential buyers outside their villages. The low access to credit among farmers tends to deny farmers from enjoying these benefits which consequently affect their production and marketing decision, notably how much to produce and where to sell their produce.

Table 5.15. Farmers' access to credit

Variable	Direct channel		Indirect channel		Total sample	
Access to credit	Frequency	Percentage	Frequency	Percentage	Frequency	Percentage
Yes	10	13.0	18	14.8	28	14.1
No	67	87.0	104	85.2	171	85.9
Total	**77**	**100**	**122**	**100**	**199**	**100**

$\chi^2 = 0.122$, p = 0.727

The few farmers who had access to credit indicated that the credit was in the form of farm inputs such as fertiliser and herbicide. These inputs were provided by the Government of Ghana under the Planting for Food and Job Scheme (PFJ). Farmers were given subsidized fertilizer inputs, and they paid fifty percent (50%) of the amount they received, and the remaining 50% had to pay after selling their farm produce. Farmers added that they did not have access to any form of cash credit from banks or microfinance. It was interesting to know that farmers were denied access to credit by financial institutions in the district because these financial institutions perceived rice farming and farming in general to be a risky business enterprise.

A handful of the farmers had access to credit either from input dealers, traders, friends and family members. These farmers further elaborated that their access to credit was dependent on the long-term relationship with the providers (viz., input dealers, traders or friend, and family members) which had resulted in trust among them. Some of the farmers repaid the loan by giving out farm produce of its equivalent.

The Pearson chi-square ($\chi^2 = 0.122$, p = 0.727) was statistically not significant at 10%, suggesting that farmers' access to credit was independent on their marketing channel decision.

5.4.4.2 Farmer Access to Extension Services

A few studies have demonstrated that the availability of extension services influences farmers' choice of marketing channels. Extension service personnel serve as a vital source of information to framers which enables them to make informed decisions regarding where to sell their farm outputs (Maertens & Velde, 2017). The result in Table 5.16 showed that the majority (53%) of the farmers did not have access to extension services. Forty-seven percent (47%) of the farmers

indicated that they had access to extension services during the 2017 cropping season. This means that they had access to training on rice production in their respective communities. This result suggested that adequate access to extension services was a major problem in the study area. This limited access to extension services was likely to have an adverse effect on the yields of farmers since extension services were the main source of information on production technologies for farmers in the district. Extension services are mostly provided by the Government of Ghana through the Ministry of Food and Agriculture Directorate in the district. There were a few numbers of extension agents in the district. The extension agents also lacked the necessary logistics such as motorbike and vehicle to enable their movement to remote communities where rice was produced. All these challenges restrict the extension agent to deliver their services to the farmers in the district effectively. This finding is consistent with the evidence from Kranjac-Berislavjevic, Blench, and Chapman (2003) who found that small-scale rice farmers in Ghana still used traditional farming practices due to limited extension agents. Table 5.16 further revealed that the Pearson chi-square value (χ^2 = 0.758, p = 0.384) showed no statistical significance even at 10%. This result implied that there was no relationship between farmers' choice of marketing channel and their access to extension services.

Table 5.16. Access to Extension Services

Variable	Direct channel		Indirect channel		Total sample	
Access to extension services	Frequency	Percentage	Frequency	Percentage	Frequency	Percentage
Yes	33	42.9	62	50.8	93	46.7
No	44	57.1	60	49.2	106	53.3
Total	**77**	**100**	**122**	**100**	**199**	**100**

χ^2 = 0.758, p = 0.384

Out of the 93 of farmers who had access to extension services, 84 of them had benefited from training on rice production while 9 of them had no training on rice production. Extension officers provided training from production till harvesting. Training on using improved seeds, proper planting technique, and disease, pest and bird's management.

Only one farmer reported that he had received some training on how to market his product while 92 of them did not have such training. Six (6) of the farmers had received some education and training on how to finance their business whereas the majority (87) had no such training.

5.4.4.3 Membership of Farmer Group

Table 5.17 shows that 25.6% of the sampled rice farmers belonged to a farmer group whereas 74.4% had no membership with any farmer group in the region. The researcher observed that the farmer groups were formed to receive support from the government and also to solicit for necessary assistance from the government and non-governmental organisations.

Some members of a farmer group indicated the association provided them with assistance on their production, particularly during harvesting. In communities where there were no combined harvesters, farmers came together to assist themselves with the harvesting of their rice outputs.

Table 5.17. Farmer Group Membership

Variable	Direct channel		Indirect channel		Total sample	
Farmers' group membership	Frequency	Percentage	Frequency	Percentage	Frequency	Percentage
Yes	19	24.7	32	26.2	51	25.6
No	58	75.3	90	73.8	148	74.4
Total	**77**	**100**	**122**	**100**	**199**	**100**

$\chi^2 = 0.060$, p = 0.807

Few farmers who belonged to farmer association mentioned that their association embarked on collective marketing. This innovative marketing strategy enabled farmers to overcome transaction costs, and it empowered their bargaining power.

The Pearson chi-square ($\chi^2 = 0.060$, p = 0.807) was not statistically significant at 10% which indicated that farmers' choice of marketing channel did not have any relationship with their membership of the association.

5.5 Factors Affecting Rice Farmers' Choice of Marketing Channels: The Binary Logit Regression Analysis

The study applied the Logit Model to analyse the determinant of rice farmers' decisions on either to sell their rice output to middlemen (collectors) at the farm gate or to processors. The explanatory variables included in the Logit Model were age, education, household size, farming experience, off-farm employment, rice farm size, motorbike ownership, bicycle ownership, rice output price, payment period, mobile phone, market information, credit, extension services and farmer group. The results from the Logit Model are presented in Table 5.18. In the Logit model, the coefficients only provide the signs of the explanatory variables but do not show the relevant marginal effects. Therefore, the marginal effects were computed and reported in Table 5.18. The marginal effect of an explanatory variable represents the effect of a unit change in the explanatory variable on the dependent variable. In this section, the marginal effects are interpreted and discussed for the purpose of policy implications. The diagnostic statistics in Table 5.18 show that the Wald Chi-square (53.91) was statistically significant at the 1% level. This result suggested that the explanatory variables included in the Logit model had a joint effect on the farmers' decision on whether to participate in the direct marketing channel or middlemen marketing channel. The Pseudo R^2 of 0.740 indicates that the Logit model predicts about 74% of farmers' choice of marketing channel. The constant term showed a negative significant effect at 1%. This result suggested that *ceteris paribus*, farmers were less likely to sell to processors. Table 5.18 revealed that six out of the fifteen variables included in the model showed statistical significance at least at 10% level. These significant variables include rice farm size, ownership of a bicycle, the price of rice output per 85 kg bag, instant payment at delivery, access to market information and access to credit.

Table 5.18. Binary Logit results on the determinants of farmers' choice of marketing channel

Variable	Coefficient	Standard error	p-value	Marginal Effects (dy/dx)	Standard error	p-value
Constant	-18.39	5.557	0.001***			
Farmer Demographic Characteristics						
Age	-0.227	0.038	0.552	-0.001	0.002	0.533
Household Size	0.016	0.077	0.831	0.001	0.004	0.829
Experience	0.027	0.059	0.647	0.001	0.003	0.633
Education	0.049	0.045	0.094	0.003	0.002	0.270
Off-farm employment	-0.756	0.700	0.280	-0.039	0.035	0.272
Farm Characteristics and Asset Endowment Factors						
Rice farm size	1.396	0.541	0.010***	0.071	0.033	0.033**
Mobile phone	0.660	0.962	0.493	0.034	0.053	0.525
Motorbike	-0.128	0.724	0.860	-0.007	0.037	0.859
Bicycle ownership	-1.776	0.912	0.051*	-0.090	0.039	0.021**
Transactional/ Marketing Factors						
Payment period	-1.210	0.724	0.095	-0.062	0.032	0.057**
Market information	3.077	0.717	0.000***	0.157	0.036	0.000***
Average rice price	0.158	0.064	0.014***	0.008	0.002	0.000***
Institutional Factors						
Credit	1.259	0.674	0.062*	0.064	0.034	0.057**
Extension services	-0.017	0.685	0.981	-0.001	0.035	0.981
Farmer group	0.429	0.644	0.505	0.022	0.033	0.513
Diagnostic statistics						
Wald Chi-square	53.91***					
P-value Chi-square	0.000					
Pseudo R^2	0.740					

*, ** and *** denote 10%, 5% and 1% statistical significance levels.

5.5.1 Significant Variables

The result of the Binary Logit model showed that the coefficient and marginal effect of *rice farm size* were both positive and exhibited statistical significance at 1% and 5%, respectively. The significant marginal effect of 0.071 implied that as a farmer increases his/her rice farm by a hectare, the probability to sell his/her rice output to processors tended to increase by 7.1%.

The coefficient and marginal effect of **bicycle ownership** exhibited negative sign and were statistically significant at 10% and 5%, respectively in the Logit model. The marginal effect was -0.090 which implied that farmers who owned bicycles were less likely to sell their rice output directly to processors.

Table 5.18 also shows that the **average price of rice per 85kg**, the payment period and access to market information were the variables under marketing/transactional factors. As expected, the coefficient and marginal effect of the price of rice output showed positive signs, and both were statistically significant at 1%. The marginal effect of 0.008 suggested that GhℂC1 increase in the price of rice output per 85kg bag was more likely to increase farmers' probability to sell their rice output to processors than middlemen.

The coefficient and marginal effect of farmers' **access to market information** were positive as expected and both showed statistical significance at 1%. The marginal effect of 0.157 implied that farmers who had access to market information were 0.157(15.7%) more likely to sell their rice to processors than those who did not receive market information.

Table 5.18 further shows that the coefficient and marginal effect of **payment period** were negative and exhibited statistical significance at 10% and 5%, respectively. The significant marginal effect of -0.062 indicated that farmers who received an instant payment for the sales of their rice output were 0.062 less likely to sell their rice to processors than middlemen. All the marketing/transactional variables included in the Binary Logit model was found to be significant. This means that these variables greatly influence farmers' choice of choosing the processor channel.

The Binary Logit results in Table 5.18 indicated that the coefficient and marginal effect of **farmers' access to credit** showed a positive sign which is consistent with the a priori expectation. The marginal effect was statistically significant at 5%, showing that farmers' access to credit tended to increase their probability to sell rice to processors by 0.064 (6.4%).

5.5.2 Insignificant Variable

Variables such as age, educational level of the farmer, their household size, farming experience and off-farm employment were included in the model. However, none of these variables was statistically significant even at 10%. Age of the farmer had a negative effect on rice farmers' choice of processor marketing channel. This means that the age of farmers has no statistical significance on their decision to use the processor marketing channel. The coefficients and marginal effects of education, household size, off-farm employment and farming experience were all found to exhibit positive signs except off-employment. However, they were not statistically significant even at 10%, suggesting that those variables did not influence the farmers' decision to participate in the direct marketing channel relative to the middlemen marketing channel. This means that none of the demographic characteristics included in the Binary Logit model were significant in influencing the decision as to where to sell their rice.

Table 5.18 also revealed that the coefficient and marginal effect of *membership of farmer group* was positive and statistically not significant on farmers' decisions to participate in the processor marketing channel. This result showed that farmers' membership of farmer group did not influence their decision on whether to participate in the processor or middlemen marketing channels. The coefficient and marginal effect of farmers' access to extension services had negative signs and showed no statistical significance even at 10%. This finding indicated that farmers' access to extension services tended not to influence their decisions regarding the choices of marketing channels.

The result further showed that the coefficient and marginal effect of *ownership of mobile phone* was positive. However, they were statistically not significant at 10%. This result suggested that ownership of mobile phone did not affect the farmers' decision to sell their rice outputs either to processors or middlemen. Furthermore, the coefficient and marginal effect of *ownership of motorbike* was found to be negative, and they were statistically not significant even at 10%. This empirical result tends to contradict with the *a priori* expectation. This result, however, indicated that farmers' ownership of a motorbike did not influence their choices of marketing channel.

91

5.6 Effects of Rice Farmers' Choice of Marketing Channel on Revenue

The revenue generated by rice farmers serves as an incentive for farmers to increase their production level. Among other factors, the revenue generated is likely to be determined by the quantity of rice output sold and the choice of marketing outlet. The average quantity of rice sold for the total sample was 9.93 of the 85kg bags with the average price GH₵ 101.86 per 85kg paid to farmers. The mean revenue generated by the farmers was GH₵ 1,096.58. Table 5.19 presents a comparison of the rice outputs, the prices, and revenues generated by farmers who sold their rice to processor and middlemen. This comparison was performed using the t-test. The t-test was used for this comparison because the variables are continuous and not categorical. This result suggested that the average rice outputs obtained by farmers who sold to processors and middlemen were 17.91 bags and 4.90 bags, respectively. The mean difference of 13.02 bags indicated that farmers who sold to processors tended to obtain a higher rice output of 13.02 bags than those who traded with middlemen. Similarly, the average price offered by processors (Gh₵ 116.40) was higher than that paid by middlemen (Gh₵ 92.70) by Gh₵ 23.66 per bag. The mean difference of price was statistically significant at 1%.

Table 5.19. Comparisons of rice output, price, and revenue between participants of processors and middlemen marketing channels

Variable	Direct marketing channel (P) (N = 77)		Indirect channel (M) (N = 122)		Mean difference (P-M)	t-value
	Mean	Standard deviation	Mean	Standard deviation		
The quantity of rice output (85 kg bag)	17.91	11.06	4.90	4.18	13.02***	11.74
Price per 85 kg bag	116.4	13.04	92.70	1.10	23.66***	12.99
Revenue	2,116	1,390.82	453.18	384.67	1,662.82***	12.49

Exchange rate as at February 2018 was NZ$ 1 = Gh₵ 3.24. **** denotes 1% statistical significance.

Moreover, the revenues of farmers who sold their rice outputs to processors and middlemen were Gh₵ 2,116 and Gh₵ 453.18, respectively. The mean difference of revenues showed statistical significance at 1%. This result suggested that farmers who participated in the direct marketing channel were more likely to generate Gh₵ 1,662.82 higher than those who participated in the middlemen marketing channel. This finding showed that farmers' participation in a direct

marketing channel such as the processor channel tended to be more profitable than an indirect marketing channel, notably middlemen.

5.7 Challenges Faced by Farmers in Rice Production and Marketing

This section highlights the constraints encountered by farmers in their rice farming business. A five-point Likert scale (strongly agree, agree, neutral, disagree and strongly disagree) was given to farmers to rate the level of agreement of the challenges listed in the questionnaire. The mean score was used to rank the level of severity the challenges faced by the farmers. In the ranking, the challenge with the least mean was agreed as the highest importance and vice versa. The ranking ranged from 1 to 5 with 1 being strongly agreed and 5 strongly disagreeing. The challenges were categorised into two main groups, notably production and marketing challenges. A list of challenges faced by rice farmers was identified from the literature and farmers were asked to rate the level of severity.

5.7.1 Production Challenges

Table 5.20 presents result in some identified production challenges that rice farmers faced in the region. The overall mean score to the production challenges was 1.99. This means that on the average, farmers agree that these challenges are evident in the rice production. Table 5.20 shows that limited access to credit was ranked the first obstinate constraint that most rice farmers in the region encounter with the least mean score of 1.54 which shows that majority of the farmer agreed that this was a major challenge affecting their production. The results revealed that 66.3% strongly agreed that limited access to credit as a very severe challenge that affects their rice production, whiles 3.0% strongly disagreed with the statement.

Table 5.20. Production Challenges faced by Rice Farmers

Constraint	Strongly agree (1)	Agree (2)	Neutral (3)	Disagree (4)	Strongly disagree (5)	Mean score
Limited access to credit	**66.3**	23.7	3.5	3.5	3.0	1.54 1st
Poor climatic conditions	**60.4**	23.6	2.0	9.5	4.5	1.74 2nd
The high cost of labour	**55.8**	25.6	8.5	6.5	3.5	1.77 3rd
The high cost of farm inputs	30.2	**51.8**	6.5	6.0	15.5	1.78 4th
Low mechanisation	**39.7**	**35.2**	14.6	6.5	4.0	2.01 5th
The high cost of farm equipment	**43.2**	42.7	17.0	6.5	0.5	2.05 6th
Limited access to extension services	33.7	**35.2**	17.1	6.0	8.0	2.20 7th
Diseases and pest infestation	**41.7**	24.1	16.0	20.1	8.0	2.24 8th
Low land development	**43.7**	18.6	3.0	5.5	29.1	2.60 9th
Overall mean score						1.99

Note: Values are in percentages

The second most serious constraint which was confronted by most farmers was *the poor climatic condition* with a mean score of 1.74. Over 80% of the farmers strongly agreed and agreed to the fact that this was a major challenge farmers do encounter respectively. However, a few farmers 14% (strongly disagree and disagree) did not admit that this was a major challenge in their production of rice. *The high cost of labour* had a mean score of 1.77 and was ranked as the third most piercing production constraints faced by rice farmers in the northern region of Ghana. The results showed that majority (55.8%) of the farmers strongly agreed to the fact that high cost of

labour was a severe challenge they faced in their production, while 25.6% agreed that it was a severe challenge. Only 10% (disagree and strongly disagree) were of the option that high cost of labour was not a challenge affecting their rice production. The means score for this challenge was 1.77 which shows that most farmers agree to the fact that the high cost of labour was a challenge, its severity was adverse on their production activities.

Again, the ***high cost of farm inputs*** was identified as the fourth most piercing with a mean score of 1.78. Inputs supplies such as fertilizers, insecticides, herbicides, were very expensive at the market and 30.2% and 51.8% of the farmers strongly agreed and agreed, respectively that farm inputs were very expensive at the market and they were unable to afford it. The farmers regarded this challenge to affect their rice output adversely.

Low mechanisation was found to the fifth most pressing challenge rice farmer encounter with a mean rank of 2.01. Most of the farming operations were done manually. Smallholder farmers in the region did not have access to machinery to help them with their production. The result indicated that 74.9% (strongly agree and agree) asserted to the fact that low mechanisation was a major production challenge. However, 10.5% (disagree and strongly disagree) of the farmers reported that the challenge of low mechanisation was not a major challenge for them. The possible reason will be that some of the farmers had access to farm machinery such as tractors, plough, and combine harvesters from private owners; therefore, they did not regard this as a major challenge in their farming business. The ***high costs of farm equipment such*** as hoes, cutlass, tractors, plough, and sprayer, among others were rated to be a major challenge that affected rice production. The majority (85.9%) of the farmers either strongly agreed or agreed that the high cost of farm equipment severe and affecting rice production.

The mean score for ***limited access to extension services*** was 2.20 and is ranked as the seventh most pressing challenge. 33.7% strongly agreed with this statement which means that access to extension services was a major challenge they encountered in their production activities. On the contrary, 10.2% (disagree and strongly disagree) that limited access to extension services had an impact on their production.

Diseases and pest infestation was one of the major challenges identified in the literature as affecting farmers in their operation (Amedi, 2014). This challenge has a mean score of 2.24 which means that on the average farmers agreed that diseases and pest infestation was prevailing, and its effect was affecting their rice production. 65.8% (strongly agree and agree) of the farmers agreed that this challenge was present, and its severity was affecting their rice production. However, 28.1% (disagree and strongly disagree) of the farmers reported that this challenge has a lesser severity in their rice production. The reason for this result is that most of the farmers were growing improved varieties that were resistant to disease and pest.

Lastly, *low land development* was reported as a challenge among farmers having a mean score of 2.60. Some farmers have been cultivating on the same piece of land for many years because there is a lack of development of new lands suitable for rice production in the study area. This study also shows that 62.3% (strongly agree and agree) of farmers were of the option that they have agricultural land they could deploy for their agricultural activities, but these lands needed further development. The lands still have big trees on them, no motorable roads around and so it was very difficult for farmers to work on these lands.

5.7.2 Marketing Challenges

Marketing challenges are encountered after harvesting of rice output through to the final consumer. Marketing is regarded as one of the integral components of the rice supply chain. However, rice farmers are confronted with limited marketing opportunities. The overall mean score of 2.3 explains that farmers agreed to these marketing constraints. *Low market prices* were identified by the farmers as the most common marketing challenges with a mean score of 1.70. Most of the farmers (86%) either strongly agreed or agreed that they received low prices for their rice production. Another reason for the low prices as perceived by farmers was influx and high preference for imported rice among Ghanaian consumers. These consumers perceived the local rice to be of low quality.

Table 5.21. Marketing Challenges faced by Rice Farmers

Constraint	Strongly agree (%)	Agree (%)	Neutral (%)	Disagree (%)	Strongly disagree (%)	Mean score
Low market prices	**54.3**	31.7	6.0	5.5	2.5	1.70 1st
Post-harvest loses	40.2	**50.8**	3.5	4.5	1.0	1.75 2nd
The high cost of transportation	36.7	**45.2**	8.5	5.5	4.0	1.95 3rd
Limited market option	33.7	**43.7**	13.1	7.5	2.0	2.01 4th
Low demand	**42.7**	26.6	3.5	10.1	17.1	2.32 5th
Poor storage facilities	**34.7**	27.6	9.5	17.1	11.1	2.42 6th
Lack of marketing standards	21.6	17.6	22.1	16.1	**22.6**	3.01 7th
Buyer dictating prices	22.6	15.1	18.6	10.6	**33.2**	3.17 8th
Overall mean score						2.3

Note: Values are in percentages

The post-harvest loss was ranked as the second most pressing challenge affecting rice farmers in the northern region of Ghana with a mean score of 1.75. 91% (strongly agree and agree) of the farmers agreed that most of the harvest is lost after harvesting.

Nearly 82% (strongly agree and agree) of the farmers accepted the fact that the *high cost of transportation* was a major challenge they encountered in the marketing of their rice. This challenge was ranked third with a mean score of 1.95. Farmers incur high cost in transporting their paddy rice from the farm to their respective houses as well as conveying the paddy rice to the nearby processing centers. Other farmers indicated that high transportation cost discouraged them from selling their paddy rice to processors who tended to offer higher prices. About 10% (strongly disagree and disagree) of the farmers disagreed that the high cost of transportation was a major challenge.

Table 5.21 shows that *limited market option* was one of the major challenges faced by rice farmers in marketing their rice. This challenge had a mean score of 2.01 and was ranked the fourth most prevailing challenge. The result from the study shows that 77.4% (strongly agree and agree) of the farmers reported that had limited marketing channels to sell their rice output.

Low demand for local rice was ranked the fifth most pressing challenge facing rice farmer with a mean score of 2.32. Exactly 42.7% of the farmers strongly agreed to the fact that the demand for the local rice is still low, whereas 26.6% agreed, 10.1% disagreed and 17.1% strongly disagreed with this fact. Farmers explained that there is a higher demand for imported rice more than the local rice.

The *poor storage facility* was ranked the sixth marketing constraint faced by rice farmers in the region. Farmers in the region complained that they do not have modern storage facilities; hence, the quality of their paddy rice diminished after storing it for some time. Most farmers keep their rice in jute bags and store in their rooms. In the bumper harvest, farmers turn their rooms into a storage facility. A majority of farmers, 62.3%, (strongly agree and agree) indicated that poor storage facility was a major challenge which affected them in marketing their rice. Farmers said this situation compelled them to sell their rice immediately after harvesting when the price was low. This low price tended to reduce their overall profit margin.

Lack of marketing standards was reported by almost 39% (strongly agree and agree) of the respondent as a major challenge. These farmers complained that they did not have any set standards. For this reason, the buyers tended to exploit them. However, most of the farmers did not see this as a major challenge.

Buyers dictating prices was the eighth marketing constraint ranked with a mean score of 3.17. In most cases, middlemen tend to dictate the price for farmers at the farm gate, particularly during the bumper harvest. Middlemen in particularly capitalise on the ignorance of the farmers regarding

the prevailing market price and their inability to transport their rice to processors in peri-urban and urban areas and offer them a low price.

5.8 Summary

This chapter provided a descriptive analysis of the sample involved in the study. Rice cultivation was regarded in the study area as a male-dominated enterprise. Most of the respondents were in their active economic age, with no formal education and had a large family size. Many of the farmers were more experience in rice farming. Most of the farmers either owned a bicycle or a motorbike which is a major means of transportation in the region. The farmers marketed their rice through two main marketing channels: middlemen and processors. The Binary Logit regression model revealed the household asset endowment factors such as rice farm size, ownership of bicycle; marketing/transactional factors such as price of rice output per 85 kg bag, instant payment at delivery, access to market information and some institutional factors such as access to credit were the significant factors that affected rice farmers' choice of marketing channel. None of the household characteristic variables included in the model was significant in affecting farmers' choice of marketing channel. However, all the marketing and transactional variables included in the model were significant in showing the importance of these variables in farmers' market channel choice decisions. Farmers' participation in the direct marketing channel increases their revenues than the participation in the indirect marketing channel. The result from the Likert scale showed that limited access to credit, poor climatic conditions, high labour cost, high costs of inputs and low mechanization were the five most important production constraints encountered by rice farmers. Farmers also ranked low market prices, post-harvest losses, the high cost of transportation, limited market option and low demand as the top five constraints they faced in the marketing of their rice output. The next chapter presents the discussion of the key findings and positions them in the context of the extant literature.

Chapter Six: Discussion

6.1 Introduction

This study identified and analysed the factors affecting rice farmers' choice of these marketing channels. The effect of the choice of marketing channel on farmer's revenue was also analysed. Another objective of the study was to identify some production and marketing challenges that rice farmers encountered. This chapter discusses the findings in relation to previous studies on marketing channel choice. The chapter consists of four sections: the first section discusses some of the factors affecting farmers' choices of marketing channels. The second section delineates a comparison of the revenues generated by farmers who sold their rice outputs through different channels followed by the presentation of the ranking of the challenges faced by farmers in the third section. The chapter ends with the concluding section.

6.2 Factors Affecting Farmer's choice of Marketing Channel

Marketing channel tends to be an important component in the agricultural supply chain. It bridges that gap between producers and users of their products. The marketing channels used by farmers tend to affect their farm profitability. This compels researchers to pay critical attention to the farmers' choices of marketing channel (Aleria Negeri 2017; Donkor et al., 2018; Martey et al., 2012; Mmbando et al., 2016; Woldie & Nuppenau, 2009; Zivenge & Karavina, 2012). In this study, two main marketing channels were used by paddy rice farmers to market their rice output. These included the direct (processor) and the indirect (middlemen) marketing channels. The study suggested that a higher proportion of the farmers sold their rice output to middlemen. This indicates that the farmers allowed the middlemen to perform their marketing function for them. The middlemen served as an intermediary between the farmers and processors who were mostly located in the peri-urban communities in Northern Ghana. Many empirical studies have identified and analysed the factors that influence farmers decision to select a particular marketing channel (Aleria Negeri 2017; Anteneh et al., 2011; Arinloye et al., 2014; Cazzuffi & McKay, 2012; Chalwe, 2011; Chiamjinnawat, 2017; Donkor et al., 2018; Maspaitella, 2015; Mmbando et al., 2016; Xaba & Masuku, 2012; Zivenge & Karavina, 2012). The significant variables found in this study have been discussed in the light of this research.

The study employed a Binary Logit regression model to analyse the factors that influenced paddy rice farmers' decision to participate in either the processor or middlemen marketing channels. The study revealed that the set of explanatory variables viz., farm size, ownership of a bicycle, output price of rice, payment period, access to market information and access to credit jointly influenced farmers' decision to participate in the direct marketing channel.

6.2.1 . Farm Characteristics and Asset Endowment Factors

Among the farm characteristics, rice farm size and bicycle had effects on farmers' decision to participate in the processor marketing channel. More specifically, the study revealed that farm size had a positive influence on farmers' decision to directly sell their rice output to processors in the peri-urban communities. The size of the farm plays a very crucial role in the production process (Martey et al., 2012). It is usually a proxy to the scale of production which suggests that farmers with a larger farm have higher production and are therefore able to sell to processors (Donkor et al., 2018). The transaction costs incurred by farmers in transporting a larger volume of rice output to processors are usually less than smaller quantities. This indicates that farmers with large rice farms could easily take advantage of economies of scale and transport their rice output to processors at minimum cost (Barrett, 2008). Also, farmers with a large farm have a higher bargaining power when dealing with processors than those with a smaller farm (Chirwa, 2009). Martey et al. (2012) reported that farmers with larger farm size were more likely to sell their products in the urban market relative to the rural market. In their study on the factors influencing market channel access by communal horticulture farmers in Zimbabwe, Zivenge and Karavina (2012) observed that farm size was positively related to market choice. They further explained that" *farmers with more land were more likely to participate in the formal marketing channel."* They also observed that farmers with more land had more capacity to produce more vegetables and were able to stagger their production in order to have an all year supply. Other empirical studies such as that of Alene et al. (2008), Maspaitella et al. (2018), Neven et al. (2009), Ouma et al. (2010), Rao and Qaim (2011) and Woldie and Nuppenau (2009) also established a positive relationship between farm size and farmers' choice of marketing channel.

The study established a significant and a negative relationship between farmers' choice of marketing channel and their ownership of a bicycle. This result suggested that farmers' ownership of a bicycle tended to minimise their probability to participate in the direct marketing channel. In the study area, it was observed that the distance between the farming communities and the processing sites were far. This long distance precluded the use of bicycles to transport a number of bags of rice to processors. Instead, farmers tended to use bicycles to transport rice outputs to their homes and sold them to middlemen. The study's finding contradicts the empirical evidence observed by Zanello et al. (2014) suggesting that ownership of bicycles increased farmers' probability to participate in distant markets rather than selling to middlemen at farm gates in the Northern Region of Ghana.

6.2.2 Marketing/ Transactional Factors

The empirical result from the Binary Logit model showed that all the transactional or marketing factors were important determinants of farmers' choices of marketing channels. The transactional variables were the price per 85kg bag, period of payment and farmers' access to market information. The study revealed that an increase in the price of rice output per 85kg bag tended to motivate the farmers to increase their participation in the direct marketing channel. This finding is consistent with the economic theory of the law of supply that establishes a positive relationship between the supply of farm output and output price ((Barkley & Barkley, 2016). An increase in the price of rice output tends to encourage farmers to increase the supply of rice output to processors. Taking into consideration, the associated transportations costs, farmers are more likely to benefit from an increase in the price of rice when sold to processors than middlemen. Mostly, middlemen tend to offer farmers a lower price when compared to that paid by processors. The study's finding collaborates with extant empirical literature that found a positive relationship between farm output price and farmers' marketing channel choices (Martey et al., 2012; Omiti et al., 2009; Tsourgiannis et al., 2008; Zivenge & Karavina, 2012). For instance, Tsourgiannis et al. (2008) reported that price was a major factor sheep and goat farmers in Greece considered in their milk distribution channel choice and not any other factor. According to Zivenge and Karavina (2012) price was a major determinant of market choice among vegetable farmers in Zimbabwe. Martey et al. (2012) also found out that the choice of a marketing channel by smallholder yam

farmers in Ghana was greatly influenced by the output price. They revealed that the output served as an incentive for farmers to produce and also determined the marketing channel choice. They explained that the urban market channel had higher prices compared to the rural channel; hence, they were more likely to sell to urban channel irrespective of the distance. Other studies have also argued that farmers were more responsive to price changes relative to transaction costs in their marketing channel choices (Olwande & Mathenge, 2011; Omiti et al., 2009; Ouma et al., 2010). On the contrary, Barrett (2008) and Siddique et al. (2017) and other researchers argued that price is not the only determinant of farmers' participation in a marketing channel, but non-price factors are equally and importantly affect their marketing decisions.

Another transactional factor that positively influenced farmers' decision to sell their rice output to processors was access to market information. Access to market information is considered as an important input in making important production, marketing and finance decisions in agribusiness (Tadesse & Bahiigwa, 2015). Farmers' access to market information enables them to understand the existing market conditions such as price, transaction costs, and available buyers. This piece of information assists farmers to make an informed decision on the marketing channel that offers the highest margin. According to Siziba, Nyikahadzoi, Diagne, Fatunbi, and Adekunle (2011), access to market information reduces the risk of deception regarding price. In the context of this study, processors tended to offer farmers a higher price than middlemen taking into consideration the associated transaction costs. Farmers with this kind of information showed a higher preference for the processor marketing channel. The possible reason will be that farmers with market information are more persuaded than those without information. This result is consistent with the findings of Woldie and Nuppenau (2011)and Panda and Sreekumar (2012). These studies observed that farmers' access to market information increased the probability to engage in higher-value markets.

Furthermore, the study indicated that the instant payment on sales tended to reduce farmers' probability to participate in the direct marketing channel. The main reason for this finding was that in the study area that most processors delayed in paying farmers. On the contrary, middlemen paid farmers instantly; therefore, farmers were highly motivated by the instant payment to sell their rice to middlemen. This result is consistent with the finding of Boger (2001) that revealed that farmers

generally enjoy prompt payment and any effort by a particular marketing channel to delay payment lead to low patronage by farmers. Another supporting empirical evidence is that of Ogunleye and Oladeji (2007) and Siddique (2015). These researchers found that farmers were risk averse and preferred instant payment. Therefore, the farmers tended to prefer a marketing channel that assured them of instant payment. In the same study, itinerant buyers offered farmers prompt payment; hence, farmers chose them over other buyers who delayed payment.

6.2.3 Institutional Factors

The study suggested that among the three institutional variables included in the binary Logit model, only one showed a significant effect on farmers' choice of marketing channel. The significant determinant was farmers' access to credit. Credit access showed a positive effect on farmers' decision to participate in the direct marketing channel which implied that farmers' access to credit tended to increase their probability to trade directly with processors instead of allowing middlemen to assume the marketing function. In most rural Northern Ghana, most rice farmers are poor; therefore, their access to credit enables them to invest in productive inputs such as agro-inputs, improved rice seed variety, among other (Kihoro et al., 2016). This kind of investment helps the farmers to increase their rice output level. It is acknowledged in the economics literature that it is cheaper to transport a large quantity of farm output to the market than a small quantity (Maertens & Velde, 2017). Also, farmers can use some of the loans to cater for the transportation costs associated with the participation in the direct channel. The study's finding agrees with existing empirical studies that suggested that access to credit exerted a positive effect on farmers' participation in markets (Aleria Negeri 2017; Kihoro et al., 2016; Woldie & Nuppenau, 2009). For instance, (Aleria Negeri 2017) found access to credit to positively and significantly influence coffee farmers in Ethiopia from choosing an end consumer outlet relative to private traders. He explained that access to formal credit (cash in hand) help farmers to recruit a transport facility in order to supply to the market. Kihoro et al. (2016) also expounded that the access to credit allowed farmers to purchase farm inputs, e.g., seeds, fertilizers which increased their production. A higher production level could increase the marketable surplus. Credit also helps farmers to cater for all their marketing costs. Woldie and Nuppenau (2009) stated that households that had access to credit had marketing channel alternatives to sell their produce. They, however, had no special

104

commitment of selling to traders (middlemen). Woldie and Nuppenau (2009) also observed that some households were obliged to sell to traders because they satisfied their cash needs in case of emergencies where they had no formal or microcredit. Once households took money from these traders, they were always liable to them and loyal to them, hence sold their commodities to them. However, (Maspaitella et al., 2018) and (Rao & Qaim, 2011) observed that access to credit had no significant effect on the choice of the market channel.

6.2.4 . Farmer Demographic Characteristics

However, on the individual basis, none of the farmer demographic characteristics showed significant effects on farmers' decision to participate in the direct channel. This evidence suggested that the farmer demographic characteristics such as farmer age, education, household size, farming experience, and engagement in off-farm employment were not important factors that affect farmers' decision to participate in the direct channel. This finding is contrary to the extant studies had observed that the aforementioned farmer demographic characteristics tended to influence farmers' marketing channel decision in developing countries including Ghana (Anteneh et al., 2011; Chirwa, 2009; Donkor et al., 2018; Martey et al., 2012; Maspaitella et al., 2018; Mmbando et al., 2017; Muamba, 2011; Omiti et al., 2009; Osmani & Hossain, 2015; Shiimi et al., 2012; Zivenge & Karavina, 2012).

Other variables such as ownership of mobile phones, access to extension services and membership to farmer group were also found to be insignificant in this study. Ownership of mobile phone did not affect the farmers' decision to sell their rice outputs to processors. This result is inconsistent to the empirical findings of Martey et al. (2012) who reported that farmers who had access to mobile phones in Ghana were more likely to sell to traders in the market than at farm gate to middlemen. Furthermore, farmers' membership to farmer group did not influence their decision to participate in the processor marketing channels. This result is inconsistent with some previous studies (Jari & Fraser, 2009; Maspaitella et al., 2018; Mmbando et al., 2017). These previous studies observed that farmers' membership in a farmer group encouraged their participation in the higher-value marketing channel. Finally, farmers' access to extension services tended not to influence their decisions regarding the choices of marketing channels. This result agrees with the

finding of Muamba (2011), Martey et al. (2012), Zivenge and Karavina (2012), Osmani and Hossain (2015) and Maspaitella et al. (2018) who reported that access to extension services was not significant in farmers marketing channel choice decisions. However, these findings contradict those of Aleria Negeri (2017) and Mmbando et al. (2016) that found that farmers' access to extension services increased their probability of selling in the market rather than at the farm gate.

6.3 . Effect of Marketing Channel Choice on Revenue

Smallholder farmers' participation in sustainable and reliable market channels is one of the important strategies to improve farm household income and welfare (Fafchamps, 2004). The result in Table 5.24 suggested that farmers who participated in the direct marketing channel were more likely to generate higher revenue than those who participated in the indirect marketing channel. This finding showed that farmers' participation in a direct marketing channel such as the direct channel tended to be more profitable than an indirect marketing channel, notably middlemen. The direct marketing channel was associated with the higher price per 85kg bag. The result collaborates with previous studies which showed that farmers' participation in higher-value market channels increases their profits (Hernández, Reardon, & Berdegué, 2007; Maspaitella et al., 2018; Mmbando et al., 2016; Mmbando et al., 2017; Rao & Qaim, 2011). For instance, Maspaitella et al. (2018) observed that there was a positive relationship between vegetable market participation and farmer's income. Their studies further explained that farmers who sold to high-value market especially supermarket had higher incomes than those who sold through the traditional channel. Mmbando et al. (2016) and Mmbando et al. (2017) also reported in their study that participation in formal channel increased the income of smallholder farmers. They further elaborated that selling to traders and wholesaler help farmers reduce the number of intermediaries and make them realise the benefits of their produce. Higher incomes help to reduce rural poverty and enhance the standard of living of rural people in developing countries including Ghana (Mmbando et al., 2017; Rao & Qaim, 2011).

6.3. Challenges Faced by Rice Farmers

This section discusses the top five production and marketing challenges encountered by rice farmers in the Northern region of Ghana.

6.3.1 Production Challenges

The top five production challenges were limited access to credit, poor climatic conditions, the high cost of labour, the high cost of farm inputs and low mechanisation. These challenges have been discussed in light with other studies.

Limited Access to Credit

Credit enables farmers to increase their acreage, the use of productive inputs and engaging themselves in associated activities like processing, packaging, and marketing (Msangya & Yihuan, 2016). Rice production requires the use of productive inputs such as fertilizer, herbicide, and weedicide. However, when these inputs are needed by farmers, farmers cannot afford to buy them because they are faced with budget constraints. Hence, access to credit become a great challenge for farmers. The reason is that most financial institutions are unwilling to grant loans to smallholder farmers because they regard smallholder rice production as a risky business venture. A similar observation was made by Msangya and Yihuan (2016) who reported that the lack of credit by small-scale rice farmers reduced timeliness of farm operations and led to the limited efficacy of cultivation.

Poor Climatic Condition

In the study area, most rice farmers rely on rainfall to irrigate their rice farms. However, the rainfall pattern is unimodal (thus, one rainy season within a year) and the pattern has been unreliable. It does not rain when expected and when it rains, it is very heavy. This tends to affect the production of rice in the study area adversely. This finding is similar to Amedi (2014) whose study ranked poor climatic condition as the first difficult constraints faced by rice farmers in Ghana.

High Cost of Labour

The high cost of labour is one of most important production constraint faced by rice farmers in the Northern Region of Ghana. Rice production in Northern Ghana is characterised by low level of mechanisation suggesting that most of the farming operations are carried out manually. This makes rice production in the region more labour intensive. During the cropping season, demand for labour increases but there is a limited supply which causes the labour wage to increase. This high labour cost tends to increase the overall production costs of rice in the region. Consequently, this reduces

the profit of the farmers. The high labour costs compel some farmers to skip some of the production activities namely, weeding which in turn minimises the rice yield (Amedi, 2014). This result is consistent with the empirical evidence by Donkor et al. (2018) that suggested that high labour cost restricted farmers to carry out all the necessary cultural practices in the cultivation of cassava.

High Cost of Farm Inputs

Farm inputs such as fertilisers, insecticides, and herbicides were very expensive in the market. This means that farmers who were either unable to purchase these inputs or buy the little they could afford. This affects rice yields and profits of farmers. This result is consistent with that of (Osei-Asare, 2010) which observed that rice production in Ghana has not been lucrative due to the high cost of inputs. Also, (Amedi, 2014) ranked high costs of farm inputs as the fourth major constraint faced by rice farmers under the Millennium Development Authority (MiDA) credit programme. (Rugumamu, 2014) explained that rice farmers in Tanzania were aware that the use of fertilizer increase their yields, yet they considered it very expensive.

Low Mechanisation

Most of the farming operations were done manually. Farmers in the region do not have access to machinery to help them with their production. Most of the machinery such as tractors, plough and combine harvesters are very expensive, and these farmers cannot afford. It was revealed that some businessmen have purchased the machinery and is used by farmers for a fee, however, since machinery is less in number, it is insufficient to use by all these farmers. This result is consistent with a recent study by Sims and Kienzle (2016). The researchers revealed that most smallholder farmers in Africa depend on simple tools such as cutlass and hoes for the crop cultivation. The researchers argued that over-reliance on these farm tools are unsustainable to produce sufficiently to feed the ever-increasing population in Africa. Rugumamu (2014) found that rice farmers in Tanzania use simple tools such as sickle and knives for harvesting while wooden sticks were used for threshing rice. He explained that harvesting of rice was conceived as one of the tedious activities because it was done manually.

6.3.2 Marketing Challenges Faced by Farmers

The top five marketing challenges were low market prices, post-harvest loss, high transportation cost, limited market option and low demand for local rice. These challenges have been discussed in light with other studies.

Low market price

The majority of the farmers sold their rice outputs right after harvesting at the farm gate when the prices are generally low. In the harvesting season, there is a glut of rice, and this forces the prices to decrease. Farming households are unable to store their paddy rice to wait for the off-season when prices are high. This finding is consistent with that of Kranjac-Berislavjevic et al. (2003) who reported that middlemen offered low prices to farmers for their rice.

Post-harvest loss

Post-harvest losses are common due to the nature of traditional harvesting and threshing methods used by farmers. The majority of the farmers do not have access to combine harvesters during the harvesting season, so they use the traditional sickle in harvesting and the manual means of threshing. Therefore, a great loss occurs in the process. This leads to reduced quantities available for sale which in turn reduce incomes thereby contributing to the rising poverty rate in rural Northern Ghana. The finding is consistent with the empirical result (Appiah, Guisse, & Dartey, 2011). The researchers observed that significant postharvest losses range from 4% to 12% in farmer fields in Ejisu in the Ashanti region of Ghana. The major causes of losses emanated from sickle harvesting and traditional threshing technique.

High Transportation Cost

Processors who offer high prices are located in peri-urban and urban areas. However, the road networks connecting the farming communities to peri-urban and urban areas are deplorable. Transporters tend to charge high transportation costs in conveying farmers' rice from their villages to processors in peri-urban and urban communities. This is likely to deter rice farmers from participating in peri-urban and urban markets. This finding is consistent with the evidence from Donkor et al. (2018) which revealed that high transportation cost discouraged cassava farmers from selling their cassava tubers to processors in the nearby peri-urban communities in Nigeria.

Limited Market Option

The limited market option is one of the most important constraints to rice marketing in the Northern region of Ghana. The marketing system in the study area is not well coordinated. Farmers either sell their rice to middlemen at the farm gate or to processors who are located in peri-urban and urban communities Dillon and Barrett (2017) made similar remarks in their recent study. They argued that limited market opportunities and market failure are one of the main causes of low productivity, low revenues and high poverty in the rural areas in Africa.

Low Demand for Local Rice

Ghanaian consumers have a high preference for imported rice because of its quality. The local rice is perceived to be of low-quality standard. Also, most processors and retailers of local rice do not have proper packaging for their rice to attract a higher price. These tend to contribute to the low demand for local rice in the Northern Region of Ghana. This result is consistent with Sedem Ehiakpor, Apumbora, Danso-Abbeam, and Adzawla (2017) who found out that Ghanaian consumers prefer imported rice to the local ones because of its cleanliness, taste, the grain size, and availability.

6.4 Summary

This chapter discussed the key findings related to the research objectives and positioned them in the existing literature. Most of the findings were consistent with the extant literature on marketing channel choices among smallholder farmers. The study has demonstrated that price was a major the factor that affected farmers' decision on whether to participate in direct or indirect marketing channels but other factors such as institutional, transactional and asset endowment factors were also important. Interestingly, none of the household demographics showed a significant influence on farmer's choice of marketing channels although the existing literature suggested otherwise. The study has also provided a better insight into the effect of marketing channel on farmers' revenue in the study area. The next chapter outlines the conclusions and policy recommendations based on the key findings.

Chapter Seven: Conclusions and Recommendations

7.1 Introduction

This chapter summarises the key findings in this study and makes a conclusion about them. It also includes a section on the recommendation for policymakers, processors and to farmers. The chapter ends with a section on some suggestions for future studies.

7.2 Summary

The objective of this study was to determine and analyse the factors that affect smallholder rice farmers' choice these channels in the Northern Region of Ghana. Secondly, the study sought to identify the effect of marketing channel choice of smallholder rice farmers revenue and finally to identify the major production and marketing challenges faced by smallholder rice farmers. A survey was conducted using a structured questionnaire to solicit for the relevant information from the farmers to enable the researcher to ascertain the stated research objectives. The structured questionnaires were administered to 199 smallholder rice farmers in three districts in the Northern Region of Ghana. The 199-smallholder rice farmers were selected using the convenience sampling method. Descriptive analysis was used to describe the dataset. Inferential analysis such as the Logit model was used to analyse the factors affecting farmer's choice of marketing channel whereas a t-test was used to check if there was a significant difference between the incomes of the participants of the two marketing channels. A five-point Likert scale was used to evaluate and rank the constraints encountered by the rice producers in the study area. The dataset was managed using SPSS version 23. Similarly, SPSS was used to perform the descriptive analysis. The inferential analysis was carried out with Stata version 13.

7.2.1 . Characteristics of the Farmers

The dataset collected from the farmers were generally categorised into farmer demographic characteristics, institutional characteristics, farm characteristics and asset endowment and transactional/marketing factors. The farmer demographic characteristics include gender, farmer's age, education, experience in rice farming, and participation in off-farm employment. The study revealed that rice farming in the northern region of Ghana was mainly dominated by males whereas females carried post-harvest activities such as threshing, milling, and selling of rice at the market. This evidence gives an impression that there is differentiation in the various activities in the rice

value chain in the Northern Region of Ghana. The literacy rate among the farmers was very high; few farmers had formal education. The low literacy tends to negatively affect the management of the rice farms in the study area, especially in retrieving information related to agricultural innovations, efficient combination of inputs, among others. Poor management of rice farms could result in low productivity as well as less profit margin. Most farmers had a large household size which tended to serve as an important source of labour. During the cropping season, there was a shortage of labour because everybody was working on his or her farms. Therefore, farmers relied on their family members for support in carrying out the various activities on the farm. In addition, it was observed from the result that many farmers were more experienced in rice farming. As already mentioned, the illiteracy rate among farmers was high; therefore, farmers relied on the knowledge acquired from rice farming over the years to manage their farms. Most of the farmers were within the active age group which suggested that there was a high participation of the youth in rice farming. Another finding of the study was that there were limited off-employment opportunities in the study area. This showed that farming was the main source of income for farmers. Farmers can be more vulnerable during the long dry seasons where the climatic conditions are unfavourable for agricultural production.

Land area under rice cultivation, ownership of communication and transport assets were classified as farm characteristics and asset endowment factors. A large number of farmers were smallholders who cultivated less than 2 ha of land. In general, many farmers owned communication such as mobile phones, a television set, and a radio set. These communication assets, notably mobile phones enabled farmers to improve their access to important market information as well as retrieving information on improved farming activities from their peers in other communities. On the other hand, few farmers owned transport assets such as tractor and vehicle. These transport assets are very expensive; hence, an individual smallholder farmer could hardly afford them. They would instead purchase less expensive other transport assets, namely a motorbike and bicycle. These transport assets helped farmers to convey their rice output from the farm to their homestead. They also enabled farmers to transport farm inputs from their homestead to the farm.

The institutional factors included in the study were farmers' access to credit and agricultural extension services and membership of farmer associations. Overall, farmer access to these institutional support services was low. However, farmers' access to credit was lower. This result was not a surprise because financial institutions including rural banks were unwilling to support smallholder agriculture. Financial institutions perceived smallholder agriculture to be riskier; therefore, there would be a high rate of loan default. This deters financial institutions from offering loans to farmers. On the other hand, farmers were discouraged from borrowing money from financial institutions if they were available because of high-interest rate and unfavourable terms of payment. This poor access to the support services tended to hamper farmers' capacity to expand their farms.

7.2.2 . Factors Influencing Farmers' Choice of Marketing Channels and Effect of Marketing Channel Choice on Farmers' Revenue

Two main marketing channels that were available to rice farmers in the Northern Region of Ghana included the processor and middlemen marketing channels. The study concluded that farmer participation in a direct marketing channel such as the direct channel was low. This conclusion implied that rice farmers allowed middlemen to market their paddy rice for them. The study further concluded that a set of varying factors such as institutional factors, transactional and asset endowment were the main determinants of farmers' choice of marketing channels in the Northern Region of Ghana. Specifically, access to credit was the only institutional factors that had a significant positive effect on rice farmers' decision to participate in the processor marketing channel. Regarding, transactional factors, an average price of rice per 85kg bag and access to market information tended to encourage rice farmers to participate in the processor marketing channel, whereas the period of payment reduced farmers' likelihood to participate in the processor marketing channel. Also, asset endowment factors, notably farm size tended to increase farmers' probability to sell their rice to processors whereas ownership of bicycle decrease farmers' likelihood to participate in the processor marketing channel. Surprisingly, none of the farmer demographic characteristics showed significant effects on rice farmers' decision to participate in either the direct channel or indirect channel. This evidence shows that farmer demographic

characteristics were not important determinants of farmers' choice of marketing channel in the Northern Region of Ghana.

Another conclusion drawn from the study was that farmers' participation in the direct marketing channel was more profitable than the participation in the indirect marketing channel That is, farmers who sold their paddy rice directly to processors generated a higher revenue than those who relied on middlemen to market their paddy rice for them. This evidence demonstrated that rice farmers' access to the direct market channel could transform the rural economy in the Northern Region of Ghana by raising farmers' incomes, promoting sustainable food security, minimising rural poverty and enhancing the overall well-being of rural people.

7.2.3 . Constraints Encountered by Rice Farmers

The study classified the challenges encountered by rice farmers into production and marketing. The study inferred that limited access to credit, poor climatic condition, the high cost of labour, the high cost of farm inputs and low mechanisation were the top five production challenges that severely affected the production of rice among farmers in the Northern Region of Ghana. It was also concluded that low market prices, post-harvest losses, the high cost of transportation, limited market option and low demand for local rice were the top-ranked marketing constraints reported by farmers. The study concluded that without addressing these challenges, smallholder rice farmers could hardly expand their rice farms, explore better marketing opportunities, and raise their farm incomes. These challenges also tended to hamper further development of the rice value chain in rural communities in the Northern Region of Ghana.

7.3 Recommendations

Farmers' participation in the direct channel was more profitable than the indirect channel; therefore, it is necessary to promote farmers' participation in that direct marketing channel. Based on the key findings from the study, the researcher suggests the following recommendations to policymakers, processors, farmers and other stakeholders improve rice producers' access to direct market in the Northern Region of Ghana.

Policymakers

- Access to credit was a major production challenge reported by rice farmers in the study area, and it also encouraged farmers to participate in the processor marketing channel. Therefore, it is important for the government, non-governmental organisational and financial institutions to support smallholder farmers with credit to enable them to expand their scale of production by purchasing the necessary productive farm inputs. More importantly, the financial institutions especially rural banks should increase their loan portfolio allocated to smallholder farmers and provide them with flexible terms of repayment. Also, the Ministry of Food and Agriculture (MoFA) and other stakeholders should establish rural agricultural finance scheme aimed at addressing the credit needs of smallholder farmers. The development of the informal credit market should also be considered. Access to credit will enable farmers to overcome the production challenges (viz., the high cost of labour, the high cost of farm inputs and low level of mechanisation) identified in the study.

- Moreover, agricultural policy should incorporate the promotion of farmers' access to reliable market information on direct markets and prices at peri-urban and urban marketing centres. This could be achieved with the assistance of the extension officers in the districts as well as the non-governmental organisations. The Statistics, Research and Information Directorate (SRID) of MoFA can create a separate department purposely for providing agricultural market information to enhance effective information delivery. Access to reliable information on price will enable farmers to bargain for a better price with the buyers including middlemen at the farm gate.

- This study also reported low mechanisation as one of the major constraints in rice production. The government should provide rice growing district with pieces of machinery such as tractors, plough and combine harvesters. These machineries can be made available at the district MoFA offices and be made able to farmers at cost. This will help reduce labour cost and post-harvest losses which are also major challenges and encourage farmers to increase their farm sizes.

- The government and other stakeholders should provide farmers with irrigation facilities to help them cultivate all year round and also to mitigate the challenge of drought. Since rice production is the main source of income, farmers were able to cultivate all year will increase their income and welfare and help reduce rural poverty.

- High input cost was also one of the major constraint faced by farmers, and it is recommended that fertilizer and other agro-inputs should be made available to farmers. The planting for food and job programme should be strengthened by effectively targeting smallholder farmers. This will encourage farmers to increase their farm sizes and production and hence will be more willing to sell to processors as farm size has a positive impact on direct channel selection.

- Much public education should be on the nutritional benefits and improved quality of local rice to encourage consumers to purchase and consume more of it. This will reduce the demand for imported rice and increase the prices of local rice. This will motivate the farmer to increase their production and enjoy the benefit of it.

Processors

Processors in the districts should pay farmers promptly when they purchase paddy rice from farmers. Instant payment tends to encourage farmers to continually supply paddy rice to processors in peri-urban and urban centres. Processors can also travel to rice growing communities to purchase rice from farmers.

Farmers

Another practical recommendation is the promotion of farmer associations in the study. The study recommends that farmers who are not members of any farmer association should join one. In communities where there are no farmer associations, farmers are encouraged to organise themselves in groups to assist each other in their rice farming. Collective action by farmers can help them to access credit, inputs and other support services. Through

116

collective actions, farmers can trade their rice to processors directly and enjoy the benefit of higher prices because this will give them higher bargaining power.

7.4 Future Research

The current study identified several limitations and based on these, some suggestions have been made for future studies.

- The study focused on only three rice producing districts in the Northern Region of Ghana. The researcher acknowledges that rice is intensively produced in other regions. Therefore, future study should expand the scope of the study by considering other rice-growing regions such as the Volta, Upper East, Upper West and Greater Accra region

- Lastly, the present study used non-probability sampling (convenience sampling) in selecting the respondent. It is suggested for future research to consider using probability sampling if possible. This will help generalise the population.

- This study primarily focused on the market channel analysis of paddy rice but did not consider the case of milled rice. For this reason, the study proposes that future research should consider the market channel analysis of milled rice.

- The present study used only the revenues generated from selling to the available buyers without incorporating the related marketing costs such as labour cost, information cost, and negotiation costs. It is suggested that future research should inculcate the marketing costs to have a better understanding of how the marketing channel choices affect farmers' profit margins rather than just the revenue.

REFERENCE

Addison, M., Sarfo-Mensah, P., & Edusah, S. (2015). Assessing Ghana's initiative of increasing domestic rice production through the development of rice value chain.

Adejobi, A., & Adeyemo, V. (2012). The Nature and Determinants of Channel Levels in Cassava Tubers and Cassava Products Market in Southwest Nigeria. *Journal of International Food & Agribusiness Marketing, 24*(4), 273-287.

Aker, J. C., & Ksoll, C. (2016). Can mobile phones improve agricultural outcomes? Evidence from a randomized experiment in Niger. *Food policy, 60*, 44-51.

Akramov, K., & Malek, M. (2012). Analyzing profitability of maize, rice, and soybean production in Ghana: Results of PAM and DEA analysis. *Ghana Strategy Support Program (GSSP) Working*, 0028.

Alene, A. D., Manyong, V., Omanya, G., Mignouna, H., Bokanga, M., & Odhiambo, G. (2008). Smallholder market participation under transactions costs: Maize supply and fertilizer demand in Kenya. *Food policy, 33*(4), 318-328.

Aleria Negeri , M. (2017). Determinants of Market Outlet Choice of Coffee Producing Farmers in Lalo Assabi District, West Wollege Zone, Ethiopia: An Econometric Approach. *Journal of Economics and Development, 19*(2), 48.

Ali, A., Abdulai, A., & Rahut, D. B. (2017). Farmers' Access to Markets: The Case of Cotton in Pakistan. *Asian Economic Journal, 31*(2), 211-232.

Alliance for a Green Revolution in Africa. (2017). *Africa agricultural status report: the business of smallholder agriculture in sub-Saharan Africa*. Nairobi, Kenya: Alliance for a Green Revolution in Africa (AGRA).

Amanor-Boadu, V. (2012). Rice Price Trends in Ghana (2006–2011). *Department of Agricultural Economics, Kansas State University. METSS-Ghana Research and Issue Paper Series*(02-2012).

Amaya, N., & Alwang, J. (2011). Access to information and farmer's market choice: The case of potato in highland Bolivia. *Journal of Agriculture, Food Systems, and Community Development, 1*(4), 35-53.

Amedi, M. (2014). Constraints among Rice Farmers under The MiDA Agricultural Credit Programme in The Hohoe Municipality.

118

Amemiya, T. (1981). Qualitative response models: A survey. *Journal of economic literature, 19*(4), 1483-1536.

Anang, B. T. (2017). Microcredit, Production System and Technical Efficiency of Smallholder Rice Production in Northern Ghana.

Anang, B. T., Bäckman, S., & Sipiläinen, T. (2016). Technical efficiency and its determinants in smallholder rice production in northern Ghana. *The Journal of Developing Areas, 50*(2), 311-328.

Anteneh, A., Muradian, R., & Ruben, R. (2011). Factors Affecting Coffee Farmers Market Outlet Choice, The Case of Sidama Zone, Ethiopia. *Centre for International Development Issues, Nijmegen, Radboud University, the Netherlands*.

Appiah, F., Guisse, R., & Dartey, P. (2011). Post harvest losses of rice from harvesting to milling in Ghana. *Journal of Stored Products and Postharvest Research, 2*(4), 64-71.

Arinloye, A., Hagelaar, J., Linnemann, A., Pascucci, S., Coulibaly, O., Omta, S., & van Boekel, M. (2012). Market Channel Participation of Smallholder Pineapple Farmers in Benin.

Arinloye, D.-D. A., Pascucci, S., Linnemann, A. R., Coulibaly, O. N., Hagelaar, G., & Omta, O. S. (2014). Marketing channel selection by smallholder farmers. *Journal of Food Products Marketing, 21*(4), 337-357.

Armstrong, G., Kotler, P., Harker, M., & Brennan, R. (2015). *Marketing: an introduction*: Pearson Education.

Asfaw, S., Amare, M., Lipper, L., & Davis, B. (2012). *Welfare effects of market participation under transaction costs: evidence from Tanzania*. Working Paper, Agricultural Development Economics Division, FAO.

Asuming-Brempong, S., & Osei-Asare, Y. B. (2007). *Has imported rice crowded-out domestic rice production in Ghana? What has been the role of policy.* Paper presented at the AAAE Conference Proceedings. Accra. Ghana.

Bahta, S., & Bauer, S. (2012). Policy options for improving market participation and sales of smallholder crop producers: A case study of the Free State Province of South Africa. *African Journal of Agricultural Research, 7*(24), 3525-3533.

Bahta, Y. T., Strydom, D. B., & Donkor, E. (2017). Microcredit and gender empowerment: policy implications for sustainable agricultural development in Eritrea. *Development in Practice, 27*(1), 90-102.

Balasubramanian, V., Sie, M., Hijmans, R., & Otsuka, K. (2007). Increasing rice production in sub-Saharan Africa: challenges and opportunities. *Advances in Agronomy, 94*, 55-133.

Barkley, A., & Barkley, W. P. (2016). *Principles of agricultural economics* (2nd Ed.). New York, USA: Routledge Publishing Group.

Barrett, C. B. (2008). Smallholder market participation: Concepts and evidence from eastern and southern Africa. *Food policy, 33*(4), 299-317.

Berman, J. (2013). Utility of a conceptual framework within doctoral study: A researcher's reflections. *Issues in Educational Research, 23*(1), 1.

Bewick, V., Cheek, L., & Ball, J. (2004). Statistics review 8: Qualitative data–tests of association. *Critical care, 8*(1), 46.

Bhattacherjee, A. (2012). Social science research: Principles, methods, and practices.

Boansi, D. (2013). Response of rice output to price and non-price factors in Ghana.

Boger, S. (2001). Quality and contractual choice: a transaction cost approach to the Polish hog market. *European Review of Agricultural Economics, 28*(3), 241-262.

Breisinger, C., Diao, X., Thurlow, J., & Al-Hassan, R. M. (2008). *Agriculture for development in Ghana: New opportunities and challenges*: International Food Policy Research Institute (IFPRI) Discussion Paper 00784, Accra, Ghana.

Bromley, D. W. (1991). *Environment and economy: property rights and public policy*: Basil Blackwell Ltd.

Byerlee, D., García, A., Giertz, A., Palmade, V., & Gurcanlar, T. (2013). Growing Africa: Unlocking the potential of agribusiness. *World Bank, Washington. DC*.

Cameron, A. C., & Trivedi, P. K. (2010). *Microeconometrics using stata* (Vol. 2): Stata press College Station, TX.

Cazzuffi, C., & McKay, A. (2012). *Rice market participation and channels of sale in rural Vietnam.* Paper presented at the selected paper prepared for presentation at the International Association of Agricultural Economists (IAAE) Triennial Conference. Brasil (18-24 August).

Chalwe, S. (2011). Factors influencing bean producers'choice of marketing channels in zambia. *University of Zambia, Zambia*.

Chiamjinnawat, B. (2017). *Factors affecting strategic marketing decisions in agriculture: a study of fruit farmers in Thailand: a thesis presented in partial fulfilment of the requirements for the degree of Doctor of Philosophy in Agribusiness at Massey University, Palmerston North, New Zealand.* Massey University.

Chipasha, H., Ariyawardana, A., & Mortlock, M. (2017). Smallholder goat farmers' market participation in Choma District, Zambia. *African Journal of Food, Agriculture, Nutrition and Development, 17*(1), 11691-11708.

Chirwa, E. W. (2009). Determinants of marketing Channels among Smallholder maize farmers in Malawi. *Working Paper 3, University of Malawi, Chancellor College*.

Clark, V. L. P., & Creswell, J. W. (2014). *Understanding research: A consumer's guide*: Pearson Higher Ed.

Coughlan, T. A., Anderson, E., Stern, W. L., & El-Ansary, I. A. (2006). *Marketing Channels*. New Jersey: Pearson Education,Inc.

Creswell, J. W. (2014). *A concise introduction to mixed methods research*: Sage Publications.

Creswell, J. W., & Creswell, J. D. (2017). *Research design: Qualitative, quantitative, and mixed methods approaches*: Sage publications.

deGraft-Johnson, M., Suzuki, A., Sakurai, T., & Otsuka, K. (2014). On the transferability of the Asian rice green revolution to rainfed areas in sub-Saharan Africa: an assessment of technology intervention in Northern Ghana. *Agricultural Economics, 45*(5), 555-570.

Demont, M. (2013). Reversing urban bias in African rice markets: A review of 19 National Rice Development Strategies. *Global Food Security, 2*(3), 172-181.

Diao, X., Hazell, P. B., Resnick, D., & Thurlow, J. (2007). *The role of agriculture in development: Implications for Sub-Saharan Africa* (Vol. 153): Intl Food Policy Res Inst.

Dillon, B., & Barrett, C. B. (2017). Agricultural factor markets in Sub-Saharan Africa: an updated view with formal tests for market failure. *Food policy, 67*, 64-77.

Dillon, S. M. (1998). *Descriptive decision making: Comparing theory with practice.* Paper presented at the Proceedings of 33rd ORSNZ Conference, University of Auckland, New Zealand.

Donkor, E., Anane, E. (2016a). Saving behaviour of citrus farmers in Ghana: implications for rural enterprise development. *Development in Practice, 26*(8), 1037-1046.

Donkor, E., Onakuse, S., Bogue, J., & De Los, I. C. (2018). Determinants of farmers' participation in direct marketing channel: a case of cassava in the Oyo State of Nigeria. *Spanish Journal of Agricultural Research,, 16*(2).

Donkor, E., Owusu-Sekyere, E., Owusu, V., Jordaan, H. (2016b). Impact of agricultural extension service on adoption of chemical fertilizer: Implications for rice productivity and development in Ghana. *NJAS-Wageningen Journal of Life Sciences, 79*, 41-49.

Donkor, E., Owusu-Sekyere, E., Owusu, V., Jordaan, H. (2016c). Impact of row-planting adoption on productivity of rice farming in Northern Ghana. *Review of Agricultural and Applied Economics, 19*(2), 19-28.

Donkor, E., Owusu, V. (2014). Effects of land tenure systems on resource-use productivity and efficiency in Ghana's rice industry. *African Journal of Agricultural and Resource Economics, 9*(4), 286-299.

Fafchamps, M. (2004). Social Capital and Development.

Faltermeier, L., & Abdulai, A. (2009). The impact of water conservation and intensification technologies: empirical evidence for rice farmers in Ghana. *Agricultural Economics, 40*(3), 365-379.

Fischer, E., & Qaim, M. (2012). Linking smallholders to markets: determinants and impacts of farmer collective action in Kenya. *World development, 40*(6), 1255-1268.

Fitzgerald, S. P. (2002). *Decision making*. Oxford, U.K: Capstone Publishing.

Food and Agriculture Organization. (2015). *Country fact sheet on food and agriculture policy trends*. Ghana, Accra: Food and Agriculture Organization of the United Nations.

Food and Agriculture Organization. (2017a). *Africa regional overview of food security and nutrition. The food security and nutrition-conflict nexus; building resilience for food security, nutrition and peace.* . Rome, Italy: Food and Agriculture Organization of the United Nations(FAO).

Food and Agriculture Organization. (2017b). *The state of food and agriculture: leveraging food systems for inclusive rural transformation*. Rome, Italy: Food and Agriculture Organization of the United Nations.

Food Security Information Network. (2017). *Global report on food crises*. Food Security
	Information Network (FSIN)

Fülöp, J. (2005). *Introduction to decision making methods.* Paper presented at the BDEI-3
	workshop, Washington.

Ghana Quest. (2017). Map of Ghana. Retrieved accessed on 28th August 2017
	http://www.ghanaquest.com/map/

Ghana Statistical Service. (2012). *2010 Population and Housing Census*. Accra: Ghana
	Statistical Service.

Ghana Statistical Service. (2014). *2010 Population and housing census. District analytical
	report: Tamale municipality*. Accra, Ghana: Ghana Statistical Service.

Girma, M., & Abebaw, D. (2012). Patterns and determinants of live stock farmers' choice of
	marketing channels: micro-level evidence. *Ethiopian Economics Association, Addis
	Ababa, Ethiopia*, P55.

Griffin, R. W., & Moorhead, G. (2010). *Organizational Behaviour: Managing People and
	Organizations* (9th ed.). Mason: South-Western Cengage Learning.

Haidar, A. D. (2016). *Construction Program Management–Decision Making and Optimization
	Techniques*: Springer.

Hastie, R., & Dawes, R. M. (2010). *Rational choice in an uncertain world: The psychology of
	judgment and decision making*: Sage.

Hernández, R., Reardon, T., & Berdegué, J. (2007). Supermarkets, wholesalers, and tomato
	growers in Guatemala. *Agricultural Economics, 36*(3), 281-290.

Higuchi, A., Moritaka, M., & Fukuda, S. (2012). The Impact of Socio-Economic Characteristics
	on Coffee Farmers' Marketing Channel Choice: Evidence from Villa Rica, Peru.
	Sustainable Agriculture Research, 1(1), 13.

Hobbs, J. E. (1997). Measuring the importance of transaction costs in cattle marketing. *American
	Journal of Agricultural Economics, 79*(4), 1083-1095.

Hossain, M. (2006). Rice in Africa. *Rice Today, 5*(1), 41.

Hurelbrink, R., & Boohene, G. (2011). Ghana Feed Sector Assessment Report. *Report for
	ACDI/VOCA*.

IITA & GOG. (2012). *Yam sector development strategy, Ghana. .* Accra: International Institute of Tropical Agriculture and Governmnent of Ghana.

International Food Policy Research Institute. (2017). *Global food policy report.* Washington, DC., USA: International Food Policy Research Institute

International Food Policy Research Institute. (2018). *Global food policy report* Washington, DC., USA. : International Food Policy Research Institute.

Jagwe, J. N., Machethe, C. L., & Ouma, E. (2010). Transaction costs and smallholder farmers' participation in banana markets in the Great Lakes Region of Burundi, Rwanda and the Democratic Republic of Congo.

Jari, B., & Fraser, G. (2009). An analysis of institutional and technical factors influencing agricultural marketing amongst smallholder farmers in the Kat River Valley, Eastern Cape Province, South Africa. *African Journal of Agricultural Research, 4*(11), 1129-1137.

Jensen, R. T. (2010). Information, efficiency, and welfare in agricultural markets. *Agricultural economics, 41*(s1), 203-216.

Jobber, D. (2009). *Principles and Practice of Marketing* (5th ed.). London: The McGraw-Hill Companies.

Kherallah, M., & Kirsten, J. F. (2002). The new institutional economics: applications for agricultural policy research in developing countries. *Agrekon, 41*(2), 110-133.

Kihoro, E. M., Irungu, P., Nyikal, R., & Maina, I. N. (2016). *An analysis of factors influencing farmers' choice of green gram marketing channels in Mbeere south sub-county, Kenya.* Paper presented at the 2016 AAAE Fifth International Conference, September 23-26, 2016, Addis Ababa, Ethiopia.

Kinicki, A., & Williams, B. K. (2013). *Management: a practical introduction* (6th ed.). New York: McGraw-Hill Irwin.

Kleemann, L., & Abdulai, A. (2013). Organic certification, agro-ecological practices and return on investment: Evidence from pineapple producers in Ghana. *Ecological Economics, 93*, 330-341.

Kleemann, L., Abdulai, A., & Buss, M. (2014). Certification and access to export markets: Adoption and return on investment of organic-certified pineapple farming in Ghana. *World development, 64*, 79-92.

Kotler, P. (2009). *Marketing management: A south Asian perspective*: Pearson Education India.

Kotler, P., & Armstrong, G. (2012). *Principles of marketing* (4th ed.). New Jersey, United States of America: Pearson Prentice Hall Publishers.

Kotler, P., & Keller, K. L. (2016). *Marketing management* (15th Global ed.). Edinburgh, UK: Pearson Education Limited.

Kranjac-Berislavjevic, G., Blench, R., & Chapman, R. (2003). Multi-Agency Partnerships (MAPS) for Technical Change in West African Agriculture. *Rice Production and Livelihoods in Ghana. ODI, UDS.*

Leavy, P. (2017). *Research design: Quantitative, qualitative, mixed methods, arts-based, and community-based participatory research approaches*: Guilford Publications.

LeRoux, M. N., Schmit, T. M., Roth, M., & Streeter, D. H. (2010). Evaluating marketing channel options for small-scale fruit and vegetable producers. *Renewable agriculture and food systems, 25*(1), 16-23.

Lewis, P. S. (2006). *Management: Challenges for tomorrow's leaders* (5th ed.). Mason, Ohio: Thomson/South-Western.

Ma, W., & Abdulai, A. (2016). Linking apple farmers to markets: Determinants and impacts of marketing contracts in China. *China Agricultural Economic Review, 8*(1), 2-21.

Maertens, M., & Velde, K. V. (2017). Contract-farming in staple food chains: the case of rice in Benin. *World Development, 95*, 73-87.

Martey, E., Annin, K., Wiredu, A. N., & Attoh, C. (2012). Does access to market information determine the choice of marketing channel among smallholder yam farmers in the Brong Ahafo region of Ghana? A multinomial Logit regression analysis.

Martey, E., Wiredu, A. N., Asante, B. O., Annin, K., Dogbe, W., Attoh, C., & Al-Hassan, R. M. (2013). Factors influencing participation in rice development projects: the case of smallholder rice farmers in Northern Ghana. *International Journal of Development and Economic Sustainability, 1*(2), 13-27.

Martin, W. E., & Bridgmon, K. D. (2012). *Quantitative and statistical research methods: From hypothesis to results* (Vol. 42): John Wiley & Sons.

Maspaitella, M., Garnevska, E., Siddique, M. I., & Shadbolt, N. (2018). Towards high value markets: a case study of smallholder vegetable farmers in Indonesia. *International Food and Agribusiness Management Review*, 1-16.

Maspaitella, M. R. (2015). *Linking smallholder vegetable farmers to high value markets in the Manokwari region, Papua Barat Province, Indonesia: a thesis presented in partial fulfilment of the requirements for the degree of Master of AgriCommerce at Massey University, New Zealand.* Massey University.

Mburu, L. M., Wakhungu, J., & Gitu, K. (2007). Determinants of smallholder dairy farmers' adoption of various milk marketing channels in Kenya highlands. *Livestock research for rural development, 19*(9), 2007.

McHugh, M. L. (2013). The Chi-square test of independence. *Biochemia Medica, 23*(2), 143-149.

Ministry of Food and Agriculture. (2010). *Agriculture in Ghana: Facts and Figures 2009*. Accra, Ghana: Ministry of Food and Agriculture.

Ministry of Food and Agriculture. (2012). *Agriculture in Ghana: Facts and Figures 2010*. Accra, Ghana: Ministry of Food and Agriculture.

Ministry of Food and Agriculture. (2013). *Agriculture in Ghana: Facts and Figures 2012*. Accra, Ghana: Ministry of Agriculture: Statistics, Research and Information Directorate (SRID).

Ministry of Food and Agriculture. (2017a). *Agriculture in Ghana: Facts and Figures 2016*. Accra, Ghana: Ministry of Food and Agriculture.

Ministry of Food and Agriculture. (2017b). *Rice projects*. Accra, Ghana: Ministry of Food and Agriculture. Retrieved from http://mofa.gov.gh/site/?page_id=736

Mmbando, F., Wale, E., Baiyegunhi, L., & Darroch, M. (2016). The choice of marketing channel by maize and pigeonpea smallholder farmers: evidence from the northern and eastern zones of Tanzania. *Agrekon, 55*(3), 254-277.

Mmbando, F. E., Wale, E. Z., & Baiyegunhi, L. J. (2017). The welfare impacts of market channel choice by smallholder farmers in Tanzania. *Development in Practice, 27*(7), 981-993.

Mohammed, M., & Ortmann, G. F. (2005). Factors influencing adoption of livestock insurance by commercial dairy farmers in three zobatat of Eritrea. *Agrekon, 44*(2), 172-186.

Mohanty, S. (2013). Trends in global rice consumption. *Rice Today, 12*(1), 44-45.

Msangya, B., & Yihuan, W. (2016). Challenges for Small-Scale Rice Farmers: A Case Study of Ulanga District- Morogoro, Tanzania

International Journal of Scientific Research and Innovative Technology, 3(6).

Muamba, F. M. (2011). Selling at the farmgate or traveling to the market: a conditional farm-level model. *The Journal of Developing Areas, 44*(2), 95-107.

Mzyece, A. (2016). *Effect of buyer type on market participation of smallholder farmers in northern Ghana.* Kansas State University.

Nasrin, S., Lodin, J. B., Jirström, M., Holmquist, B., Djurfeldt, A. A., & Djurfeldt, G. (2015). Drivers of rice production: evidence from five Sub-Saharan African countries. *Agriculture & Food Security, 4*(1), 12.

Neven, D., Odera, M. M., Reardon, T., & Wang, H. (2009). Kenyan supermarkets, emerging middle-class horticultural farmers, and employment impacts on the rural poor. *World Development, 37*(11), 1802-1811.

Ogunleye, K., & Oladeji, J. (2007). Choice of cocoa market channels among cocoa farmers in ila local government area of Osun state, Nigeria. *Middle-East Journal of Scientific Research, 2*(1), 14-20.

Ohen, S., Etuk, E., & Onoja, J. (2013). Analysis of market participation by rice farmers in southern Nigeria. *Journal of Economics and Sustainable Development, 4*(7), 6-11.

Olwande, J., & Mathenge, M. K. (2011). *Market participation among poor rural households in Kenya*: Tegemeo Institute of Agricultural Policy and Development.

Omiti, J., Otieno, D., Nyanamba, T., & McCullough, E. (2009). Factors influencing the intensity of market participation by smallholder farmers: A case study of rural and peri-urban areas of Kenya. *African Journal of Agricultural and Resource Economics, 3*(1), 57-82.

Osei-Asare, Y. (2010). Mapping of poverty reduction strategies and policies related to rice development in Ghana. *Nairobi, Kenya: Coalition for African Rice Development (CARD)*.

Osmani, A. G., & Hossain, E. (2015). Market participation decision of smallholder farmers and its determinants in Bangladesh. *Ekonomika Poljoprivrede, 62*(1), 163.

Ouma, E., Jagwe, J., Obare, G. A., & Abele, S. (2010). Determinants of smallholder farmers' participation in banana markets in Central Africa: the role of transaction costs. *Agricultural Economics, 41*(2), 111-122.

Owusu Coffie , R., Burton, M. P., Gibson, F. L., & Hailu, A. (2016). Choice of rice production practices in Ghana: A comparison of willingness to pay and preference space estimates. *Journal of Agricultural Economics, 67*(3), 799-819.

Owusu, V., Donkor, E., & Owusu-Sekyere, E. (2017). Accounting for the Gender Technology Gap Amongst Smallholder Rice Farmers in Northern Ghana. *Journal of Agricultural Economics*.

Panda, R. K., & Sreekumar. (2012). Marketing channel choice and marketing efficiency assessment in agribusiness. *Journal of International Food & Agribusiness Marketing, 24*(3), 213-230.

Ragasa, C., Dankyi, A., Acheampong, P., Wiredu, A. N., Chapoto, A., Asamoah, M., & Tripp, R. (2013). Patterns of adoption of improved maize technologies in Ghana. *IFPRI Ghana Strategy Support Program Working Paper, 36*.

Randela, R., Alemu, Z. G., & Groenewald, J. A. (2008). Factors enhancing market participation by small-scale cotton farmers. *Agrekon, 47*(4), 451-469.

Rao, E. J., & Qaim, M. (2011). Supermarkets, farm household income, and poverty: insights from Kenya. *World Development, 39*(5), 784-796.

Reddy, S. S., Ram, P. R., Sastry, T. V. N., & Devi, I. B. (2004). Agricultural Economics *Oxford and IBH Publishing CO.PVT. Ltd, New Delhi India*.

Rhodes, V. J., Dauve, J. L. & Parcell, J. L. . (2007). *The Agricultural Marketing System* (6th ed.). USA: Holcomb Hathaway.

Robbins, S., & Coulter, M. (2012). *Management: Global Edition* (11th ed.): Pearson Education: .

Robbins, S. P. (2011). *Management* (6th ed.). Frenchs Forest, N.S.W: Pearson.

Robson, C., & McCartan, K. (2016). *Real world research*: John Wiley & Sons.

Rosenbloom, B. (2012). *Marketing channels*: Cengage Learning.

Roy, S. (2016). Various Approaches to Decision Making. In *Decision Making and Modelling in Cognitive Science* (pp. 23-49): Springer.

Ruane, J. M. (2005). *Essentials of research methods: A guide to social science research*: Blackwell publishing.

Rugumamu, C. P. (2014). Empowering smallholder rice farmers in Tanzania to increase productivity for promoting food security in Eastern and Southern Africa. *Agriculture & Food Security, 3*(1), 7.

Sauders, M., Lewis, P., & Thornhill, A. . (2012). *Research Methods for Business Student.* (6th ed.). Harlow: Pearson Education Limited.

Schermerhorn, J. R. (2013). *Management* (12th ed.). Hoboken, NJ: John Wiley & Sons.

Schipmann, C., & Qaim, M. (2011). Modern food retailers and traditional markets in developing countries: comparing quality, prices, and competition strategies in Thailand. *Applied Economic Perspectives and Policy, 33*(3), 345-362.

Secchi, D. (2011). Bounded Rationality. In *Extendable Rationality* (pp. 19-25): Springer.

Sedem Ehiakpor, D., Apumbora, J., Danso-Abbeam, G., & Adzawla, W. (2017). Households' Preference for Local Rice in the Upper East Region, Ghana. *Advances in Agriculture, 2017*.

Sekaran, U., & Bougie, R. (2010). *Research methods for business: A skill building approach*. Chichester: John Willey & Sons Ltd.

Shiimi, T., Taljaard, P. R., & Jordaan, H. (2012). Transaction costs and cattle farmers' choice of marketing channel in North-Central Namibia. *Agrekon, 51*(1), 42-58.

Siddique, M. I. (2015). *Factors affecting marketing channel choice decisions in citrus supply chain: a thesis presented in partial fulfilment of the requirements for the degree of Doctor of Philosophy in Agribusiness at Massey University, Palmerston North, New Zealand.* Massey University.

Siddique, M. I., Garnevska, E., & Marr, N. E. (2017). An Analysis of Marketing Channel Choice Decisions by Smallholder Citrus Growers. *Australian Academy of Business and Economics Review, 1*(1), 50-84.

Sigei, G., Hillary, B. K., Jonah, K. K., & Timothy, O. O. (2015). Factors Influencing the Choice of Marketing Outlets among Small-Scale Pineapple Farmers in Kericho County, Kenya. *International Journal of Regional Development, 2*(2), 1.

Sims, B., & Kienzle, J. (2016). Making mechanization accessible to smallholder farmers in sub-Saharan Africa. *Environments, 3*(2), 11.

Siziba, S., Nyikahadzoi, K., Diagne, A., Fatunbi, A., & Adekunle, A. (2011). Determinants of cereal market participation by sub-Saharan Africa smallholder farmer. *Journals of Agriculture & Environmental Studies, 2*(1).

Soe, W. P. P., Moritaka, M., & Fukuda, S. (2015). An analysis of the factors influencing marketing channel choice by paddy rice farmers in Myanmar. *Journal of the Faculty of Agriculture, Kyushu University, 60*(2), 535-542.

Suhonen, N. (2007). Normative and descriptive theories of decision making under risk: A short review. *Finland: Economics and Business Administration, University of Joensuu, Finland, 4*.

Tadesse, G., & Bahiigwa, G. (2015). Mobile phones and farmers' marketing decisions in Ethiopia. *World Development, 68*, 296-307.

Tsourgiannis, L., Eddison, J., & Warren, M. (2008). Factors affecting the marketing channel choice of sheep and goat farmers in the region of east Macedonia in Greece regarding the distribution of their milk production. *Small Ruminant Research, 79*(1), 87-97.

USDA. (2018). *Grain: world markets and trade*. United States Department of Agriculture (USDA), Foreign Agricultural Service.

Ward, H., 1995. Rational choice theory. In: Marsh, D. and Stoker, G., Editors, 1995. *Theories and Methods in Political Science*, London: Macmillan, pp.76–93.

Wilson, E., Kenny, A., & Dickson-Swift, V. (2018). Ethical challenges of community based participatory research: exploring researchers' experience. *International Journal of Social Research Methodology, 21*(1), 7-24.

Woldie, G. A., & Nuppenau, E. (2009). Channel choice decision in the Ethiopian banana markets: A transaction cost economics perspective. *Journal of Economic Theory, 3*(4), 80-90.

Woldie, G. A., & Nuppenau, E. (2011). A contribution to transaction costs: evidence from banana markets in Ethiopia. *Agribusiness, 27*(4), 493-508.

World Atlas. (2015). World Map/ Africa/ Ghana/ Where is Ghana. Retrieved May 10, 2018 http://www.worldatlas.com/af/gh/where-is-ghana.html.

World Bank. (2016). Country/ Ghana/ Data. Retrieved December 4, 2017 from http://data.worldbank.org/country/ghana.

Xaba, B. G., & Masuku, M. B. (2012). Factors affecting the choice of marketing channel by vegetable farmers in Swaziland. *Sustainable Agriculture Research, 2*(1), 112.

Yu, D., & Zhou, R. (2017). Coordination of Cooperative Knowledge Creation for Agricultural Technology Diffusion in China's "Company Plus Farmers" Organizations. *Sustainability, 9*(10), 1906.

Zanello, G., Srinivasan, C. S., & Shankar, B. (2014). Transaction costs, information technologies, and the choice of marketplace among farmers in northern Ghana. *The Journal of Development Studies, 50*(9), 1226-1239.

Zivenge, E., & Karavina, C. (2012). Analysis of factors influencing market channel access by communal horticulture farmers in Chinamora District, Zimbabwe. *Journal of Development and Agricultural Economics, 4*(6), 147-150.

APPENDIX 1. QUESTIONNAIRE FOR HOUSEHOLD SURVEY

Massey University

QUESTIONNAIRE FOR HOUSEHOLD SURVEY

Name of Enumerator:	
Date:	
Questionnaire No.:	
District	
Community/Town/Village:	
Telephone Number:	

SECTION A: DEMOGRAPHICS CHARACTERISTICS

2. What is the gender of the respondent?

☐ Male   ☐ Female

3. What is the age of the respondent?

☐ Age: _____

5. What is your level of education

☐ Number of years of formal education: _____

6. What is the total number of people in the household?

☐ Total number: _____

8. **How many years have you been farming?**

☐ Years: _____

9. How many years have you been cultivating rice?

☐ Years: _____

SECTION B: FARM CHARACTERISTCS &ASSETS ENDOWNENTS FACTORS

B1. FARM SIZE AND LAND TENURE

10. What is your total farm size (acres)?.......................................

1

11. What was the total land area allocated to rice production in 2017 (acres)?.....................

12. Did you apply irrigation on your rice farm last season?

☐ Yes   ☐ No

13. Do you engage in any off-farm activities?

☐ Yes   ☐ No

13a. If YES, how much do you get from off-farm activities in a month?

☐   Amount (GH₵): _____

13b. What kind of off-farm activities do engage in?

Name of off-farm activities.

i. ....

ii...

iii..

iv..

14. Do you own any livestock? *Please skip 19a, if answered No*

☐ Yes   ☐ No

14a. If Yes, kindly indicate the number in each type of livestock.

Type of Livestock		Number
i.	Cow	
ii.	Goat	
iii.	Sheep	
iv.	Chicken	
v.	Rabbit	
vi.	Donkey	
vii.	Others, please specify	
viii.		
ix.		

15. Which of these transport assets do you own? *Tick all applicable options.*

☐ Vehicle   ☐ Tractor   ☐ Motorbike   ☐ Bicycle

16. What communication assets do you have? *Tick all applicable options.*

☐ Radio   ☐ TV set   ☐ Mobile phone   ☐ Others: _____

SECTION C: INSTITUTIONAL CHARACTERISTICS

C1. FARMERS' ASSOCIATION

17. Are you a member of any farmer association? *If NO, please skip to 25.*

☐ Yes   ☐ No

17a.Did you pay any fee for membership in the association?

☐ Yes   ☐ No

17ai. If Yes, how much did you pay?...

17b. What kind of support do you get from the association?

☐ Finance ☐ Production of rice ☐ Marketing of rice product ☐ Others please, specify...............

C2. AGRICULTURAL EXTENSION SERVICES

18. Did you receive agricultural extension services related to rice production last year? *If NO, please skip to 19.*

☐ Yes ☐ No

18a. If Yes, how many extension visits did you receive during the last year?

☑ Number of visits: _____

18b. Who is the extension service provider?

☐ Government ☐ NGO's ☐ Research institutes ☐ Others please, specify....................

18c. What kind of agricultural extension services did you receive last year?

☐ Finance ☐ Production of rice ☐ Marketing of rice product ☐ Others please, specify...........

C3. ACCESS TO CREDIT

19. Did you access credit for rice production in last year? *If NO, please skip to 20.*

☐ Yes ☐ No

19a. What was the form of the credit?

☐ Cash ☐ Planting materials ☐ Agrochemicals ☐ Others please specify...............

19b. Where did you get the credit from?

☐ Bank ☐ Microfinance ☐ NGO ☐ Family/friends
☐ Cooperative ☐ Traders ☐ Input dealer ☐ Other: _____

19c. What was the amount of credit received?

☐ The amount of credit (Cedis): _____

19d. In what area did you spend the credit that you borrowed?

☐ Input ☐ Marketing ☐ Education ☐ Health

19e. What was the interest rate for the credit (%)?

☐ The interest rate for the credit (%): _____

19f. Have you been able to pay the loan?

☐ Yes ☐ No ☐ Partially

SECTION D: RICE PRODUCTION COST

20. Please provide the information on the Farm Inputs and Costs during the last years cropping season:

Input	Quantity	Unit	Per unit cost	Total cost
i. Seeds		Kg or bowls		
ii. Fertilizer		Kg or bags		
iii. Herbicide		Litre or gram		
iv. Insecticide		Litre or gram		
v. Tractor hiring		Per acre		
vi. Land rent		Per acre/season		
vii. Net				
viii. others				

3

134

21. Please provide the information on the labour input and cost during the last years' cropping season:

	Total cost of hired labour	Total cost of family labour
1. Land clearing /ploughing		
2. Planting		
3. 1st weeding (manual)		
4. 2nd weeding (manual)		
5. Weedicides application		
6. Fertilizer application		
7. Insecticides application		
8. Harvesting		
9. Threshing		
10.Drying and winnowing		
11. De-husting		
12. Transporting of produce from the farm to home		
13. Transporting of produce from farm to market		

22. Please provide the information on the fixed input and cost during the last years' cropping season:

Item		Quantity	Years of Use	Unit cost	Total cost
i.	Hoes				
ii.	Cutlass				
iii.	Baskets				
iv.	Sacks				
v.	Wheelbarrow				
vi.	Knapsack sprayer				
vii.	Wellington boots				
viii.	Knives				
ix.					
x.					
xi.					

SECTION E: TRASACTIONAL/ MARKETING FACTORS

23. What is the total quantity of rice that you harvested?

☐ Quantity of paddy rice in bags (50kg bag): _____

24. What rice product did you sell?

☐ Paddy rice   ☐ Milled rice   ☐ Both

25. What proportion of the rice did you sell as paddy and milled

☐ Proportion of paddy rice sold (%):_____
☐ Proportion of milled rice sold (%):_____

4

135

26. How much did you sell the paddy rice (unprocessed rice) per 85kg bag?

☐ Price of paddy rice per 85kg bag (Cedis) _____

26a. Why did you not mill all your rice?

☐ Reasons: 1_____
     2
     3

27. What channel did you use to sell your paddy rice ?

Market channel	Tick	Quantity sold (50kg bag)	Price/ 50kg bag
Middlemen			
Processors			
Others			

28. What is the distance from your home to the nearest rice processor?

☐ Distance from home to **rural** rice processor: Minutes:_____ Kilometers: _____

☐ Distance from home to **urban** rice processor: Minutes:_____ Kilometers: _____

29. What is the condition of the road to the nearest processing center?

☐ Tarred road   ☐ Tarred with several pot holes   ☐ Untarred road

30. How did you transport rice to the processor?

☐ Vehicle   ☐ Tractor   ☐ Motorbike
☑ Bicycle   ☐ Carry on the head   ☐ Other: _____

31. How much did you pay to transport your rice to the processing firm?

☐ Total transportation cost (Cedis): _____

32. Did you receive any market information? *If No please skip to 33*

☐ Yes   ☐ No

32a. When did you receive information on price of rice?

☐ Before planting   ☐ Before harvesting   ☐ After harvesting

32b. What are the main sources of market information? *Tick all applicable options.*

☐ Contact with   ☐ Extension officers   ☐ Fellow farmers   ☐ Radio
   traders/buyers
☐ Farmer association ☐ Personal knowledge   ☐ Mobile phone   ☐ TV
                         of the market

32c. What type of market information do you usually receive? *Tick all applicable options.*

☐ Price information   ☐ Buyer's   ☐ Market place   ☐ Other/Not applicable:
                         information   information   _____

33. Who determines the prices of the produce?

☐ Buyer   ☐ Farmer Association   ☐   Seller (you)
☐ Negotiation   ☐ Market conditions   ☐   Other: _____

5

136

34. When are you paid the rice sold?

☐ At delivery   ☐ In one week   ☐ More than one week

35. Describe your bargaining position

☐ Accept price offered   ☐ Sometimes bargain   ☐ Set price and do not bargain

36. What is your level of satisfaction for the prices you receive for the produce?

☐ High   ☐ Medium   ☐ Low

37. What <u>MAJOR FACTORS</u> do you think determine the prices you receive? *Tick all applicable options.*

☐ Seasonality or availability of produce   ☐ Bargaining/negotiation strength of buyer(s)   ☐ Lack of marketing information

☐ Lack of transport means   ☐ Do not know   ☐ Other: _____

SECTION F: CHALLENGES

38. Please indicate your level of severity of the following constraints in your rice production

Constraints	Strongly agree	Agree	Neutral	Disagree	Strongly disagree
Production					
1. High cost of labour					
2. Erratic rainfall pattern					
3. High input cost					
4. Diseases and pest infestation					
5. Limited access to credit					
6. Low mechanization					
7. Limited access to extension services					
8. High cost of farm equipment					
9. Low land development					
Marketing					
1. Limited marketing options					
2. Low demand for rice products					
3. Low market prices					
4. High postharvest losses					
5. High transportation cost					
6. Lack of marketing standards					
7. Buyers dictating prices					
8. Poor storage facilities					

Any other comments

THANK YOU VERY MUCH FOR YOUR COOPERATION

APPENDIX 2. ETHICS APPROVAL FORM

MASSEY UNIVERSITY
TE KUNENGA KI PŪREHUROA
UNIVERSITY OF NEW ZEALAND

Date: 01 December 2017

Dear Eunice Adu

Re: Ethics Notification - 4000018749 - Factors Affecting Smallholder Rice Farmers' Choices of Marketing Channels in the Northern 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 Dr Brian Finch, Director - Ethics, telephone 06 3569099 ext 86015, 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

[signature]

Dr Brian Finch
Chair, Human Ethics Chairs' Committee and Director (Research Ethics)

APPENDIX 3. INFORMATION SHEET

MASSEY UNIVERSITY
COLLEGE OF SCIENCES
TE WĀHANGA PŪTAIAO

INFORMATION SHEET

My name is Eunice Adu, a Master student at Massey University, Palmerston North, New Zealand.

Research Description and Invitation

My research is titled *"Factors Affecting smallholder rice farmers Choices of Marketing Channel in the Northern Region of Ghana"*. The aim of this research is to find out the important factors that influence rice farmers' choices of either the middlemen or processor for their products and how these factors can be analysed. These objectives are set in order to achieve the research aims.

During my data collection process, I intend to have interviews with the rice farmers as the main participants in this research. I will also conduct personal interviews for other stakeholders, specifically the agricultural extension officers at the Ministry of Food and Agriculture (MoFA) to obtain adequate information.

I am therefore inviting you to participate in this research. If you decide to participate in the interview, you will be asked to sign a consent form on which you can choose to have your name and position acknowledged in the study. The interviews will take approximately one hour.

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 the interview session;
- Ask any question about the study at any time during the interview session;
- Ask the recorders to be turn off at any time during the interview session; and
- Be given access to a summary of the research result when it is concluded.

Data Management

Data gathered will be analysed and utilised for the thesis completion in the degree of Master in AgriCommerce and for other academic publication. All data will be stored securely in safe

Te Kunenga
ki Pūrehuroa

School of Agriculture and Environment (PN 433)
Private Bag 11222, Palmerston North 4442, New Zealand T +64 356 9099 F +64 6 350 5680 htttp://sciences.massey.ac.nz

139

place, while required, names will be changed, and pseudonyms will be used to ensure confidentiality. The thesis will be accessed through the Massey University Library

Project Contacts

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

Researcher	Chief Supervisor	Second Supervisor
Eunice Adu 9/ Keiller Place Palmerston North New Zealand	Dr. Elena Garnevska Senior lecturer, Agribusiness Department, Institute of Agriculture and Environment	Dr. Muhammed Imran Siddique Postdoctoral Fellow Institute of Agriculture and Environment
	Massey University Palmerston North New Zealand (+64) 63569099 ext 87794	Massey University Palmerston North New Zealand (+64) 63563099 ext.86165
aeunice.knust@gmail.com	E.V.Garnevska@massey.ac.nz	M.I.Siddique@massey.ac.nz

I thank you in advance for your participation.

Eunice

APPENDIX 4. CONSENT FORM

MASSEY UNIVERSITY
COLLEGE OF SCIENCES
TE WĀHANGA PŪTAIAO

PARTICIPANT CONSENT FORM- INDIVIDUAL

I have read, or the information sheet has be read out for me and I 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 to participate in this study under the conditions and participant rights set out in the information sheet.

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

Full name...

Signature..

Date   ....

APPENDIX 5. BINARY LOGITIC REGRESSION RESULT

```
                                      result
Continous variables

. logit marketing_channel price  Access_to_market_info  Age education
Years_of_farming Ho
> usehold_size ricefarm off_farm_activity Motorbike_ownership Bicyle_ownership
Mobile_pho
> ne_ownership Farmer_group_membership Access_to_extension_services
Access_to_credit paym
> ent1, vce(robust)

Iteration 0:    log pseudolikelihood = -132.80408
Iteration 1:    log pseudolikelihood = -41.855802
Iteration 2:    log pseudolikelihood = -35.145596
Iteration 3:    log pseudolikelihood = -34.575438
Iteration 4:    log pseudolikelihood = -34.569743
Iteration 5:    log pseudolikelihood = -34.569737
Iteration 6:    log pseudolikelihood = -34.569737

Logistic regression                          Number of obs   =        199
                                             Wald chi2(15)   =      53.91
                                             Prob > chi2     =     0.0000
Log pseudolikelihood = -34.569737            Pseudo R2       =     0.7397

-------------------------------------------------------------------------------
--------
                    |                Robust
    marketing_channel |    Coef.  Std. Err.     z    P>|z|    [95% Conf.
Interval]
----------------------+--------------------------------------------------------
--------
              price |  .1575751  .0641818    2.46   0.014    .0317811
.2833691
 Access_to_market_info |  3.07794  .7167397    4.29   0.000    1.673156
4.482724
                Age | -.0227118  .0382055   -0.59   0.552   -.0975931
.0521696
          education |  .0491915  .0468594    1.05   0.294   -.0426512
.1410342
 Years_of_farming_rice |  .0268436  .0586475    0.46   0.647   -.0881034
.1417906
      Household_size |  .0163348  .0767511    0.21   0.831   -.1340945
.1667642
            ricefarm |  1.395534  .541143     2.58   0.010    .3349133
2.456155
    off_farm_activity | -.7563299  .700376    -1.08   0.280   -2.129042
.6163819
  Motorbike_ownership | -.1279276  .7239831   -0.18   0.860   -1.546908
1.291053
      Bicyle_ownership | -1.775755  .911831   -1.95   0.051   -3.562911
.0114007
Mobile_phone_ownership |  .6601016  .9618247    0.69   0.493   -1.22504
2.545243
```

Page 1

142

result 2

MARGINAL EFFECTS
. margins, dydx(price Access_to_market_info Rice_farm_size off_farm_activity Motorbike_ownership Bicyle_
> ownership Mobile_phone_ownership Farmer_group_membership Access_to_extension_services Access_to_credit p
> ayment1)

Average marginal effects   Number of obs   =   199
Model VCE   : Robust

Expression   : Pr(marketing_channel), predict()
dy/dx w.r.t. : price Access_to_market_info Rice_farm_size off_farm_activity Motorbike_ownership
               Bicyle_ownership Mobile_phone_ownership Farmer_group_membership
               Access_to_extension_services Access_to_credit payment1

                            | Delta-method
                            | dy/dx   Std. Err.   z   P>|z| [95%
Conf. Interval]
----------------------------+--
----
                      price | .0079106   .0016821   4.70   0.000
.0046137   .0112074
      Access_to_market_info | .1553388   .0371891   4.18   0.000
.0824494   .2282282
             Rice_farm_size | .0318075   .013204   2.41   0.016
.0059281   .0576868
          off_farm_activity | -.0291664   .0364696   -0.80   0.424
-.1006456   .0423128
        Motorbike_ownership | -.0021563   .0332573   -0.06   0.948
-.0673394   .0630267
           Bicyle_ownership | -.0881004   .043698   -2.02   0.044
-.1737469   -.0024539
     Mobile_phone_ownership | .0451596   .0511857   0.88   0.378
-.0551625   .1454817
    Farmer_group_membership | .0292189   .030652   0.95   0.340
-.0308579   .0892956
Access_to_extension_services | -.0014305   .03553   -0.04   0.968
-.071068   .0682069
           Access_to_credit | .0723466   .0331231   2.18   0.029
.0074266   .1372667
                   payment1 | -.0666165   .0305387   -2.18   0.029
-.1264712   -.0067618