2019

Funding Strategies for Smallholder Rice Farmers in Afadzato South District, Ghana

Faith S. Ababio-Twi
Walden University

Walden University

College of Management and Technology

This is to certify that the doctoral study by

Faith S. Ababio-Twi

has been found to be complete and satisfactory in all respects,

and that any and all revisions required by

the review committee have been made.

Review Committee

Dr. Christopher Beehner, Committee Chairperson, Doctor of Business Administration Faculty

Dr. Jonathan Schultz, Committee Member, Doctor of Business Administration Faculty

Dr. Rocky Dwyer, University Reviewer, Doctor of Business Administration Faculty

Chief Academic Officer and Provost

Sue Subocz, Ph.D.

Walden University

2019

Abstract

Funding Strategies for Smallholder Rice Farmers in Afadzato South District, Ghana

by

Faith S. Ababio-Twi

MS, Governors State University, 2010

BS, Governors State University, 2007

Doctoral Study Submitted in Partial Fulfillment

of the Requirements for the Degree of

Doctor of Business Administration

Walden University

December 2019

Abstract

Agriculture revenue contributions to Ghana's gross domestic product have declined because of limited farm funding, which has constrained some smallholder rice farmers access credit to acquire necessary inputs, and to secure a stable market for their harvests. The purpose of this qualitative multiple case study was to explore successful strategies some smallholder rice farmers in the Afadzato South District of Ghana used in obtaining farm funding. Data collection included semistructured, face-to-face interviews with 9 smallholder rice farmers who successfully obtained farm funding. Previous research, reports, and policies of the Ghana Ministry of Food and Agriculture served as additional data collection sources. Data were analyzed using thematic analysis and resulted in three major themes: the smallholder farmer's strategy of belonging to cooperative association membership, the smallholder farmer's strategy for satisfying lender collateral requirements, and smallholder farmer's strategies for developing a repayment rating history. The implications for positive social change include the potential to guide the smallholder farmers to successful strategies to access farm funding for their farming activities and increase their farm sizes. The increase in farm sizes may result in more rice production that can help mitigate hunger and reduce poverty in the Afadzato South District of Ghana.

Funding Strategies for Smallholder Rice Farmers in Afadzato South District, Ghana

by

Faith S. Ababio-Twi

MS, Governors State University, 2010

BS, Governors State University, 2007

Doctoral Study Submitted in Partial Fulfillment

of the Requirements for the Degree of

Doctor of Business Administration

Walden University

December 2019

Dedication

I dedicate this work to the loving memories of my caring mother, Florence Akua Agbo, and my father, David Kwaku Twi. William Eddie Kwesi Twi, how I wish you there to see this work. I am very grateful to all of you.

Acknowledgments

I wish to express my profound gratitude to the Almighty God through Jesus Christ my personal savior who die and risen on the third day for the wisdom, knowledge, health, strength, and peace. His grace toward me has been unplumbed and exclusive.

My thanks also go to Dr. Christopher G. Beehner, my doctoral chairperson for his staunch support and kindness. I am beholden and thankful to Drs. Denise Land and Jonathan Schultz, who both served as second committee members, and Dr. Rocky Dwyer, the University Research Reviewer for their clear direction, support, and encouragement which helped me to complete the doctoral study process.

Finally, thanks to my children (Emefa, Etornam, Elorm and Esenam). My family helped me to navigate through the tough challenges of adult learning and the successful completion of the doctoral program. I affirmed my promise to you all to give back to the community and serve humanity as a global scholar of social change.

Table of Contents

List of Tables

Section 1: Foundation of the Study

Since the early 19th century, smallholding and family farming based agriculture has played an essential role in global food security and sustainable socioeconomic development (Alves, Silva, Oliveira Neto, Barrella, & Santos, 2015). In 2014, United Nations officials declared the International Year of Family Farming to provide an opportunity to reflect on the status of family based agriculture throughout the world in relation to food security (Food and Agriculture Organization, 2013). Some scholars claim that the global food system creates significant challenges for systematic policy design aiming to maximize global food and nutrition security to secure livelihoods, environmental sustainability, and socioeconomic development (Smith & Haddad, 2015; United Nations Food and Agriculture Organization, 2013). In Ghana, rice is a staple crop to the community, and for the country, funding such farms could create job opportunities and more profit (Martey, Al-hassan, & Kuwornu, 2012). For example, Afadzato South District in the Volta Region is agriculturally suitable for fulfilling Ghana's food production and food security (Appiah, 2013; Yankey, 2013). Therefore, this region was the focus of this study that was intended to explore successful strategies for farm funding.

Background of the Problem

Agriculture continues to be the healthiest economic sector of many developing nations including Ghana, with over 60% of the population in sub-Saharan Africa, Asia, and the Pacific depending on food production (Martey, Etwire, Wiredu, & Dogbe, 2014). The smallholder farmers who rely on unimproved inputs dominate the production of food in most African economies (Ali, Bowen, & Deininger, 2017). However, improving the

smallholder rice farmers' sustainability to ensure food security and boost the economy imposes several constraints.

These problems require institutional intervention to facilitate service delivery, support markets, and provide access to capital (Apiors, Kuwornu, & Kwadzo, 2016). The underperformance of Ghana's agricultural sector is due to limited funding, which prevents the smallholder rice farmers from increasing their productivity and profit (Diwan & Emerson, 2013). The factors hindering the smallholder farmers' improvement must be addressed to ensure an increase in agriculture production. Prior studies show that access to credit is one of the most significant challenges facing smallholder farmers in developing countries, including Ghana (Abdul-Rahaman, & Abdulai, 2018; Hossain, Muhammad, Jibril, & Kaitibie, 2019; Inusah et al., 2015; von Loeper, Drimie, & Blignaut, 2018; Wilson, 2018). Research has suggested that credit is significant in agriculture production, making it important to analyze the factors that limit farmers from access to funding such as credit (Denkyirah, Adu, Aziz, Denkyirah, & Okoffo, 2016; Inusah et al., 2015).

An area that would especially benefit from access to funding and credit is the Volta region of Ghana. The Volta region (named for the Volta River and the Volta Lake basin) is the hub for rice production in Ghana due to its vegetation and two-season rainfall pattern. The climate, land texture, and rainfall patterns are suitable for high-yield rice cultivation (Lacombe & McCartney, 2016). Afadzato South District in this region has a vast swampy land area ready to support commercial rice farming without irrigation,

but rice cultivation has only been carried out on a subsistence basis up to now due to lack of funding. Afadzato South District is made up of 79 communities and shares boundaries with Hohoe Municipal to the north, Kpnado Municipal to the West, the Republic of Togo to the east, and Ho Municipal and South Dayi District to the south, respectively.

Problem Statement

The agricultural sector is an engine of economic growth in almost every country and a source of raw materials for many industries (Anicic, Vukotic, & Krstic, 2016), with 72% of the Ghanian population depending on agriculture for employment and income (Donkor, Owusu-Sekyere, Owusu, & Jordaan, 2016). However, agriculture's contribution to Ghana's gross domestic product declined from 29.8% in 2010 to 18.9% in 2016 (Ghana Statistical Service, 2016). Further, Ghana's agricultural sector lost its top position for receiving loans and advances in 2012 to the service industry, with 38% of funds allocated to the service sector and 29% to agriculture (Sebe-Yeboah & Mensah, 2014). The general business problem is that farmers in Ghana lack access to funding to support their farming activities. The specific business problem is that some smallholder rice farmers lack strategies to obtain farm funding.

Purpose Statement

The purpose of this qualitative multiple case study was to explore the strategies smallholder rice farmers use to obtain farm funding. The targeted population comprised 20 smallholder rice farmers in the Afadzato South District of Ghana who successfully developed and implemented strategies to obtain farm funding. The positive social change

implications include the possibility to guide smallholder rice farmers in accessing farm funding for their farms. The increase in farm funding will improve farm production, which might help increase the production of rice. Consequently, there would be additional food to families within the community, more job opportunities, and profit for the farmers, reducing poverty in the Afadzato South District of the Volta region.

Nature of the Study

The three research methods are qualitative, quantitative, and mixed methods. A qualitative method was suitable in this study because qualitative research is appropriate for gaining the insights of participants (Bryman & Bell, 2015; Flick, 2018). Researchers have advanced understanding of changes in societies by using qualitative methodology (Green & Thorogood, 2018; Garcia & Gluesing, 2013). The qualitative method allowed me to ask participants open-ended questions to determine the funding strategies of smallholder rice farmers in Afadzato South District who have successfully obtained farm funding. The quantitative method was not appropriate for this study because no numerical data analysis was necessary to examine the relationships or correlations between any variables (Green, & Thorogood, 2018; Schutt, 2018; Yilmaz, 2013). The mixed research method is the combination of qualitative and quantitative methods in a single study (Johnson & Christensen, 2019; Venkatesh, Brown, & Bala, 2013), but it was unnecessary to add any quantitative procedure to this study.

An exploratory multiple case study approach was appropriate to obtain a deep understanding of answers to questions with no single set of outcomes (Yin, 2017).

Previous researchers have used an exploratory case study with in-depth interviews to explore the achievements and prospects of the Thai rubber industry (Weerathamrongsak & Wongsurawat, 2013; Collins, 2018). In contrast, narrative researchers deal with the individual story arranged in chronological order (Nguyen, Melewar, & Chen, 2013; Schutt, 2018; Johnson & Christensen, 2019). Additionally, ethnographic design researchers focus on setting individual stories within a cultural group (Merriam & Tisdell, 2015). Finally, phenomenology is a description of the essence of the experience of a phenomenon (Katsirikou & Lin, 2017). A multiple case study design was most appropriate because I was seeking answers to the research question about how smallholder rice farmers obtain farm funding, a question which may not provide one single set of answers.

Research Question

The central research question of the study was "What strategies do smallholder rice farmers in Afadzato South District use to obtain farm funding?"

Interview Questions

To obtain answers to the research question, the following open-ended discussion questions were used. The objective of the interviews was to explore successful funding strategies for smallholder rice farmers in the Afadzato South District in Ghana.

1. What traditional farm funding strategies are available for smallholder rice farmers in Afadzato South District?

2. How successful are the traditional farm funding strategies for smallholder rice farmers?
3. What funding strategies have helped farmers to successfully obtain farm funding?
4. What strategies are available to smallholder rice farmers in obtaining nontraditional funding?
5. How successful have these strategies been for obtaining nontraditional farm funding?
6. What state policies support successful farm funding strategies for smallholder rice farmers in Afadzato South District?
7. What are successful collateral strategies for smallholder rice farmers in obtaining farm funding?
8. What are successful strategies aiding cooperative rice farmers in obtaining farm funding?
9. What payback strategies are available for smallholder rice farmers?
10. What other topics that we did not cover in our discussion would you like to discuss that can contribute to my understanding of the strategies you use to obtain farm funding?

Conceptual Framework

The conceptual framework as the lens for my study is general systems theory (GST). Boulding (1956) and von Bertalanffy (1969) contributed to the initial concept of GST. Freedman's approach to GST was focused on system structure instead of system function (Bielecki, 2015; Freedman, 2013). Further, Kuhn, Courtney, and Morris (2015) explained the impact of systems theory on organizational diagnosis adaptability in the pursuit of enhanced system structure. Kuhn et al. discussed GST as complex systems that share some basic organizing principles irrespective of their purpose, specifically exchange and bounds (Ilin & Varga, 2015; Kuhn et al., 2015; Zeng & Pathak, 2003). Exchange is the transaction between businesses, and bounds are the barriers or restrictions in business-to-business transactions (Zeng & Pathak, 2003). GST is based on the analytic division of the natural world into the environment and systems, constituting the major foundational, axiomatic philosophical assumption of GST (Graça & Zhong, 2015; Pontani, Cecchetti, & Teofilatto, 2015; Stahl, Doherty, Shaw, & Janicke, 2014).

According to von Bertalanffy (1969), systems have five foundational elements: boundaries, inputs, outputs, throughputs, and feedback tools. Boundaries separate components of the organizational system from the external environment. Inputs consist of the fundamental resources that the system requires to produce outputs. Outputs include primary goods and services produced by the system that are desired and valued by customers and provide remuneration for workers. Throughputs, or transformational mechanisms, consist of the sequential or parallel and interdependent elements that contribute to the conversion of inputs. Feedback tools are the means by which

organizational members determine the extent to which the system—and each subsystem—interacts within the organizational system (von Bertalanffy, 1969).

I considered several theories in this study, including (a) complex adaptive systems theory, (b) GST, (c) disruptive innovation theory, and (d) decision theory. The smallholder rice farmers in Ghana are attempting to assimilate multiple agents or alternative funding resource systems in financing rice farms. Therefore, GST was the appropriate conceptual framework for exploring alternative funding strategies as a method for providing sustainable financing for rice production in Ghana.

Operational Definitions

I define three technical terms here that helped me to unfold the sustainability constraints affecting the smallholder rice farmers in Afadzato South District of Ghana. The following terms will be used throughout the dissertation.

Agricultural finance: Agricultural finance is the raising and accumulation of funds from different sources and transferring them primarily from moneylenders to borrowers to commence any sort of spending as well as the following repayment of loans. Agricultural finance involves the provision of funds to support the activities of agriculturalists and other people engaged in the production, storage, processing, handling, and distribution of agricultural products (Akhtar, Malik, & Awan, 2016).

Small-scale farmers: Small-scale farmers are those who use manual and traditional tools in cultivating their farms of 1-2 hectares of land, mainly on family-run farms (Nakashima & Ishikawa, 2016).

Subsistence agriculture: Subsistence agriculture is an economic farming model in which farmers produce only enough to feed themselves; it does not lead to improving income or eradicating social inequalities (Kovacic & Salazar, 2017).

Assumptions, Limitations, and Delimitations

Assumptions

An assumption is an element of the fact assumed to be true without actual verification (Marshall & Rossman, 2018). The primary assumption with my study was that there is a problem with smallholders' rice production in Afadzato South District in Ghana. Another assumption was that all participants would give accurate responses. A third assumption was that the participants would be honest about the success of their funding strategies.

Limitations

Limitations are conditions that influence the interpretation of study results that are not controllable by the researcher (Marshall & Rossman, 2018). In this qualitative case study, I explored funding sustainability constraints influencing the smallholder rice farmers in Afadzato South District in the Volta Region of Ghana. The geographical location of the study was limited to this district, which may limit transferability of the study findings. English is the only medium of communication, and the interviews were conducted solely in English. Additionally, my funding availability for travel to and from the research site was a limitation, as was the cost involved in data collection and processing. The time period in which to conduct and complete this study was a further

constraint. Other limitations involved the availability of officials for interviews at the Ministry of Food Agriculture (MOFA) and Afadzato South District Assembly.

Delimitations

Delimitations are limitations imposed by researchers to ensure a study does not exceed the boundaries of the study topic (Marshall & Rossman, 2018). The study was designed to include only individuals or companies participating in the business of smallholder rice farming in Afadzato South District in Ghana. Private rice vendors, rice research institutions, and the end users were excluded from the study. The study was also designed to exempt junior officers of MOFA; only senior management officers were included, because they have sufficient experience in smallholder rice farming funding, decision making, and implementation in comparison to the junior officers.

Significance of the Study

The study findings may valuable to businesses in improving financial constraints facing smallholder rice farmers in Ghana that have a negative effect on the expansion of agricultural production in the study area. Smallholder rice farmers have limited or no sources of funding for their farming activities in Ghana. The business significance of this research study includes providing supplemental support for the financing needs of farmers with seasonal production activities. Several study findings have demonstrated that access to alternative methods of financing such as microfinance supports and supplements farmers who operate with seasonal production activities (Ullah & Khan, 2017; Weber & Musshoff, 2017). This study may contribute to effective practice of

business in funding agriculture production activities, which is an important factor in improving smallholder farms' growth and increasing production capacities (Ha, Bosch, & Nguyen, 2016; Petrović & Vuković, 2016).

The results might contribute to positive social change by bridging the gap between subsistence and mechanized rice farming in Ghana. The findings of this study may contribute to the economic sustainability of the smallholder rice farmers in agriculture production. Improving the availability of funding sources could upgrade both rice output and standard of living. Further, this study's findings might enable smallholder rice farmers to improve production, increase profitability, and stabilize rice production deficits while creating a permanent agricultural job base in the Afadzato South District of Ghana. Futher, the findings may support the arguments of microfinance specialists that sufficient financial investments can renovate rural communities and reduce poverty (see Borda-Rodriguez & Vicari, 2014).

A Review of the Professional and Academic Literature

The literature review was guided by the purpose of the study, which was to explore the strategies smallholder rice farmers use to obtain farm funding, as well as the research question: What strategies do smallholder rice farmers in Afadzato South District use to obtain farm funding? The theoretical framework of the study was GST, which provided the basis for exploring the fundamental resources that the system requires to produce outputs. In this section, I provide a critical analysis and synthesis of the literature pertaining to smallholder rice farmers' funding. The literature review for the study

consists of analytical and synthesis of pertinent literature related to the problem statement, the conceptual framework topics of smallholder rice farmers funding, the purpose statement, and the research question.

I searched for agricultural and food journal articles and historical literature with discussion on food security and funding. The sources included peer-reviewed academic journals, trade journals, and books, dissertations, and conferences proceedings. Walden University Library and Google Scholar were essential to finding related peer-reviewed journals and articles about smallholder farmers funding. Specialized databases in agricultural funding, social sciences, and business funding including Business Source Complete, Emerald Journals, Elsevier, Rutledge, SAGE Premier Database, and Sage Publications produced a significant amount of literature. Useful keywords and the alternatives of these key words included *smallholder farms, smallholder farm funding, smallholder rice farm, funding smallholder farms, funding smallholder rice farm, rural farming, smallholder rice farmer cooperatives, microfinance, agricultural financing, food security,* and *smallholder agriculture cooperatives.*

Using these keywords, I also explored business and social sciences databases to discover peer-reviewed articles, journals, books, and periodicals dealing with qualitative research methods and the GST as the conceptual framework for the study. To ensure diligence, the literature review includes citation of 145 distinctive and relevant journals. A total of 136 journals (90.7%) were peer reviewed. Out of the 166 articles referenced sources, 145 articles were published from 2015 or later, meaning 87.3% of sources were

within 5 years of the anticipated completion date of the doctoral study (2019). Table 1 includes a summary of the sources cited in the literature review.

TABLE 1

SOURCES CITED IN THE LITERATURE REVIEW

Reference type	Total	Less than 5 years	Greater than 5 years (2014-below)	Proportion of total references
Research-based peer-reviewed journals	166	145	21	95.40%
Dissertations	3	2	1	1.72%
Seminal books	4	3	1	2.30%
Government Sources	1	1		0.58%
Total	174	151	23	
Proportion of total references	100%	86.78%	13.22%	

The global concern and concept of Food Security

Following the World Food Conference in 1974, researchers introduced the concept of food security, which they circulated in the 1980s and have offered as a guide for many state health-related interventions since then (Braun, 2013; Jarosz, 2011; Marsden & Arce, 2017; Weiler et al., 2014). In 1980, experts at institutions such as the World Bank and World Trade Organization began using food security discourse to justify neoliberal trade liberalization projects (Marsden & Arce, 2017; Otero, Pechlaner, & Gürcan, 2013; Slocum & Cadieux, 2015). Food safety and food security can refer to

sustainability, social justice, and self-reliance at the community scale (United Nations Food and Agriculture Organization, 2013).

Smallholder farms contribute toward food security in regional and global markets. In the developing world, more than half of food calories produced globally come from local units where each farming household is less than 5 hectares in size. Smallholder units are key in the production of staple crops and direct a greater proportion of their production toward the food supply. A 2016 study showed that small farms constituted only 12% of the global available farmland but represented 84% of all farms (Samberg, Gerber, Ramankutty, Herrero, & West, 2016). In the developing world, 3 billion rural people live on farms less than 2 hectares in size; these farms are home to half of the planet's undernourished population, where the majority of people live in absolute poverty and the women, who in many places are less food secure, play a crucial role in smallholder farm systems (Schindler et al., 2016).

There are several issues with the global food commodities market volatility as it pertains to food security and food importing in developing countries (Sarris, 2013). The major risks involve not only large and unpredictable price variations but also trade finance as well as import contract enforcement concerning institutions and policies to assist developing countries to better cope with the risks of commodity market volatility. Recent trends in food security and violent conflict are diverse, posing a challenge for causal identification. But there are high frequency microlevel data on both food security and conflict. For example, Brück and d'Errico (2019) identified strong individual and

institutional capacities to cope with conflict, maintaining food security against the odds across very diverse settings, stressing the importance in accounting for the type of conflict at the microlevel. Brück and d'Errico, also discussed how resilience is a useful lens for understanding household food security in conflict settings.

Local food security is also crucial, as smallholder agriculture supports the livelihoods of many of the planet's marginalized populations. Smallholder farmers' livelihoods are exposed to risk in many sectors and at many scales—most face missing or inequitable access to markets or capital, while few have resources to cope with hazards and shocks (High-Level Panel of Experts on Food Security and Nutrition, 2013). In the early 21st century, the structure of smallholder farming has rapidly changed in nature and intensity, requiring revised policies to reflect the changes. According to Venot (2016), the success of smallholder agriculture in much of the world is dependent on supportive policy environments that provide appropriate technology and market supports for smallholder farmers and create incentives for sustainable intensification. However, the policies designed to improve food security in rural regions of developing countries often fail (High-Level Panel of Experts on Food Security and Nutrition, 2013).

The world population's food insecurity increased at the end of the first decade of the 21st century. However, in a 2010 report, United Nations researchers argued that food security could improve if the government supports development programs that target smallholder farmers (Glenna et al., 2012). Along with distinguishing the outreach efforts to help smallholder farmers increase production, the political and economic conditions

that limit the longevity of outreach programs need to be addressed (Glenna et al., 2012). Documents revealing expenditures and smallholder farm yields have been indicators of success in mobilizing farmers to increase rice production (Glenna et al., 2012). However, this success depends on state funding, which can lead to pressure to meet certain outcomes.

Food security measures have been adopted as part of public health programs led by nongovernmental bodies, civil society organizations, scholars, and governments responding to growing food insecurity among marginalized populations (Ashe & Sonnino, 2012; Koc, MacRae, Desjardins, & Roberts, 2008; van Elsland, van der Hoeven, Joshi, Doak, & Ponce, 2012). However, these public health initiatives often face institutional pressures to measure programmatic success based on individual human health outcomes (Seed, Lang, Caraher, & Ostry, 2013). The communities' food security initiatives often correspond to demands for individual economic actors who are responsible for their health (Tornaghi, 2017). Alternatively, more sustainable farming systems must also perform well in both social and economic terms where farming systems can achieve high yields and profits (Garibaldi et al., 2017). For example, the Ghana National Rice Development Strategy was created in 2009 to double rice production by 2018 with a 10% annual increase and to reduce overreliance on imports and help achieve national food security, increased income, and reduced poverty. Since its inception, rice production has been growing at 7.5% annually, with only 1.5% coming from productivity improvements but 6% coming from land area expansion (Ragasa & Chapoto, 2017). Thus, expansion of irrigated areas coupled with market infrastructure,

extension services, and technologies will be necessary to boost rice productivity and production in Ghana (Ragasa & Chapoto, 2017).

Food security can also be increased with financing options for farmers. The sources of agricultural finance are both informal and formal (Tang & Guo, 2017). The informal sources include private moneylenders, friends and relatives, well-to-do rural people, shopkeepers, and marketing intermediaries. The formal sources are the commercial banks, rural banks, agricultural development banks, agro-product credit corporations, various government agencies for agricultural development, land mortgage banks, and cooperative banks and societies.

Overall rural credit also serves an important role in improving household income concerning total income, per capita income, and nonfarm income (Luan, Bauer, & Kühl, 2016). However, different credit schemes affect the recipient in various ways; successful credit schemes require consideration of the variations in transaction costs, disbursement scheme, loan characteristics, and typical socioeconomic conditions of credit recipients. The social collateral model for access credit should be included in the determinants of credit for smallholder farmers, which can include social capital, group pressure, entrepreneurship skills, and culture (Kamaluddin, Hadi, Alam, & Adil, 2015). Additionally, cash flows in production and consumption have a strong effect on credit demand (Lam, Cuong, & Lebailly, 2016), though factors like age and gender do not (Nwaru, 2011). Financing also needs to be tailored to demand based on small farmers' needs, which includes not only farm investments but also living costs. Financing at the

right time will also make for greater efficiency, improved product quality, and increased income.

Further, microfinance, also known as microcredit or microloans, is a financial service in which lenders offer loans, savings and insurance to smallholder business and entrepreneurs who do not have access to traditional sources of capital, like banks or investors (Ullah & Khan, 2017; Weber & Musshoff, 2017). Microloans are smaller than traditional bank loans. The goal of microfinancing is to provide individuals with money to invest in themselves or their smallholder business. In most cases the microlenders prefer that the borrowers work together to repay their loans, which improves accountability for timely repayments and better credit.

Smallholder farmers capture benefits of the value addition created when agricultural value chains and their financing mechanisms strengthen the interface between product and financial markets. Value chain finance from commercial banks and other financial institutions is limited and is made possible mainly through tripartite agreements among the financing institutions, lead firms, and farmers. Directors of financial institutions and policymakers obtain results from various value chain models and their financing mechanisms and then take measures to strengthen value chain finance in smallholder agriculture (Chen, Joshi, Cheng, & Birthal, 2015).

Successful agricultural activities depend on the proper availability of financial resources and their utilization (Akhtar et al., 2016). Smallholder farmers tend to utilize agricultural finance in proper ways; therefore, agricultural finance should be made

available activities that can improve agricultural output. Agricultural finance is an integral part of equitable development within a framework of macroeconomic stability. For example, directors of the State Bank of Pakistan are pursuing initiatives to expand quality and availability of agricultural finance, achieving self-reliance in agricultural commodities, ensuring food security, and providing export orientation and improved productivity (Akhtar et al., 2016). The availability of adequate and affordable agricultural finance is central to the implementation of this strategy. One difficulty is that limited access exists to short-term and long-term financing needed for agricultural purposes (Akhtar et al., 2016). However, the current administration may be willing to endure the long-term borrowing costs that defaulting creates rather than risk the short-term survival costs of removing cheap food policies for urban consumers. The overreliance on imported food affects urban unrest in the face of rapidly increasing food prices that are more urbanized. These countries are significantly more likely to be in default on their external sovereign debt (Ballard-Rosa, 2016; Hendrix and Haggard, 2015).

Researchers have paid increasing attention to funding within the agriculture system in recent years, as private financial actors have played a growing role in various aspects of the sector. But owners of private capital have been reluctant to invest in agriculture without assurances and support from the state, and states have imposed varying degrees of regulation on private financiers in the sector (Clapp, 2015). However, the implications of these private financial actors' role in the food system remain unclear, because researchers have paid relatively less attention to the ways in which these actors

have historically interacted in relation to the state in mediating agricultural finance (Martin & Clapp, 2015).

Smallholder farmers require better access to institutional credit to improve productivity for attaining greater food security. Past efforts to extend institutional credit to smaller farmers have failed for several reasons, including subsidized operation of government-aided credit schemes (Khandker & Koolwal, 2014). Recently, efforts to expand credit for smallholder agriculture that rely on innovative credit delivery schemes at market prices have received much policy interest. Although not many households report borrowing specifically for agriculture, outcomes do substantially improve with institutional borrowing, particularly microcredit. Access to microcredit is one of the important constraints facing farmers in Ghana. The smallholder farmers' access to agricultural microcredit in Northern Ghana is influenced by gender, household income, farm capital, improved technology adoption, extension contact, the farm's location, and awareness of lending institutions in the area (Anang, Sipiläinen, Bäckman, & Kola, 2015).

Lack of access to credit facilities creates low outcomes for agricultural households. The presence of credit constraints affects these households' investment in productivity with less enhanced technology. Small-scale farmers have been especially affected by financing, as their livelihoods have become even more uncertain due to increasing volatility in agricultural markets, which have made them weaker in the agro-food supply chain in addition to growing competition for their farmland (Isakson, 2014).

Additionally, smallholder rice farmers face a number of risks such as unpredictable weather, crop price variation, and investment in technology.

Promoting more dynamic agriculture development will require clear institutional frameworks rather than a narrow focus on smallholder farmers, and alternative modes and scale of production require new institutional and policy frameworks (Collier & Dercon, 2014). Members of the international community and directors of national agricultural research systems recognize the importance of supporting smallholders to reduce poverty and promote the food security status of some of the most vulnerable groups in the world (John & Fielding, 2014). Several researchers have found that growth in smallholder agriculture can have strong impacts on poverty reduction (Luan, Bauer, & Kühl, 2016; Samberg et al., 2016). Successful policies aimed at poverty alleviation, food security, and protection of biodiversity and natural resources depend on the inclusion and participation of smallholder farmers (Samberg et al., 2016). Further, the availability of good quality seed at affordable prices can raise agricultural productivity, increase household income, and contribute to poverty reduction (Awotide, Karimov, Diagne, & Nakelse, 2013).

The lack of cash income restricts rice farmers' ability to purchase food in markets or to invest in rice cropping to improve productivity or output (Duncan, Tompkins, Dash, & Tripathy, 2017). Smallholder rice farming generates little or no financial return for most rice farmers. Households often sell rice to cover short-term household costs. These farmers do not use a commercially oriented strategy of generating surpluses to sell and to

generate income and possibly savings. Rather, the strategy adopted by some smallholder farmers is to sell crops in response to their need for cash and to support their short-term survival and does not enable accumulation and sale of surplus production, thereby restricting the flow of investment in farm improvement (Duncan et al., 2017). Despite these constraints, the role of smallholder farming is vital to a country's economy. Grant funds specifically targeted to smallholder farmers to facilitate innovation are a promising agricultural policy instrument. These funds stimulate smallholder farmers to experiment with improved practices, and to engage with research, extension, and business development services providers. However, evidence regarding the impact and effectiveness of these grants is scarce (Ton, Klerkx, de Grip, & Rau, 2015). According to Ton et al., there are three modalities of grants: vouchers, business development matching grants, and farmer-driven innovation support funds. Innovation grant funds are receiving increasing recognition as a promising avenue for agricultural innovation; nevertheless, funds that are specifically targeted to smallholder farmers are quite rare.

According to Pannell, Llewellyn, and Corbeels (2014), economics includes not just short-term financial benefits and costs, but also the whole farm management context, constraints on key resources such as labor and capital, risk and uncertainty, interactions between enterprises, and time-related factors, such as interest rates and the urgency of providing for the farm family. The great challenge facing agriculture is meeting projections of global food security under climate change. Agriculture is not getting the needed investment and foreign aid is not increasing appropriately to assist developing countries to maintain sustainable agriculture under climate change. Successfully

financing sustainable agriculture under climate change will involve mainstreaming agricultural mitigation and adaptation into agricultural development programs, enhancing local capacity, and considering different stakeholders' needs, all of which are major undertakings (Huang & Wang, 2014) that require long-term planning. Consistent funding allocated to well-known agencies or their affiliates is thus more likely to influence farmer behavior in the short term than contract advisory projects awarded to novice service providers. Advisors may be motivated to provide information about easy access to agriculture grants, rather than actions with an environmental benefit (Sutherland et al., 2013).

Smallholder farmers may overcome agriculture production constraints through contract farming. These constraints include financial limitations, poor access to inputs, lack of technical and managerial capacity, and an unstable market for their harvests (Ragasa, Lambrecht, & Kufoalor, 2018). Agricultural innovation grants are used to stimulate private sector and farmer engagement in activities related to technology generation, dissemination, and overall innovation processes. In the last decade, the increased use of innovation grants is a result of two tendencies that shaped policies on agricultural extension and advisory services (Ton et al., 2015). Researcher reviews point to an important and transversal outcome area of innovation grant systems: the creation of human and social capital to sustain creative thinking and innovative practices (Ton et al., 2015).

Rice agriculture represents an economic and symbolic livelihood. Kalingas practice intensive wet-rice cultivation as their primary means of subsistence, but it is not the only type of food production. Women are deemed the agriculturalists in Kalinga, while men participate in large jobs during the harvests (Longacre & Hermes, 2015). Human cultivation of rice makes an important contribution to global food security, and requires an understanding of yield gaps in rice-based farming systems. However, estimates of yield gaps are often compromised by a failure to recognize the components that determine yield gaps on a local scale. A good understanding of rice yield gaps and the factors leading to yield gaps will allow better targeting of agricultural research and development priorities for livelihood improvement and sustainable rice production (Stuart et al., 2016). Rice cultivation also requires cooperation for water management in an irrigation system in Kalinga. Households vary in the number and size of rice fields and in the quality of access to shared irrigation systems. Social cooperation offers a means to level household subsistence. There is a clear inverse relationship between household investment in rice farming and ceramic exchange with other community households (Longacre & Hermes, 2015).

Countries with a very high level of poverty and food insecurity, especially in the Southwestern region of Madagascar, with its chronic food shortages, need an intervention to assess the local food security status for more effective land management planning and famine prevention. However, information on crop production, food availability, and coping strategies of smallholders to deal with food shortages is scarce (Noromiarilanto, Brinkmann, Faramalala, & Buerkert, 2016). Despite high climate-induced risk in crop

production, the inhabitants need improvements in agricultural techniques to enhance food self-sufficiency (Noromiarilanto et al., 2016). In the long term, inhabitants also need access to off-farm income opportunities to sustain local livelihoods (Noromiarilanto et al., 2016).

Bangladesh's agricultural system has been transformed by the use of Green Revolution technologies through the introduction of high-yielding rice and wheat varieties, chemical fertilizers and pesticides, and the expansion of well-irrigated tube areas, enabling crop production during the dry season. However, serious challenges continue to plague the agriculture sector, including scarcity of land due to high population density, unbalanced use of fertilizers and pesticides, and great variation in water supply across seasons from drought to stagnant flood conditions (Bell, Bryan, Ringler, & Ahmed, 2015).

The agricultural sector in Laos is forecast to move from subsistence rice production to a more modernized and market-oriented sector, with a greater focus on commercialization. The southern and central regions are the main rice-growing region of Laos. Though the dry land farmers rely on rainfall with poor soil, the rural householders are experiencing a rapid change in their yield and livelihood systems. Members of the Laos government project substantial increases in the rice production in the southern plains, which requires specialized and tailored support to allow the sector transformation of the farmers where many stakeholders currently envisage livelihood and production goals (Alexander et al., 2018). Mumuni and Oladele (2016) stated that livelihood capital

to the rice farmers normally improves the internal focus of control by which the farmers improve their management abilities and ultimately boost their agricultural entrepreneurial capacities. Afrin, Haider, and Islam, (2017) claimed that Malaysia farmers who take credit become more efficient in their activities than their counterparts who do not take credit, but more especially, the farmers improve more when they received credit literacy. In support of smallholder farmers, to develop agricultural activities, Shafiai and Moi (2015), claimed the Department of Agriculture of Malaysia normally gives aids in a form of subsidy to her farmers for a reason of benefiting development of agricultural land and also as a short-term cushion.

For Africa to succeed in economic development by 2070, agriculture production must be massively increased to support growth. However, this will require labor productivity, a vast reduction in the proportion of the population engaged in agriculture, and a large move out of rural areas. The smallholder agriculture continuing commitment is the main route for growth in African agriculture and for poverty reduction (Collier & Dercon, 2014).

The high levels of seasonal climatic variability influencing the consistency of rice production in Cambodian rain-fed, lowland systems necessitate strategies to improve farmer food security, and better meet national domestic and export demands (Dalgliesh, Charlesworth, Lonh, & Poulton, 2016). While there is a substantial gap between actual and potential rice yield, little research has been undertaken in Cambodia to improve rain-fed rice agronomy or the efficient of use of natural resources in a climate-constrained

environment, which is the key to better productivity and food security (Dalgliesh et al., 2016). Rice cultivation is closely merged with socio-cultural values, which creates specific agro-biodiversity. Traditional rice production creates distinctive cultural landscapes in Southeast Asia. Improving development pressures lead to intensification of small-scale production systems, and with these changes of landscapes and associated ecosystems services (Tekken et al., 2017). In their work on drought prone areas of Indonesia, Khanal and Regmi (2018) claimed that constrains by financial and liquidity constrains does not affect farmers production efficiency. This was supported by Banna et al. (2016) who asserted that factors such as financial and liquidity constrains negatively influence smallholder farmers production efficiency. In the event of farmer's adoption of technology, Mariyono (2019), farmer's household prosperity is enriched by micro credit and this aids the farmers to mediate technology adoption.

Experts looking toward the future predict an increase in global warming, with detrimental consequences for rain-fed crops that are dependent on natural rainfall. According to Singh, McClean, Büker, Hartley, and Hill (2017), many crops grown under rain-fed conditions support the livelihoods of low-income farmers; therefore, it is important to highlight the vulnerability of rain-fed areas to climate change to anticipate potential risks to food security. However, in sub-Saharan African countries, the majority of the population is in the rural areas, where poverty, chronic hunger, and deprivation are more pervasive (Siddik, Kabiraj, Shanmugan, & Kahota, 2015).

Regarding climate change vulnerabilities, Awolala and Ajibefun (2015), ascertained that smallholder rice farmer's activities are influenced by associated climate change vulnerabilities. These vulnerabilities are generally influenced by socioeconomic factors such as inadequate agricultural support, geographical and human capital variables. They however advised that with a stronger wealth, asset, education, adequate infrastructure and availability of basic amenities in place, smallholder farmers are quick to adapt to the climate change vulnerabilities. In another development to support this claim, Banna et al. (2016) asserted that agricultural activities are greatly affected by climate changes therefore needs conscious effort of the farmers to be geared toward adaptations to climate changes. It is crucial for the smallholder famers to make efforts improving their understanding, attitudes and will to pay for programs and activities that curtail the adaptation. Banna et al., however added that for the actualization of this farmer's education and income levels acceleration, behavioral and attitudinal abilities enhancement is a key. In addition, the government and nongovernment organizations must play a role of intensifying adaptation training campaign, provide technical support and organize workshops for the farmers on climate changes (Banna et al., 2016).

Increased supports for agricultural infrastructure inputs are therefore crucial and central to the livelihood of the rural population in most African communities. About 70% of the sub-Saharan African population engages in agricultural activities with the view to reduce poverty and increase enhancement of economic activities (Siddik et al., 2015). The role of smallholder farmers is not only cultivation, but also having a voice in crops decision-making. According to James and Sulemana (2014), smallholder farmers' voices

are important regarding genetically modified crops but also in relation to policies, technologies, and other efforts designed by interests seeking ostensibly to improve the livelihoods of smallholder farmers.

Some Challenges Faced by Smallholder Farmers

The issue of limited bargaining power for smallholder farmers in accessing information, complying with market requirements, and negotiating and managing the contractual arrangements (Poulton et al., 2010; Wiggins et al., 2010). While farmers are highly heterogeneous, repeated patterns emerge among their farm systems, strategies, constraints, and aspirations (Giller et al., 2011). In Ethiopia, firms and a cooperative union has helped enhancing capabilities in strengthening the cooperative's internal governance, managerial capabilities, and financial and non-financial resources (Royer, Bijman, & Abebe, 2017).

Leonardo, Bijman, and Slingerland (2015) stated that while it is impossible to develop interventions for each single farm, the typologies are further used to gain insight into farmers' goals, priorities and drivers of livelihood strategies that can guide interventions and policies to link farmers to agricultural markets. For instance, less resourceful farmers may find opportunities for livelihood improvement in social promotion interventions, whereas for more resourceful farmers, agricultural markets may be the appropriate avenue (Leonardo et al., 2015).

The main challenge of farming systems is how decisions are made in relation to resource allocation (Giller, 2013). Smallholder farmers are squeezed out of value chains

that require large volumes; in these situations, collective action can help smallholder farmers to achieve scale, improve bargaining power, and benefit from new market opportunities (Cramb, Manivong, Newby, Sothorn, & Sibat, 2017). Successful collective action assumes a certain degree of homogeneity among farmer interests. However, smallholder farmers are not a homogeneous group, and collective action needs to accommodate this heterogeneity.

The issues of oil palm cultivation, plan composition and arrangements was a central concern in the work of Harun & Salleh (2017), when they claimed that the work involves triangular double avenue and boundary planting. Plant species and arranged can be categorized into sustainable plant composition and arrangements and also into unsustainable plant composition and arrangements. In another development, the asserted that transformation of monoculture system with low sustainability toward sustainable farming practices of agroforestry system can be achieved through crop component, maturity of oil palm, market value and demand, belowground and aboveground interaction and diversification of plant composition and arrangement.

As Cramb et al. (2017) observed, there is a need for measures beyond collective action that address the immediate selling of products by these farmers when market prices are low. Smallholder farmers struggle to pay for independent advisory services to access knowledge from distant sources for diversification, whereas formal advisors were perceived to lack credible production knowledge. Small-scale farmers seek formal advice

primarily to access subsidies, and use social capital to access tacit knowledge for production (Nettle, Klerkx, Faure, & Koutsouris, 2017).

Smallholder farm businesses illustrate tremendous resiliency because they are consistently transferred from generation to generation. Smallholder farm businesses have survived beyond the third generation, and almost a third have operated in the same area for over a century, with multiple generations working together; however, smallholder farmers tend to earn less profit on investment and sometimes show a loss instead (Glover & Reay, 2015). It is important to choose strategies that meet both the needs of the business and the smallholder farming family, though the choice may be not to maximize profit but rather to keep the business running. Cost-effective farming strategies provide smallholder farming families with a way of countering the increasingly threatening situation of limited production quotas, decreasing prices, the high cost of land, and the obligation to farm in a more environmentally sound way (Glover & Reay, 2015).

Harvest challenges. Efficient before-and-after harvest services are essential if smallholder farmers in high potential areas are to intensify production. These are especially important if smallholder farmers in marginal areas are to manage their natural resource base, in the face of growing population pressure and climate change, to contribute to economic growth and reduce poverty (Kilelu, Klerkx, & Leeuwis, 2017). The difficulties that smallholder farmers face in accessing services indicate how incentives for commercial delivery of services to smallholder farmers differ between

staple food, traditional cash crop, and high value product supply chains (Prager, Labarthe, Caggiano, & Lorenzo-Arribas, 2016).

The major challenge in service delivery to smallholder farmers in much of Africa relates to coordination of service development and delivery. The future of all smallholder farmers may well lie not in farming, but in the measures taken to stimulate the rural non-farm economy and provide jobs for those leaving farming; a favorable rural investment climate, provision of public goods, and institutional development are largely the same as those for agricultural development as well (Warner, Kuzdas, Yglesias, & Childers 2015).

The survival of smallholder farmers is important not only to the farmers themselves but also to society, because these farmers can have a significant effect on rural economic development and social harmony, especially in geographically remote regions where they are a vital source of employment in the community (Galdeano-Gómez, Pérez-Mesa, & Godoy-Durán, 2016). Irrespective of scale of operation, legal form, industrial activity, social political state, and market development, smallholder farmers provide a critical infrastructure for economic activity and wealth creation (Spigel, 2017).

Considerable variations exist in the strategies of smallholder farmers: each smallholder farmer holds different preferences, interests, and environmental assessments that transform into a range of exploits, particularly when passing the smallholder farm to the next generation (Mills et al., 2017). Some scholars suggested that reducing costs has

become the prevailing strategy practice by many smallholder farmers (Altieri, Nicholls, Henao, & Lana, 2015).

The smallholder rice farmers face challenges that need be addressed to improve the farmer's productivities. Access to ready credit with less constrains will go a long way to help farmers output. Smallholder farmer's credit is essential in making farmers productivity.

Ghana Government Support for the Smallholder Rice Farmers in Ghana

Ghana has an abundant natural resource base from the numerous upland and inland valleys found in the country's agro-ecological zones. The Ministry of Food and Agriculture (MOFA) in Ghana, is promoting the smallholder farmer, drives its policy to serve as a core investment for value chain development in Ghana, and aligns parallel financing to complement (MOFA, 2016).

In line with the strategic framework to build a strategic axis in linking up smallholder farmers to agribusinesses to enhance pro-poor growth, through value chain investment approach (MOFA, 2016). The MOFA, formed viable farmer-based organizations with gender equity, to enhance the knowledge, skills, and access to resources along the value chain, and for stronger bargaining power in marketing (MOFA, 2016). MOFA advocates to improve rural infrastructure, strongly promotes out grower-nucleus farmer linkage as a way of improving smallholders' access to credit. In addition, MOFA provides an improved planting material, extension on improved agronomic practices, and capacity to expand farm size per smallholder (MOFA, 2016).

In order to achieve the objectives of supporting and promoting successful and formidable farmers association groups, the MOFA recruits consultants to build capacity for the farmers' associations over a two-year period created and strengthened farmers associations groups (MOFA, 2016). In 2014, the government of Ghana through the MOFA initiated the Inland Valley rice development project (IVRDP) to provide basis for sustainable rice development in the inland valleys through provision of simple, low-cost water management structures and use of improved production inputs and post-harvest management practices (MOFA, 2016)

It has been demonstrated that Inland Valley rice production is more profitable than both conventional irrigation and upland cropping, provided water management is improved and farmers adopt improved rice production practices (MOFA, 2016). The Inland Valley Project's objectives was to enhanced food security in Ghana, reduce importation of rice and increase of smallholder rice producers, traders' processors through increased production of good quality rice.

MOFA, in support for the smallholder rice farmer provided short-term production credit for rice production groups (for seed, fertilizers and agro-chemicals), Inventory credit for rice trader groups (to purchase paddy), Medium-term equipment credit for rice production (power tillers, rice reapers, rice threshers) and rice processors (improved rice mills, storage sheds, digital moisture meters) (MOFA, 2016).

The government of Ghana through MOFA provides credit for crop development to production, inventory and equipment credit to rice farmers, traders and processors.

Seed growers were supported with credit to produce rice seedlings of jasmine and sikamo (MOFA, 2016). Production groups, marketing groups, miller/processor groups, were formed to facilitate access to credit for the stakeholders involved in the rice value chain and institutional capacity development in credit service delivery and capacity building for the stakeholders through support organizations (MOFA, 2016).

Land acquisition support for smallholder farmers and rice processors: the MOFA through its technical field officers (the Extension officers) assist farmers having ownership of lowlands that require development, identified site availability and suitability of land for rice production, availability of water, land use and ownership or tenure situation, willingness of farmers and community to participate. Lowlands to be assessed through local stakeholder (farmers, chiefs and landowners, and District Assemblies) participatory methodologies. MOFA support the farmers in land development, capacity building, literacy classes, and extension services and technical support for rice processing (MOFA, 2016).

As part of Ghana government's efforts to increase and improve the quality of locally-produced rice, the government sourced for a concessional loan to promote another project, the Upland Nerica rice in the country to support food security (MOFA, 2016). The main goal of the Nerica Project is to contribute to poverty-reduction and food security, through enhanced access to high yielding Nerica upland rice varieties. The project aimed to contribute to increasing locally produced rice for food security and conserve foreign exchange earnings through import substitution. The Nerica Project

within its implementation arrangement used a community seed multiplication system to ensure that farmers have easy access to quality seed in sufficient quantities at the right time (MOFA, 2016). The government of Ghana is concerned with the problems facing the stallholder rice farmers in Ghana and in support introduces projects to help food security and improve the wellbeing of the smallholder rice farmer's family.

Smallholder Rice Farmer Cooperative Association Benefits

Production groups of marketers, millers and processors were formed through the support organizations to facilitate access to credit involved in the rice value chain and institutional capacity development in credit service delivery. Ma and Abdulai (2017) examined the strategies and impact of agricultural cooperative membership on output price, gross income, farm profit, and return on investment. Ma and Abdulai found that cooperative membership has a positive and statistically significant impact on apple price, gross income, farm profit, and return on investment. In addition, the highest profit effect of cooperative membership does not in fact result in the highest return on investment. Smallholder farmers face challenges of age, household size, education, and farm size; consequently, membership in a cooperative and annual income are significant factors affecting the likelihood of a farmer's access to loans. There should be a deliberate policy to ensure easy access to loans at soft interest rates, while agricultural extension education on loan acquisition should be intensified (Ma & Abdulai, 2017).

Awotide, Karimov, and Diagne (2016) recommended that formation of cooperative associations among rural farmers should be encouraged. Access to seed and

information about improved rice varieties are also essential to increase the intensity of their adoption programs to improve contact with extension agents, increase access to credit, raise educational background, and enlarge the area devoted to cultivating improved rice varieties are the factors to promote to increase market participation and improve the welfare of rural households (Awotide et al., 2016).

Yang, Klerkx, and Leeuwis (2014) took an innovation intermediary perspective to examine farmer cooperatives' roles in facilitating agricultural innovation and its positioning in the agricultural system. They drew from the rapidly emerging farmer cooperative field in China with three cases to cross-check findings, and used innovation journey analysis within each case to investigate farmer cooperative engagement in innovation processes. According to Yang et al., (2014), farmers in cooperatives recognize the importance of connecting technical, social and economic dimensions of farming practice and provide corresponding services to link farmers to relevant actors, like extension agencies, research institutes, and supermarkets (Intarakumnerd & Goto, 2018). Though they mainly work through bilateral relationships as opposed to acting as a systemic intermediary, they could take the role of coordinator in the service system and bridge the gap between the research and policy system and everyday farming practice, especially in the absence of a systemic coordinator (Intarakumnerd & Goto, 2018).

However, their legitimacy as intermediary might be challenged due to the potential conflicts with governments, market actors, or their members, and their local position may provide insufficient clout for developing durable relationships with relevant

actors. Members of the public sector in southern Benin initiated rice producers' groups to take responsibility for maintaining the collective irrigation infrastructure to form a cooperation in canal maintenance (Nyssen et al., 2018). The largest and most diverse group of rice producers appeared well organized and equipped to engage in cooperation (Sidibé et al., 2018). Smallholder rice farmers' size and diversity might actually allow the emergence of institutional arrangements that can overcome social dilemma situations and demotivation emanating from customary privileges and exemptions and better use of Africa's irrigation potential (Nyssen, et al., 2018; Sidibé et al., 2018; Totin et al., 2014).

Smallholder farmers may gain notable livelihood benefits by participating in organic value chains. However, the availability of sufficient resources to maintain organic production sustainably on smallholder farms in resource-poor regions is lacking (Ditzler et al., 2018). Suh (2015), in a case study, indicated that organic rice farmers in Hongdong, South Korea use communitarian cooperative organic farming, a collective organic farming model, which has been communally executed by smallholder rice farmers there since 1994. The organic rice farming is illustrated by place-based cooperatives, community-supported agriculture, and strong community leadership. The residents of Hongdong have demonstrated that communitarianism and smallholder cooperatives can work for each other complementarily and therefore that communitarian organic farming through smallholder cooperatives is highly operational (Suh, 2015). The model is of great relevance to other parts of the rice-growing world which are controlled by smallholder farmers such as those in Ghana.

Discounted credit to farmers is a means of increasing their investment capacity and mitigating poverty among the smallholder farmers. Smallholder farmers need credit facilities to maintain adequate farm size, finance the use of purchased inputs such as fertilizer, improved seeds, insecticides, and additional labor (Bacon et al., 2014). The local collective action situation of employing and maintaining a small-scale cooperative banking system using a specific finance model provides the community with access to a pooled capital fund that may play an important role in ensuring its capacity to produce and reproduce economic processes according to its own specifications. In a study in Kampot, Cambodia, Scheidel and Farrell (2015) showed that the villagers' coordinated action for effective institutional performance of common pooled resource governance included social and environmental dimensions, which are necessary for achieving transformations toward more sustainable economic activity. The adoption of small-scale cooperative banking guaranteed improved ecological and social impacts. The finance model could play a supporting role in enhancing the potential of smallholder farming communities to improve their farming activities (Scheidel & Farrell, 2015).

Although farmers in professional cooperatives face great challenges for further development, including limited access to land and capital, a massive loss of laborers, low market competitiveness, weak internal management, and limited government support, these farmers, through their professional cooperatives, can make important economic, social, and environmental contributions to rural development by adopting alternative strategies and activities (Chen & Scott, 2016).

Successful Strategies Smallholder Rice Farmers

Nuhu, Inusah, Ama, and Sano (2014) stated that a noteworthy connection exists between production of crop production and microfinance in Ghana. Farmers who have access to micro credit obtain crop yield such that each Ghanaian cedi of micro credit rises crop production by 1/3 of a bag of grains. Adu-Gyamfi and Ampofo (2014) performed a study and postulated that the microfinance credit has made a substantial effect on the financial life of farmers. The authors advised that more community farmers should use the microfinance schemes as their farming incentives. Citing Nkonya et al. (1998); Yadav and Rahman (1994); Chipeta and Mkandawie (1991), and Owuor G. et al. (2014), acknowledged that accompanied by the formal financial market participations, policy environment group credit boosted credit overcoming hindrances, and helped small-scale farmers to enriched farm outputs. In attestation, Tetteh Anang, Sipiläinen, Bäckman, and Kola (2015) maintained that access to micro credit was important limitations facing farmers in Ghana. Northern Ghana for an example, Agricultural micro credit schemes ranged as low as 40% of the respondents who had access to formal credit. Tetteh Anang et al. (2015), meanwhile, farmers' larger access to micro credit was dependent on gender, size households, the magnitude of farm capital and cattle ownership, and adaptation of improved technology. Women are considered for micro credit, whilst their men counterparts obtained larger formal loans for their farming businesses.

Sulemana and Dinye (2016), indicated that, microcredit remained indispensable to improving agricultural incomes for farmers because it is a catalytic aid to income inequality. Djoumessi, Kamdem, Afari-Sefa, and Bidogeza, (2018), asserted that factors

such as education, membership to farmers association, extension services, and proximity to credit sources were statistically important with the likelihood of accessing credit by farmers. Kudadze, Ahado, and Donkoh (2016), postulated that agricultural credit availability was certainly inclined to group membership, gender, and physical size of farms. However, in real terms males were usually offered less credits than females. Formal institutions relied on guarantors for loans their credit retrieval. That was a good choice because it qualifies the farmers to access credit without collateral for farm credit. Kadadze et al. indicated that agricultural business was profitable because it primed the increased production. Kadadze et al. revealed that small scale farmer's credit encasement aided farmers in funding for basic farm inputs like seeds, and fertilizers. Kadadze et al. further indicated that the yield of farmers from two districts in Ghana acceded that agricultural credit had positively up surged output levels of some farmers.

Olayide and Okartei-Akko (2018) argued that farmer-based organizations were helpful to their farmers particularly on the foundation of training on good farming practices, technology, available and inexpensive access to credit, and marketing researches. Consequently, Nithia (2018), said that there existed an optimistic bearing on farm revenue for the members of any agricultural cooperative associations. Olayide and Okartei-Akko claimed that rice farmers in Ghana who happened to be members of cooperative organizations have accessibility to market information, healthier pricing, and received credit support from contact buyers or off-takers. Owuor et al. (2014) also proclaimed that group credits have substantially impacted on the better quality of farm inputs, because yields from borrowers were significantly higher than nonborrowers.

Olayide and Okartei-Akko and Denkyirah, Aziz, Denkyirah, Nketiah, and Okoffo (2016) postulated that 85.9% of rice farmers in Ghana who had access to credit were members of farmer-based organizations.

According to Kudadze, Ahado, and Donkoh (2016), the criteria for credit availability was positively relied on group membership, size of farm, and whether loan applicants were a male or female. Kudadze et al. generalized that males had less credit than female farmers on the average. Abdallah (2016), social organizations were a factor and circumventions through which farmers' accessed agricultural credit, whilst old age, educational levels, extension services, and yields from previous harvest were other factors limiting.

In support to the above-mentioned statement Denkyirah et al. (2016) averted that 84.5% of rice farmers in Ghana accessed credit from friends and relatives as an informal source. Arguably, 15.5% of the farmers obtained formal institutional credit as mean of financing their farm activities. Mumuni and Oladele (2016) asserted that age, marital status, membership of farmer-based cooperative organizations, Agricultural extension visits, record keeping, and farm income were the significant variables that influenced accessing farm credit. According to Diagne et al. (2015), objective measuring of rice farmers in Benin showed that 38.9% of farmers usually accessed credit in cash and kind with the higher rates of female farmers. However, rice farmers who succeeded in obtaining credit used other reasons rather than rice farming as their primary reason for farm credit. Diagne et al. stated credit obtained to finance rice farming has enormous,

conservative, and marketable impact on the rice yields. The authors submitted that access to credit allowed the users of the credit in rice farming to improve their input utilization in order to increase their year to year household income, yields of rice output, and rice incomes.

Avea et al. (2016), revealed that in Ghana nongovernment organizations and development agencies were involved in building farmer's capacity, assisting farmers to access inputs, and market information which was geared toward poverty alleviation and increasing farming sustainability. Chandio, Jiang, Wei, Rehman, and Liu, (2017), there were eight household factors very important to lenders of agricultural loans which were taken into considerations when farmers were to be considered for their credit. The authors claimed were gender, size of household, oldness or age, level of education, farming experience, and magnitude of landholding, level of income, and collateral or substance. Diagne et al. (2015), however, to obtain bank credit from financial institutions in the rural Sindh province of Pakistan, banking institutions should perceive you as a humble farmer. Only that can truncate your access to credit when being compared to commercial farmers because of the lack of collateral and minimal landholding sizes.

Wulandari, Meuwissen, Karmana, & Lansink (2017), revealed that in Indonesia, variable borrowers existed, where many of the primary borrowers were related to agricultural microfinance credit. These agricultural financing institutions have different criterial by which they assessed farmer lenders before giving out farm credits. Wulandari et al. claimed that banks and the Microfinance institutions provided institutional credit to

farmer cooperative associations together with traders in agricultural input kiosks with flexible payments for inputs.

Wulandari et al., (2017) reported that on the bases of screening the farmers for loans, the banks usually considered the existing past records of loan repayments and farmers ability to manage their farms. Besides microfinance institutions relied on character of the farmers and their spouse's knowledge of the funding applications. According to Wulandari et al., farmer associations who offered in-kind finance took to account whether the farmers have membership of the registered farmers association, while traders perceived farmers ability and to offer sales contract. Wulandari et al. further stated input kiosks on the other hand considered the character of the farmers requesting funding.

Saqib, Kuwornu, Panezia, and Ali (2018), proclaimed that a combination of certain economic and social features were important requirements for farmers to access agricultural credit in Pakistan flood-hit farming areas. These economic factors, Wulandari et al. (2017), suggested were educational level, experience in farming, size of landholding for farming purposes, the numerical size of farmers family, and proportion of retained land readily available as a repercussion for farmers' credit access. According to Wulandari et al., negatively most farmers were illiterates and have little or no collateral to access credit from the financial institutions.

Ellinger and Jarry (2018), asserted that credit worthiness was always analyzed by agricultural lenders on the bases of considerable combination of judgements and risks

assessment credit scoring models. According to Ellinger and Barry, the credit scoring models considered solvency, repayment history, business profitability, liquidity, and collateral information about the borrower. Faster processing required that the borrower of agricultural loans kept and submitted relevant documents to the lenders credit assessment team to aid in the evaluation process

According to Isaga (2018), lenders assessment of bank credit was dependent and determined by gender, educational level of smallholder farmers, and the value of assets invested into the faming activities. Generally, the value of assets invested into farming activities have significant relationship with bank credit accessing therefore valid loan selection criterion included value of assets invested in farming activities. Mumuni and Oladele (2016) said that the key factors that aided Ghanaian farmers to attain strong and consolidated farming capabilities were the networking, and the funding from the banks and financial institutions. Isaga found funding from the banks was one of the livelihood capitals for farming ventures. Consequently, the networking skills hand in hand with the funding from the banks accelerated the farmers toward consolidated farming abilities.

Sebatta, Wamulume, and Mwansakilwa (2017) claimed that Zambian agricultural finance usage by smallholder rural farmers has clichés associated with it. However, to mitigate the clichés, the government made frantic efforts through policy frameworks and reformed the financial sector toward facilitating the outreach to prevailing financial institutions to the rural enclaves as facilitating emergence of new financial institutions. Sebatta et al. claimed in consideration for the credit, factors such as household size

control, and improved educational levels were keenly considered. Sebatta et al. further noted smallholder rural farmers who applied for the loans were faced with screening factors, household characteristics; as educational level of the head of the household, numerical size of the household, and the number of the square meals averagely served daily by the family as a role players to the amount of loan to be disbursed to the borrowers. According to Sebatta et al. there were external factors such as loan payback period, determined by the banks, and the financial institutions that attracted to the volume of smallholder rural farmers toward participating in the loan application with a longer payback period.

Linh, Long, Chi, Tam, and Lebailly (2019), proclaimed that in Vietnam, rural credit market was basically two namely; formal and informal and were complementary. Socio-Economic factors dominated the screening process of the financial institutions to the borrowers. Linh et al. (2019) noted factors like age, family size, household income, education, gender, and size of the landholding were the socio-economic factors considered in the Vietnam smallholder rural farmers' microcredit. Linh, et al. also noted alongside the observable factors, social capital was also considered to affect access to credit though it was invisible. Linh et al. further asserted that, Vietnam rural credit market was characterized by scanty participant's couple with clearly indicated government interventions and segmentation. From foreign studies, Vietnam credit market were highlighted as ethnic and urbanized commune, and value of livestock or livestock holding. Socio-economic factors of the Vietnam credit market were considered as foreign and Vietnam rural. Linh et al. claimed Vietnam credit market have positively influenced

reliance on output of production, total household income, and productive efficiency as well as non-farmer income. Ultimately, poor rural farmers were mostly excluded from formal credit markets as they were indulged in vulnerable farming activities coupled with their incompetent agricultural policies.

Ojo and Ayanwale (2019) revealed that, access to credit by smallholders' farmers was significantly determined by the farmers' level of education, duration of credit processing, aggregate interest rate on the credit, land holding ability, and the value of assets in a specified farming business. Ojo and Ayanwale further noted the amount of credit requested by the farmers and the specific amount granted the farmers were respectfully estimated and tied to a specific production efficiency and its benefit to the farmers. Ojo and Ayanwale proposed that to estimate the actual credit to bridge the gap between the basic farm level financing and the real credit can impact productivity, creditors must consider farmers technical efficiency, interest rate, and the amount of money granted to the farmers, to nullify the problems of mismanagement and indiscipline in the farmers' credit usage.

According to Sekyi, Abu, and Nkegbe (2017), the variables that influenced access to credit by the smallholder farmers were farming non-mechanized equipment, age, group membership, and literacy, condition for credit constraints by group membership, household size, household durable assets, and the locations of the farmers businesses. Sakyi et al. suggested farmers productivity was dependent on farmers marital status, farm

size, locality, farm mechanization, commercialization, household size, group membership, mechanized equipment, and household durable assets.

Michael, Giroh, Polycarp, and Ashindo (2018), claimed that access to formal credit was positively influenced by the income status and educational levels of the farmers. Michael et al. enumerated such factors as complex banking procedures, high interest rates, low financial literacy, and the lack of collateral of the farmers which limited the farmers' credit access.

Transition

In Section 1 the researcher addressed the general background of the study. The primary purpose of the study was to explore the sustainability constraints of smallholder rice farmers in Ghana, which fall under the jurisdiction of the Food and Agriculture Ministry. A problem statement outlines the inadequate funding faced by smallholders' communities in the Afadzato South District. The purpose statement provides the research methodology and design. The researcher's review of the professional and academic literature on funding smallholder rice farmers indicates gaps in the literature, but also revealed that, due to sustainability constraints, smallholder rice farmers in Ghana need alternative funding strategies. Globally, there is a need for alternative sources of funding smallholder rice farmers to improve the communities' socio-economic development. The second section will describe the study project, with data collection analysis, data organization, the role of researcher, the ethical reliability and validity based on the selected research methodology and study design.

Section 2: The Project

Section 2 of this study consists of (a) the purpose statement, (b) the role of the researcher, (c) the participants involved in the study, (d) the research method and design, (e) the selected population and sampling methods, and (f) the techniques for data collection, data organization, and data analysis. I will also discuss validity and reliability aspects of the research and provide a summary and transition of the section.

Purpose Statement

The purpose of this qualitative multiple case study was to explore the strategies smallholder rice farmers use to obtain farm funding. The targeted population comprised 20 smallholder rice farmers in the Afadzato South District of Ghana who successfully developed and implemented strategies to obtain farm funding. The positive social change implications include the possibility to guide smallholder rice farmers in accessing farm funding for their farms. The increase in farm funding will improve farm production, which might help increase the production of rice. Consequently, there would be additional food to families within the community, more job opportunities, and profit for the farmers, reducing poverty in the Afadzato South District of the Volta region.

Role of the Researcher

As the researcher, I collected the data through individual in-depth, face-to-face interviews with participants. Other data sources included public documents and field observations of the affected communities to understand the views of the smallholder rice farmers concerning the problem and policies of the Ghana MOFA. Another role of the

researcher is addressing ethical dilemmas that may arise at each stage of the research (Fouché & Chubb, 2017). The case study has ethical relevance to the researcher as a resident of the selected community. I maintained the participants' privacy by residing in the selected community and adhering to the defined research guidelines to ensure confidentiality, reliability, and validity in the study.

Participants

The participants of this study consisted of smallholder rice farmers from the Afadzato South District of the Volta Region of the Republic of Ghana. I gained access to the participants through former alumni, former coworkers, and social and community networks. The selection of the participants was based on purposive sampling not by the probability technique. As residents of the selected region in the study, the participants had background knowledge of the focus problem and were able to express their views about it. In addition, the participants had a better knowledge of the existing smallholder rice farmers' problems in the community. For ethical protection, all participants were asked to give their consent to participate with Walden University Institutional Review Board (IRB) permission. Upon choosing to participate, the participants were asked to complete and sign informed consent documents stating that their participation was voluntary. The option of audio-recording interview consent was given to all participants. All participants' identities were ensured privacy and confidentiality; no person other than me knew each participant's responses and opinions.

Research Method and Design

In this qualitative multiple case study, I explored the funding strategies of smallholder rice farmers in Afadzato South District and the recommended effective strategies for funding smallholder rice farming capable of successful delivery of sustainable rice production.

Research Method

There are three primary types of research method: qualitative, quantitative, and mixed methods. Scholars using qualitative research seek to attain a thorough understanding of a situation or organized group, whereas scholars using the quantitative method collect data coded in numeric formats and statistically analyze the data and utilize surveys, experiments, and scales to manipulate data (De Veaux, Hoerl, & Snee, 2016). In a quantitative study, the researcher manipulates variables in one or multiple instances of an object of the study to obtain scores. Scholars using mixed-methods research employ a combination of the qualitative and quantitative methods with both statistical and transcribed data (De Veaux et al., 2016; Thomas, Nelson & Silverman, 2015). A qualitative research method was most appropriate because this study involved variables that cannot be manipulated.

In qualitative studies, the most important sources of case study information are interviews. The interviews are guided conversations rather than structured queries (Peterson, Hahn, Lee, Madison, & Atri, 2016). As the researcher pursues a consistent line of inquiry, a stream of questions in a case study interview is likely to be fluid rather than

rigid (Peterson et al., 2016; Rubin & Rubin, 2012). Employing the multiple exploratory case study design to investigate the financing constraints facing smallholder rice farmers in the Afadzato South district, I followed the line of inquiry as a reflection of case study protocol, presenting the actual questions in an unbiased manner (see Peterson et al., 2016). Members of the Afadzato South District Assembly Department of Food and Agriculture participated in in-depth interviews,

Research Design

Researchers using qualitative design present and evaluate why circumstances are different to understand complex social phenomena (Yin, 2015). The researcher also participates in interaction with the participants (Fouché & Chubb, 2017). There are five types of qualitative design: narrative research, ethnography, case studies, phenomenology, and grounded theory. Narrative research involves individual stories arranged in chronological order, and ethnography is focused on individuals' stories in a cultural group. In the case study, a case (or cases) is selected to illustrate the issues in depth. This design can also help expand on existing theory by identifying gaps and filling them (Pannone, 2017). Phenomenology is a description of the essence of the experience of a phenomenon. Grounded theory emerges when a theory is often portrayed in the visual model (Abdu, Stenner, & Vydelingum, 2016). A case study design was most appropriate for this project based on the research question. Case studies are common in psychology, sociology, political science, anthropology, social work, business, education, nursing, and community planning (Yin, 2014). In this study, the data collection was accomplished with a questionnaire and interview. Qualitative analysis is more common

and generously used in the literature for most research conducted in Africa because of the scarcity of empirical data for quantitative studies; hence, qualitative methodology was more appropriate for this research study.

Scholars have the option of many case study research approaches, including practice-oriented case study, theory-building case study, and theory-testing case study. For this research, I used a multiple case study, employing semistructured interviews along with observations and examination of internal and external documentation. Because multiple case studies help to explore contemporary phenomena within a real-life context (Yin, 2014), I was able to explore indigenous cultivation of food and agriculture production, adopting a data collection approach to explore whether rice producers were consistent in their use of compelling business practices. Farmers at different levels in the district participated in interviews that were supplemented with observations made while socializing with community leaders and residents in the Afadzato South District Assembly as well as peer-reviewed literature and documentation about the sustainability constraints of smallholder rice farmers.

Population and Sampling

The focus region of this study included communities in Afadzato South District in the Volta Region in the Republic of Ghana. Afadzato South District Assembly is a diverse district assembly in the Volta Region containing 11 traditional areas. It is bounded on the northeast by the Republic of Togo, on the north by Hohoe Municipal Assembly and North Dayi District, on the northwest by Kpando Municipal Assembly, on

the west by the Ho, and on part of the southeast by South Dayi District. Two prominent commercial ventures in the area, Ve-Koleenu Market and Logba Market, attract traders from across the country trading in food and agriculture products. The communities boast of academia, politicians, businesspersons, the rich and the poor, all of whom have knowledge of smallholder rice farmers' problems in the region. This municipal assembly was the focus of the study, and the population and sample were drawn from this region.

When setting up the sample structure, I followed Rosenstock et al.'s (2016) steps concerning target population, sample size parameters of interest, sample frame, and sampling method. The target population in this study consisted of 20 smallholder farmers within the Afadzato South District of Ghana. The selection criteria for participants were their geographic residence and their experience and knowledge of strategies to obtain farm funding. I used homogenous purposive sampling to obtain a sample of successful smallholder rice farmers who demonstrated the most experience with obtaining farm funding and who agreed to participate in the semistructured interviews. Researchers use homogenous purposive sampling to select candidates who share similar traits or specific characteristics that relate to the study topic (Etikan, Musa, & Alkassim, 2016). The sample structure depended on the gravity of the problem based on demographic information about the region (Ghana Statistical Service, 2016). To support the exploratory nature of the study, the sampling frame consisted of nine participants: three from Ve-Golokwati, three from Ve Kolenu, and three from Liati Woti. Use of this sample size allowed me an in-depth inquiry per each participant until all possible questions were exhausted and no new themes emerged.

Ethical Research

I obtained the approval of Walden University's IRB to collect data (approval #06-05-18-0315508). Because it is important to address ethical dilemmas, especially in case study designs (Tallapragada, Eosco, & McComas, 2017), I took steps to ensure ethical protection. For example, all participants in this study were required to complete and sign a consent form upon agreeing to participate, indicating that their participation was voluntary. Participants were able to give permission to audio-record the interview; otherwise, the interview went on unrecorded and field notes were used instead. Furthermore, by using letter codes such as A1 instead of individuals' names throughout the report, I maintained confidentiality of participants' identities. No other person than myself knew participants' responses, which I scanned and stored electronically on a password-protected computer. I will store field notes in a locked file cabinet for 5 years in my residence.

Data Collection Instruments

As the researcher, I was the primary instrument for collecting data in this study. Data collection approaches in qualitative research include methods such as interviews, written documents, and observations (Yin, 2017). The various types of interviews available to researchers include (a) structured interviews, (b) semistructured interviews, and (c) unstructured interviews (McTate & Leffler, 2017). Researchers use semistructured interviews to gain an understanding of participants' views of the phenomenon through follow-up questions (Wethington & McDarby, 2015). I used both a semistructured interview protocol and document review of the MOFA funding strategy

on the strategies smallholder rice farmers use to obtain farm funding as data collection methods. Semistructured, face-to-face interviews allows participants to describe and elaborate on individual experiences, enhancing the richness of the data through the discovery of new themes (McTate & Leffler, 2017; Peters & Halcomb, 2015; Wethington & McDarby 2015). Semistructured interviews allowed me to collect data from experts for insights into the strategies smallholder rice farmers used to obtain farm funding.

The reliability and validity of a case study starts with transcript review (Morse, 2015). Researchers also achieve reliability by ensuring the data collection, analysis, and reporting processes are in line with the study (Yin, 2015). Qualitative researchers maintain focus on the research topic throughout the data collection process to ensure reliability (Flick, 2018; King, Horrocks, & Brooks, 2018). In a multiple case study design, a semistructured interview protocol is essential (Flick, 2018), which I followed, asking the same questions to all nine participants (see Appendix B), for validity and reliability of the study. After the interviews, the responses were transcribed and communicated directly with participants to clarify, validate, and confirm the accuracy of the data collected. To ensure further validity and reliability member checking to ensure credibility of the research (McTate & Leffler, 2017; Wethington & McDarby, 2015).

Data analysis as described by Yin (2017) involves (a) interviewing of participants, (b) transcribing the data collected, (c) analysis and synthesis of interview data, (d) confirmation of accuracy of information by participants, and (e) continued member checking until data saturation and reporting. Archival documents can be used to

triangulate all data through a convergence of the data to make meaningful information and ensure the reliability and validity of the research study (King, Horrocks, & Brooks, 2018). I reviewed the MOFA funding strategy to have an in-depth understanding of the strategies smallholder rice farmers use to obtain farm funding.

Data Collection Technique

Data collection included questionnaires, interviews, and document review from the affected communities and government agencies if available. The data collection techniques were a combination of the three to achieve reliability and validity of the case study. I conducted semistructured, in-depth interviews using open-ended questions to collect data. Although the choice of open-ended questions can be time-consuming sometimes, based on a participant's perspective, the objective was to provide direction to the discussion. The questionnaires were straightforward to establish the problem on the ground. Field notes were reviewed and responses from audio recorder in the final analysis for comparison.

Upon receipt of consent forms, interview appointments were scheduled to discuss and conduct interviews. The interview questions were clear, concise, and open-ended. I aligned interview questions with the research objectives for consistency and information reliability, according to Leung (2015) interview questions should be aligned with research objective for consistency. During the interviews, participants answered initial questions and, if necessary, follow-up questions to clarify thoughts and comments or to provide further insight. Participants were not restricted in addressing each question to

expose participants' detailed viewpoints. Interview sessions were audio-recorded whenever possible and coded to indicate participant numbers alongside detailed notes taken during interviews.

I conducted a thorough field notes review to corroborate evidence from interviews and questionnaires, and reviewed documents such as social amenities policies, Public Utilities Acts, and articles and regulations of natural resources (subject to availability). It is essential for researchers using the qualitative case study design to obtain multiple sources of evidence and different sources of information, construct a case study database, and establish of a chain of evidence (Noble & Smith, 2015; Rispin, Dittmer, McLean, & Wee, 2017). Therefore, this researcher obtained multiple sources of evidence and information, constructed a case study database, and established of a chain of evidence. A pilot study was not necessary for this study. A copy of the interview questions used in the data collection are attached as Appendix A, and the interview protocol used in the data collection is attached as Appendix B.

Data Organization Technique

A semistructured interview and questionnaires were used for the data collection in this study, and was audio-recorded with the permission of the interviewees. Microsoft excel was used to create database to record data collection through questionnaires. Data files were stored and secured with passwords on a computer, and will be kept in a fireproof safe for 5 years after the completion of the study. These secure files will be strictly confidential for 5 years. Detailed field notes were taken as each interview

progressed. The entire interview recordings were transferred onto my personal computer and external data storage device immediately after the interviews, where they will remain secure for at least 5 years. File name combination were created with codes which includes participant's name identification, location and date of the interview to securely save the file.

Data Analysis

Data was reviewed through the experiences of the smallholder rice farmer and the various interview questions. In this case study, a semistrutured interview was recorded, transcribed, coded, and analyzed participants' responses to the interview questions to identified themes and patterns. To ensure the participants adequately expressed their experiences, and data quality the following strategies were adopted, a semistructured interview, audio recording of interview, most suitable and convenient location for the interview, take careful field notes, mindful of incidental data, had a follow up interview and continue maintain confidential link with participants. Data analysis process followed a multi-step procedure for qualitative analysis and interpretation. As Alshenqeeti (2014) recommended, I reviewed the transcribed interviews, questionnaire, and journal notes carefully to obtain an initial understanding of the responses.

Microsoft excel software version 2010 was used to analyzed interview data. Microsoft excel software is a convenient and cost-effective software tool available for simple primary data analysis. Microsoft tools are helpful in interpreting the data and synthesizing the core factors. I explored answers to the research question on the

smallholder rice farmers strategies used by the farmers in Afadzato South District. To further protect the participant's identity alphanumeric coding was used to differentiate significant levels of participants' responses with color-coded keywords and related statements for further analysis (Rosenthal-von der Pütten & Krämer, 2014). Throughout the data analysis, the research question were compared with interview questions for consistency.

Reliability and Validity

Reliability and validity in a qualitative study enriches research rigor and assure that research findings reflect the objectives of the study (Andriopoulos & Slater, 2013). Qualitative studies are highly prone to personal bias, such that there is need to validate the quality and reliability of data (Blum, 2015; McNulty, Zattoni, & Douglas, 2013). I achieved validation by: (1) extending engagement in the field; (2) observing the subjects; (3) taking detailed field notes; (4) audio recording interviews; (5) transcribing interviews; (6) using multiple sources to achieve triangulation; (7) conducting a peer review; (8) conducting external audits of the data; and, (9) addressing the researcher's bias.

According to Mero-Jaffe (2011), by transferring transcripts to the interviewees for review, a researcher can validate the transcripts, preserve research ethics, and empower the interviewees to control data accuracy. Mero-Jaffe noted that interviewees' review of responses allows ratification of contents, maintaining the authenticity of data collected during the interview, and correcting language or making additional clarifications. Qualitative research is a rule-based sequences of data treatment and participant feedback

brings validity, reliability, and credibility to the interpretation process (Schilling, 2017; Thomas, 2017). Where necessary, the researcher should conduct a follow-up interview to ensure reliability and validity of the data interpretations as well as make room for modifications or expansion of the initial interpretations (Qu & Dumay, 2011; Schilling, 2017).

The researcher observed Mero-Jaffe's (2011) recommendations for maintaining the study's validity by taking notes while interviewing, and transcribing all the interviews and validating them with the participants. Findings in a qualitative case study are not generalizable to individuals and places outside the study (Anney, 2014), hence, the concerned was more with internal validity than external validity. In qualitative studies personal bias is critical element during an interview and this was carefully assessed and identified areas of personal bias and sorted these out during interviews and data analysis. To ensure credibility, I interviewed the participants adhering to the interview protocol, and spent adequate time in the interview process to gain a sound understanding of the case and meanings to the research question. A member checking was used to ensure reliability and validity of data; after conducting the interview and transcribing the audio recording, the transcripts were interpreted and share the interpretation with the participants to obtain feedback that may validate the data.

Transferability refers to how well researchers can apply the findings of a study to other studies involving a different population and similar context (Birt, Scott, Cavers, Campbell, & Walter, 2016). The transferability of this qualitative study findings may be

determined by the readers and research users. Member checking and transcript review are two validation techniques used to improve the accuracy, credibility, reliability, and validity of a qualitative study (Birt et al., 2016). Member checking, also known as participant validation, is a technique for exploring the credibility of results (Birt et al., 2016). Member checking is often mentioned as one in a list of validation techniques, where data are returned to participants to check for truthfulness and reverberation with their experiences.

To improve transferability of the study, I provided readers with a rich and detailed presentation of findings that included direct quotes from the participants. Confirming a rich description of the study contents and measures of the study improves the transferability of the data (Hays, Wood, Dahl, & Kirk-Jenkins, 2016). The theory of transferability also produces prospects for further studies and provides a stage for active collaboration among researchers (Löblich (2017) and Hays et al. (2016). An in-depth description of the context of this study was provided that other researchers can consider when they are trying to transfer the research information to other populations. I methodically followed the data collection and analysis techniques proposed for this study, using the interview protocol (Appendix B), and conducted member checking until data saturation reached.

Confirmability here refers to the point to which the study findings are free from bias, objectivity and accuracy of data (Hays et al. (2016). Researchers can enhance confirmability by asking probing follow-up questions during the interviews, member

checking, asking questions from different perspectives, and triangulation (Boddy, 2016). I documented all replications regarding any personal understandings, culture, biases, and explanations that may inform and influence the research process. To ensure confirmability, objectivity was maintained, field notes were kept in a reflective journal. Sutterlüty et al. (2018) explained that confirmability promotes self-awareness of the study process and ensures that the researcher adheres to the research procedure. Data saturation is the point at which participants provide no new themes, ideas, or viewpoints (Sim, Saunders, Waterfield, & Kingstone (2018). Data saturation is the point a researcher has all the relevant information to understand the phenomenon and no new insights emerge even if the number of participants increases (Sutterlüty et al., 2018). Member checking was used until no new information emerged, to ensure data saturation. Sim et al. (2018) used resampling methods to determine the point of data saturation in surveys using open-ended questions.

Transition and Summary

Section 2, the purpose was restated of the research study and discussed the role as the researcher. I presented a description of the proposed research method and design, delineating the reasoning for the selection of a qualitative multiple case study to explore the funding strategies of smallholder rice farmers in Afadzato South District. I discussed the population and sampling, ethical considerations, data collection instruments, and data collection technique and data organization, analysis, and reliability and validity of the data from the proposed study. In Section 3, is the analysis, findings, and interpretation of the data from the study. I also discussed the application of the research to professional

practice, the implications for social change, recommendation for action, suggestions for social change, reflections and concluding statements.

Section 3: Application to Professional Practice and Implications for Change

Introduction

The purpose of this qualitative multiple case study was to explore funding strategies smallholder rice farmers used to obtain farm funding in the Afadzato South District, Ghana. I conducted face-to-face interviews with nine smallholder rice farmers who had successfully obtained farm funding in addition to reviewing research and policies of the MOFA. Data analysis consisted of reading the text of interviews with the participants, noting words that they used frequently and assigning meaning to the derivative thematic expressions. The findings of the study revealed that farm funding was obtained by being members of cooperative associations, rice farmers groups, and unions; meeting the lenders' collateral requirements for farm funding; and having a good loan repayment history and land rentals or land ownership. Increasing agricultural input efficiency can have environmental benefits for both crop and livestock systems (Clark & Tilman, 2017).

This section is comprised of a description of the outcomes from conducting this study. Included are an overview of the study, presentation of the findings, application to professional practice, implications for social change, and recommendations for action and further studies. The section ends with personal reflections and conclusions regarding the findings.

Presentation of the Findings

The central research question of the study was "What strategies do smallholder rice farmers in Afadzato South District use to obtain farm funding?" The general system theory was conceptual framework for this doctoral study. In this section, I discuss the participants' responses, the process of data analysis with Microsoft Excel, emergent themes, and the conclusions that enabled me to address the central research question. This research study consisted of a multiple case study of three rice farming communities, which involved semistructured interviews of the nine participants and review of Ghana government support documents for smallholder rice farmer through MOFA. The participants' responses were analyzed as detailed in the following sections starting with the demographic information followed by responses in the order of interview questions.

Participants' Demographic Information

I conducted interviews in three locations in Afadzato South District. The three locations were selected because there are more successful smallholder rice farmers in these locations. The average age of the nine participants interviewed was 42; the oldest participant was 60, and the youngest was 28 years old (see Table 2). Of the nine interviewees, eight (89%) were male, and one (11%) was female. All the participants had been farming for at least 5 years, and all had been rice farmers for at least 5 years. More than half (55%) had been farming for less than 10 years, whereas just under half (45%) had been farming for 10-30 years. Six interviewees (67%) had been rice farmers for fewer than 10 years, and three (33%) had been rice farmers for 10-15 years.

TABLE 2

INTERVIEWEES' DEMOGRAPHIC INFORMATION

Code name	Location	Age	Gender	Number of years farming	Number of years as a rice farmer
A1	Ve Kolenu	45	M	10	7
A2	Ve Kolenu	46	M	5	5
A3	Ve Kolenu	28	M	5	5
B1	Ve Golokwati	60	M	30	15
B2	Ve Golokwati	44	M	5	5
B3	Ve Golokwati	38	M	7	5
C1	Liati Woti	53	M	20	10
C2	Liati Woti	37	M	5	5
C3	Liati Woti	32	F	15	15

Funding Strategies for Small-Scale Rice Farmers in Afadzato South District

The first theme was that smallholder farmer membership in a cooperative organization is a strategy to obtain funding. The participants identified seven traditional sources of funding for their farming operations in response to the interview question "What traditional farm funding strategies are available for smallholder rice farmers in Afadzato South District?" Loans from established lenders such as Plan Ghana (a nongovernment organization) and banks via regular and microfinance vehicles were reported by almost four-fifths of the respondents (78%, $n = 7$). Slightly more than half of the respondents (55%, $n = 5$) identified nonmonetary district support in the form of land

rentals, help from technical officers, or seedlings, fertilizer, and other agricultural credits. One-third of the participants (33%, *n* = 3) identified friends and family or cooperative groups as traditional sources of funding, and one-tenth (11%, *n* = 1) reported personal savings or credit unions.

All the participants responded that the strategies were "successful" or "very successful" in response to the interview question "How successful are the traditional farm funding strategies for smallholder rice farmers?" Nearly one-half (44%, *n* = 4) did not elaborate on their response. Slightly more than one-half (55%, *n* = 5) qualified their response. Two interviewees (A1 and B1) specified that the loans to farmers are successful, becoming emotional and showing excitement on their faces. Participants A1 and B1 said that they have been educating other farmers to join the association and take advantage of the benefits.

Successful strategies for obtaining nontraditional farm funding. This section includes the successful farm funding strategies that participants identified; all nine participants noted at least one strategy. Nearly half (44%, *n* = 4) identified Plan Ghana loans/credit plans or personal savings. One-fifth (22%, *n* = 2) listed friends and family, and one-tenth (11%, *n* = 1) listed a strong credit history or District Assembly credit for seeds and fertilizer as successful funding strategies. Table 3 shows the successful farm funding strategies that each participant identified. As Table 3 shows, one-third of respondents (33%, *n* = 3) noted two successful funding strategies. Both B3 and C2 cited

personal savings and friends and family, whereas C1 cited personal savings and District Assembly credit for seeds and fertilizer.

TABLE 3

SUCCESSFUL FARM FUNDING STRATEGIES

	A1	A2	A3	B1	B2	B3	C1	C2	C3
Funding Strategy									
Plan Ghana loan/credit	X	X	X						X
Personal savings					X	X	X	X	
Friends and family						X		X	
Strong credit/ farming history*				X					
District Assembly credit (seeds & fertilizer)							X		

Note. ***** Bank accounts history, payback history, keeping of successful farms, farm and land inspections

Participants' responses further support the data in Table 3. For example, Participant C2 said, "It is helpful to the farmers who are not in any group or co-operative says." The nontraditional farm funding was beneficial to the farmers to be able to farm and have food to feed their family. According to A3, "borrowing the seedlings helps [one] to farm successful[ly] and pay for the seedlings after harvest and sometimes gives the farmer the flexibility to pay back in installments." Participant C3 elaborated that the strategy was successful and "it help[s] farmers get some of [the] funding for their farms without going through the process of collateral requirements." Participant B3 confirmed that "the strategies [are] very successful and help farmers to produce more crops, increase

their farm size, and have funds on hand to operate their farming activities." Participant C1 observed that the nontraditional funding strategies help those who are not able to get a bank or credit union loan due to collateral and other lending requirements.

Available strategies to smallholder rice farmers in obtaining nontraditional funding. This section includes the nontraditional sources of farm funding that participants identified in response to interview question "What strategies are available to smallholder rice farmers in obtaining nontraditional funding?" Almost nine-tenths (89%, *n* = 8) of respondents mentioned land rental as a source of funding, whereas almost eight-tenths (78%, *n* = 7) listed rice buyers/market women credit or loan. One-third of participants (33%, *n* = 3) identified farm input credit in the form of seeds, seedlings, fertilizer, boots, or farming tools. Last, one-fifth (22%, *n* = 2) mentioned farm lease or borrowing from family and friends as nontraditional sources of farm funding.

As shown in Table 4, all the participants identified at least two nontraditional sources of farm funding. Two-thirds of the respondents (66%, *n* = 6) named land rental and rice buyers/market women credit or loan as two of their nontraditional sources. Nearly half of the participants (44%, *n* = 4) mentioned three sources of funding, and just over half (55%, *n* = 5) mentioned two sources.

TABLE 4

NONTRADITIONAL SOURCES OF FARM FUNDING

Funding Source	A1	A2	A3	B1	B2	B3	C1	C2	C3

Land rental	X	X	X	X		X	X	X	X
Rice buyers/Market women credit or loan	X	X			X	X	X	X	X
Farm input credit (seeds, seedlings, fertilizer, boots, farming tools)			X	X				X	
Farm lease	X						X		
Borrowing from family and friends					X				X

State Policy Support for Smallholder Rice Farmers in Afadzato South District

Eight of the nine participants (89%) indicated the District Assembly was the supporting body that provided policies for successful farm funding strategies. All eight participants indicated that the state policies support successful farm funding strategies for smallholder rice farmers in Afadzato South District in the form of agricultural input supports that the government of Ghana provides through the District Assembly to the farmers on credit bases, which helps the farmers have access to fertilizer seedlings and weed killers on time. This finding is supported by documents reviewed from the secondary source indicating that MOFA provided support for the smallholder rice farmers by providing short-term production credit for rice production groups (for seed, fertilizers and agro-chemicals), inventory credit for rice trader groups (to purchase paddy), ,edium-term equipment credit for rice production (power tillers, rice reapers, rice threshers), and rice processors (improved rice mills, storage sheds, digital moisture meters; MOFA, 2016).

Almost four-fifths (78%, *n* = 7) of the participants stated that fertilizers were a successful farm strategy supported by the state. Two-thirds of respondents (67%, *n* = 6) asserted that some form of credit, installment plan, or post-harvest payment was also a successful strategy. The next most frequently mentioned strategies (55%, *n* = 5) were seeds and assistance from technical officers or farm supervisors. Building a strategic axis by linking smallholder farmers to agribusinesses to enhance pro-poor growth through the value chain investment approach, the MOFA formed viable farmer-based organizations with gender equity to enhance the knowledge, skills, and access to resources along the value chain as well as for stronger bargaining power in marketing (MOFA, 2016). Slightly fewer than half the respondents (44%, *n* = 4) noted that agriculture/farm inputs were a successful strategy; similarly, one-third (33%, *n* = 3) listed a discounted rate for seeds, etc. Approximately one-fifth of the interviewees (22%, *n* = 2) mentioned tractors or harvesters as successful state-supported funding strategies. Finally, about one-tenth of participants (11%, *n* = 1) listed weed killers or loans as successful strategies.

Table 5 illustrates the breakdown of participants' identification of successful state-supported farm funding strategies. One participant each (11% each; 55% total, *n* = 5), listed one, two, three, four, or six strategies, respectively. The largest group—nearly half of the respondents—mentioned five strategies (44%, *n* = 4).

TABLE 5

SUCCESSFUL STATE-SUPPORTED FARM FUNDING STRATEGIES

	A1	A2	A3	B1	B2	B3	C1	C2	C3

Funding Strategy									
Fertilizers		X		X	X	X	X	X	X
Credit/Installment Plan/Payment after Harvest	X	X		X	X			X	X
Seeds		X		X		X	X		X
Technical Officers/Farm Supervisors		X	X				X	X	X
Agriculture/Farm inputs	X					X	X	X	
Discounted rate for seeds, etc.					X			X	X
Tractors		X		X					
Harvesters							X		X
Weed killers						X			
Loans				X					

Collateral Strategies for Smallholder Rice Farmers

This section presents the successful collateral strategies identified by participants in response to interview question "What are successful collateral strategies for smallholder rice farmers in obtaining farm funding?" Of note, one interviewee did not answer this question. The most frequently mentioned strategy, farmland, was named by three-quarters of respondents (75%, $n = 6$), followed by membership in a group, union, or cooperative organization (62.5%, $n = 5$). A house was listed by a little over one-third of participants (37.5%, $n = 3$). Existing farms were named as successful collateral strategies by one-quarter of the interviewees (25%, $n = 2$), and one person (12.5%) mentioned personal finance or credit history.

Table 6 illustrates the breakdown of participants' identification of successful collateral strategies. Two participants (25% or 12.5% each) listed two or five strategies, respectively. Two respondents (25%) named three strategies. The largest group—one-half of the respondents—mentioned one strategy (50%, *n* = 4). Those who listed one strategy were evenly split between farmland and group membership.

TABLE 6

SUCCESSFUL COLLATERAL STRATEGIES

Collateral Strategy	A2	A3	B1	B2	B3	C1	C2	C3
Farmland	X		X	X	X	X	X	
Membership in group/union/association/ cooperative organization	X	X				X	X	X
House					X	X	X	
Existing farms					X	X		
Personal finance/ credit history						X		

Benefits of Membership in Cooperative Organizations

This section provides the successful cooperative organization strategies participants identified for obtaining farm funding in response to the question "What are

successful strategies aiding cooperative rice farmers in obtaining farm funding?" Two-thirds of the interviewees (67%, *n* = 6) stated that membership guarantees loans to farmers. Nearly one-half of the participants (44%, *n* = 4) noted that members get a secure loan without the need for collateral. One-fifth of the respondents (22%, *n* = 2) said that loans are granted without delay, and one-tenth of the interviewees (11%, *n* = 1) added that farming inputs are provided without delay.

Table 7 illustrates the breakdown of interviewees' responses to interview question. Nearly half of the respondents (44%, *n* = 4) identified two successful cooperative organization strategies for obtaining farm funding, whereas just over half (55%, *n* = 5) identified one strategy. Of the five participants who identified one strategy, four of these (80%) chose the most-often mentioned option: membership guarantees loans to farmers. The fifth participant in this group chose the next-often-mentioned option, which was that members are given secure loans without collateral (see Table 7).

TABLE 7

PARTICIPANTS' IDENTIFICATION OF SUCCESSFUL COOPERATIVE/ASSOCIATION FARM FUNDING STRATEGIES

	A1	A2	A3	B1	B2	B3	C1	C2	C3
Cooperative/Association Funding Strategy									
Membership guarantees loan to farmers.	X	X	X		X		X	X	
Members get secure loan without collateral.		X				X		X	X

Loan is granted without delay.	X	X	
Farming inputs are provided without delay.	X		

Payback Strategies for Smallholder Rice Farmers

The payback strategies available for smallholder rice farmers are described in this section. All interviewees mentioned after-harvest payback as a payback strategy. Slightly over half of the respondents (55%, *n* = 5) listed installment payments as a strategy, and one-fifth (22%, *n* = 2) noted use of crops as a payment option.

Table 8 shows the distribution of participants' responses to payback strategies available for smallholder rice farmers. One respondent (11%) mentioned all three payback strategies,and three respondents (33%) mentioned only one. Most interviewees—over one-half (55%, *n* = 5)—mentioned two payback strategies. Of this group, four listed after-harvest payback and installment payments as their two strategies, whereas the fifth listed after-harvest payback and use of crops as payment (Table 8).

TABLE 8

PAYBACK STRATEGIES

Payback Strategy	A1	A2	A3	B1	B2	B3	C1	C2	C3
After-harvest payback	X	X	X	X	X	X	X	X	X

Installment payments	X		X	X	X	X
Use of crops (rice) as payment	X	X				

Additional Topics Not Addressed

The final research question allowed participants to bring up additional topics that we had not addressed so far. The majority of these, whether stated explicitly or inferred, related to the farmers' unmet needs. For example, the topic "lack of irrigation (dams) to supply water" implies a need for better irrigation systems. This section includes the items of interest or concern to respondents. The two topics mentioned most frequently were the need for ready-market availability and the need for farm machinery and farm tools; two-thirds of participants (67%, $n = 6$) brought these up. Lack of ready-market availability refers to the farmers' limited access to sell their produce shortly after it is harvested. The local markets are only open one day a week (every Tuesday), and the farmers do not have storage facilities in which to keep their produce fresh. The buyers come from the cities and show up only on market day.

Regarding farm machinery, respondents specified that they need tractors, combine harvesters, and power tillers. Farm machinery in Ghana is very expensive, priced at over one hundred thousand U.S. dollars ($100,000). The cost of acquisition is the number-one problem and the cost of maintenance is also a factor, but the proceeds from rentals can cover the cost of maintenance and fuel when it is managed properly. Nearly half of the

interviewees (44%, *n* = 4) listed post-harvest loss prevention as a concern. This topic is tied in with the first two because: (a) the farmers lack storage facilities to protect their produce from the elements. Timing is critical in rice farming; unlike other crops, one week hold time for rice harvest will create substantial loss.

After harvest, if the produce is not sold immediately, loss is created from rain damage or other weather-related conditions; this was a problem due to lack of secure storage facilities. And (b) the machinery prevents post-harvest loss. When the harvester is used in harvesting rice, there is no waste and it takes just about 5 hours to harvest, process, and bag. In contrast, using manual labor, the same acreage takes over a week to harvest and process, which turns out to be more expensive than using machinery. Three of the four participants who brought up this topic also listed the first two, so these topics are most likely related.

At first glance, the remaining topics appeared unrelated and scattered among a small percentage of participants. Upon closer inspection, however, the relationships are clearer. For example, one-fifth of respondents (22%, *n* = 2) expressed concern about weather conditions/ rainfall patterns, while one-fifth (22%, *n* = 2) mentioned the need for bore holes to supplement rainfall, and one-tenth (11%, *n* = 1) noted a lack of irrigation to supply water. Table 9 reveals that these statistics coalesce into three people, or one-third of the respondents, who expressed concern about adequate water for crops. A similar example appears in the one-fifth of respondents who mentioned high labor costs (22%, *n* = 2) and the one-tenth of respondents who cited pricing concerns (11%, *n* = 1), rental fees

(11%, *n* = 1), and the need for land (11%, *n* = 1) as well as a loan to prepare the land (11%, N = 1). As mentioned earlier, these concerns were raised by three people, or one-third of the participants, who were interested in money-related issues.

Note that C3 did list all three of the water/weather-related items in the first example above. Moreover, B2 said he needed land, rental fees, and a loan to prepare the land in the second example. However, the fact that they were joined by two other participants who were concerned about at least one of the same issues increases the overall percentage for the topics of concern.

TABLE 9

PARTICIPANTS' IDENTIFIED ADDITIONAL TOPICS

Topic	A1	A2	A3	B1	B2	B3	C1	C2	C3
Ready-market availability	X	X	X			X	X	X	
Need farm machinery (tractors, combine harvesters, power tillers) & farm tools	X	X	X	X			X	X	
Post-harvest loss prevention	X	X		X				X	
Weather conditions/rainfall patterns							X		X
High labor costs						X		X	
Need bore holes to supplement rainfall.				X					X
Need more technical officers to support the farmers.		X							
Pricing						X			
Lack of irrigation (dams) to supply water.									X

Need land	X
Need rental fees	X
Need initial loan to prepare the land.	X

This section was about the farmers' needs at the beginning of the farming season. Land ownership is by family or clan. Some family land is not fertile for rice farming, so to grow rice the farmers must lease or rent land from other family members. The farmers take out loans from various sources to pay for their initial costs. Access to alternative option can give families an important sense of security (Makate, Wang, Makate, & Mango, 2016; Wan, Li, Wang, Liu, & Chen, 2016), allowing farmers to remain in farming, instead of migrating to urban areas (Ward & Ruckstuhl, 2017). The farmer's income options, thus providing families with income and food security during the off-season or in cases of crop failure (Wan et al., 2016). According to Altieri et al. (2015), agroecological techniques are found to be key to successful adaptation by smallholders. However, Davies et al. (2018) stated that the most prevalent changes overall were in farm productivity and technical knowledge of producers.

Emergent Themes

The participant's responses to the interview question revealed new information that my literature review did not contain. The new information was smallholder rice farmers' accessibility to bore holes, availability of ready markets for the produce at favorable prices, the need for combine harvesters to prevent harvest loss, and the education of farmers through the Ministry of Food and Agricultural Extension officers on

the scientific method of rice farming. MOFA in Ghana, is promoting the smallholder farmer, drives its policy to serve as a core investment for value chain development in Ghana, and aligns parallel financing to complement (MOFA, 2016).

The farm funding information made available to me through participants' interviews included the following topics: (a) land rentals, (b) smallholder rice farmers' group membership benefits from cooperative associations, (c) lenders' collateral requirements for farm funding, and (d) loan repayment history benefits.

Land rentals: smallholder rice farmers who do not have their own rice fields (land) rent rice fields each farming season to farm, this practice is the direction reflection of literature reviewed, cost associated with land acquisition and the farming inputs (Bell et al., 2015). Land acquisition support for smallholder farmers and rice processors: the MOFA through its technical field officers (the Extension officers) assist farmers having ownership of lowlands that require development, identified site availability and suitability of land for rice production, availability of water, land use and ownership or tenure situation, willingness of farmers and community to participate. Lowlands to be assessed through local stakeholder (farmers, chiefs and land owners, and District Assemblies) participatory methodologies. MOFA support the farmers in land development, capacity building, literacy classes, and extension services and technical support for rice processing (MOFA, 2016).

Benefits of cooperative association: smallholder rice farmers' group membership benefits the members in accessing farm funding without the bottleneck of collateral, as

the cooperative associations signs as guarantors for the members. The government of Ghana through MOFA provides credit for crop development to production, inventory and equipment credit to rice farmers, traders and processors. Seed growers were supported with credit to produce rice seed seedlings of jasmine and sikamo. Production groups, marketing groups, miller/processor groups, were formed to facilitate access to credit for the stakeholders involved in the rice value chain and institutional capacity development in credit service delivery and capacity building for the stakeholders through support organizations (MOFA, 2016). However, Davies et al. (2018) argued that the most prevalent changes overall were in farm productivity and technical knowledge of producers. Farmers in cooperatives recognize the importance of connecting technical, social and economic dimensions of farming practice and provide corresponding services (Yang et al., 2014).

Lenders' collateral requirements: Lending institutions demand collateral from the borrowers which were major challenges for the smallholder rice farmers, who can barely make a living out of their farming (Awotide et al., 2016). As part of Ghana government's efforts to increase and improve the quality of locally-produced rice, the government sourced for a concessional loan to support rice farmers in the country to improve food security and contribute to poverty-reduction through enhanced access to high yielding Nerica upland rice varieties. The community seed multiplication system approach was used to ensure that farmers have easy access to quality seed in sufficient quantities at the right time (MOFA, 2016).

Loan repayment benefit: a good loan payback demonstrates the ability to payback future loans. The payback history was the risk indicators to the lending institutions this was revealed in the literature (Prager et al., 2016). It is essential for the government and non-governmental organizations to promote education and cooperative membership among farmers to improve smallholder farmers' access to credit. Researchers revealed that membership of cooperative farmers group was found to increase the farmer's access to credit by 31 percent and having a guarantor18 percent, however, the likelihood of credit access decreases with availability of collateral by 12 percent (Assogba et al., 2017).

Smallholder farmers face numerous challenges due to the costs associated with accessing information, complying with market requirements, and negotiating and managing the contractual arrangements (Poulton et al., 2010; Wiggins et al., 2010). Smallholder farmers are highly heterogeneous, repeated patterns emerge among their farm systems, strategies, constraints, and aspirations (Giller et al., 2011). Leonardo et al. (2015) stated that, while it is impossible to develop interventions for every single farm, the typologies are further used to gain insight into farmers' goals, priorities, and drivers of livelihood strategies that can guide interventions and policies to link farmers to agricultural markets.

The main challenge of farming systems is how decisions are made in relation to resource allocation (Giller, 2013). Less resourceful farmers may find opportunities for livelihood improvement in social promotion interventions, whereas for more resourceful farmers, agricultural markets may be the appropriate avenue (Leonardo et al., 2015).

Smallholder farmers are squeezed out of value chains that require large volumes; in these situations, collective action can help smallholder farmers to achieve scale, improve bargaining power, and benefit from new market opportunities (Cramb et al., 2017). Smallholder farmers struggle to pay for independent advisory services to access knowledge from distant sources for diversification, whereas formal advisors were perceived to lack credible production knowledge. As Cramb et al. observed, there is a need for measures beyond collective action that address the immediate selling of products by these farmers when market prices are low. Small-scale farmers seek formal advice primarily to access subsidies and use social capital to access tacit knowledge for production (Nettle et al., 2017).

Smallholder farmers tend to earn less profit on investment and sometimes show a loss instead (Glover & Reay, 2015). Cost-effective farming strategies provide smallholder farming families with a way of countering the increasingly threatening situation of limited production quotas, decreasing prices, the high cost of land, and the obligation to farm in a more environmentally sound way (Glover & Reay, 2015). The efficiency before-and-after harvest services are essential if smallholder farmers in high potential areas are to intensify production, to face the growing population pressure and climate change, to contribute to economic growth and reduce poverty (Kilelu et al., 2017). The difficulties that smallholder farmers face in accessing services indicate how incentives for commercial delivery of services to smallholder farmers differ between staple food, traditional cash crop, and high value product supply chains (Prager et al., 2016). The measures taken to stimulate the rural non-farm economy and provide jobs for

those leaving farming; a favorable rural investment climate, provision of public goods, and institutional development are largely the same as those for agricultural development as well (Warner et al., 2015). In Ghana, MOFA advocates to improve rural infrastructure, strongly promotes out grower-nucleus farmer linkage as a way of improving smallholders' access to credit. In addition, provides an improved planting material, extension on improved agronomic practices, and capacity to expand farm size per smallholder (MOFA, 2016).

Smallholder farmers can have a significant effect on rural economic development and social harmony, especially in geographically remote regions where they are a vital source of employment in the community (Galdeano-Gómez et al., 2016). Smallholder farmers provide a critical infrastructure for economic activity and wealth creation (Spigel, 2017). Considerable variations exist in the strategies of smallholder farmers: each smallholder farmer holds different preferences, interests, and environmental assessments that transform into a range of exploits, particularly when passing the smallholder farm to the next generation (Mills et al., 2017). Some scholars suggest that reducing costs has become the prevailing strategy practice by many smallholder farmers (Altieri et al., 2015).

Cooperative membership has a positive and statistically significant impact on apple price, gross income, farm profit, and return on investment (Ma & Abdulai, 2017). The MOFA recruits consultants to build capacity for the farmers' associations over a two-year period created and strengthened farmers association groups, in order to achieve

the objectives of supporting and promoting successful and formidable farmers association groups (MOFA, 2016). There should be a deliberate policy to ensure easy access to loans at soft interest rates, while agricultural extension education on loan acquisition should be intensified (Ma & Abdulai, 2017). Awotide et al. (2016) recommended that formation of associations among rural farmers should be encouraged. Access to seed and information about improved rice varieties are also essential to increase the intensity of their adoption., programs to improve contact with extension agents, increase access to credit, raise educational background, and enlarge the area devoted to cultivating improved rice varieties are the factors to promote to increase market participation and improve the welfare of rural households (Awotide et al., 2016). According to Yang et al. (2014), farmers in cooperatives recognize the importance of connecting technical, social and economic dimensions of farming practice and provide corresponding services to link farmers to relevant actors, like extension agencies, research institutes, and supermarkets. Smallholder rice farmers' size and diversity might allow the emergence of institutional arrangements that can overcome social dilemma situations and demotivation emanating from customary privileges and exemptions and better use of Africa's irrigation potential (Totin et al., 2014).

In Hongdong, South Korea, findings of a case study conducted by Suh (2015) indicated that organic rice farmers used communitarian cooperative organic farming, a collective organic farming model, which has been communally executed by smallholder rice farmers there since 1994. The residents of Hongdong have demonstrated that communitarianism and smallholder cooperatives can work for each other

complementarily and therefore that communitarian organic farming through smallholder cooperatives is highly operational (Suh, 2015). Yang et al. (2014) drew from the rapidly emerging farmer cooperative field in China with three cases to cross-check findings, and used innovation journey analysis within each case to investigate farmer cooperative engagement in innovation processes. Farmers in cooperatives recognize the importance of connecting technical, social and economic dimensions of farming practice and provide corresponding services to link farmers to relevant actors, like extension agencies, research institutes, and supermarkets (Yang et al., 2014).

In Kampot, Cambodia, the smallholder farmers in the villagers' coordinated action for effective institutional performance of common pooled resource governance included social and environmental dimensions, which are necessary for achieving transformations toward more sustainable economic activity (Scheidel & Farrell, 2015). The adoption of small-scale cooperative banking guaranteed improved ecological and social impacts. This finance model could play a supporting role in enhancing the potential of smallholder farming communities to improve their farming activities (Scheidel & Farrell, 2015).

The foundational elements of GST was relevant to this study because of the essential inputs resources that the system requires to produce outputs which includes primary goods and services produced by the system that are desired and valued by customers, and provide remuneration for workers. Findings of the study were that the smallholder rice farmers obtained farm funding if they were members of cooperative

associations, met the lenders' collateral requirements for farm funding, farming loan repayment history and land rentals or ownership. The elements equally provided a successful learning strategy for the community lending institutions and as guide to smallholder rice farmers in obtaining farm funding in the study area. This successfully enhanced the system of farm funding and curbing the farmers' funding difficulties toward their farming activities.

The capabilities and limitations of agricultural systems contribution from multiple disciplines have made major advances relevant to a wide range of agricultural system (Jones et al., 2017). Although current agricultural systems models have features that are needed for the use cases, found that all of them have limitations and need to be improved (Jones et al., 2017). Understanding alternative agricultural production systems, agricultural input efficiency, and food choice drive environmental degradation is necessary for reducing agriculture's environmental impacts (Clark & Tilman, 2017).

Jones et al. (2017) identified common limitations across all use cases, such as a scarcity of data for developing, evaluating, and applying agricultural system and inadequate knowledge systems that effectively communicate model results to society. Jones et al. (2017), argued that these limitations are greater obstacles to progress than gaps in conceptual theory or available methods for using system models. This provide a useful framework for considering capabilities and limitations of existing models and data. The accessibility of farm funding to the smallholder rice farmers in the Afadzoto South District helped to retain more farmers in these communities. Successful accessibility of

farm funding to the smallholder rice farmers led to increases in farm sizes and higher yields. Consistently, the fundamental elements helped to increase the farm funding investment options for the smallholder rice farmers, created jobs, and increased rice production in the Afadzato South District.

Applications to Professional Practice

Access to farm funding is one of the most significant challenges facing smallholder farmers in developing countries, including Ghana (Inusah et al., 2015). Several scholars argued that credit is paramount in agriculture production; hence, it is imperative to analyze the factors that limit farmers from access to funding (Denkyirah et al., 2016). This research data was collected through face-to-face interviews with smallholder rice farmers who successfully used farm funding strategies for their farming activities in Afadzato South District, and review of the research, reports, and policies of the MOFA. The study unveiled funding strategies available to smallholder rice farmers in this region. However, the smallholder farmers must satisfy the prevailing farm funding conditions: they must meet the collateral requirements, be a member of cooperative associations and demonstrate good repayment history to qualify. The participants in this study do not have difficulty in accessing farm funding. Farm funding was available to smallholder rice farmers as they turn to support each other by reminding each other of on-time payback. The findings from this study might serve as a pilot study for a larger project for imparting to smallholder rice farmers the strategies for farm funding in Afadzato South District. Increased farm output might lead to poverty reduction, self-

sufficiency, and hunger prevention. These outcomes might add to the knowledge of partners and stakeholders when deliberating on aligning farm funding inadequacies.

Additionally, these findings might influence policy makers in Ghana and other parts of the world. The findings from this research will afford business leaders insight into how to evaluate the suitability of their rebranding smallholder farm funding image regarding the perception payback. Cooperatives could promote efficient usage of production inputs among members (Ma, Renwick, Yuan, & Ratna, 2018). The impact of smallholder rice farm funding strategies may be realized in the long run with continuous use of the knowledge acquired from the smallholder rice farmers funding strategies. The provision of credit enhances the timely purchase and efficient allocation of farming inputs to produce the maximum possible output (Martey, Wiredu, Etwire, & Kuwornu, 2019). The cost of executing the findings of this study may be minimal compared social and economic benefits of sustaining and retaining the economically stout population of smallholder farmers and rural families. Smallholder rice farmers funding strategies improved efficiency by providing easy access to productive inputs and rooted support services such as co-operative membership. Production credit impacts positively on smallholder farmers' technical efficacy (Martey et al., 2019).

Organizations with a large pool of funding smallholder farmers tend to have a long-term competitive advantage over their competition and are more likely to sustain their profitability over a more extended period (Abdul-Rahaman, & Abdulai, 2018).Through applying the strategies identified in this study, smallholder rice farmers

association/ group or cooperative enhanced farmers funding strategy, and enhanced service delivery credibility, business leaders may improve the business performance and long-term sustainability of their organization.

Implications for Social Change

The implications for social change included the potential for this exploratory multiple case study to lead to an enhanced perception of farm funding essentials by the smallholder rice farmers in Afadzato South District. Significant increase in farm sizes and yields revealed some increases in efficiency in the production process. Increasing the number of farm funding adequacies in the farm production process might lead to retaining more smallholder rice farmers to cultivate rice in the study area. Improved farm funding strategies might benefit the smallholder rice farmers in the study by allowing them to generate private investments, improve employment, and increase food production above the subsistence level. When the smallholder rice farmers have increased farm yields, this might lead to reliable enough income to reduce poverty and increase security for farm families in the study area. These efforts might enable the smallholder rice farmers to contribute to the commercialization of food production initiatives and the agricultural growth of Afadzato South District as well as the entire nation.

Recommendations for Action

The smallholder farmer interviews suggested that farm funding sources are essential to the farmers' sustainability. All the participants interviewed expressed their dependence upon some type of farm funding to enable them to continue their farming

activities. Smallholder rice farmers were the main target of the findings of this study and they are most likely to benefit from the study. The findings of this study suggested that an increase in productivity occurs when smallholder rice farmers use farm funding. The barrier preventing smallholder farmers' access to farming funding is lack of successful strategies. A lack of knowledge about successful farm funding strategies available to the smallholder rice farmers in their community are barriers to them choosing to use a successful farm funding strategy.

Ghana's government, through the District Assembly, intensified its support for the smallholder farmers. The government of Ghana should stipulate a special interest rate for smallholder farmers. Furthermore, loans to smallholder farmers should be streamlined such that the "collateral bottleneck" is reduced. Findings from my research revealed that smallholder farmers received farm funding through a cooperative's membership without collateral requirement from the lenders. I recommend that the other smallholder rice farmers should emulate and join cooperative associations to avoid collateral requirement demanded by the funding institutions. I further recommend that the government of Ghana, in collaboration with the funding intuitions, private sector, and smallholder farmers, should come out with a strategic system to mitigate the funding deficiencies. This recommendation is aligned with Liu et al.'s (2015) study, which signified the systems integration holistic approaches to integrating various components of human and natural systems. A strategic system of funding smallholder rice farmers that will attract private investment will increase food production and create more employment.

The results of this study are useful to the smallholder rice farmers in Afadzato South District, Ghana's government, academicians, private investors, and entrepreneurs in sub-Saharan Africa. The participants in this study each received a copy of the results. Globally, the results will be accessed through the Walden University Library database. I will present the findings to Afadzato South District Assembly, Volta Regional Administration and Ghana library board. I will also present the study findings through MOFA training seminars. I will also make further presentation of the findings through conferences and seminars organized by the Ghana Private Sector Investment Promotion Center.

Recommendations for Further Research

The research of funding strategies for smallholder rice farmers in Afadzato South District is esteemed because it might aid to an increase in farming output. These research findings were wholly for the Afadzato South District, and the participants for the study were not necessarily representative of all smallholder rice farmers in Ghana. Future studies may be conducted in the other rice-growing districts of Ghana and across sub-Saharan Africa and elsewhere to explore successful farm funding strategies. Conducting the same study in the other districts and regions, or even extending to smallholder farmers who cultivate similar food crops, such as maize, yams, or beans would be relevant. This research finding could be tremendously beneficial to those participants included in the study and be replicated in other districts and regions at large.

Conducting a future similar study on one specific successful farm funding strategy such as cooperative associations, market women or small farmers group would be pertinent and would enlarge our information on successful farm funding strategies. However, comparative studies would be predominately worthwhile for comparing districts and regions or even specific types of farming experiences. The participants' responses from the interviews indicated the need for support in the area of more technical officers, combine harvesters, post-harvest loss, and ready markets, which are all credible areas for future studies. Future researchers could explore why some smallholder rice farmers who successfully used the farm funding strategies did not expand their farm sizes to increase output.

This study did not include all types of successful farm funding strategies; hence, my recommendation is to conduct a similar study to explore those strategies not included in this study. The findings from this study are based on the raw data from the face-to-face interview data findings. I recommend that researchers conducting future studies on the subject consult the District Assembly technical and finance officers, as they were invaluable in this study. Finally, it is recommended that researchers continue to conduct studies that are supportive to marginalized groups to inspire social change and improved quality of life for those individuals.

Reflections

Throughout the studies the perceptions and experiences of nine smallholder rice farmers' strategies of obtaining farm funding in the Afadzato South District of Ghana

was explored. I set aside all personal biases and relied on the participants' responses to understand their experiences and insights empirically. During the research process, I strictly held to the protocols established in my IRB application. The participants reviewed the transcripts for accuracy and confirmed those were the true reflections of their responses. The participants cooperated with me, and provided pertinent information on the subject of study without any due anticipation of obtaining gifts and money or any form of compensation from the lenders or me. My participants' availability was wholesome, and they appeared excited throughout the interviewing process.

Conversely, the responses from participants revealed new information that my literature review did not contain. The new information was smallholder rice farmers' accessibility to bore holes, availability of ready markets for the produce at favorable prices, the need for combine harvester to prevent harvest loss, and the education of farmers through the Ministry of Food and Agricultural Extension officers on the scientific method of rice farming. The farm funding information made available to me through my interviews included: (1) land rentals, (2) smallholder rice farmers' group membership benefits from cooperative associations, (3) the collateral requirements for farm funding by the lenders, and (4) loan repayment history benefits.

Conclusion

Face-to-face interviews were conducted in three communities with three participants from each community, making a total of nine participants to explore individual views regarding funding needs of the smallholder rice farmers in Afadzato

South District. The second source of data was obtained through the review of the research, reports, and policies of the Ghana MOFA. Four themes emerged from the interviews: (a) land rentals or acquisition, (b) cooperative or group membership, (c) collateral requirements for getting farm funding, and (d) loan repayment history (credit history). Funding needs of smallholder rice farmers were more essential in the rural communities because productivity depends upon the amount of funding available to the farmers. The informal source of credit was characterized with a higher interest rate, while the source formal credit was relatively low, but there were numerous bottlenecks associated with obtaining formal credit by the smallholder rice farmers.

The participants identified informal sources of credit to smallholder farmers as family or friends, money lenders, produce buyers and farmers' cooperatives, while the formal sources of credit were the rural bank, microfinance banks, and commercial bank. The government of Ghana through the District Assembly have adopted credit policies to ensure availability and accessibility of credit to enhance rural farming, such as providing farming inputs like fertilizers, seeds, weed killers, and equipment rental on a credit basis. In conclusion, I strongly recommend that smallholder rice farmers join the cooperative and other associations or groups for successful farm funding strategies.

The study outcomes might provide a better perspective to aid the policy makers, private sector, business financiers, and other stakeholders. The understanding of these findings might lead to new strategies that will promote the funding needs of smallholder

rice farmers in Afadzato South District of Ghana and elsewhere. The study may also expand the existing literature on smallholder rice farmers' farm funding knowledge.

References

Abate, G. T., Francesconi, G. N., & Getnet, K. (2013). Impact of agricultural cooperatives on smallholders' technical efficiency: Evidence from Ethiopia. Euricse Working Paper no. 50. doi:10.2139/ssrn.2225791

Abdallah, A. H. (2016). Agricultural credit and technical efficiency in Ghana: Is there a nexus? *Agricultural Finance Review*, *76*, 309-324. doi:10.1108/AFR-01-2016-0002

Abdu, L., Stenner, K., & Vydelingum, V. (2016). Exploring the health visiting service from the view of South Asian clients in England: A grounded theory study. *Health & Social Care in the Community*, *24*, 596-604. doi:10.1111/hsc.12233

Abdul-Rahaman, A., & Abdulai, A. (2018). Do farmer groups impact on farm yield and efficiency of smallholder farmers? Evidence from rice farmers in northern Ghana. *Food Policy, 81*, 95-105. doi:10.1016/j.foodpol.2018.10.007

Abdul-Rahaman, A., & Abdulai, A. (2018). Do farmer groups impact on farm yield and efficiency of smallholder farmers? Evidence from rice farmers in northern Ghana. *Food Policy, 81*, 95-105. doi:10.1016/j.foodpol.2018.10.007

Adu-Gyamfi, E., & Ampofo, K. A. (2014). A study of effects of microfinance credit on community farmers in Upper Denkyira East Municipality of Ghana. *Journal of Agriculture and Environmental Sciences*, *3*(1), 67-88. Retrieved from http://jaesnet.com/journals/jaes/Vol_3_No_1_March_2014/6.pdf

Afrin, S., Haider, M. Z., & Islam, M. S. (2017). Impact of financial inclusion on technical efficiency of paddy farmers in Bangladesh. *Agricultural Finance Review*, *77*, 484-

505. doi:10.1108/AFR-06-2016-0058

Akhtar, A., Malik, M. S., & Awan, A. G. (2016). Impact of agricultural finance on production of fruits: Evidence from Pakistan. *Pakistan Journal of Social Sciences (PJSS)*, *36*, 693-703. Retrieved from https://www.bzu.edu.pk/PJSS/Vol36No22016/PJSS-Vol36-No2-9.pdf

Alexander, K. S., Parry, L., Thammavong, P., Sacklokham, S., Pasouvang, S., Connell, J. G., . . . Case, P. (2018). Rice farming systems in Southern Lao PDR: Interpreting farmers' agricultural production decisions using Q methodology. *Agricultural Systems*, *160*, 1-10. doi:10.1016/j.agsy.2017.10.018

Alshenqeeti, H. (2014). Interviewing as a data collection method: A critical review. *English Linguistics Research*, *3*(1), 39-45. doi:10.5430/elr.v3n1p39

Altieri, M. A., Nicholls, C. I., Henao, A., & Lana, M. A. (2015). Agroecology and the design of climate change-resilient farming systems. *Agronomy for Sustainable Development*, *35*, 869-890. doi:10.1007/s13593-015-0285-2

Alves, E. P., Silva, M. L. D., Oliveira Neto, S. N. D., Barrella, T. P., & Santos, R. H. S. (2015). Economic analysis of a coffee-banana system of a family-based agriculture at the Atlantic forest zone, Brazil. *Ciência e Agrotecnologia [Science & Agrotechnology]*, *39*, 232-239. doi:10.1590/S1413-70542015000300004

Anang, B. T., Sipiläinen, T., Bäckman, S., & Kola, J. (2015). Factors influencing smallholder farmers' access to agricultural microcredit in Northern Ghana. *African Journal of Agricultural Research, 10*, 2460-2469. doi:10.5897/AJAR2015.9536

Andriopoulos, C., & Slater, S. (2013). Exploring the landscape of qualitative research in international marketing: Two decades of IT IMR IT. *International Marketing Review, 30,* 384-412. doi:10.1108/IMR-03-2012-0061

Anicic, J., Vukotic, S., & Krstic, S. (2016). Strateški aspekti i rezultati razvoja poljoprivrede srbije u tranzicionom periodu. [The strategic aspects and results of agriculture development in Serbia in the transition period.] *Ekonomika Poljoprivrede [Economics of Agriculture]*, *63,* 175-187. Retrieved from http://www.ea.bg.ac.rs/images/ Arhiva/2016/Broj%201/11%20EP%201%202016-11.pdf

Anney, V. N. (2014). Ensuring the quality of the findings of qualitative research: Looking at trustworthiness criteria. *Journal of Emerging Trends in Educational Research and Policy Studies (JETERAPS), 5,* 272-281. Retrieved from https://pdfs.semanticscholar.org/1419/f7b54e6b7f1215717a5056e0709f8946745b.pdf

Apiors, E. K., Kuwornu, J. K. M., & Kwadzo, G. T. (2016). Effect of mechanisation use intensity on the productivity of rice farms in southern Ghana. *Acta Agriculture Slovenica, 107,* 439-451. doi:10.14720/aas.2016.107.2.16

Appiah, M. (2013). Understanding the complexities and resource sustainability in Afram Plains, Ghana. *Environmental Management and Sustainable Development, 2*(1), 34-50. doi:10.5296/emsd.v2i1.3040

Ashe, L. M., & Sonnino, R. (2012). At the crossroads: New paradigms of food security, public health nutrition, and school food. *Public Health Nutrition, 16,* 1020-1027.

doi:10.1017/S1368980012004326

Assogba, P. N., Kokoye, S. E. H., Yegbemey, R. N., Djenontin, J. A., Tassou, Z., Pardoe, J., & Yabi, J. A. (2017). Determinants of credit access by smallholder farmers in North-East Benin. *Journal of Development and Agricultural Economics, 9*(8), 210-216. doi:10.5897/JDAE2017.0814

Avea, A., Zhu, J., Tian, X., Baležentis, T., Li, T., Rickaille, M., & Funsani, W. (2016). Do NGOs and development agencies contribute to sustainability of smallholder soybean farmers in Northern Ghana - A stochastic production frontier approach. *Sustainability*, *8*(5), 465. doi:10.3390/su8050465

Awolala, D. O., & Ajibefun, I. A. (2015). Rice farmers' vulnerability to extreme climate: Deploying local adaptation finance in Ekiti State, Nigeria. *World Environment*, *5*(3), 91-100. doi:10.5923/j.env.20150503.01

Awotide, B. A., Karimov, A. A., & Diagne, A. (2016). Agricultural technology adoption, commercialization and smallholder rice farmers' welfare in rural Nigeria. *Agricultural and Food Economics, 4*(1), 3. doi.10.1186/s40100-016-0047-8

Awotide, B. A., Karimov, A., Diagne, A., & Nakelse, T. (2013). The impact of seed vouchers on poverty reduction among smallholder rice farmers in Nigeria. *Agricultural Economics*, *44*, 647-658. doi:10.1111/agec.12079

Bacon, C. M., Sundstrom, W. A., Gómez, M. E. F., Méndez, V. E., Santos, R., Goldoftas, B., & Dougherty, I. (2014). Explaining the "hungry farmer paradox": Smallholders and fair trade cooperatives navigate seasonality and change in Nicaragua's corn and coffee markets. *Global Environmental Change, 25*, 133-

149. doi:10.1016/j.gloenvcha. 2014.02.005

Ballard-Rosa, C. (2016). Hungry for change: Urban bias and autocratic sovereign default. *International Organization, 70*, 313-346. doi:10.1017/S0020818315000363

Banna, H., Afroz, R., Masud, M. M., Rana, M. S., Koh, E. H., & Ahmad, R. (2016). Financing an efficient adaptation programme to climate change: a contingent valuation method tested in Malaysia. *Cahiers Agricultures*, *25*(2), 25003. doi:10.1108/AFR-07-2016-0068

Basco, R. (2015). Family business and regional development: A theoretical model of regional familiness. *Journal of Family Business Strategy*, *6*, 259-271. doi:10.1016/j.jfbs.2015.04.004

Bell, A. R., Bryan, E., Ringler, C., & Ahmed, A. (2015). Rice productivity in Bangladesh: What are the benefits of irrigation? *Land Use Policy, 48*, 1-12. doi:10.1016/j.landusepol.2015.05.019

Bielecki, A. (2015). The general entity of life: A cybernetic approach. *Biological Cybernetics*, *109*, 401-419. doi:10.1007/s00422-015-0652-8

Birt, L., Scott, S., Cavers, D., Campbell, C., & Walter, F. (2016). Member checking: a tool to enhance trustworthiness or merely a nod to validation? *Qualitative Health Research*, *26*, 1802-1811. doi:10.1177/1049732316654870

Blum, D. A. (2015). Exploring gender disparity in US-based venture capital firms. *Journal of Diversity Management (Online)*, *10*(1), 43. doi:10.1016/j.acap.2011.05.001

Boddy, C. R. (2016). Sample size for qualitative research. *Qualitative Market Research:*

An International Journal, 19, 426-432. doi:10.1108/QMR-06-2016-0053

Borda-Rodriguez, A., & Vicari, S. (2014). Rural co-operative resilience: The case of Malawi. *Journal of Co-operative Organization and Management*, *2*(1), 43-52. doi:10.1016/j.jcom.2014.03.002

Boulding, K. E. (1956). General systems theory—the skeleton of science. *Management Science, 2,* 197-208. doi:10.1287/mnsc.2.3.197

Braun, J. A. (2013). Pickles, beets, and bread: Examining traditional food knowledge in a rural Albertan community. Edmonton, Alberta, Canada: University of Alberta. doi:10.7939/R34M56

Brück, T., & d'Errico, M. (2019). Food security and violent conflict: Introduction to the special issue. *World Development, 117,* 167-171. doi:10.1016/j.worlddev.2019.01.007

Bryman, A., & Bell, E. (2015). *Business research methods* (4th ed.). Oxford, England: Oxford University Press.

Chandio, A. A., Jiang, Y., Wei, F., Rehman, A., & Liu, D. (2017). Famers' access to credit: Does collateral matter or cash flow matter?—Evidence from Sindh, Pakistan. *Cogent Economics & Finance*, *5*(1), 1369383. doi:10.1080/23322039.2017.1369383

Chen, A., & Scott, S. (2016). Rural development strategies and government roles in the development of farmers' cooperatives in China. *Journal of Agriculture, Food Systems, and Community Development*, *4*(4), 35-55. doi:10.5304/jafscd.2014.044.005

Chen, K. Z., Joshi, P. K., Cheng, E., & Birthal, P. S. (2015). Innovations in financing of agri-food value chains in China and India. *China Agricultural Economic Review, 7,* 616-640. doi:10.1108/CAER-02-2015-0016

Clark, M., & Tilman, D. (2017). Comparative analysis of environmental impacts of agricultural production systems, agricultural input efficiency, and food choice. *Environmental Research Letters, 12*(6), 064016. doi.10.1088/1748-9326/aa6cd5

Collier, P., & Dercon, S. (2014). African agriculture in 50 years: Smallholders in a rapidly changing world? *World Development, 63*, 92-101. doi:10.1016/j.worlddev.2013.10.001

Collins, H. (2018). *Creative research: The theory and practice of research for the creative industries.* London, England: Bloomsbury.

Cramb, R., Manivong, V., Newby, J. C., Sothorn, K., & Sibat, P. S. (2017). Alternatives to land grabbing: Exploring conditions for smallholder inclusion in agricultural commodity chains in Southeast Asia. *The Journal of Peasant Studies, 44*, 939-967. doi:10.1080/03066150.2016.1242482

Dalgliesh, N. P., Charlesworth, P., Lonh, L., & Poulton, P. L. (2016). Promoting resilience in Cambodian lowland rice ecosystems: Farming system research to support flexible climate response strategies for smallholder farmers. *Field Crops Research, 198,* 148-159. doi:10.1016/j.fcr.2016.09.007

Davies, J., Maru, Y., Hall, A., Abdourhamane, I. K., Adegbidi, A., Carberry, P., ... & Njoya, A. (2018). Understanding innovation platform effectiveness through experiences from west and central Africa. *Agricultural Systems, 165*, 321-334.

doi:10.1016/j.agsy.2016.12.014

De Veaux, R. D., Hoerl, R. W., & Snee, R. D. (2016). Big data and the missing links. *Statistical Analysis and Data Mining: The ASA Data Science Journal*, *9*, 411-416. doi:10.1002/sam.11303

Denkyirah, E. K., Adu, D. T., Aziz, A. A., Denkyirah, E. K., & Okoffo, E. D. (2016). Analysis of the factors influencing smallholder rice farmers' access to credit in the Upper East Region of Ghana. *Asian Journal of Agricultural Extension, Economics & Sociology*, *10*(4), 1-11. doi:10.9734/AJAEES/2016/24768

Denkyirah, E. K., Aziz, A. A., Denkyirah, E. K., Nketiah, O. O., & Okoffo, E. D. (2016). Access to credit and constraint analysis: the case of smallholder rice farmers in Ghana. *Journal of Agricultural Studies*, *4*(2), 53-72. doi:10.5296/jas.v4i2.9167

Diagne, A., Kinkingninhoun-Medagbe, F. M., Amovin-Assagba, E., Nakelse, T., Sanni, K., & Toure, A. (2015). 10 Evaluating the Key Aspects of the Performance of Genetic Improvement. *Crop Improvement, Adoption and Impact of Improved Varieties in Food Crops in Sub-Saharan Africa*, 183. Retrieved from http://www.cabi.org

Ditzler, L., Breland, T. A., Francis, C., Chakraborty, M., Singh, D. K., Srivastava, A., & Decock, C. (2018). Identifying viable nutrient management interventions at the farm level: The case of smallholder organic Basmati rice production in Uttarakhand, India. *Agricultural Systems*, *161*, 61-71. doi:10.1016/j.agsy.2017.12.010

Diwan, I., & Emerson, R. O. (2013). Business models for commercializing African

agriculture. *Africa Policy Journal, 9,* 54-67. doi:10.1016/j.jfbs.2015.04.004

Djoumessi, Y. F., Kamdem, C. B., Afari-Sefa, V., & Bidogeza, J. C. (2018). Determinants of Smallholder Vegetable Farmers Credit Access and Demand in Southwest region, Cameroon. *Economics Bulletin*, *38*, 1231-1240. doi:10419/hdl.handle.net/179942

Donkor, E., Owusu-Sekyere, E., Owusu, V., & Jordaan, H. (2016). Impact of row-planting adoption on productivity of rice farming in Northern Ghana. *Review of Agricultural and Applied Economics*, *19*(2), 19-28. doi:10.1016/j.njas.2016.10.002

Duncan, J. M., Tompkins, E. L., Dash, J., & Tripathy, B. (2017). Resilience to hazards: Rice farmers in the Mahanadi Delta, India. *Ecology and Society*, *22*(4), 3. doi:10.5751/ES-09559-220403

Elias, A., Nohmi, M., Yasunobu, K., & Ishida, A. (2013). Effect of agricultural extension program on smallholders' farm productivity: Evidence from three peasant associations in the highlands of Ethiopia. *Journal of Agricultural Science, 5*(8), 163-181. doi:10.5539/jas.v5n8p163

Ellinger, P. N., & Barry, P. J. (2018). *A farmers guide to agricultural credit.* Urbana-Champaign, IL: The Center for Farm and Rural Business Finance, University of Illinois Urbana-Champaign.

Elphick, C. S., Kelsey, T. R., Hickey, C. M., Buttner, P., Strum, K. M., & Iglecia, M. N. (2018). Wetland bird conservation in California rice fields. In J. E. Austin, K. L. Morrison, and J. T. Harris (Eds.) *Cranes and agriculture*: *A global guide for*

sharing the landscape (pp. 293-303). Baraboo, WI: International Crane Foundation.

Etikan, I., Musa, S. A., & Alkassim, R. S. (2016). Comparison of convenience sampling and purposive sampling. *American Journal of Theoretical and Applied Statistics, 5*, 1-4. doi:10.11648/j.ajtas.20160501.11

Flick, U. (2018). *An introduction to qualitative research*. Thousand Oaks, CA: Sage.

Food and Agriculture Organization of the United Nations. (2013). *The state of food insecurity in the world 2013.* Retrieved from http://www.fao.org/docrep/018/i3434e/i3434e00.htm

Fouché, C. B., & Chubb, L. A. (2017). Action researchers encountering ethical review: A literature synthesis on challenges and strategies. *Educational Action Research, 25*(1), 23-34. doi:10.1080/09650792.2015.1128956

Freedman, A. M. (2013). The application of systems theory to organizational diagnosis. In H. S. Leonard, R. Lewis, A. M. Freedman, & J. Passmore (Eds.), *The Wiley-Blackwell handbook of the psychology of leadership, change, and organizational development* (pp. 405-441). Oxford, England: Wiley. doi:10.1002/9781118326404.ch20

Galdeano-Gómez, E., Pérez-Mesa, J. C., & Godoy-Durán, Á. (2016). The social dimension as a driver of sustainable development: The case of family farms in southeast Spain. *Sustainability Science, 11*, 349-362. doi:10.1007/s11625-015-0318-4

Garcia, D., & Gluesing, J. C. (2013). Qualitative research methods in international

organizational change research. *Journal of Organizational Change Management, 26*, 423-444. doi:10.1108/09534811311328416

Garibaldi, L. A., Gemmill-Herren, B., D'Annolfo, R., Graeub, B. E., Cunningham, S. A., & Breeze, T. D. (2017). Farming approaches for greater biodiversity, livelihoods, and food security. *Trends in Ecology & Evolution*, *32*(1), 68-80. doi:10.1016/j.tree.2016.10.001

Ghana Statistical Service. (2016). *Annual gross domestic product*. Retrieved from http://www.statsghana.gov.gh

Giller, K. E. (2013). Can we define the term "farming systems"? A question of scale. *Outlook on Agriculture, 42*(3), 149-153. doi:10.5367/oa.2013.0139

Giller, K. E., Tittonell, P., Rufino, M. C., van Wijk, M. T., Zingore, S., Mapfumo, P., … & Vanlauwe, B. (2011). Communicating complexity: Integrated assessment of trade-offs concerning soil fertility management within African farming systems to support innovation and development. *Agricultural Systems, 104*, 191-203. doi:10.1016/j.agsy.2010.07.002

Glover, J. L., & Reay, T. (2015). Sustaining the family business with minimal financial rewards: How do family farms continue? *Family Business Review, 28*, 163-177. doi:10.1177/0894486513511814

Graça, D. S., & Zhong, N. (2015). An analytic system with a computable hyperbolic sink whose basin of attraction is non-computable. *Theory of Computing Systems, 57*, 478-520. doi:10.1007/s00224-015-9609-5

Green, J., & Thorogood, N. (2018) *Qualitative methods for health research* (4th ed.).

London, England: Sage.

Ha, T., Bosch, O., & Nguyen, N. (2016). Practical contributions of the systems-based evolutionary learning laboratory to knowledge and stakeholder management. *Systemic Practice & Action Research, 29,* 261-275. doi:10.1007/s11213-015-9363-2

Hays, D. G., Wood, C., Dahl, H., & Kirk-Jenkins, A. (2016). Methodological rigor in Journal of Counseling & Development qualitative research articles: A 15-year review. *Journal of Counseling & Development, 94*(2), 172-183. doi:10.1002/jcad.12074

Hendrix, C. S., & Haggard, S. (2015). Global food prices, regime type, and urban unrest in the developing world. *Journal of Peace Research, 52*(2), 143-157. doi:10.1177%2F0022343314561599

High-Level Panel of Experts on Food Security and Nutrition. (2013). *Investing in smallholder agriculture for food security. A report by the High-Level Panel of Experts on Food Security and Nutrition of the Committee on World Food Security*. Rome, Italy: Author. Retrieved from http://www.fao.org/3/a-av034e.pdf

Hossain, I., Muhammad, A. D., Jibril, B. T., & Kaitibie, S. (2019). Support for smallholder farmers through Islamic instruments: The case of Bangladesh and lessons for Nigeria. *International Journal of Islamic and Middle Eastern Finance and Management, 12,* 154-168. doi:10.1108/IMEFM-11-2018-0371

Huang, J. K., & Wang, Y. J. (2014). Financing sustainable agriculture under climate change. *Journal of Integrative Agriculture, 13,* 698-712. doi:10.1016/S2095-

3119(13)60698-X

Ilin, T., & Varga, L. (2015). The uncertainty of systemic risk. *Risk Management, 17*, 240-275. doi:10.1057/rm.2015.15

Intarakumnerd, P., & Goto, A. (2018). Role of public research institutes in national innovation systems in industrialized countries: The cases of Fraunhofer, NIST, CSIRO, AIST, and ITRI. *Research Policy*, *47*, 1309-1320. doi:10.1016/j.respol.2018.04.011

Inusah, B. I., Dogbe, W., Abdulai, A. L., Yirzagla, J., Mawunya, M., & Issahak, A. S. (2015). Yield gap survey in Sudanno-Guinea savanna agro-ecological zones of Ghana. *Sustainable Agriculture Research, 4*(1), 127-137. doi:10.5539/sar.v4n1p127

Isaga, N. (2018). Access to bank credit by smallholder farmers in Tanzania: a case study. *Afrika Focus, 31*(1).doi.10.21825/af.v31i1.9048

Isakson, S. R. (2014). Food and finance: The financial transformation of agro-food supply chains. *Journal of Peasant Studies*, *41*, 749-775. doi:10.1080/03066150.2013.874340

James, H. S., & Sulemana, I. (2014). Case studies on smallholder farmer voice: An introduction to a special symposium. *Agriculture and Human Values*, *31*, 637-641. doi:10.1007/s10460-014-9554-y

Jarosz, L. (2011). Defining world hunger: Scale and neoliberal ideology in international food security policy discourse. *Food, Culture, and Society: An International Journal of Multidisciplinary Research, 14*(1), 117-139.

doi:10.2752/175174411X12810842291308

John, A., & Fielding, M. (2014). Rice production constraints and 'new' challenges for South Asian smallholders: Insights into *de facto* research priorities. *Agriculture & Food Security, 3*(18), 1-16. doi:10.1186/2048-7010-3-18

Johnson, R. B., & Christensen, L. (2019). *Educational research: Quantitative, qualitative, and mixed approaches*. Thousand Oaks, CA: SAGE.

Jones, J. W., Antle, J. M., Basso, B., Boote, K. J., Conant, R. T., Foster, I., ... & Keating, B. A. (2017). Toward a new generation of agricultural system data, models, and knowledge products: State of agricultural systems science. *Agricultural systems, 155*, 269-288. doi:10.1016/j.agsy.2016.09.021

Kamaluddin, A., Hadi, N. A., Alam, M. M., & Adil, M. A. M. (2015). Social collateral model for Islamic microfinance. *The Journal of Developing Areas, 49*, 353-363. doi:10.1353/jda.2015.0068

Katsirikou, A., & Lin, C. S. (2017). Revealing the "essence" of things: Using phenomenology in LIS research. *Qualitative and Quantitative Methods in Libraries, 2*, 469-478. Retrieved from http://www.qqml-journal.net/index.php/ qqml/ article/view/123

Khanal, A. R., & Regmi, M. (2018). Financial constraints and production efficiency: A case from rice growers in drought prone areas of Indonesia. *Agricultural Finance Review, 78*(1), 25-40. doi:10.1108/AFR-07-2016-0068

Khandker, S. R., & Koolwal, G. B. (2014). Does institutional finance matter for agriculture? Evidence using panel data from Uganda. *World Bank Policy*

Research Working Paper No. 6942. Retrieved from https://ssrn.com/abstract=2458730

Kilelu, C. W., Klerkx, L., & Leeuwis, C. (2017). Supporting smallholder commercialisation by enhancing integrated coordination in agrifood value chains: Experiences with dairy hubs in Kenya. *Experimental Agriculture, 53,* 269-287. doi:10.1017/S0014479716000375

King, N., Horrocks, C., & Brooks, J. (2018). *Interviews in qualitative research*. Thousand Oaks, CA: SAGE.

Koc, M., MacRae, R., Desjardins, E., & Roberts, W. (2008). Getting civil about food: The interactions between civil society and the state to advance sustainable food systems in Canada. *Journal of Hunger & Environmental Nutrition, 3*(2-3), 122-144. doi:10.1080/19320240802243175

Kovacic, Z., & Salazar, O. V. (2017). The lose-lose predicament of deforestation through subsistence farming: Unpacking agricultural expansion in the Ecuadorian Amazon. *Journal of Rural Studies, 51,* 105-114. doi:10.1016/j.jrurstud.2017.02.002

Kudadze, S., Ahado, S., & Donkoh, S. A. (2016) Agricultural credit accessibility and rice production in Savelugu-Nanton and Walewale districts of Northern Ghana. *Research Journal of Finance and Accounting, 7*(14), 126-136. Retrieved from https://uds.edu.gh

Kuhn, J. R., Courtney, J. F., & Morris, B. (2015). A theory of complex adaptive inquiring organizations: Application to continuous assurance of corporate financial

information. *The Knowledge Engineering Review, 30*, 265-296. doi:10.1017/S0269888913000428

Lacombe, G., & McCartney, M. (2016). Evaluating the flow regulating effects of ecosystems in the Mekong and Volta river basins. *International Water Management Institute Report, 166*, 1-40. doi:10.5337/2016.202

Lam, B. T., Cuong, T. H., & Lebailly, P. (2016, November 5-7). Determinants credit demand of small farmers in remote areas of Vietnam: A case study of Seng Cu rice production in Lao Cai Province. Communication poster at International Society for Southeast Asian Agricultural Sciences International Congress & General meeting: *National and Global Good Agricultural Practices in Southeast Asia*, Hanoi, Vietnam. Retrieved from http://gembloux.ulg. ac.be/eg/publications-cooperation-internationale/doc_view/521-determinants-credit-demand-of-small-farmers-in-remote-areas-of-vietnam-a-case-study-of-seng-cu-rice-production-in-lao-cai-province?tmpl=component&format=raw

Leonardo, W. J., Bijman, J., & Slingerland, M. A. (2015). The Windmill Approach: Combining transaction cost economics and farming systems theory to analyse farmer participation in value chains. *Outlook on Agriculture, 44*, 207-214. doi:10.5367/oa.2015.0212

Leung, L. (2015). Validity, reliability, and generalizability in qualitative research. *Journal of Family Medicine and Primary Care, 4*, 324-327. doi:10.4103%2F2249-4863.161306

Linh, T. N., Long, H. T., Chi, L. V., Tam, L. T., & Lebailly, P. (2019). Access to rural

credit markets in developing countries, the case of Vietnam: A literature review. *Sustainability*, *11*(5), 1468. doi:10.3390/su11051468

Liu, J., Mooney, H., Hull, V., Davis, S. J., Gaskell, J., Hertel, T., ... & Li, S. (2015). Systems integration for global sustainability. *Science*, *347*, 963-972. doi:10.1126/science.1258832

Löblich, M. (2017). Rigor in qualitative research. *The International Encyclopedia of Communication Research Methods*, 1-9. doi:10.1002/9781118901731.iecrm0220

Longacre, W. A., & Hermes, T. R. (2015). Rice farming and pottery production among the Kalinga: New ethnoarchaeological data from the Philippines. *Journal of Anthropological Archaeology*, *38*, 35-45. doi:10.1016/j.jaa.2014.09.005

Luan, D. X., Bauer, S., & Kühl, R. (2016). Income impacts of credit on accessed households in rural Vietnam: Do various credit sources perform differently? *AGRIS on-Line Papers in Economics and Informatics*, *8*(1), 57-67. doi:10.7160/aol.2016.080106

Ma, W., & Abdulai, A. (2017). The economic impacts of agricultural cooperatives on smallholder farmers in rural China. *Agribusiness*, *33*, 537-551. doi**:**10.1002/agr.21522

Ma, W., Renwick, A., Yuan, P., & Ratna, N. (2018). Agricultural cooperative membership and technical efficiency of apple farmers in China: An analysis accounting for selectivity bias. *Food Policy*, *81*, 122-132. doi:10.1016/j.foodpol.2018.10.009

Makate, C., Wang, R., Makate, M., & Mango, N. (2016). Crop diversification and

livelihoods of smallholder farmers in Zimbabwe: adaptive management for environmental change. *Springerplus, 5*(1), 1135.doi:10.1186/s40064-016-2802-4

Mariyono, J. (2019). Microcredit and technology adoption: sustained pathways to improve farmers' prosperity in Indonesia. *Agricultural Finance Review*, *79*(1), 85-106. doi:10.1108/AFR-05-2017-0033

Marshall, C. & Rossman, G. (2018) *Designing qualitative research* (6th ed.). Thousand Oaks, CA: Sage.

Martey, E., Al-hassan, R. M., & Kuwornu, J. K. M. (2012). Commercialization of smallholder agriculture in Ghana: A Tobit regression analysis. *African Journal of Agricultural Research, 7*, 2131-2141. doi:10.5897/AJAR11.1743

Martey, E., Dogbe, W., Etwire, P. M., & Wiredu, A. N. (2015). Impact of farmer mentorship project on farm efficiency and income in rural Ghana. *Journal of Agricultural Science*, *7*(10), 79.doi:10.5539/jas.v7n10p79

Martey, E., Etwire, P. M., Wiredu, A. N., & Dogbe, W. (2014). Factors influencing willingness to participate in multi-stakeholder platform by smallholder farmers in Northern Ghana: Implications for research and development. *Agricultural and Food Economics*, *2*(1), 1-15. doi:10.1186/s40100-014-0011-4

Martey, E., Wiredu, A. N., Etwire, P. M., & Kuwornu, J. K. (2019). The impact of credit on the technical efficiency of maize-producing households in Northern Ghana. *Agricultural Finance Review*. doi:10.1108/AFR-05-2018-0041

Martin, S. J., & Clapp, J. (2015). Finance for agriculture or agriculture for finance? *Journal of Agrarian Change*, *15*, 549-559. doi:10.1111/joac.12110

McNulty, T., Zattoni, A., & Douglas, T. (2013). Developing corporate governance research through qualitative methods: A review of previous studies. *Corporate Governance: An International Review*, *21*, 183-198. doi:10.1111/corg.12006

McTate, E. A., & Leffler, J. M. (2017). Diagnosing disruptive mood dysregulation disorder: Integrating semi-structured and unstructured interviews. *Clinical child psychology and psychiatry*, *22*, 187-203. doi:10.1177%2F1359104516658190

Mero-Jaffe, I. (2011). 'Is that what I said?' Interview transcript approval by participants: An aspect of ethics in qualitative research. *International Journal of Qualitative Methods*, *10*, 231-247. doi:10.1177/160940691101000304

Merriam, S. B., & Tisdell, E. J. (2015). *Qualitative research: A guide to design and implementation*. San Francisco, CA: Wiley.

Michael, A., Giroh, Y. D., Polycarp, M., & Ashindo, Z. E. (2018). Analysis of Rural Farm Households' Access to Formal Agricultural Credit in Yola South Local Government Area, Adamawa State, Nigeria. *Acta Universitatis Agriculturae et Silviculturae Mendelianae Brunensis*, *66*, 947-954. doi:10.11118/actaun201866040947

Mills, J., Gaskell, P., Ingram, J., Dwyer, J., Reed, M., & Short, C. (2017). Engaging farmers in environmental management through a better understanding of behaviour. *Agriculture and Human Values*, *34*, 283-299. doi:10.1007/s10460-016-9705-4

Ministry of Food and Agriculture. (2018). *Sustainable development of rain-fed lowland rice production project*. Accessed September15, 2018.

http://mofa.gov.gh/site/?page_id=12506

Morse, J. M. (2015). Critical analysis of strategies for determining rigor in qualitative inquiry. *Qualitative health research*, *25*(9), 1212-1222. doi:10.1177%2F1049732315588501

Mumuni, E., & Oladele, O. I. (2016). Access to livelihood capitals and propensity for entrepreneurship amongst rice farmers in Ghana. *Agriculture & Food Security*, *5*(1), 1. doi.10.1186/s40066-015-0049-x

Nakashima, T., & Ishikawa, S. (2016, March). Energy inputs and greenhouse gas emissions associated with small-scale farmer sugarcane cropping systems and subsequent bioethanol production in Japan. *NJAS-Wageningen Journal of Life Sciences*, *76*, 43-53. doi:10.1016/j.njas.2015.11.003

Nettle, R., Klerkx, L., Faure, G., & Koutsouris, A. (2017). Governance dynamics and the quest for coordination in pluralistic agricultural advisory systems. *Journal of Agricultural Education and Extension*, *23*, 189-195. doi:10.1080/1389224X.2017.1320638

Nguyen, B., Melewar, T. C., & Chen, J. (2013). The brand likeability effect: Can firms make themselves more likeable? *Journal of General Management*, *38*(3), 25-50. doi:10.1177/030630701303800303

Nithia, H. S. (2018) .Impacts *of Agricultural Cooperatives on Farmers 'Revenues and Farm Households' Food Security in Cambodia: A Case Study of Tram Kak District, Takeo Province* (Doctoral dissertation, Kyushu University). Retrieved from https://catalog.lib.kyushu-

u.ac.jp/opac_detail_md/?lang=0&amode=MD823&bibid=1959178

Noble, H., & Smith, J. (2015). Issues of validity and reliability in qualitative research. *Evidence-Based Nursing, 18*(2), 34-35. doi:10.1136/eb-2015-102054

Noromiarilanto, F., Brinkmann, K., Faramalala, M. H., & Buerkert, A. (2016). Assessment of food self-sufficiency in smallholder farming systems of south-western Madagascar using survey and remote sensing data. *Agricultural Systems, 149*, 139-149. doi:10.1016/j.agsy.2016.09.005

Nuhu, E., Inusah, A. H., Ama, G. R., & Sano, Z. M. (2014). Impact analysis of microfinance on crop production in Ghana. *International Journal of Academic Research in Accounting, Finance and Management Sciences*, *4*(3), 97-108. doi:10.6007/IJARAFMS/v4-i3/1025

Nwaru, J. C. (2011). Determinants of informal credit demand and supply among food crop farmers in Akwa Ibom State, Nigeria. *Journal of Rural and Community Development, 6*(1), 129-139. Retrieved from http://journals.brandonu.ca/jrcd/article/view/618/139

Nyssen, J., Fetene, F., Dessie, M., Alemayehu, G., Sewnet, A., Wassie, A., & Annys, S. (2018). Persistence and changes in the peripheral Beles basin of Ethiopia. *Regional Environmental Change*, *18*, 2089-2104. doi:10.1007/s10113-018-1346-2

Ojo, M. P., & Ayanwale, A. B. (2019). Estimating farm-level financing gap: a technical efficiency approach. *Agricultural Finance Review*, *79*(2), 174-191. doi:10.1108/AFR-02-2018-0008

Olayide, Olawale & Okartei-Akko, Galina. (2018). *Linking smallholder farmers to markets enhances productivity growth: A case study of rice farmers in Ghana*. Final report by: Uju Oranu (Matric No: 203393). doi:1013140/RG.2.2.22626.38089.

Otero, G., Pechlaner, G., & Gürcan, E. C. (2013). The political economy of "food security" and trade: Uneven and combined dependency. *Rural Sociology*, *78*, 263-289. doi:10.1111/ruso.12011

Pannell, D. J., Llewellyn, R. S., & Corbeels, M. (2014). The farm-level economics of conservation agriculture for resource-poor farmers. *Agriculture, Ecosystems & Environment*, *187*, 52-64. doi:10.1016/j.agee.2013.10.014

Pannone, S. J. (2017). The influence of homeschooling on entrepreneurial activities: A collective case study. *Education Training*, *59*, 706-719. doi:10.1108/ET-05-2016-0091

Peters, K., & Halcomb, E. (2015). Interviews in qualitative research. *Nurse Researcher (2014+)*, *22*(4), 6. doi:10.7748/nr.22.4.6.s2

Peterson, K., Hahn, H., Lee, A. J., Madison, C. A., & Atri, A. (2016). In the Information Age, do dementia caregivers get the information they need? Semistructured interviews to determine informal caregivers' education needs, barriers, and preferences. *BMC Geriatrics*, *16*, 164. doi:10.1186/s12877-016-0338-7

Petrović, P., & Vuković, D. (2016). Financial sources of small and medium enterprises for agribusiness and eco-tourism in Serbia. *Economics of Agriculture*, *63*, 1433-1444. doi:10.5937/ekoPolj1604433P

Pontani, M., Cecchetti, G., & Teofilatto, P. (2015). Variable-time-domain neighboring optimal guidance, part 1: Algorithm structure. *Journal of Optimization Theory and Applications, 166,* 76-92. doi:10.1007/s10957-014-0676-6

Prager, K., Labarthe, P., Caggiano, M., & Lorenzo-Arribas, A. (2016). How does commercialisation impact on the provision of farm advisory services? Evidence from Belgium, Italy, Ireland and the UK. *Land Use Policy, 52,* 329-344. doi:10.1016/j.landusepol.2015.12.024

Qu, S. Q., & Dumay, J. (2011). The qualitative research interview. *Qualitative Research in Accounting & Management, 8,* 238-264. doi:10.1108/11766091111162070

Ragasa, C., & Chapoto, A. (2017). Limits to Green Revolution in rice in Africa: The case of Ghana. *Land Use Policy, 66,* 304-321. doi:10.1016/j.landusepol.2017.04.052

Ragasa, C., Lambrecht, I., & Kufoalor, D. S. (2018, February). Limitations of contract farming as a pro-poor strategy: The case of maize outgrower schemes in upper West Ghana. *World Development, 102,* 30-56. doi:10.1016/j.worlddev.2017.09.008

Rispin, K., Dittmer, M., McLean, J., & Wee, J. (2017). Preliminary reliability and internal consistency of the Wheelchair Components Questionnaire for Condition. *Disability and Rehabilitation: Assistive Technology, 12*, 852-856. doi:10.1080/17483107. 2016.1277793

Rosenstock, T. S., Sander, B. O., Butterbach-Bahl, K., Rufino, M. C., Hickman, J., Stirling, C., ... & Wollenberg, E. (2016). Introduction to the SAMPLES approach. In T. S. Rosenstock, M. C. Rufino, M.C., K. Butterbach-Bahl, E. Wollenberg, &

M. Richards (Eds.), *Methods for measuring greenhouse gas balances and evaluating mitigation options in smallholder agriculture* (pp. 1-13). Cham, Switzerland: Springer International. doi:10.1007/978-3-319-29794-1_1

Rosenthal-von der Pütten, A. M., & Krämer, N. C. (2014). How design characteristics of robots determine evaluation and uncanny valley related responses. *Computers in Human Behavior*, *36*, 422-439. doi:10.1016/j.chb.2014.03.066

Royer, A., Bijman, J., & Abebe, G. K. (2017). Cooperatives, partnerships and the challenges of quality upgrading: A case study from Ethiopia. *Journal of Co-operative Organization and Management*, *5*(1), 48-55. doi:10.1016/j.jcom.2017.04.001

Samberg, L. H., Gerber, J. S., Ramankutty, N., Herrero, M., & West, P. C. (2016). Subnational distribution of average farm size and smallholder contributions to global food production. *Environmental Research Letters*, *11*, 124010. doi:10.1088/1748-9326/11/12/124010

Saqib, S. E., Kuwornu, J. K., Panezia, S., & Ali, U. (2018). Factors determining subsistence farmers' access to agricultural credit in flood-prone areas of Pakistan. *Kasetsart Journal of Social Sciences*, *39*, 262-268. doi:10.1016/j.kjss.2017.06.001

Sarris, A. (2013). Food commodity price volatility and food insecurity. *Bio-Based and Applied Economics*, *2*, 213-236. doi:10.13128/BAE-13114

Scheidel, A., & Farrell, K. N. (2015). Small-scale cooperative banking and the production of capital: Reflecting on the role of institutional agreements in supporting rural livelihood in Kampot, Cambodia. *Ecological Economics*, *119*,

230-240. doi:10.1016/j.ecolecon.2015. 09.008

Schindler, J., Graef, F., König, H. J., Mchau, D., Saidia, P., & Sieber, S. (2016). Sustainability impact assessment to improve food security of smallholders in Tanzania. *Environmental Impact Assessment Review*, *60*, 52-63. doi:10.1016/j.eiar.2016.04.006

Schutt, R. K. (2018). *Investigating the social world: The process and practice of research*. Thousand Oaks, CA: Sage.

Sebatta, C., Wamulume, M., & Mwansakilwa, C. (2014). Determinants of smallholder farmers' access to agricultural finance in Zambia. *Journal of Agricultural Science*, *6*(11), 63. doi:10.5539/jas.v6n11p63

Sebe-Yeboah, G., & Mensah, C. (2014, March). A critical analysis of financial performance of Agricultural Development Bank (ADB, Ghana). *European Journal of Accounting, Auditing and Finance Research*, *2*(1), 1-23. Retrieved from http://www.ea-journals.org

Seed, B., Lang, T., Caraher, M., & Ostry, A. (2013). Integrating food security into health and provincial government departments in British Columbia, Canada. *Agriculture and Human Values*, *30*, 457-470. doi:10.1007/s10460-013-9426-x

Sekyi, S., Abu, B. M., & Nkegbe, P. K. (2017). Farm credit access, credit constraint and productivity in Ghana: Empirical evidence from Northern Savannah ecological zone. *Agricultural Finance Review*, *77*, 446-462. doi:10.1108/AFR-10-2016-0078

Shafiai, M. H. M., & Moi, M. R. (2015). Financial problems among farmers in Malaysia: Islamic agricultural finance as a possible solution. *Asian Social Science*, *11*(4), 1.

doi:10.5539/ass.v11n4p1

Siddik, M. N. A., Kabiraj, S., Shanmugan, J., & Kahota, S. (2015). Assessing smallholder farming and poverty in post-conflict-Sierra Leone. *Journal of Finance, 3*, 156-166. doi:10.15640/jfbm.v3n1a14

Sidibé, A., Totin, E., Thompson-Hall, M., Traoré, O. T., Traoré, P. C. S., & Olabisi, L. S. (2018). Multi-scale governance in agriculture systems: Interplay between national and local institutions around the production dimension of food security in Mali. *NJAS-Wageningen Journal of Life Sciences, 84*, 94-102. doi:10.1016/j.njas.2017.09.001

Sim, J., Saunders, B., Waterfield, J., & Kingstone, T. (2018). Can sample size in qualitative research be determined a priori?. *International Journal of Social Research Methodology, 21*, 619-634. doi.10.1080/13645579.2018.1454643

Singh, K., McClean, C. J., Büker, P., Hartley, S. E., & Hill, J. K. (2017). Mapping regional risks from climate change for rainfed rice cultivation in India. *Agricultural Systems, 156*, 76-84. doi:10.1016/j.agsy.2017.05.009

Spigel, B. (2017). The relational organization of entrepreneurial ecosystems. *Entrepreneurship Theory and Practice, 41*, 49-72. doi:10.1111/etap.12167

Stahl, B. C., Doherty, N. F., Shaw, M., & Janicke, H. (2014). Critical theory as an approach to the ethics of information security. *Science and Engineering Ethics, 20*, 675-699. doi:10.1007/s11948-013-9496-6

Stuart, A. M., Pame, A. R. P., Silva, J. V., Dikitanan, R. C., Rutsaert, P., Malabayabas, A. J. B., ... & Singleton, G. R. (2016). Yield gaps in rice-based farming systems:

Insights from local studies and prospects for future analysis. *Field Crops Research, 194,* 43-56. doi:10.1016/j.fcr.2016.04.039

Suh, J. (2015). Communitarian cooperative organic rice farming in Hongdong District, South Korea. *Journal of Rural Studies, 37,* 29-37. doi:10.1016/j.jrurstud.2014.11.009

Sulemana, A., & Dinye, R. D. (2016). Microloans and Agricultural Sector Incomes in Developing Countries: An Empirical Study of the PRU District in Ghana. *Asian Economic and Financial Review, 6*(1), 43. doi:10.18488/journal.aefr/2016.6.1/102.1.43.53

Sutherland, L. A., Mills, J., Ingram, J., Burton, R. J., Dwyer, J., & Blackstock, K. (2013). Considering the source: Commercialisation and trust in agri-environmental information and advisory services in England. *Journal of Environmental Management, 118,* 96-105. doi:10.1016/j.jenvman.2012.12.020

Sutterlüty, A., Šimunović, N., Hesser, F., Stern, T., Schober, A., & Schuster, K. C. (2018). Influence of the geographical scope on the research foci of sustainable forest management: Insights from a content analysis. *Forest policy and economics, 90,* 142-150. doi:10.1016/j.forpol.2018.02.003

Tallapragada, M., Eosco, G. M., & McComas, K. A. (2017). Aware, yet ignorant: Exploring the views of early career researchers about funding and conflicts of interests in science. *Science and Engineering Ethics, 23,* 147-164. doi:10.1007/s11948-016-9764-3

Tang, S., & Guo, S. (2017). Formal and informal credit markets and rural credit demand

in China. In *2017 4th International Conference on Industrial Economics System and Industrial Security Engineering (IEIS)* (pp. 1-7). IEEE. doi:10.1109/IEIS.2017.8078663

Tekken, V., Spangenberg, J. H., Burkhard, B., Escalada, M., Stoll-Kleemann, S., Truong, D. T., & Settele, J. (2017). “Things are different now”: Farmer perceptions of cultural ecosystem services of traditional rice landscapes in Vietnam and the Philippines. *Ecosystem Services, 25*, 153-166. doi:10.1016/j.ecoser.2017.04.010

Tetteh Anang, B., Sipiläinen, T. A. I., Bäckman, S. T., & Kola, J. T. S. (2015). Factors influencing smallholder farmers' access to agricultural microcredit in Northern Ghana. *African Journal of Agricultural Research, 10*, 2460-2469. doi:10.5897/AJAR2015.9536

Thomas, D. R. (2017). Feedback from research participants: Are member checks useful in qualitative research? *Qualitative Research in Psychology, 14*, 23-41. doi:10.1080/14780887.2016.1219435

Thomas, J. R., Nelson, J. K., & Silverman, S. S. (2015). *Research methods in physical activity* (7th ed.). Champaign, IL: Human Kinetics.

Ton, G., Klerkx, L., de Grip, K., & Rau, M. L. (2015). Innovation grants to smallholder farmers: Revisiting the key assumptions in the impact pathways. *Food Policy, 51*, 9-23. doi:10.1016/j.foodpol.2014.11.002

Tornaghi, C. (2017). Urban Agriculture in the Food-Disabling City:(Re) defining Urban Food Justice, Reimagining a Politics of Empowerment. *Antipode, 49*, 781-801. doi:10.1111/anti.12291

Totin, E., Leeuwis, C., van Mierlo, B., Mongbo, R. L., Stroosnijder, L., & Kossou, D. K. (2014). Drivers of cooperative choice: Canal maintenance in smallholder irrigated rice production in Benin. *International Journal of Agricultural Sustainability*, *12*, 334-354. doi:10.1080/14735903.2014.909644

Ullah, I., & Khan, M. (2017). Microfinance as a tool for developing resilience in vulnerable communities. *Journal of Enterprising Communities: People and Places in the Global Economy*, *11*, 237-257. doi:10.1108/JEC-06-2015-0033

van Elsland, S. L., van der Hoeven, M., Joshi, S., Doak, C. M., & Ponce, M. C. (2012). Pressure cooker ownership and food security in Aurangabad, India. *Public Health Nutrition, 15,* 818-826. doi:10.1017/S1368980011002461

Venkatesh, V., Brown, S. A., & Bala, H. (2013). Bridging the qualitative-quantitative divide: Guidelines for conducting mixed methods research in information systems. *MIS Quarterly*, *37*, 21-54. Retrieved from http://www.misq.org

Venot, J. P. (2016). A success of some sort: Social enterprises and drip irrigation in the developing world. *World Development*, *79*, 69-81. doi:10.1016/j.worlddev.2015.11.002

von Bertalanffy, L. (1969). *General system theory: Foundations, development, applications.* New York, NY: Braziller.

von Loeper, W. J., Drimie, S., & Blignaut, J. (2018). The struggles of smallholder farmers: A cause of modern agricultural value chains in South Africa. In G. Egilmez (Ed.) *Agricultural value chain* (pp. 161-180). London, England: IntechOpen. doi:10.5772/intechopen.75710

Wan, J., Li, R., Wang, W., Liu, Z., Chen, B. (2016). Income diversification: A strategy for rural region risk management. *Sustainability 2016, 8,* 1064. doi:10.3390/su8101064

Warner, B. P., Kuzdas, C., Yglesias, M. G., & Childers, D. L. (2015). Limits to adaptation to interacting global change risks among smallholder rice farmers in northwest Costa Rica. *Global Environmental Change, 30,* 101-112. doi:10.1016/j.gloenvcha.2014.11.002

Weber, R., & Musshoff, O. (2017). Can flexible agricultural microfinance loans limit the repayment risk of low diversified farmers? *Agricultural Economics*, *48,* 537-548. doi:10.1111/agec.12355

Weerathamrongsak, P., & Wongsurawat, W. (2013). The rubber industry of Thailand: A review of past achievements and prospects. *Journal of Agribusiness in Developing and Emerging Economies, 3,* 49-63. doi:10.1108/204408313 11321665

Weiler, A. M., Hergesheimer, C., Brisbois, B., Wittman, H., Yassi, A., & Spiegel, J. M. (2014). Food sovereignty, food security and health equity: a meta-narrative mapping exercise. *Health Policy and Planning, 30,* 1078-1092. doi:10.1093/heapol/czu109

Wethington, E., & McDarby, M. L. (2015). Interview methods (structured, semistructured, unstructured). *The Encyclopedia of Adulthood and Aging,* 1-5. doi:10.1002/9781118521373.

Wiggins, S., Kirsten, J., & Llambí, L. (2010). The future of small farms. *World*

Development, 38, 1341-1348. doi:10.1016/j.worlddev.2009.06.013

Wilson, S. (2018). An opportunistic approach to climate resilience in developing countries. In C. Schaer and N. Kuruppu (Eds.) *Private-sector action in adaptation: Perspectives on the role of micro, small and medium size enterprise*s (pp. 39-50). Copenhagen, Denmark: UNEP DTU Partnership. Retrieved from http://www.unepdtu.org

Wulandari, E., Meuwissen, M. P., Karmana, M. H., & Lansink, A. G. O. (2017). Access to finance from different finance provider types: Farmer knowledge of the requirements. *PloS one, 12*(9), e0179285. doi:10.1371/journal.pone.0179285

Yang, H., Klerkx, L., & Leeuwis, C. (2014). Functions and limitations of farmer cooperatives as innovation intermediaries: Findings from China. *Agricultural Systems, 127,* 115-125. doi:10.1016/j.agsy.2014.02.005

Yankey, R. (2013, May 16). Ghana: Farmers in Afram Plains quadruple food production. *Ghanaian Chronicle.* Retrieved from http://www.africa-agri.com/ghana-afram-plains-farmers-quadruple-food-production/

Yilmaz, K. (2013). Comparison of quantitative and qualitative research traditions: Epistemological, theoretical, and methodological differences. *European Journal of Education, 48,* 311-325. doi:10.1111/ejed.12014

Yin, R. K. (2015). *Qualitative research from start to finish*. New York, NY: Guilford Publications.

Yin, R. K. (2017). *Case study research and applications: Design and methods*. Sage publications.

Yin, R. K. (2018). *Case study research*: *Design and methods* (6th ed.). Thousand Oaks, CA: Sage.

Zeng, A. Z., & Pathak, B. K. (2003). Achieving information integration in supply chain management through B2B e-hubs: Concepts and analyses. *Industrial Management and Data Systems*, *103*, 657-665. doi:10.1108/02635570310506070

Appendix A: Interview Questions

Interviewer: ……

Interview date: ……

Location: ……

1. What traditional farm funding strategies are available for smallholder rice farmers in Afadzato South District?

2. How successful are the traditional farm funding strategies for smallholder rice farmers?

3. What funding strategies have helped you to successfully obtain farm funding?

4. What strategies are available to smallholder rice farmer in obtaining nontraditional funding?

5. How successful have these strategies been for obtaining nontraditional farm funding?

6. What state policies support successful farm funding strategies for smallholder rice farmers in Afadzato South District?

7. What are successful collateral strategies for smallholder rice farmers in obtaining farm funding?

8. What are successful strategies aiding cooperative rice farmers in obtaining farm funding?

9. What payback strategies are available for smallholder rice farmers?

10. What other topics that we did not cover in our discussion would you like to discuss that can contribute to my understanding of the strategies you use to obtain farm funding?

Appendix B: Interview Protocol

Pre-Interview

Participant Code: _____ Date of Interview: _____

Interview Mode: Face-to-face_____ Telephone_____

Guidance notes:

* Explain the purpose of the study to the participant.

* Retrieve signed informed consent forms

* Write the label assigned to the participant on top of the interview sheet to ensure confidentiality.

* Audio record the interview and assign same label to identify the data.

* Watch for nonverbal cues

* Ask follow-up probing questions to get more in-depth information

* Wrap up interview thanking participant

Post-Interview

Schedule follow-up member checking interview

Participant Code: _____ Date of Interview: _____

Interview Mode: Face-to-face_____ Telephone_____

Guidance notes:

* Share copy of succinct synthesis for each question in the interview

* Bring in probing questions related to other related information found

* Walk through each question, read the interpretation and ask:

*Did I miss anything? Or, * what would you like me to add?

Appendix C: National Institutes of Health (NIH) Certificate of Completion

Certificate of Completion

The National Institutes of Health (NIH) Office of Extramural Research certifies that **Faith Ababio-Twi** successfully completed the NIH Web-based training course "Protecting Human Research Participants."

Date of Completion: 05/03/2018

Certification Number: 2811219

NIH National Institutes of Health
Office of Extramural Research