

Mobile Phones and Innovations

**An Empirical Description of Farmers' Utilizations of the Mobile
Phone in Upper East Region, Ghana.**



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Acknowledgments

First I want to thank the village chief in Kazugo for allowing me to live almost eight weeks in his palace. That was a great time and I learned incredibly much about Ghana, farming, life in marginalized area and also about myself. The fieldwork would never have been the same if it were not for the time I got to spend in this friendly community. Thank you father!

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Abstract

The mobile phone has provided new opportunities for various people around the globe. During the last 20 years the accessibility of this technology has increased tremendously. This study will describe some changes that the mobile phones has produced in Upper East Region, Ghana. It will show that rural farmers have found the mobile phone helpful in various ways. To be able to call to the markets to access price information, organization of transport and discussion on agricultural diseases with pesticide dealers are some of the findings that will be presented in this text. The data has been collected through a two-and-a-half-month fieldwork in the Kassena-Nankana Districts during the dry season 2016-17. I conducted a pilot survey to get a varied sample for the semi-structured interviews, and I had group discussions where I collected data to supplement the interviews.

Theories about General Purpose Technologies, innovation, agricultural innovation systems and institutions will be addressed. Through these theories I will try to present the mobile phone as a technology that can facilitate change on a scale that is almost unprecedented in the study area. The mobile phone has connected people that were previously disconnected, and the communication possibilities it offers may have wide ranging effects on how the farmers conduct their market transactions as well as their production methods. This paper will indicate that the market places are losing its central importance as a geographical area. It will show that a mobile phone handset has different functions that some farmers utilize to enhance local knowledge. Mobile Money Transfer (MMT) is a mobile phone banking service that is accessible to many more people than the commercial banks. Some of the changes can be regarded as innovations, and it is clear that some farmers benefit in many ways from the mobile phones different functions.

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Note: Unless otherwise stated, all the images are the authors.

Abbreviations:

MIS = Market Information Services

UER = Upper East Region

GPT = General Purpose Technologies

CEDEC = Catholic guest house Center for Development and Communication

MMT = Mobile Money Transfer

SAP = Structural Adjustment Programs

1. Introduction

The first handheld mobile phone as we know it today was produced by Motorola in 1973 (Katz, 2008). This was the beginning of a technology that has become widespread across the globe. It's main function provides instant communication between people far away from each other, as long as they are connected to the cellular network. Mobile phones compared to mainline phones, which require physical cables, only requires a cellular mast providing mobile phone network over large areas. The relatively simple infrastructural improvement to create such masts, have made some developing countries leapfrogging the conventional development with cabled mainlines (Etzo & Collender, 2010), and provided cellular networks to areas previously unconnected to any telecommunications infrastructure. Donner (2008) argue that “questions remain at the micro-level about the actual household-, firm-, and village-level processes by which mobile telecommunications support growth and poverty alleviation” (p. 29). This thesis will discuss some of these processes at farmer household level.

My supervisor introduced me to the subject of working with mobile phones in Ghana. Overå (2006) conducted fieldwork in Ghana in 2000 and 2003, and at this time 8 % of the population had a mobile phone. Her focus during this fieldwork was on traders and how they could benefit from this technology. She observed that the mobile phones could help reduce transportation and transaction costs, and enhance “personal confidence” between trading partners through frequent long-distance communication (p. 1313). The accessibility of the mobile phone has increased enormously that last decade. During the fieldwork in 2016, almost every farmer I talked to had their own mobile phone, or had access to one in their household.

Researchers have presented various ways in which the mobile phone have helped farmers. According to Egyir et al. (2013) the mobile phone has made it easier for the farmers to get information from different markets, and reducing price asymmetries can help farmers get better prices for their crops. With substantial training, literate farmers in Northern Ghana have learned to make use of weather forecast-, crop planning- and marketing-services on SMS through a market information service company, Esoko, on the mobile phone (Nikoi et al., 2016). Alhassan & Kwakwa (2012) mention that farmers become better at coordinating

access to agricultural inputs like pesticides and fertilizers. For some farmers it has also helped them coordinate better with the traders, they can now harvest their crops when they know that a trader will come to their village (Boadi et al., 2007; Overå, 2006). This helps them reduce the spoilage of their perishable crops.

For farmers in the Upper East Region (UER) the mobile phone has brought similar changes as mentioned above. This study indicates that the most important change that the mobile phone has brought to the farmers is the various ways in which the farmers can call to friends at the markets and get the current day's information about supply, demand and prices. It has also proven useful to organize large scale transportation of crops, and it offers the farmers possibilities to call friends, traders, veterinarians, pesticide and fertilizer dealers for help. The mobile network providers in Ghana also offer Mobile Money Transfer (MMT) for their customers if they register for it. This service allows farmers to send and receive remittances and save money on personal accounts, something that also have helped some of the local farmers.

This thesis presents research findings on the many ways in which farmers in UER utilize their mobile phones. This empirical overview will be complemented by a discussion on how these utilizations may affect the local farmers' activities. Particularly whether mobile phone utilizations induce various forms of innovations that may increase the farmers' efficiency or profits. Another aim of the study is to investigate if the mobile phone can help farmers become more embedded in the regional agricultural innovation system by providing farmers with a tool to interact with other actors and acquire information. A regional agricultural innovation system (World Bank, 2006; Hermens et al., 2012) tries to encapsulate all actors and agencies involved in an agricultural innovation in an area. The mobile phone is a General Purpose Technology (GPT) (Lipsey et al., 2005; Jovanovic & Rousseau, 2005), because of its widespread usage and various utilizations. This thesis will also highlight some utilizations of the phone that is not directly related to communication, like photography and recording, as useful tools for farmers.

1.1 Study Area

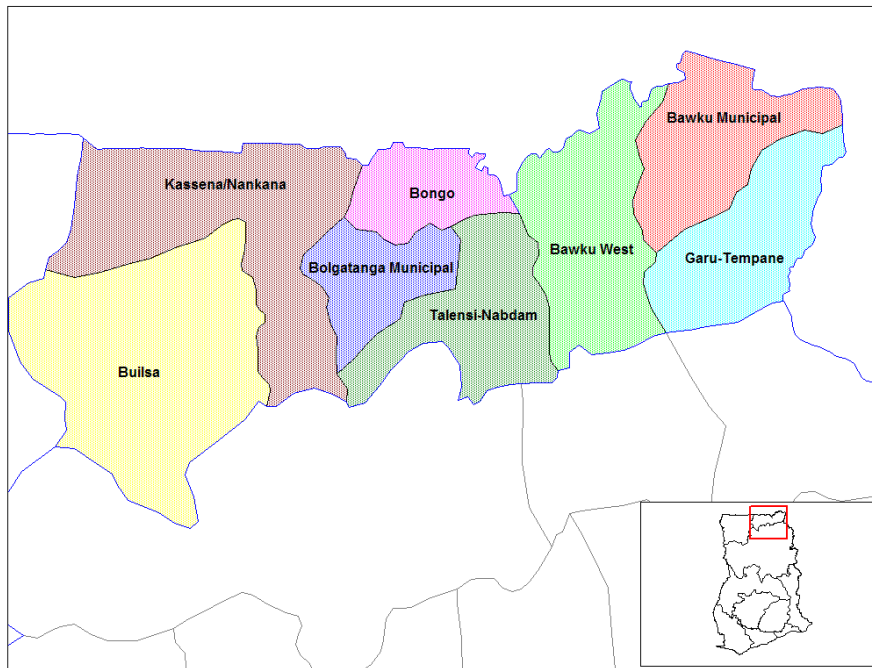
The fieldwork for this study was performed in two districts in Ghana, Kassena-Nankana East and Kassena-Nankana West, located in the Upper East Region (UER), where Bolgatanga is

the regional capital. Upper East Region has been the poorest region in the country since independence (Laube et al., 2011), and its dry and challenging climatic conditions will continue to present difficulties for the inhabitants here. The climate decides what crops farmers can produce, and it is an underlying factor that affects every farmer's crops. Furthermore, climate change will increase the uncertainty for the farmers in this area with unpredictable rainfalls and shorter rainy seasons (Wossen et al., 2014; Laube et al., 2011).

The Kassena-Nankana districts are located in the north western part of UER, close to the border with Burkina Faso. In 2008, the Kassena-Nankana district was split into two districts, the Kassena-Nankana East and the Kassena-Nankana West. Paga is capital of Kassena-Nankana West and Navrongo is the capital of Kassena-Nankana East, which also was the capital of the Kassena-Nankana districts before they were separated. Altogether, there is a population of 180 000 people in these two districts, with Kassena-Nankana east being the biggest with 110 000 inhabitants (Tia & Salifu, 2010; Salifu & Abdul-Jalil, 2010). The two villages where the fieldwork was conducted is Kazugo in Kassena-Nankana West and Pungu in Kassena-Nankana East. Pungu is a village that can be regarded as a suburb of Navrongo (Tia & Salifu, 2010). These two villages are located a few kilometres apart, but Kazugo is only accessible on a one-row gravel road. Pungu has a two-row paved road that connects the village to Navrongo.

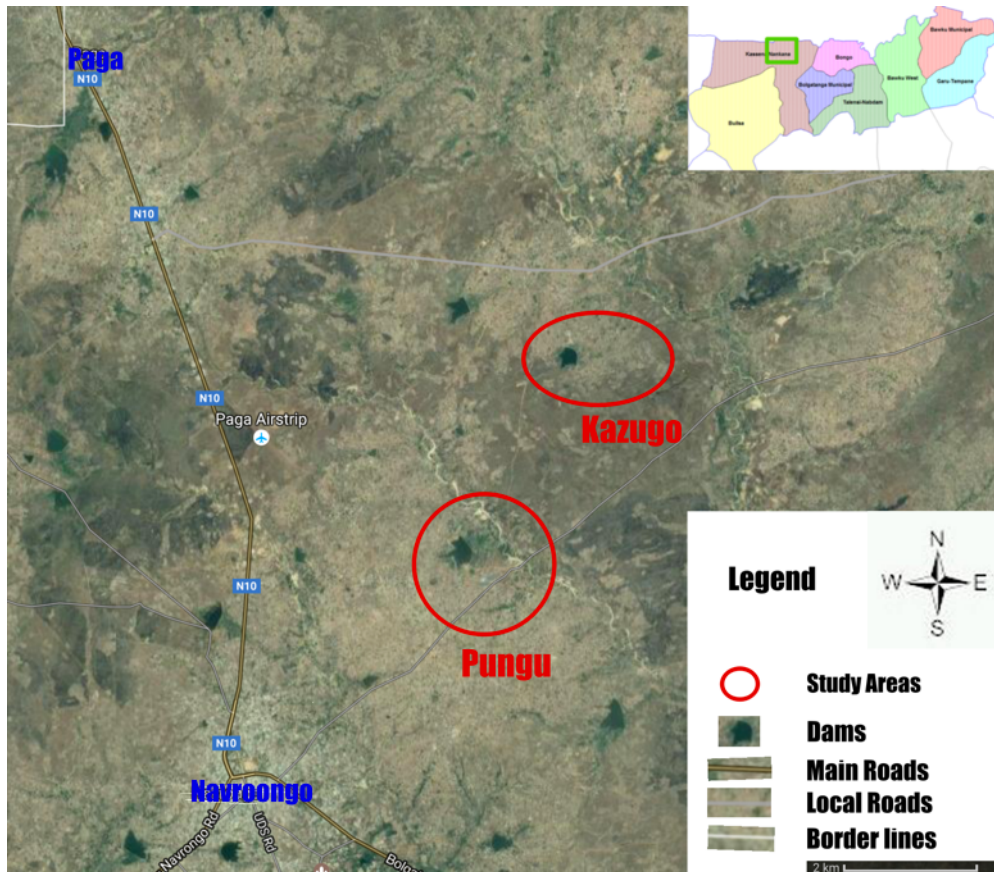
Agriculture is the sector that employs most people in Kassena-Nankana districts. About 80% of the population in these districts conduct a farming activity, either for sustenance or for sale (Tia & Salifu, 2010; Salifu & Abdul-Jalil, 2010). There are two effective farming seasons, the dry season and the rainy season. During the dry season, farmers are dependent on dams that fill with rain water during the rainy season. The two dams and the study areas are encircled in Image 1.2. The farmers grow different crops in the two seasons. For those that produce crops to sell, the local market is where most of them conduct their sales transactions. The Navrongo market is a big market that attracts customers from different districts as well, making it the most attractive market for my informants from both of the villages. The markets consist mostly of female traders selling various agricultural produce.

Image 1.1: Upper East Region with it's districts.



The Kassena-Nankana districts are presented as one, but were separated in 2008. Source: Wikipedia

Image 1.2: Satellite image with Navrongo, Paga, Kazugo and Pungu.



Source: Google

1.1.1 Local Environment

The environment in the two districts are very similar (Tia & Salifu, 2010; Salifu & Abdul-Jalil, 2010). The rainy season normally lasts from May until December. At the peak of the rainy season it may rain several times during a day. During the dry season there may be some drizzle, but it is too little and too irregular for the farmers to rely on for food production. During my stay I only experienced some small drizzle on three occasions, most likely because I was there during the driest period of the year, the Harmattan. The Harmattan is a period where the north-eastern trade winds that blow sand and dust from the Sahara Desert. This creates a constant layer of dust that reduces visibility, reduces the moisture in the air and reduces the strength of the sun. Due to the dust, the sun does not heat the ground to the same extent, and this makes evenings and mornings relatively cold during this period.

According to a 2008 report, Northern Ghana is located in a high risk area for droughts, floods and environmental shocks “demanding immediate and sustained research and development efforts” (Wossen and Berger, 2014, p. 96). Climate change is having an impact on the region. The annual rainfall is predicted to stay at the same levels, maybe even increase (ibid, p. 95). But it is also predicted that the amount of rainfall at the onset of the rainy season will decrease. This latter phenomenon may already be in effect. It is reported that the onset of the rainy season now begins a couple of weeks later, in the beginning of May instead of late April (Laube et al, 2011). To grow rain-fed crops, substantial rain when the crops are sowed is important for the yields. If these developments continue it may become a problem for small-scale local farmers plant the seeds at the right time, and receive good yields.

The K-N East and West districts are located in the Guinea Savannah Woodlands. These savannahs provide a Sahel and Sudan-Savannah type of vegetation (Tia & Salifu, 2010). Such an area consists mainly of widespread individual trees surrounded by high grass. There are two types of soils located in these districts, Savannah Ochrosols and Groundwater Latire (Tia & Salifu, 2010; Salifu & Abdul-Jalil, 2010). These two different soils have different properties that affect the crops and how often the crops need water. The Savannah Ochrosols is the preferred soil to produce on by the farmers, and it comprises some 60% of the land area (Tia & Salifu, 2010).

1.1.2 Brief History of Northern Ghana

Northern Ghana consists of three different regions: Northern Region, Upper West Region and Upper East Region (UER). The Northern Region is the biggest of the three, and the regional capital city, Tamale, is located in the centre of this region. The Upper West region is the second largest but the least populated and is located in the north western part of Ghana. UER is the smallest and most densely populated of the three northern regions. Northern Ghana is regarded as the poorest and least developed part of Ghana.

During the colonial era the British were in need of more labour in the south than they could acquire in Southern Ghana alone. The colonial masters decided that they could get the extra labour from the arid and unproductive regions of the north (Yaro, 2013). Many young and healthy men were moved from the north to work on cocoa plantations and mines. The working conditions and sanitation on these plantations and mines were really bad and many people attracted diseases. This resulted in a labour drain of young healthy men, as many of those who returned were sick and unfit to work.

These colonial policies had made a substantial difference between south and north when Ghana became independent in 1957. The national government wanted to reduce the differences by promoting groundnut, cotton, tomato, shea nuts and tobacco production in the north. Various documents from the colonial era indicated that the north had a comparative advantage for producing these crops (Yaro, 2013, p. 6). The projects and programs implemented in the north was based on collectivisation models promoted by the Socialist government led by Ghana's first prime minister Kwame Nkrumah. In 1966 there was a military coup in Ghana while Nkrumah was on a trip abroad. The new government did not support collectivization models, and changed the official support model to one that mainly promoted credit financing to individuals in the north.

In 1983 the Ghanaian government, run by John Jerry Rawlings, accepted Structural Adjustment Program (SAP) loans from the World Bank. In order to get these loans, the country had to go through some national structural adjustments towards a more neo-liberal economy. Trade regulations and import barriers were reduced. Also the state was diminished because the World Bank thought it did wasteful investments. This effectively removed some of the agricultural subsidies and introduced fees in the health and social services (Yaro, 2013,

p. 10). Some of these changes still affect tomato farmers (Mark, 2007) in the north as imported tomatoes from subsidized farmers in Europe reduces the prizes local tomato farmers can achieve.

In later years, irrigation technology has played an important role in increasing yields for farmers in UER (Laube et al, 2011). This is especially the case for the dry season crops like tomato, onion and pepper. Dams as a water source during the dry season have been constructed since the mid 1950's (Lund, 2008), but there is potential for more dams according to a government report arguing that the Kassena-Nankana districts have few dams (Abdul-Jalil & Salifu, 2010). Even though the government provides support to construct the dams, Laube et al (2011) argues that most of the agricultural development in UER is farmer-driven. The farmers themselves share information and knowledge in reciprocal relationships. Laube et al. (2010) suggests that one of the reasons why government led development projects do not always produce the desired outcome, is their top-down implementations. Many of the projects are not designed and implemented in collaboration with the local farmers, and this may create a distrust in the projects. I experienced that many farmers felt left alone by the government, and I also observed a general distrust in many projects, programs and NGOs by some of the local farmers I talked to.

Another challenge for development in Northern Ghana is that the government actively promotes the production and export of cocoa. The government wants to increase domestic cocoa production and offers subsidies to cocoa farmers that will turn their farm into a cocoa business (Laven & Boomsma, 2012, p.19). In northern Ghana the environmental conditions do not allow for cocoa production, making these subsidies irrelevant for farmers there. A common complaint from the local farmers was “we don't get anything because we don't produce cocoa”.

1.1.3 Telecommunication History in Ghana

In 1881, the first telegraph line was installed in Ghana, at that time called The British Colony of the Gold Coast (Alletoy & Akorli, 1999, cited in Overå 2006, p. 1304). With minimalistic 0.3 mainlines per 100 inhabitants, the Gold Coast reached one of Africa's highest telephone densities by 1950 (Michelsen, 2003, in Overå 2006, p. 1304). The development stagnated after the 1950's, and there was an uneven distribution of the telephone lines, where the rural

areas were hardly connected. During the latter half of the 20th century there was a state run corporation, Ghana Post and Telecommunications Corporation (PTC), which controlled the national telecommunications development. With an oversized administration, and lack of skilled technical staff the PTC was an inefficient corporation. It was privatized in 1995 when the government sold 30% of the shares to Telecom Malaysia, and it was renamed Ghana Telecom (ibid, p. 1304). In 1996, the National Communication Authority (NCA) was established in Ghana (Frempong, 2007) to regulate the telecommunications industry.

From 1995-2003, the number of active mainlines more than doubled, and the increase of mobile phones was even more dramatic. Reaching about 800 000 operational mobile phones (Overå, 2006, p. 1305) in 2003, the cellular network providers had failed to see how fast the mobile phone became adopted by users, resulting in congested networks. In 2008 Vodaphone Ghana bought the 70% of shares that the government owned in Ghana Telecom. From 2008-2013 there were a substantial improvement in the cellular network in Ghana resulting in better coverage and cheaper mobile phone credits (Egyir et al., 2013). Such expansion has resulted in more rural areas being covered with mobile phone networks, providing more farmers with the transforming technology that the mobile phone is for previously unconnected people.

Today in Ghana there are six network providers MTN, Vodaphone, Airtel, Tigo, Expresso and Globacom. MTN is the largest and the others follow respectively. It is substantially cheaper to call between mobile phones using the same network providers. This has made many of the inhabitants in Ghana have registered phone numbers from several network providers. The rate of nationally registered mobile phone numbers compared to inhabitants in the country is 128 % (Laary, 2016), a relatively high mobile penetration rate. Many mobile phones that farmers can buy in Ghana support two or more sim-cards simultaneously.

1.1 Research Questions

This study aims to understand how the mobile phone may have induced changes in the activities of farmers in Ghana. My focus in this thesis will be centred around the farmers and their mobile phone utilization. The research topic will of course deal with traders, veterinarians and other actors in the regional farming system, but then limited to the farmer's interaction with these actors and agents. Most of the new modes of interaction a farmer will experience with the mobile phone will be new to them, due to the both previous and current

lack of landline telephones in the farmer villages in Ghana. The farmers experience new ways to interacting with other actors, which may induce innovations in their agricultural work. In the task of identifying such innovations I have formulated an overarching research question:

- Has the adoption of the mobile phone led to innovations in production, marketing or organization of farming activities and produce among farmers in Northern Ghana?

With this overarching research question the ambition is to encapsulate changes that the farmers may experience in their farming system, which I will examine through the following sub-research questions:

1: What kind of innovations have the mobile phone facilitated?

2: Has the mobile phone influenced how a farmer gathers new knowledge?

3: Has the mobile phone affected local institutions?

Each of these sub-research questions will be analysed in a theoretical perspective. The first sub-research question focus on the innovations that I have observed. The mobile phone is a GPT that have provided rural farmers in the study area with possibilities previously unavailable to them. This sub-research question allows me to present the various changes that farmers may have experienced after adopting the mobile phone. Then I will discuss how some of these changes constitute innovations according to Schumpeter's types of innovations (McCraw, 2007).

With the second sub-research question I hope to learn how the mobile phone influence how the farmers access knowledge and information in the regional agricultural innovation system. Knowledge and sharing of information is central in an agricultural innovation system (World Bank, 2006). I will investigate how the mobile phone's different function's may influence the knowledge gathering methods for the local farmers. The thesis will also discuss whether the mobile phone may change farmers position in the innovation system by allowing some of them to become brokers who conduct upscaling or outscaling (Hermans et al., 2012, p. 118-119) of information, knowledge and innovations amongst other farmers.

In the final sub-research question I want to see if the mobile phone has affected local institutions, like the way they conduct sales with each other. Institutions may be regarded as norms, rules and practices that guide human interactions (Doloreux & Parto, 2004; Leach et al., 1999). Various norms and rules govern market transactions in the study area. There are no fixed prices in the study area (Egyir et al., 2013). Visual inspection before traders buy agricultural produce is necessary because of varying quality on crops (Overå, 2006). These are some of the norms that is central in market transactions, and I will discuss if the mobile phone may have affected these and other norms and common practices in the study area.

1.2 Chapter Overview

This thesis consists of seven chapters. The introduction presents the thesis, the study area, local history and the research questions. The second chapter presents the theoretical framework that I have chosen to discuss the research findings. In the third chapter there will be a description and discussion about the research methods that was utilized during the fieldwork. Chapter four presents the farming system and its central actors in the research area. Here I will describe the farming and living conditions of the informants. The fifth chapter will present the research findings on how the mobile phone has affected a local farmer's production, organization or marketing of his crops. In the sixth chapter the research findings will be discussed with the theories that is presented in chapter two. Chapter seven conclude the thesis by answering the research questions and some concluding remarks.

2. Theoretical Framework

Ghanaian farmers have experienced changes in their daily lives after adopting mobile phone usage. Some of these changes may be regarded as innovations, and the present work will focus on how innovations may affect rural farmers who work in the agricultural sector. In this chapter I will present 1) the mobile phone as a General Purpose Technology, and how it may introduce innovation, 2) theories on innovations, 3) an overview of agricultural innovation systems, and 4) a definition of institutions and explain how they are relevant.

2.1 General Purpose Technologies

The term General Purpose Technologies (GPTs) tries to encapsulate technologies that have been introduced to one sector, but later proved to be helpful in many other sectors as well. Such technological breakthroughs have happened throughout history for the last 10 000 years (Lipsey et. al., 2005) beginning with the Neolithic revolution (ibid, p. 138), when people learned how to cultivate crops, to the Information and Communication Technologies (ICTs) that have transformed human interaction the last 50 years (ibid, p. 114). The GPT theories try to single out a technological invention and study how that technology alone may have affected the society and other present technologies. This does not mean that GPTs can exist without other technologies, but it implies that there is a hierarchy of technologies (Lipsey et al., 2005, p. 373). For example, without the electricity as a technology, many of today's technologies like light and the ICTs, would never have been possible.

Since a GPT may vary in many ways it is difficult to find a simple definition. Lipsey et al. (2005) present four criteria that a technology has to fulfil in order to be a GPT (p. 97). I will supplement those with three criteria that Bresnahan and Trajtenberg presented in 1996 (Jovanovic & Rousseau, 2005, p. 1185). The first criterion is that the technology needs the ability to be continually improved, that it has a large “scope for improvement” after its initial implementation (Lipsey et al., 2005, p.97). The value of the technology will improve through “ancillary supporting technologies”, while the costs of the existing technologies will be reduced. This is identical with Bresnahan and Trajtenberg’s (1996) criterion Improvements (Jovanovic & Rousseau, 2005, p. 1185). The prices of mobile phone handsets have been dramatically reduced the last 20 years.

The second criterion is that a GPT needs a large variety of uses. By variety of uses Lipsey et al. (2005) refer to “the number of distinct uses that are made of a single technology” (p. 97). The light bulb as a technology may only be used to produce light from a lamp, without a lamp the light bulb is rather useless. On the other hand, steam power could be used to pump water, to automate bellow-use in breweries and as a power source for trains, boats and early cars (Ibid: p. 98). Their third criterion for a GPT is that it needs to have a wide range of uses. This means that it can be introduced to various sectors of the economy, from agriculture to mechanical industries to hospitals. For example, the mass production technology started in the automobile industry but has later become a dominant production method in many industries. Bresnahan and Trajtenberg (1996) combined these two latter criteria and dubbed it Pervasiveness, arguing that a GPT should have enough varieties of uses that it should spread to most sectors in the economy (Jovanovic & Rousseau, 2005, p. 1185).

The final criterion for a GPT is that the technology has spillover effects. This means that the technology will benefit people “far beyond those agents that initiate the change” (Lipsey et al. p. 98). The usage of the technology will improve or change existing processes, products or organisational practices in sectors that were not thought of during the initial invention of the technology. The improvements and changes the GPT facilitate may sometimes be regarded as innovations, and Bresnahan and Trajtenberg’s (1996) final criterion is called Innovation Spawning. A “GPT should make it easier to invent and produce new products or processes” (Jovanovic & Rousseau, 2005, p. 1185). This trait of a GPT is important in the thesis where I describe some innovations spawned from mobile phone utilizations.

Both Lipsey et al. (2005) and Bresnahan and Trajtenberg argue that almost every technology will possess one or more of these criteria (Jovanovic & Rousseau, 2005). But a GPT would need to fill these four criteria in abundance. There must be many improvements of the technology, and it must be beneficial for a large amount of people, and it needs a rich variety of uses and spread into most sectors of the economy before it can be regarded as a GPT. With these criteria explained I will present a definition (Lipsey et al., 2005, p. 98):

“A GPT is a single generic technology, recognizable as such over its whole lifetime, that initially has much scope of improvement and eventually comes to be widely used, to have many uses, and to have many spill over effects.”

Lipsey et al. (2005) divide GPTs into two categories, the “transforming GPTs” and “normal” GPTs (p. 13). The “transforming” GPTs are technological inventions that result in greater economic, social and political transformations, while “normal” GPTs are technologies that fit well in the economical, technological and cultural society, and simply increase efficiency rather than promote wider societal transformations. The “transforming” GPTs may not be utilized fully under the economic, social or political structure present during the invention, but will promote a change in these structures that consequently transform the society to better utilize the new technology. For example, when the voltaic battery was invented in 1800, electricity was a weak power source that did not compete with the evolving steam technologies (ibid, p. 197-198). In 1867, the dynamo was invented and showed promise for this new technology, and over the next 50 years the number of uses expanded and electricity became the dominant energy source for economic development.

Lipsey et al. (2005) argues that not every GPT is a transforming technology, as some GPTs evolve from the social, economic and cultural structures that are present at the time of invention. These GPTs will become widely adopted into various sectors of the economy, but they do not result in any big transformations due to their applicability in the present social structures. For example, the mobile phone technology is not a transforming GPT in western economies as the technology evolved from the telegraph and simply enhanced some technologies that were already present in our society. But for rural societies in Africa that never had access to telegraph or main line telephones, the mobile phone technology may be regarded as “transforming”.

2.2 Innovation

Innovation is a widely used term that may characterize a change that has economic consequences. Innovations may often be discussed in relation to inventions. While the term invention describes something that is completely new, the term innovation refers to inventions that have been commercially modified to increase profits (Lipsey et al., 2005, p. 12). This implies that the term invention is about creating something new in a general perspective, but innovations always occur in an economic context.

The economic literature has many definitions of innovation (McCraw, 2007; Mytelka & Smith, 2002; Godin, 2006), and as with other social and economic terms scholars do not always agree. As a starting point, Schumpeter's theories about innovation are still useful to describe the different types of change that may constitute an innovation (McCraw, 2007). Schumpeter connects innovations to the entrepreneur that may give his or her company a temporary monopoly by introducing a new product, a new way to produce a product or a new way of organizing the process of production to increase the company's profits. In Schumpeter's (1934) book he defines five different types of innovations (McCraw, 2007, p. 73):

1. Introduction of a new product, or a new quality of a product
2. Introduction of a new way to produce a product
3. To open a new market in an area
4. Introduce a new source of supply for raw materials or half manufactured goods
5. A new way of organizing in the industry

These five types are useful because they illustrate how many of the different aspects in the production of a product that may be changed or innovated to increase profits. Innovations are therefore more than just a new product, innovations encapsulate changes in the organization and the production as well. These types of innovation also indicate that innovations do not need to constitute big changes. This is important to bear in mind when analysing how the mobile phone has changed some of the farmer's practices in UER. These changes are not ground-breaking, but are small changes that comes from a better flow of information and that may in turn increase efficiency and profits.

One critique of Schumpeter's theories is that he presents a too linear relationship between the actors in the process of innovation. In the linear model of innovation, there is a one-way relationship between the actors that have been working on an innovation (Godin, 2006). In such a relationship the basic research department in a company would not receive information and feedback from the production or distribution departments when they create innovations. Critiques of the linear model of innovation argue that there should be a more dynamic relationship between the departments inside a company for an innovation to be successful. Innovations need continual improvements based on information from various departments in

a company or competing companies (Mytelka & Smith, 2002; Lipsey et al., 2005; World Bank, 2006)

A pioneer in innovation theories in the 1980's was Nathan Rosenberg who argued that every innovation needed post-innovation improvements (Mytelka & Smith, 2002, p. 1472) or incremental improvements (Lipsey et al., 2005, p. 90). Rosenberg indicates that these improvements alone do not have much impact, but the cumulative effect of such improvements may result in a substantial increase in an innovation's performance and efficiency (ibid, p. 90). These improvements derive from knowledge received after the company or organization has released their innovation. In order to implement these improvements, responses and information have to be delivered from for example, the production and diffusion department to a department in an earlier production phase of the innovation. This has generated a more dynamic understanding of the innovating process. Today there are many actors involved in an innovation, even actors outside the innovating firm (World Bank, 2006).

A central term in innovation theory is knowledge and knowledge production. According to the World Bank (2006) the way we produce and share knowledge and information has changed the society. This is evident in the developing world with mobile phones. Through Information and Communication Technologies (ICT), knowledge and information has never been as easily accessible as it is today. The easy access to knowledge transforms our society from a "knowledge elite society" to a "knowledge society" (World bank, 2006, p. 2). An important change is how we acquire new knowledge in a society where it is easy accessible. The World Bank argues that new knowledge used to come from research, but now a company would acquire the knowledge through search, consultations and research projects in collaboration with other actors and companies as well. This new way of acquiring for knowledge is central in innovation systems theories.

2.3 Agricultural Innovation System

In relation to this newer understanding of the development of an innovation, there were scholars who started using the concept systems of innovation (Freeman, 1987). This systems approach emphasizes the dynamic relationship between all actors and agencies in an innovation process, and ought to help policy-makers create better policies that facilitate

innovations. While some 20th century theories about innovation showed how actors *inside* a company should work together to create the best innovations (Godin, 2006), the systems theory add that knowledge produced outside a company may also help the company improve their products. Knowledge produced outside a company may come from either official or private companies and organizations. The theory of innovation systems emphasizes how firms or entrepreneurs should make use of knowledge and information that is generated by others (World Bank, 2006). In this thesis I will use the term regional agricultural innovation system, because I am studying an agricultural innovation system in a specific regional context.

Hermans et al. (2012) writes about upscaling and outscaling in innovation systems. The concept of upscaling describes how information and knowledge is shared between the different actors such as consumers and producers, or farmers and researchers. Outscaling looks at how innovations spread between the different types of organizations in the same sector, i.e. farmer to farmer communication. Hermans et al. (2012) present four different types of promoters that should be present in an innovations system in order for it to be successful; a “power promotor”, a “technological promotor”, a “process promotor” and a “relationship promotor” (p. 118-119). The “power promotor” and “process promotor” are two of these actors that I observed during the fieldwork. These promoters are persons who act like *brokers* in an innovation system.

The “process promoters” work with the outscaling of an innovation. They look at personal and organizational relationships and collaborations to see how an innovation best can diffuse to different organizations and companies in the same sector. This could be relevant to understand the role played by Agricultural Extension Officers, who provide technological and agricultural help to farmers in UER. Hermans et al. (2012) argues that these innovation brokers can be identified by looking at who the participants are in the different kind of workshops, conferences, public debates, presentations, meetings and other public or private programs. Identifying these brokers and facilitating their collaboration in knowledge co-creation may be important for successful diffusion of an innovation in a regional innovation system (Hermans, 2012, p. 127). The “power promotor” is focusing on political and power relations inside an innovation system. This can be relationships between the national government and the local government or the relationship between a village chief and a local actor. The village chiefs can invite different organizations and groups to the village and allow them to introduce and teach new technologies and techniques.

Nafstad & Iversen (1996) use the term "information poverty" (p. 74) about people that lack the equipment or infrastructure to get access to relevant information. In an agricultural innovation system information is a key to success, and people who lack access to information may fall behind in the regional development. Information infrastructure (Nafstad & Iversen, 1996, p. 76) is important to reduce the gap between "haves" and "have nots", as illustrated in Overå (2008) comparing two salt producing coastal towns in Ghana. When one of the towns received telephone lines, it became the favourite town for salt traders in Accra. The traders could call the town and ask if a trader there could send salt to Accra, thus the trader in Accra would not need to travel back and forth to the town. Consequently, traders reduced their salt demand from the town that lacked the information infrastructure like telephone lines.

The "information poor" are also more exposed to information asymmetries, for example different prices for the similar products (Nayyar, 1990). Such information asymmetries allow people to negotiate prices that are not fixed, and it may let traders cheat farmers to accept relatively low prices for their produce compared to the market value. This is a problem that rural farmers in Ghana may have experienced when a trader would come to their village before the mobile phone and the required infrastructure was build (Egyir et al., 2013). Market Information Services (MIS) company Esoko have proved helpful for farmers in northern Ghana (Nikkoi, 2016). MIS companies offers farmers information about weather forecasts, market prices, crop tips and other farming related information. It is documented that the mobile phones have reduced price dispersion by 6 % on grains between markets in Nigeria (Aker, 2010, in: Zanello et al., 2014, p. 817), and the possibility for farmers to contact the markets from their village may reduce the price asymmetries between the village and the market.

Inhabitants in areas that have newly been connected with information infrastructure and accessible equipment have received new ways to keep contact with their networks. Lissoni & Pagani (2003) discuss innovation networks, and how such networks of various actors may help share information and diffuse innovations (p. 221-222). A person's innovation network may be regarded as the people that the person is in contact with in relation to the work. For a household in UER the innovation networks may consist of farmers, traders, family, veterinarians, drivers, chiefs, chemical dealers and in some cases an agricultural extension officer and NGO's. Because few people are content to rely on generalized morality and

institutions to spare them from trouble related to their work (Granovetter, 1985, in: Overå, 2006, p. 1303), actors in innovation networks need to build their own network based on reputation of reliability and trustworthiness. This reputation may be built by actors through repeating reliable and honest transactions with other actors in their network, something the mobile phone may help with (Overå, 2006; 2008).

Long-term-oriented co-operation between economic organizations may result in important advantages (Bachmann, 2003, p. 58). Such co-operations require a certain degree of trust between the organizations, as trust provides one organization a specific assumption of the future behaviour of the collaborating organization (ibid, p. 61). During the fieldwork everyone replied positively when asked whether they helped others or others helped them. The trust that I observed between the informants constitute a high level of social capital for farmers in this region. Social capital refers to the sum of resources, both actual and virtual, accumulated through friendly gestures and actions between people in a society (Ellison et al., 2007). The trust between them may be regarded as personal trust, as opposed to system trust. A personal trust relationship usually originates from multiple face-to-face interactions between two individuals (Bachmann, 2003, p. 64). Such relationships build on reciprocity; they both believe that they will benefit from the it. Reciprocal actions happen when a person perceives another person's action as kind or unkind (Falk & Fischbacher, 2006, p. 294), and act according to their conception of the other person's actions. If a farmer acts trustworthy towards a trader, the trader may want to act trustworthy towards the farmer because she believes the relationship can be beneficial, and vice versa.

System trust may come from institutions in place in a system that help people trust each other even though they have never met before, institutional-based trust (Zucker, 1986, in: Bachmann, 2003, p. 64). A high degree of system trust will reduce peoples fear that other people may cheat them. For example, efficient official laws that punish people who try to cheat others, are institutions which may increase system trust. But in societies where the rule of official laws is weak and inefficient, like in the study area, the system trust may be regarded as low.

2.4 Institutions

Institution is a word that may be ambiguous, as there is a substantial difference in the meaning of the word whether you use it in everyday speech or in social sciences. Institutions are often regarded as social organizations in everyday speech, like schools and hospitals. But in social sciences, this term encapsulates norms and rules in a group or society that helps reduce risk in human interactions.

2.4.1 Definition

Research on institutions has a long history (Edquist & Johnson, 1997), but its central role in innovation and economic theory originated in the end of the 20th century (Hounkonnou et al., 2012; Doloreux & Parto, 2004). Douglass North is one of the pioneers describing economically important institutions, and his formulation that institutions work as a guide to reduce uncertainty in human interactions is commonly used (Doloreux & Parto, 2004, p. 25). North also states that a theory of institutions must include a theory of property rights, a theory about the state and a theory about ideology (North, 1981, in: Edquist & Johnson., 1997, p. 45), illustrating the complexity of this theoretical term. Robin Mearns (1995) has a broad definition; institutions are regularised patterns that guide social and individual behaviour in a group or society (Leach et al., 1999, p. 226). Based on these texts I will define institutions as written or unwritten rules and norms that guide interactions between individuals and groups in a society, to reduce the risks involved in interactions between unknown and known people.

Institutions in everyday speech may often refer to concrete social structures, like a hospital, a school or a court. In academic literature, such social structures are regarded as organizations. Still, we have organizations that can be regarded as institutions, like households (as way to organize family production) and certain cooperatives (de Janvry et al., 1993, p. 566). This distinction between organizations and institutions is a matter of degree, as grass root organizations can introduce new contracts or ways to interact, that might become institutions “if they are extensively practiced, standardized, and recognized” (ibid, p. 566-567).

Most researchers divide between “formal” and “informal” institutions (Edquist & Johnson, 1997). This divide is useful to separate institutions that are officially recorded and institutions that are locally rooted. One important difference is that formal institutions are codified; they

are written down in formal papers. Criminal laws can be understood as formal institutions, they provide people with a framework of what is allowed and not, often written down in a national law. The criminal laws are upheld by a police force that ensures that people will act according to the rules. The informal institutions are often norms and unwritten rules often (ibid, p. 50). The rule that the “pumping day” was only every sixth day in Kazugo, and that they would stop pumping water from the dam by the end of February, are such examples of informal institutions.

2.4.2 Why Institutions Matter

An example of how institutions may affect development is the Green Revolution. It made clear improvements towards food security in Asia, but it failed to show the same results in Sub-Saharan Africa (Hounkonnou et al., 2012). Researchers who tried to understand why this was the case, often conclude that the local institutions may be an important factor. The World Bank (Morris et al., 2009) presented a paper, *Awakening The Sleeping Giant*, which concludes that there is little evidence that large-scale farming is necessary, or even promising, in Sub-Saharan Africa (p. 8). This may be one important difference from Asia, where many large-scale farmers have played an important role in implementing the innovations that emerged during the Green Revolution. In Africa there are fewer institutions promoting large scale farming. The fact that there is little private ownership of land in northern Ghana (Lund, 2008, p. 69), and few large-scale farmers (MOFA, 2010) made it difficult for African farmers to afford innovations which the Green Revolution could introduce. The World Bank paper indicates that the main challenge in Africa is to “transform SSA’s [Sub-Saharan Africa] smallholdings into sustainable and productive family farms” (Hounkonnou et al., 2012, p. 75), something the mobile phone may contribute to.

Institutions have various functions and may conflict with each other, and some argue that in most cases the institutions serve to protect the power of the powerful (Cleaver, 2002, in: Hounkonnou et al., 2012). In Africa there may be various institutions that affect a farmer. Eenhoorn and Becx (2009) conducted a survey addressing these aspects of institutions as problematic for farmers in Ghana: “insecurity in land tenure; lack of infrastructure; uncertain markets and variable prices; corruption; lack of farmer organizations that can defend farmers’ interests; probability that other people (including state officials) will cream off profits.” (Hounkonnou et al., 2012, p. 79). Some of these institutional challenges were an issue in the

Kassena-Nankana districts as well, with poor mobile network infrastructure, uncertain market prices, poor organization of farmers and regular accusations of politicians and state officials as corrupt.

In order to enhance the efficiency of new innovations in a region, Participatory Technology Development (PTD) may be an important approach (Hounkonnou et al., 2012). As indicated in the name, PTD aims to include locals when implementing new innovations and technologies. This is opposed to the more linear and top-down implementations of innovations that happened through the Technology Supply Push (TSP) approach. The TSP grew from the idea that exogenous technological improvement increases the social and economic development (Hounkonnou et al., 2012), which is an understanding that Laube et al (2011) say result in farmers being reluctant to development projects. In Southern Ghana for example, a NGO introduced many grasscutters, large rats, to a village, in order to increase the amount of protein in the villagers' diet (Carr, 2011). This was done without any discussion with the villagers, and the abundant grasscutters ended up eating the farmer's food crops, and eventually the grasscutters destroyed more food than they supplemented. PTD may improve the chances of an innovation to be successful because it will make room for innovation brokers, like agricultural extension officers, in the agricultural innovation system to adjust and customize innovations to better fit with local institutions, work and environment. For organisations that want to introduce new technologies, better access to farmers and agricultural extension officers due to the mobile phone may contribute to increased participation from local actors when the technology is implemented.

This chapter has described theories that are relevant to the thesis. The GPT theories try to explain how the mobile phone may affect the new adopters. Then I briefly discussed what may constitute an innovation, and it was followed by a discussion of Agricultural Innovation Systems. Agricultural Innovation Systems theories tries to encapsulate all actors involved in the innovating process. In the end of the chapter, institutions were defined, followed by a discussion that show why institutions are important when discussing adaptations of innovations. In the following chapter I will review the research methods that have been utilized. It also contains a discussion of the statuses and roles that I may have been attributed during the fieldwork.

3. Methods

This thesis is about the phenomenon "different mobile phone utilizations". A quantitative research project often tries to show what and how widespread a phenomenon is, while a qualitative approach tries to understand why a phenomenon takes place and what factors that need to be present for the phenomenon to occur (Aase & Fossåskaret, 2014). To study these factors and relations I have decided to do a case study in two communities. In case studies, the researcher does a thorough investigation into a specific place in space and time (Baxter, 2010). It is both location and time which is important in a case study, because time may change a community to such an extent that development goals and plans would also need to change. The purpose of this case study is to understand rural farmer utilization of the mobile phone, present the findings of the study and hopefully contribute to the knowledge about how development occurs. If we get an understanding of local activities within a case we can better understand peoples' living conditions, and therefore be able to produce better projects and plans towards fruitful development (Carr, 2009).

This project involved various research methods during the fieldwork. It started with a pilot-survey, followed by focus group discussions and finished with semi-structured interviews. Along with these methods I lived in one of the research communities and did participatory observations and field conversations. This can be regarded as a multi-method approach (Dunn, 2010; Longhurst, 2010) which has the possibility to crosscheck results from one method with results from a different method. Triangulation is a term that describes how we can use different research methods to see if there are corresponding results between the methods (Jick, 1979).

This chapter will provide a detailed discussion of how I chose the research communities, and my status and positionality along with the interpreters. I will continue to discuss the specific research methods and end the chapter by describing how I have analysed the data after the fieldwork.

3.1 Entering The Field

There are several reasons why I chose Navrongo in UER as the study area. I personally wanted to travel to an area with a marginalised population, and UER which is the poorest region in the country seemed like the natural place. Another reason was that my supervisor would travel to Navrongo during the field trip, which meant that I could meet with her during the fieldwork to get inputs and tips.

Before I went to Navrongo I had been in contact with both the Navrongo Health Research Center and a catholic priest about accommodation in Navrongo. I decided to sleep at the Catholic guest house Center for Development and Communication (CEDEC). On the first day in Navrongo I bought a bike, and on the second day I went on my first bike ride around Navrongo in order to try to find a suitable research community. That day I had no idea where to start to look for a study area, but while biking in Navrongo I found a sign that pointed to a large scale solar plant. I wanted to see this solar plant, so that decided the direction I biked that day. The solar plant was located in Lower Talanya in Pungu, and there was a paved road from Navrongo which ended by the plant. From the solar power plant, I used my bike to travel north east, because I asked a guy at the solar plant if he knew about any local villages and he pointed me in that direction. After roughly two and a half kilometres I arrived in a community without electricity, Kazugo. Here I was greeted by a young man. This young man talked English well and showed me around in the community. We went on a walk in the village together and I got a quick introduction to dry season farming in the Kassena-Nankana districts.

During the next two days, I used my bike to travel and visit different communities located around Navrongo. I also learned that Kazugo had been part of a Canadian voluntary project for three consecutive years. The tree-planting voluntary project ended in 2014 when the Ebola outbreak hit some West-African countries. I believe that because most of the children were accustomed to the presence of white people, they were more relaxed while I was around than in other villages I visited. The children, the welcoming young man and the fact that the community was without electricity, are the reasons why I chose Kazugo as a study area, and I also decided to live there. I called the young man from Kazugo and asked if it could be suitable for me to conduct the research there. The reply was positive and four days later I left Navrongo and headed for Kazugo where I shared a room and a bed with the young man that

had greeted me. This young man became the first research assistant and interpreter. However, he was a student and had to travel back to Kumasi about a month after we first met.

Image 3.1: My bike.



I am having a break on my trip from Navrongo to Kazugo.

The following day the two of us had a discussion about mobile phones with the village chief, and he described a situation with bad network coverage and problems with charging phones due to their lack of electricity. With this dim view of mobile phone utilizations in Kazugo, I felt that it could be a good idea to try to compare this community with a nearby community where they would have good coverage and electricity. I had passed a mobile phone mast on my way to Pungu, so I thought it would be better coverage there. I asked the chief and his son if they thought I would be able to talk to farmers in Pungu as well, and they replied positively.

I decided that I wanted to talk to farmers in both Kazugo and Pungu because I thought it could be interesting to do a comparative study between two communities with noticeable infrastructural differences. With electricity, proximity to a mobile phone mast, paved road and a school present for over 40 years, more than twice as long as in Kazugo, I believed that

Pungu would be noticeably different than Kazugo. I wanted to talk to farmers in Pungu, because I thought I would meet more literate informants, experience good network coverage, and get to talk to some smart phone users. However, after the focus groups and some semi-structured interviews in Pungu I learned that the network was poor there as well, and only a few of the informants from Pungu were literate or could speak English. The fact that the differences were minimal made me decide that I would not do a comparative study, but rather work with these two communities as a single case. Regarding organisation of transport, there is a noteworthy difference between these communities, and I will explain that difference in the thesis.

The chief's son became my gatekeeper in Kazugo and Pungu. He welcomed me to live in the community. During the first days we walked around and he introduced me to different people. They answered the short pilot-survey questions and some of them later became the informants for the group discussions and semi-structured interviews. In Pungu the first interpreter was even more helpful than in Kazugo to get me in contact with the farmers. Most of the farmers there did not know him, but many had heard about his family name. I believe that his status as a chief's son from a nearby community helped us get respect in Pungu. When we did our first travel to Pungu and conducted the pilot survey, people were welcoming and helpful from the beginning.

3.2 My Status and Role in the Field

3.2.1 Theoretical Background

In many interactions between a researcher and an informant, data is generated by both of them and not produced straight from the informant (Dunn, 2010; Longhurst, 2010). Therefore, it is important for researchers to analyse their own status and role in the field. How the informants understand and think about the researcher's status and local role may also influence what kind of information the informants will share (Mullings, 1999). In the following section I will discuss my own role and status in the two communities where I conducted the fieldwork.

Mullings (1999) writes about a researcher being perceived as an "outsider" or "insider" (p. 4) by the informants, and that this position will affect what kind of information the researcher will receive. "Insiders" would study a group that they belong to and be able to access more

intimate information from their informants with this status. “Outsiders” do not belong to the group of study, and therefore are “more likely to be perceived as neutral” (ibid: p.4) and this status may provide the researcher with information that may not be given to an insider. This can be similar to Goffmann’s “frontstage” and “backstage”. Goffmann tries to describe that, what an informant understands, knows and feels about the researcher may affect how personal and true information the informant shares (Goffmann, 1959 in: Aase and Fossåskaret, 2014, p. 93). If the informant trusts the interviewer, the interviewee may access “backstage” information, while an unknown interviewer probably would only get “frontstage” information from an informant.

The classical definition of status is that it is a social position which is bound to certain duties and rights (Linton, 1936, in: Aase & Fossåskaret, 2014, p. 66). In addition to formalized rules Aase & Fossåskaret further argue that most statuses are also tied to unwritten norms and rules (ibid. p. 67). Status is a title that holds a certain social or professional value, a value that may grant an individual a certain role, expectation and position. I often presented myself as a researcher, a status that people seemed to perceive as a person who comes to help and bring development. During cross-cultural fieldwork, a researcher’s *positionality*, the combined position from statuses like gender, class, race, profession etc., plays a central role in the field and in the final text (Mullings, 1999; England, 1994). Since data is generated by both informant and researcher, a researcher’s positionality does not only affect how the informant replies, but also the underlying premises for how and why the research is conducted. A comprehensive discussion about a researcher’s status will inform readers and increase transferability.

3.2.2 Discussion of my Positionality

When I arrived in Kazugo I was an “outsider” due to my status as a white researcher. I was also unfamiliar with the farming practices in the area, and I have very little farming knowledge from Norway. I wanted to live in Kazugo to try to become an “insider”, a part of the community. And after sharing a bed with the chief’s son in the “chief’s Palace” for a week, the chief started calling me his son as well. A status that made me feel welcome and appreciated. The status as the chief’s son combined with me living in the chief’s Palace may have affected how some of the informants in Kazugo perceived me. I stayed in the upper part of Kazugo, in the chief’s compound and with his neighbours, and this area was where I spent

most of my spare time in Kazugo. There were only a few people who knew English in Kazugo. One of them was the nephew of the chief, and he became a key-informant (Gobo, 2004) with whom I could have talks and discussions with in the evenings. The language barrier made it difficult for me to get close to other people during the evenings and in their leisure time, and hence difficult to become a part of the community in the way I wanted to. I quickly learned to greet people in various ways in the local language, and I used this to improve my relations with new informants.

While living in Kazugo, I was very different from everyone in my way of spending money. For example, I often travelled to the neighbour village, Navio, where there was electricity, to buy food and drinks in the evening. Also, within a month, I had given a new mobile phone to my first interpreter, a new mobile phone to the chief, and an old laptop that I brought from Norway to the chief's nephew, who was the key-informant. These signs of a sufficient amount of money might have affected what people expected from me. Edward Carr (2009) argues that in his experience from Ghana, some people may present themselves living in worse conditions than what is true because they believe this may increase their chance to receive something from the researcher or project planner. When I, in the middle of the fieldwork, brought gifts to people in Kazugo, there is a possibility that some of the informants from this community may have presented themselves in a worse situation than what was the case.

In Pungu I felt more like an “outsider” than in Kazugo since I did not reside there. The farmers in Pungu only got to know me in my role as a researcher, whereas in Kazugo I could enter roles like a “cook”, “construction worker” or “a white man who tries to implement a brush into the local laundry technique”. How the farmers talked and replied to me was noticeably different in the two different communities. I felt a little more respected in Pungu, where many seemed to act seriously and in a more ceremonial way when I was nearby. This contrasts to Kazugo where I could feel during the interviews that the informants acted more freely. In Kazugo some of the informants looked more relaxed when we sat down and talked. For example, they were not afraid to interrupt an interview to greet a fellow farmer who passed by, while in Pungu I experienced people rejecting farmers who passed by with a gesture because they were busy with our interview.

My skin colour may be a reason for why some people asked what they would gain by participating in the project. This may be due to the role expectations (Aase and Fossåskaret,

2014, p. 27) some Africans have from white people, that “we must help them in order for them to help us”. I never gave any of the informants gifts for their research participation, though I arranged a dinner party for the informants that could come, on my last evening in Upper East Region.

I will argue that my most important status throughout the data collection was the “white researcher”. This was the initial status conveyed to the informants when the first interpreter presented me and himself. And I do not believe that my statuses have made the data collected biased by my positionality.

3.3 The Interpreters

As positions and role is important for a researcher, fieldwork that requires an interpreter may also be affected by the interpreter’s position and role. In this section I will discuss the two interpreters’ positionality.

3.3.1 The Status and Role of the First Interpreter

The first interpreter was also my main research assistant and gatekeeper. He was the middle of three sons of the current chief in Kazugo. He was 25 years old and studied to become a senior high school ICT teacher at The Winneba University in Kumasi. He had done his education in Bolgatanga, due to the lack of a school in Kazugo before 2001. After senior high school he had returned home and lived in Kazugo for two years to earn some money on farming. This money was spent on his education in Kumasi.

As one of the chief’s sons, the interpreter was a respected man in Kazugo. This respect was helpful when we walked around in Kazugo to present me and the project. Even though he did not know many of the farmers in Pungu, his status as a fellow farmer from the nearby community Kazugo as well as the fact that his family name seemed to be well known to some, is something I believe was helpful when we introduced ourselves and the project. His local status made him a great gatekeeper for me. But his position as a fellow farmer offered some challenges during the group interviews because he had his own experience and knowledge about the work. In his summaries of long discussions between informants, the stories could sometimes be told simple and short to me, often in similar ways like we had discussed a

phenomenon during earlier evenings. I wanted to know about the details of specific stories in order to understand the premises that cause a specific action from the informants, but in summaries presented by someone who may have their own understandings of an action due to their own experiences, can leave specific details out.

His position as the chief's son also presented me with a challenge. I realized that if he was to be the interpreter during the semi-structured interviews, his status could affect the responses from the informants. Therefore, I decided to find another interpreter to help me conduct the semi-structured interviews. I knew that the chief's son would have to leave for Kumasi to continue his studies after I had spent three weeks in the field, so that was the plan all along. I decided that during these three weeks we would conduct the pilot-survey and the group interviews together before he had to travel. During the pilot-survey and the group discussions I did not ask of any sensitive information that the informants might be afraid to share in front of the interpreter. During the group interviews there would also be many people participating and that may have decreased the potential influence the interpreter could have on the conversations. This is why I continued to use this interpreter even though I realized there could be a potential problem with credibility.

3.3.2 The Status and Role of the Second Interpreter

At first I thought I would easily find another interpreter myself by meeting people. But after asking some friends from Navrongo and a few students at the local university, I realized that few people actually had time to help me in the next weeks. It was the priest from Navrongo Catholic church that helped me get accommodation at the CEDEC guest house, who introduced me to my second interpreter. She was a 19-year-old woman who had completed senior high school. She wanted to start journalism studies and was now working every Sunday during the mass in order to save money for education. She was born in the town of Paga, but had lived close to the centre of Navrongo since her childhood. I thought it could be an advantage to have a female interpreter in the male dominated farming sector.

In a society where age is a sign of wisdom and the man is the household's landowner, the second interpreter's status as an unmarried young woman implied some challenges. These challenges were not evident during the interviews, but later I received some kind of complaints about her not showing the farmers enough respect and not answering questions

they asked her. All of this happened in a language that I did not understand. I believe that her status as a young woman may have made the informants expect more respect from her than she showed them, therefore making them a little angry. The key-informant, who told me about the complaints, said that one of the guys told him he did the interview because of me, this guy also declined to answer some questions. The other guys who complained also came with a favourable comment about me personally. These comments make me feel that the credibility of the data was not noticeably affected by these situations.

As an interpreter I believe she did a good job. She was good at pointing out different details during the interviews. Her inexperience with farming made her become impressed by how many of the farmers worked and lived. When we had discussions between interviews it seemed like she thought this was exciting. What I feel may have influenced her work sometimes was that she had to pick up her sister after school each day. This did not affect how she translated, but sometimes meant she spent as little time on the last informant as possible.

3.4 Research Methods and Samples

During my 10 weeks' fieldwork in Ghana from December 2015 to February 2016, I spent more than eight of them in UER. During the first four weeks I located the study area and conducted the pilot survey and the group interviews. Afterwards I spent two weeks in Navrongo to find the second interpreter and also to meet my supervisor. Then I spent a little more than two weeks conducting the semi-structured interviews. The final week I travelled to meet the first interpreter at his university in Kumasi, followed by a short trip to Cape Coast to visit the colonial castles, and the villages that Carr (2011) conducted his fieldwork in.

3.4.1 The Pilot Survey

The pilot survey was primarily done because I wanted to use the data collected to select a purposive sample (Gobo, 2004) of farmers for my semi-structured interviews. It included six simple questions about dry season farming, family situation and mobile phone ownership. With the first interpreter I walked around in Kazugo and visited different farmers inside their gardens. I took notes in my small field book and took photos of the informants in front of their gardens.

I intended the sample for the pilot-study to be random. However, in Kazugo the chief's son selected who we talked to. In Pungu I used the same research instruments and the same questions. The difference between Kazugo and Pungu is that the interpreter did not know anyone in Pungu. He did not decide whether or not we should talk to the person in Pungu, he rather asked me if we should talk to the guy he pointed at. The sample of my pilot survey in Kazugo was biased because the first interpreter selected them instead. This may have made me come in contact with people who he thought could be helpful to me. But we talked to more than 25 households in many parts of the community, so I considered that it was sufficient for me to try to find 10 suitable informants for my semi-structured interviews. Both in Kazugo and Pungu I met new farmers during the group interviews that also were asked the pilot-survey questions.

During my pilot-survey I realized that there were two main categories of farmers in these communities, well-farmers and pumping machine-farmers. Well-farmers got their water from a well, while the pumping machine-farmers used pumping machines to get water from the local dam. There were more pumping machine-farmers than well-farmers, but I did not get the exact distribution. In my sample of 59 informants, 22, about 37 %, are well-farmers, and based on my observations this is a fairly representative distribution.

Data from the pilot-survey cannot be used as complementary to the data I gathered from my group interviews and semi-structured interviews. That is because I used the pilot-survey mainly to find a sample for my interviews which contains different questions than those I asked during the other research methods. With the pilot data I got an overview of mobile phone accessibility, what kind of livestock the households owned, what kind of dry season crops they produced and if they had any form of off-farm incomes. In these tables (presented in chapter 4) I looked for patterns and irregularities to choose a varied sample of farmers for the semi-structured interview.

3.4.2 Group Interviews

Focus groups is as much about listening to as it is about talking to people (Longhurst, 2010, p. 103). One way this method differs from semi-structured interviews is that it gives information from interactions between the informants rather than the interaction between one informant

and the researcher. The four group interviews varied in number of participants. In some of the interviews there were a few participants who were more active than others. This may have affected those who were shy or less talkative in a way that their opinions did not become a part of the discussion.

When I first prepared for this field trip I decided not to use group interviews. To have an interpreter translate discussions would be a challenging task. The reason why I actually conducted group discussions was that the farmers in Pungu asked me to arrange it when I was there on my first day conducting the pilot survey. The first interpreter said that he would manage to translate the discussions for me, and he agreed with the farmers that it would be a good idea. I feared that these discussions in a language that I did not understand would not make the focus group research method realize its full potential, but it has proved to be useful anyway.

As expected, translating discussions was a difficult task. For example, when four people discussed between themselves for a couple of minutes, it ended in a short translated summary of less than 30 seconds. One reason these summaries was short was because I did not ask for detailed explanations during the group interviews. I felt that I spoiled the farmers' time when they sat there watching me and the interpreter talk English.

Even though there are notable weaknesses with the group discussions, I consider them useful. Group discussions can help the researcher to get an overview of a research subject (Longhurst, 2010), and it did provide me with a good overview of mobile phone utilisations. But it also prepared the informants, as "both the researcher and the research subjects may simultaneously obtain new insights" (Goss & Laibach, 1996, in: Cameron, 2010). When I, during the group discussions, first asked how the mobile phone was helpful, the discussion could start slowly, but after a while more and more people pointed out different aspects where the mobile phone had changed certain things in their life. In fact, these group interviews made the informants to better understand what I wanted to know, when they could discuss and get inputs from each other before our one-to-one semi-structured interviews.

In order to make homogenous groups (Longhurst, 2010) with people that share opportunities and challenges through similar work, I separated the groups in one well-farmer group and one pumping machine-farmer group in both communities. The discussions in Kazugo were with

eight pumping machine-farmers and nine well-farmers. These were conducted at the Kazugo market square close to the school in Kazugo, which is the usual gathering spot for meetings and programs in the village. While we waited for well-farmers to show up, a group of four people stopped by and asked what was happening. It became evident that these people were well-farmers that wanted to participate in the discussion too. I asked them my pilot survey questions before we started the group interview.

Image 3.2: Group discussion under The Shadow.



The participants during the group discussion with well-farmers in Pungu.

The samples for my group interviews were originally thought to be the ones that had participated on the pilot survey. In Kazugo we gave verbal invitations to the informants. In Pungu, we could not find all my informants we wanted to invite for the group interview. So we agreed with one of the farmers that he would tell the others about place and time. This message was probably spread to more people than the pilot-survey informants, because in Pungu several farmers arrived whom I had not talked to before. Some of these new arrivals were asked the pilot-survey questions. Pungu is a larger community, and my group discussion with the pumping machine farmers there was located under a big tree, “the shadow” was the

local name of the tree. There was a crossroad located under this tree, and that made many people pass while the group interview was happening. Some of the people who passed by could decide to sit down and join the group interview. This is also a reason why this group got more than 20 participants, a considerably higher number than the suggested 6-12 participants for a focus group (Longhurst, 2010).

My last discussion was with well-farmers in Pungu. It took place beneath a smaller tree located a couple of hundred metres from the dam, a regular relaxing spot for some of the well-farmers. This was a group of 14 people and there were many active participants. In the group discussion some of the informants started a discussion that I remembered as interesting, and when I then conducted a semi-structured interview with one of them, he could easily pick up the thread from the focus group discussion. This is an example of why I felt that these group interviews were helpful.

3.4.3 Semi-structured interviews

I chose to conduct semi-structured interviews because I wanted to have a dialogue with the informants rather than a one-way conversation that is common during structured interviews. The semi-structured interviews may fill gaps in knowledge on the diversity of meaning, opinion and experiences that observations and census data are unable to produce (Dunn, 2010). If the informant would end up talking about a topic that I had prepared for later in the interview, it was easy to change the order of questions and topics. This interview technique also allowed me to ask follow-up questions. I conducted 23 semi-structured interviews that lasted between 20-55 minutes. I used my iPad to record the interviews. I also took notes to remember more details immediately after the interviews. This is in accordance with the advice of Aase and Fossåskaret (2014) saying that it could be wise to act in a manner that shows that you are interested in your informant and what he is saying.

21 of the 23 households in the semi-structured interviews were chosen by purposive sampling, and I only talked to one farmer per household. Purposive sampling is a contrast to random sampling. The sample is purposive because I used data from the pilot-survey and impressions from the group discussions to personally choose the informants. There were two informants in Kazugo that were chosen semi-randomly. I had never seen them before, but they were specifically chosen by me because they were people who I had not been introduced to through

my first interpreter.

The pilot survey provided some quantitative data about the informants. I used this data to create tables about mobile phone accessibility, crop species and livestock species. In these tables I looked for trends and patterns, and through purposive sampling I wanted to talk to people with various life situations. I choose some households which were outliers, for example one of the three that did not produce pepper, or the only one that produced cucumber. Wossen et al. (2014) argue that off-farm labour and cattle are helpful for farmers in UER to reduce their dependability of crops that are affected by unpredictable climate. I used the data on livestock and off-farm labour to choose some informants that I understood as relatively economically insecure and secure. Most of the interview samples are farmers that I categorize as normal in the sense that they produced the most common crops and owned the most common livestock. I also chose some of the interview informants based on their level of participation during the group interviews. I looked at their living conditions appearing from the pilot-survey data so I could cover the different life situations I wanted. In this way I utilized purposive sampling to try to get informants from various living conditions. The distribution between well-farmers and machine-farmers was 9 well-farmers and 14 machine-farmers.

I wanted to conduct the interviews in Kazugo in a neutral location. As I lived in the chief palace in Kazugo, my own room was not suitable for interviews because of its affiliation with the community's chief. In my effort to reduce how my living situation affected my status I chose to conduct the interviews in the informant's own garden. In this manner the informants felt safe and spoke freely.

I walked between the informants' gardens and asked the ones I wanted to talk to if they had time for a talk. Everyone answered yes, but with two of them I had to finish quickly because they did not actually have that much time. One of the talks became so short that I had to come back another time to finish the interview. When the interviews were conducted in the informants' gardens other people sometimes passed by and then expressed some comments. This could start some small conversations that disrupted the interviews a little. I made sure that no people were around when I asked questions, so I do not think that these interruptions affected the information provided by the informants. I did not ask much about socially sensitive issues, except how much profit they made per year, how much they spent on mobile

credits and how they got access to the piece of land that they cultivated. I was always observing the informant's response to try to see if he or she felt uneasy when I asked particular questions, thus I could quickly change subject. In this way I tried to avoid sensitive and difficult issues.

22 of the 23 semi-structured interviews were conducted with my second interpreter. The one interview I conducted with my first interpreter was with one of his good friends, and his status would be less influential. Two interviews were conducted in English, since the informants spoke English. The interviews always began with me informing the informants that the participation is voluntary and that they would be anonymised. We then started by talking about their crops and fields, followed by questions about mobile phone usage. We discussed what types of media the informants used in order to get new knowledge and information about agricultural business and production. I also asked about how they cooperated with fellow farmers in order to get an idea of farmers' competition and cooperation. At the end we had small discussions about profit, veterinarian services, and whether or not the farmers knew about any organisation or program offering subsidies or support.

3.4.4 Participation and Observation

Participatory observation can be regarded as the researcher trying to learn by observing the practical and empirical actions that generate a phenomenon. A researcher aiming to do research that may benefit farmers, will have to know how farming is conducted in order to be able to help the farmers. Laurier (2010) uses the example of a sports commentator, who would have to know the game he or she is commenting. There are details in all kinds of phenomena that a skilled eye can see compared to a person who has never seen the phenomena before. Participatory observation may give the researcher a better understanding of his subject by providing concrete empirical supplementary comments or knowledge from the specific area.

To observe every day off-farm and off-work utilization of mobile phones may provide valuable descriptive information that could complement the answers from the interviews (Kearns, 2010). Robert Kearns observed during a study on housing problems in New Zealand in 1991, that information collected in "field notes added to (and often contrasted with) what people said about their own dwellings" (Kearns, 2010, p. 242). Therefore, observation will

provide valuable information to strengthen or weaken the credibility of the data regarding common mobile phone utilizations that I received from the interviews.

Participatory observation can also be effective to add commentary to the research (Laurier, 2010) and the method became a very important part of the fieldwork. I lived in Kazugo, one of the research communities, for six and half week. Here I observed how farmers conduct their dry season farming, how they sell their products, how they transport their products, what they eat and how their leisure time is spent in the evenings. Since I lived in the community I got to do both controlled and uncontrolled observations (Kearns, 2010). The controlled observation was when I did explicit actions in order to participate or observe a specific phenomenon, while the uncontrolled observation was arguably something that happened all the time I spent in the village.

To be alone as a researcher living with my informants can also be a way to let the informants influence the research methods, for example when I decided to have a group discussion because the farmers in Pungu wanted to. To conduct research in a way that the informants wanted was something I did to get on good terms with them in order to hopefully get better responses. During my stay in Kazugo and Pungu I actively learned how to water the gardens, harvest the crops and transport the produce to the market. For me to stand in the garden pulling up water from the well, use the hoe to guide the water from a machine, harvest products in bags or carry them to the tricycle made me well-known in Kazugo. As a consequence, I believe, the informants agreed to participate in the interviews.

3.4.5 Field Conversations

During the fieldwork I spent quite much time in different gardens and with different farmers. This allowed me to have many small conversations where I could straight away ask about specific actions that they conducted in their gardens or with their phones. These conversations were also helpful to give me answers to questions that I did not ask (Aase and Fossåskaret, 2014), as well as to let me get more precise understanding of the farmers' actions. One time I was in a garden where I was informed about the three different soil types in the region without asking, something that proved to be important because the soil type decides how often the farmer needs to water his garden.

3.5 Data Analysis

After collecting the data, there is a need to analyse the data in order to present credible and valid information about a phenomenon.

3.5.1 Qualitative Data

During the pilot survey I gathered data that is of qualitative nature about the most common crops and livestock, age, family size, off-farm labour and the availability of the mobile phone. The data was gathered during the pilot survey and does not provide any meanings or explanations of the different life-situations; it merely showed me the trends in the area. I have used the data mainly to create tables in order to categorize the pilot-survey informants into different life situations, and pick my sample for the semi-structured interviews. I will also use this data in chapter four to show trends when I describe the living conditions in UER.

I have used secondary data in this thesis. I have used government papers to find relevant data from the study area. Some of this have been statistical, but I have also used historical sources. Books and papers have presented me with historical data about the research area. I have also utilised statistical data from some third party websites. Secondary data may have been manipulated for a particular purpose (White, 2010, p. 62), and this can make secondary data less trustworthy. I have kept this in mind when I worked with these sources.

3.5.2 Transcribing and Coding Interviews

I returned home with 23 interviews from which I took notes and recorded with an iPad. In order to analyse the results of my interviews I have transcribed them. With the transcripts I can categorize and arrange the different responses through the coding process.

Coding can be regarded as the process of analysing data by evaluating, organising and categorising it into different themes in order to find patterns and make sense of the data (Cope, 2012). I began my coding process with “margin coding” (Bertrand et al, 1992, in: Cameron, 2010, p. 168) by quickly reading through the semi-structured interview transcripts in order to find key themes and categories. I coded six categories in my transcripts. The first is personal and family information, the second is about crops and farming situation. One

category is about mobile phone accessibility and usage, another is about information gathering, production and sharing. I have also chosen to make a category about farming technology inputs, and the final one encapsulate infrastructure, veterinarians and other private and official organisations.

After the coding process I reread parts of my interviews. The coding process has helped me mostly by making it easier to find the relevant answers in the transcripts. I remembered some details from various interviews, and after the coding process it became much easier to find the data in my transcripts.

3.6 Reliability, Validity and Transferability of Research Findings

3.6.1 Reliability

Reliability can be regarded as the trustworthiness of data (Guba, 1981). In my case, this can be affected either by an informant who provides untrue information, or that the informant misunderstands the question or the interpreter misunderstands the answer. There are some ways in which a researcher can increase the reliability of his or her data. Grønmo (2004, p. 220) argues that if you manage to acquire similar data through different research methods, the data will become more reliable. If you have a high degree of compliance between the methods, you have a high degree of reliability in your findings. This methodological combination can be regarded as triangulation (Jick, 1979), where “multiple viewpoints allow for greater accuracy” on the information (p. 602).

There are four research methods that have provided me information about similar phenomena. This is the group interviews, the semi-structured interviews, field conversations and the participatory observation. Due to the questions in my pilot-survey, there is little data there that can be used to cross-check with the data from my interview transcripts. The compliance between my group discussions, field conversations and semi-structured interviews is high. That may be because some of my semi-structured interview questions were based on information I received during the group discussions, and most of the semi-structured interview informants had participated in one of the group discussions as well. The compliance between my observations and the interviews were not always as high, for example that I observed that some farmers go to the market with crops without calling to the market first.

However, I never experienced any contrasting observations to what I had learned from the interviews.

There was no language barrier between the informants and the interpreter during the interviews, they both spoke their native language. I believe that they generally understood each other. There were some times I felt that the interpreter did not fully understand me and I would reformulate the questions to get the answers I wanted. She had never worked as an interpreter or research assistant before, and that may have distorted the information if she did not fully understand the question or the answer (Ric Liamputtong and Ezzy, 1999, in: Kapborg & Berterö, 2001). With semi-structured interviews I could ask some follow-up comments during the interviews. Some of these questions were directional, I would ask them in a way that they could reply yes or no, and yes was the obvious answer. In questions like this, an informant may answer yes because it may seem like it is the answer I want to hear, even if it is not necessarily completely true. As I mentioned above, for informants in Kazugo, they could see that I brought gifts and had a substantial amount of money. I don't think the responses from Kazugo were biased because of this, except in the case of one informant who clearly presented a marginalized and poor living situation, even though he had more livestock and square kilometers of land than many other informants. This makes his answers about farming and living condition biased, but his responses to insensitive questions about mobile phone utilizations are still credible.

I also had various discussions with traders and chemical (pesticide and fertilizer) dealers. These are unrecorded conversations where I took notes afterwards in some occasions. This data is based mostly on memory and my own understandings of the phenomena that were discussed, and is therefore only used supplementary.

3.6.2 Validity

Validity is about how well the data that have been gathered are relevant to answer the research questions (Grønmo, 2004, p. 221). High validity means that the data that have been gathered adequately answer the research questions. High validity also requires that the data are reliable, but reliable data does not immediately make them valid. If the data are trustworthy, but provide information about something irrelevant for the research questions, the validity of the research will be low. In this thesis I have a overarching reserach question

that I have worked with since the term paper. I consider that the data I have gathered is sufficient to answer this question. But with the research questions I have done some modifications. I have made them more precise since the fieldwork. I have also altered the sentence structure, but tried to keep the central theoretical theme. These changes have made the research questions easier to operationalize and increases their relevance according to the data I have gathered, thus enhancing the validity of the research findings.

During the fieldwork I learnt a lot about life in UER, but most of it is not relevant to the research on farmers' mobile phone utilizations. To ensure high validity in this thesis, I need to keep focus and present the gathered data that is relevant to the research questions.

3.6.3 Transferability

In quantitative research, the researcher often wants to locate trends to make generalizations. This generalization is seldom the goal in qualitative research (Cresswell, 1994, in: Slevin & Sines, 2000, p. 91), it is rather to understand contexts and results of a phenomenon. With understanding of contexts and results, it is desirable for the researcher to discuss if this knowledge can be used effectively in other areas. Due to this nature of qualitative research, it is better to use the word transferability rather than generalizability (Lincoln & Guba, 1985, in: Slevin and Sines, 2000, p. 91), about the usefulness of a research project in other areas.

Based on the fieldwork I have presented information that I believe is relevant to how I gathered data or how I may have influenced informants and their responses. This includes a discussion about my own and the interpreters' status and roles, and a detailed description of social, natural and cultural situations in the study area. Furthermore, I have described the research methods, their samples and their utilization, and finally I discussed how I have worked and prepared the data I collected. Discussing these phenomena in the thesis will increase its external validity (Kapborg & Berterö, 2001) and transferability, because it allows other researchers to compare and duplicate research methods.

Such representations of qualitative data are important because it can explain why some research findings are similar while some are not. There are various factors affecting how people respond to changes and development. Such factors should be addressed so that

researchers may compare them with similar factors that are present in different study areas. The more similar such factors are between two study areas, the higher is the transferability of research findings between the areas.

In this chapter I have presented how I chose the study area for the thesis. I have also discussed my own positionality, and how I may have been perceived by the informants. It also contains a discussion of the interpreters' positionality. The different research methods have been presented and how I have utilized the data to construct the thesis. In the next chapter there will be a presentation of how farmers in UER conduct their farming and live their lives.

4. The Farming System in Upper East Region

This chapter will present the living and working conditions for farmers in rural villages in UER. I will use a farming system approach that describes any level of unit, in its social, political, economic and environmental context, engaged in agricultural production (Turner II & Brush, 1987, p. 13). First I will present the social contexts when I describe how people live, eat and share their lands. This part will also point out how some political contexts with dam constructions and land tenure. The second part will be about the farming work in the area. Here I will address some economical contexts that drive the farmers, as well as how they adapt their work to the environmental contexts in the area.

4.1 Living in Upper East Region

4.1.1 Living Conditions

In the Kassena-Nankana districts most families in the villages live in clay houses that usually are connected to a bigger housing compound. These compounds usually have several houses where related families live. Also inside these compounds is the stall where they keep their livestock during nights. The clay houses are constructed by bricks made from soil mixed with water. The soil is grinded and humidified, and the mixture is formed into bricks that hardens over a week. This makes housing material practically free, and houses can be deconstructed into new bricks if they want to rearrange their housing compounds. Some of these compounds have a toilet inside, but toilets could also be found around in the village. The toilets are houses placed above a six feet deep hole that is filled with rain water.

Households are the main production units in the regional farming system. The members in a household work together on the piece of land the eldest male in the family had been allocated by the village's landlord. I could see children, men and women guarding their gardens from livestock alone or together, although I usually observed the oldest man in the family doing that job. In most cases, a compound housed a single household, but I also talked to members from two households that had separate land pieces even though they lived in the same compound. In this thesis I will define a household as the people who share the outcome of the same piece of land.

Image 4.1: House building in Kazugo.



Local farmers are laying a foundation for a new house.

Table 4.1: Household Sizes

Household size	No. of households. (n) = 59
2 members	2
3-4 members	7
5-6 members	12
7-8 members	17
9-10 members	10
11-12 members	4
13-14 members	1
15-16 members	3
16+ members	3

Source: Fieldwork 2016

The households could consist of just a man and a wife, but the largest household in the pilot-survey had 32 members. Initially I wanted this information to compare with the household’s land size. But the first time I asked of how big garden the household shared, both the interpreter and informant started to laugh. During the dry season, the size of the household’s

gardens are smaller than a square kilometre, and the informants would not give me any answer because they were not sure. During the semi-structured interviews, I received approximate information about land size. However, that was the land they cultivated during the rainy season, which was substantially larger. None of the informants could give me an exact size of their land.

Both the research communities have a primary and secondary school. There have been a school in Pungu for more than 40 years, but the primary school in Kazugo was built in 2001. The secondary school in Kazugo was finished in 2003. Even though educational infrastructure has been present in Pungu for more than twice as long as in Kazugo, there was no noteworthy difference in the general education level among the informants from the two communities.

Millet is the staple crop in the region. It is commonly served as a firm porridge called *TZ*, *Tuo Zaafi*, with vegetable soup. The vegetable soup is also called Okra Soup, and Okra is a crop that many of the farmers I spoke to cultivated. *Banku* which is made of maize, was also popular, but since they produce more millet than maize during the rainy season, it was not as common as *TZ*. The inhabitants drink water from boreholes that went down to ground water. In UER these holes can vary from 15-50 meters deep (Adekile & Kwei, 2009, p. 6).

Fish is their main source of protein. In the nearby Tono dam, they caught Tilapia, but this fish is seldom served with the regular main meals. The most common fish are very small fish that is dried and grinded into a fish powder. This powder is mixed into the various soups and the rice when they boil it. These small fish can be captured in the same dams that provide water for the livestock and the gardens. There are farmers who may establish fisheries in some these dams (FAO, 2016).

Meat is expensive and it is never served together with main meals. Meat, from the retailers, is cut into small pieces, fried and served as snack with onion, usually during the evening. Pork, chicken, goat and guinea fowl are the most commonly eaten animals in the community I lived in, and could be bought daily. Every third day (on Navrongo market days), it was possible to buy dog meat in the community as well. I also observed farmers hunting for meat with their slingshots. From these hunts the farmers could catch small birds, moles and grasscutters, a large bush rat. The day they caught a grasscutter it was party-like conditions, and the children who was nearby would line up for a small piece of the meat.

There is a health clinic in Paga where people could get vaccines for example. In Navrongo there is a Hospital. I did observe a motorcycle accident in Navrongo where one of the drivers had to be taken by ambulance to the hospital one hour away, in Bolgatanga, due to lack of medical equipment at the hospital in Navrongo.

Commercial banking activities is not widespread in the area, but in Kazugo they had a community based *Susu* account. *Susu* is a financial service where groups of people save money together in a bank account. The members put money on the account over a period, and at the end of the period the accumulated money is returned with interest (Quartey et al., 2012, p. 5). In Kazugo there was 4 different groups who had weekly *Susu* meetings where the farmers would deliver money to a *Susu* collector, who put the money in the group account. The members are not allowed to freely withdraw money from the account, but farmers may borrow money from their group's account and pay back with an interest. This interest is then shared among the *Susu* participants, even the ones who borrowed money, when their accumulated money is given back at the end of the defined period. This offered the farmers possibility to save and borrow small amounts of money. In Kazugo they had yearly meetings where the farmers had access to their accumulated money.

Image 4.2: A *Susu* meeting.



The author is handing out envelopes filled with accumulated money to members of one of the Susu groups in Kazugo.

4.1.2 Funerals

Apart from Navrongo market days, funeral days were also busy days for the farmers. People usually hold two types of funerals, a religious one and a traditional one. The religious funeral is a one-day service that happens relatively quick after the deceased passed away. The traditional funeral is a three-day ceremony that is highly respected, and could be postponed. The traditional funeral would happen in the deceased's hometown, and would not take place until the body was transported there. The traditional way was more important than the religious one, and whole communities were invited for these festivities where attendees would be served food and drinks. I heard several people complain about the expenses for a traditional funeral, that it has become a problem for many families. During the fieldwork there were in total three funerals in the two communities. When these funerals were held in the community, the farmers from that community would be too busy for me to do any data collection.

4.1.3 Chieftaincy and Land Tenure

The land distribution system in Ghana combines traditional customary rules and statutory laws (Djokoto and Opoku, 2010). The traditional land tenure system is largely unwritten rules that are based on local customs and norms. These local rules may vary from area to area, and in Ghana there are several different customary ways to share land. Since the colonial era, statutory laws have gradually been introduced and various institutions have been formed to oversee a fair distribution of land. The Lands Commission, The Metropolitan and District Assemblies and The Office of the Administrator of Stool Lands are some institutions that operate with land management today (ibid, p. 3). The combination of these two rule sets allows land disputes to be settled through various bodies of both traditional and judicial nature, but usually locals prefer to resolve the disputes locally through traditional rules (ibid, p. 5).

In the Kassena-Nankana district I observed a land distribution system with strong roots in the customary traditions and rules. Every village have their village chief who lives in "The Chief Palace". The family members of the chief are all benefitting from a royalty status. The chief will have his position until he dies, and he can only be succeeded by one of his sons or a son of the former chief, meaning that the sons of a chief's daughter may not become chiefs.

Together with the chief the villages have a landlord or earthpriest (Lund, 2008) who is viewed as the original owner of the land. The landlord will also keep his status until he dies, but the new landlord will be appointed by representatives from the village. Due to this way of being elected, the landlord may be regarded as having the trust from the inhabitants in the village (Tia & Salifu, 2010, p. 3).

Image 4.3: The chief's palace in Kazugo.



During rainy season, the land in the front of the image is cultivated with millet. In the back of the image is the Kazugo chief's compound.

A village chief is a highly respected person in the Ghanaian society. A president would always have to lift his hat and bow to greet a village chief according to the first interpreter (the chief's son). The role of a chief may vary from district to district. In the Kassena-Nankana districts their main roles are to be a political figure and the main official representative of the village, and to oversee sale and distribution of land in the village. The chief may decide whether or not a new family may move into the village, but it is the landlord who decides what land the family should get and where they can live. Land is given to the eldest man in the family, and he will distribute it to his family. When the eldest man dies, his

oldest son will gain control over the land. The women in the family are not entitled any family assets nor allocated any productive land if their father dies (Tia & Salifu, 2010).

In Northern Ghana, the land as a territory is owned by the government, but the land as a property is owned by the owners (Lund, 2008, p. 69). This means that there is almost no private ownership of land, the government is the official owner of most the land in Northern Ghana. But as a property where people can produce agricultural products, family heads control the land and the output of the land they are allocated by the village landlord. This region has had previous challenges with chiefs and the boundaries of their chiefdoms (ibid., p. 83-84). I experienced this too, the chiefs of Navio and Kazugo are not speaking to each other. They were allegedly in court in 2011, after a dispute about land allocation. I talked to some residents in these two villages, in my spare time, who said this dispute was bad for local development.

4.2 Farming in Upper East Region

Table 4.2: Age and Gender of the Sample Farmers.

Age	Number	Males	Females
21-30	12	12	
31-40	24	23	1
41-50	11	10	1
51-60	4	3	1
60+	8	7	1
Total	59	55	4

Source: Fieldwork 2016

The agricultural sector employs about 70% of the working people in the K-N districts. There are more female farmers than male farmers in these districts (Salifu & Abdul-Jalil, 2010; Tia & Salifu, 2010). This is something that is conflicting with my experience. During the fieldwork I observed a clear majority of male farmers working and guarding their gardens, this is also reflected in table 4.2. One reason for this may be the farming season during the fieldwork. Some of the informants told me that it was only during the dry season they produced crops they could sell for profit, and the men may want to control the crops that

generate profit in order to control the family economy (Carr, 2011). I believe that I would have observed more female farmers during rainy season when the crops are mainly produced to feed the family.

Table 4.2 shows the age of the informants. The average age is 41.7 years. This is not fully representative for the average age of the farmers in the K-N districts. The number of participants is low (59), and when I arrived at a garden to ask the questions, I would always talk to the oldest farmer. This may also explain that my sample had a clear majority of men. In most cases I only met one farmer per garden, so I will still argue that the sample is fairly representative of the gender distribution in the dry season gardens.

4.2.1 Agricultural Production

The two seasons in the K-N districts are substantially different, and so is the farming process. I was told that during rainy season, almost all of the land surrounding the compounds would be cultivated. The crops that they would produce are also different. Millet, maize, rice and groundnut were common crops to cultivate during rainy season. A few informants cultivated small amounts of maize during the dry season as well, because they wanted to enjoy fresh maize once in a while.

During dry season, the production process is different. The biggest difference is the size of cultivated land. Since there is virtually no precipitation, the cultivated land is totally dependent of water from an external source. These water sources can either be a well or a dam. Pepper, is the most common crop to cultivate during dry season, and people only cultivate it in this season. For the pepper, farmers usually keep the seeds until the next season, but for tomato several farmers buy new seeds every year. All they grew during the rainy season was primarily for household consumption, unless something would happen that required money. One farmer (82 years) told me “This is always for consumption, only if a problem comes up we will have to sell it” when I asked which of his rainy season crops he produced to sell and which he produced for subsistence. School fees was a reoccurring expense for some informants, and this would sometime require them to sell some of the produce originally stored for own consumption. Such extra expenses could come suddenly and would force farmers to sell small quantities of their available crops. In many cases, such money had to be accumulated fast and then farmers would go to the market even though the

prices were not optimal. I believe that some of my observations of farmers who did not make a mobile phone call to get price information before they went to the market were in immediate need of money, so that day's prices were irrelevant.

Below I have made a table that shows how many households that produce the different crops. Pepper, tomato, kenaf and okra are the most common crops during the dry season. Many of the informants told me that it was only during dry season they could sell some of their produce for profits. Furthermore, it was only tomato and pepper that many of them would sell, but some farmers also mentioned they sold kenaf, okra and groundnut. One farmer (25 years) said that "Kassena-Nankana district is the pepper producing district in Ghana", and the high number of farmers producing pepper supports this claim. According to Laube et al. (2011) onion is a common crop in UER, but that is in the eastern part in the area around the town of Bawku. Onions require much water, and the pumping machine farmers would use much petrol to water these onions.

Table 4.3: Different Dry Season Crops Owned by the Sample Farmers

Type of Crop	Nr. of households. (n) = 59
Pepper	56
Tomato	41
Bean Leafs	22
Okra	44
Kenaf	52
Maize	3
Garden Eggs	12
Cassava	2
Cucumber	1
Sweet potato	3
Onion	3
Cabbage	1

Source: Fieldwork 2016

Image 4.4: A farmer guiding the water.



Water is pumped from the dam to this garden. The farmer will control the water stream into rows. In the background is a millet fence that surrounds these gardens.

During the dry season, most of the gardens were surrounded by a fence made of dry millet straws. These fences were made to protect the gardens from livestock who would eat the crops. Since livestock can eat their way through such fences, someone would have to watch over the gardens anyway. Many households would place their gardens close to each other. In this way they could cooperate by constructing one fence together around their gardens, and share the work of guarding the gardens. Some farmers could have their housing compounds far from the dams, but have their dry season gardens close to the dams. The livestock was scared away by the slingshots, as just the sound of the slingshot would make any livestock run away. During rainy season, when a lot more land is cultivated, the livestock is herded by young “cow-boys” to a suitable area. During dry season the livestock would roam around free

from sunrise to sunset. I was fascinated by how all the herds of livestock would come back to their stalls every evening.

Table 4.4: Different Livestock Species Owned by the Sample Farmers.

Species of livestock	Nr. of households. (n) = 59
Sheep	51
Goat	54
Cattle	36
Chicken	49
Guinea Fowls	40
Donkey	7
Pork	8

Source: Fieldwork 2016

Image 4.5: The dam in Kazugo.



This picture is of the dam in Kazugo. This is at the end of the dry season farming period, and the water level is low. The rest of the water is for the farmer’s livestock until the onset of the rainy season.

Table 6 shows how many households that own the different livestock species. The table does not show the number of each animal in the households, only if they own at least one or more. Goats are the most widespread animals as more than 95% of the farmers have at least one

goat. Chicken are widespread and the most abundant animal by numbers in the region (Tia & Salifu, 2010, p. 54; Salifu & Abdul-Jalil, 2010, p. 51). I never observed anyone sell their livestock, but I was told a big bull could be worth more than 1000 Ghanaian Cedi, about \$ 265 US dollars. This is almost 50% of a typical yearly profit for a farmer. From the informants that answered the question, I learned that their yearly profit was between 2000 – 3000 Ghanaian Cedi. One male farmer from Pungu (43 years) told me that “A hardworking farmer can get up to three times of what he invests, while a low-working farmer can only get two times of that”. This farmer invested about 1100 Ghanaian cedi, about \$280 USD, into his garden the last season.

4.2.2 Farming Technologies and Techniques

As mentioned, there are two kinds of farmers in UER, well-farmers and machine-farmers. The machine-farmers use a water pumping machine to transport water from dams to their gardens through tubes. The source of water is most commonly a dam. These dams are constructed by humans and funded by the government (Lund, 2010, p. 163), like the dam in Kazugo and Pungu. The dams are excavated holes that form small dams by gathering rain-water during the rainy season. They are at their fullest right after the rainy season and will gradually be drained during the dry season. The fact that these dams may become depleted has made the locals organize the pumping of water so the dams do not dry out before the onset of the rainy season. It is vital that they do not deplete them because the dams are the water source for the farmers’ livestock as well. In the community that I stayed, Kazugo, they had their pumping day every sixth day, and by the end of February the farmers could no longer use the dam to water their gardens in order not to deplete it. In Pungu the dam was larger, so they had no rules about how often farmers could use their machines. There were also two different soil types around the Pungu dam. One informant told me that one soil type required watering every fourth day, while the other would only need water every seventh day. They did however, usually stop people from using the machines in the beginning of March. The farmers were about to have a collective farmer meeting to discuss the date to stop pumping, but this meeting did not take place before I left UER.

The machine-farmers have an extra expense, the petrol for the pumping machines. Petrol is relatively expensive and the farmers would have to bring the petrol to their village from a petrol station in the town Navrongo. For farmers in Kazugo it is the availability of water that

prevent farmers from watering their gardens whenever they want, but for machine farmers, the petrol prices also affect how often they could water their gardens. The key-informant in Kazugo spent three litres of petrol on a pumping day. One farmer from Kazugo had a garden in Pwalugu, a village near the White Volta River, and here he had plenty of water to use. But he only irrigated his garden every sixth day because of petrol prices. He told me he would have irrigated the garden more often if the petrol prices had been lower.

The other type of farmers are the well-farmers. The well farmers tend to have smaller gardens than the ones that use pumping-machines, although it is not always the case. For machine-farmers, the petrol decides the size of their garden, while for well-farmers it is labour. The well farmers use wells as their source of water instead of the dams. These wells are dug out by the farmers themselves, and tend to be around five meters deep. The wells' water source is the same as the dams', they are filled during the rainy season and is gradually drained during the dry season. The well farmers usually irrigated their crop every day during the morning and the evening hours. It is not preferable for a farmer to water his garden during mid-day, because the strong sun makes it very hot and much of the water would evaporate. There are no mechanisms to collect the water from the well, meaning that the well farmers manually pulled up buckets of water by hand.

The number of working hours is the biggest difference I experienced between these two categories of farmers. I was told that well-farmers generally worked 1-2 hours every morning and evening, compared to most machine-farmers who I hardly observed irrigating their gardens unless it was pumping day. The machine-farmers were free to manually water and work with their garden every day, but I personally did not get the feeling that it was common practice. Apart from working hours, working effort is also a major difference. The machine-farmers pump the water to the "top" of their gardens that have been formed in rows, as row-planting. The water will then stream down and into the rows with the crops. A simple move with the hoe will close or open the row as the farmers want to. The well-farmers do also use the row-planting technique, but they fill the rows with their buckets that is manually filled in the wells.

The pumping machine is an expensive investment. When I asked my informants that used wells why they did not have a pumping machine, lack of money was the main problem. To use a pumping machine, you need to purchase the machine, tubes and petrol. I heard various

prices, and it seems from the data collected like the prices have increased during the last five years. Now the price was between 400-450 Cedi (\$94 - \$105 USD) for a 2.5” model, and about 700 Cedi (\$ 164 USD) for the 3.5” model. The difference is the size of the tubes, and it decides how much water that is pumped per minute. There were farmers who shared their pumping machine, and the borrowing farmer would pay for petrol and contribute to the reparations if the machine was spoiled. Farmers with gardens located far away from the dam, would have to pay a lot more for the tubes compared to a farmer with a garden located close. The tubes are expensive, and from the informants, this seemed like the main reason they didn't could not afford a pumping machine. The well-farmers' gardens where usually located relatively far from the dams compared to the machine farmers' gardens.

All the farmers I talked to used pesticides and fertilizers. These chemicals were sold by certified dealers in the main towns, Paga and Navrongo. Most of the farmers would be told what pesticides to use against the different diseases by these dealers, but the radio was also helpful with such information. There are agricultural extension officers located in UER that work for the Ministry of Food & Agriculture (Zanello, et al, 2014). The few farmers that said they were helpful for them, used the officers to discuss fertilizers, pesticides and other technological inputs.

I learned that the radio was by a large margin the most important source for new information about agriculture for the farmers. From the local and regional radio stations, the farmer got information about farming techniques and technologies that are relevant for the study area. There were one Ghanaian and one Burkinabe radio station close to the study area that mostly broadcasted in the local Kassena language. Some informants mentioned that they also listened to a radio station from Bolgatanga, in the Frafra language, which is very similar to the Nankana language that most of my informants could understand. The information that the farmers got from the local radio stations could be descriptions of new fertilizers and pesticides, different ways to utilize these chemicals, how to effectively plant new seeds, weather forecasts and commercials with special offers on agricultural products, current animal epizooties, as well as national and international news.

The majority of the informants left some of their rainy season land fallow for two-three years, but not everyone. Some dug holes in the ground and threw animal excrement and perished crops inside them to compost. I talked to a few who said they did not leave any land fallow or

dig holes because they had to grow on all of their land. Mostly, the farmers used cattle to plough their fields before the rainy season because the tractor was too expensive. But a few people said they used a tractor over yearly intervals, and others said at some specific parts of their field.

4.2.3 Markets

Agricultural markets in Northern Ghana are not regulated and thus potentially accessible for all households (Zanello et al., 2014, p. 818). Every village has local markets, and market day is every third day. The rural village markets tend to be small and with little infrastructure. In Kazugo there was a small market square, but during market days most people went to the neighbor town Navio which had market day on the same day. There was also a market area in Pungu, but this was not popular among the informants. Pungu's proximity and good road connection to Navrongo, made the farmers in Pungu call Navrongo their market. The traders at the rural village markets were almost exclusively women and their children, and the farmers would bring small quantities of their produce.

If the farmer would sell in large quantity on the market, usually in Navrongo, they would pay a tri-cycle, a three-wheeled motorcycle, driver to transport their goods. But in most of the cases, when a farmer went to the market it was with small quantities that they could carry on their bikes which they either owned or borrowed. For owners of donkeys, they would use it to transport their goods to the market. In some households it was only the wife who travelled to the market, in other households it could be both. I followed a male farmer to the Navrongo market one day, who wanted to sell okra, kenaf and a small quantity of pepper. He was recognized by three different women on the way to the market, and each of them bought some of his products. This may indicate that he has done the trip to the market many times. When he arrived at the big market area in Navrongo, he spoke to a woman, who for me seemed like an organizer, who pointed him to one person whom he sold all of his final products to.

The market place is an important area for farmers in UER. This is the place where many farmers sell their products. In the Kassena-Nankana districts the two main markets are in Navrongo and Paga, but Navrongo was seemingly the most popular. I did not do interviews on Navrongo market days because most of the farmers would be busy. Here it was pepper and tomato that were the main products. Other important products were kenaf and okra. There are

no fixed prices on agricultural produce and prices may vary depending on the markets, and supply and demand (Egyir et al., 2013). Visual inspections of products are an important aspect of a market transactions because there are varying degrees of quality on agricultural produce (Overå, 2006).

There were two market areas in Navrongo. In the area closest to the bus station, town centre, there was a market area that would have traders every day, and this was the market I got pointed to when I asked for the market in Navrongo. But during market days it was a big field further away from the bus station that would become the main market. This was where the wholesalers of agricultural produce used to be and the area that the informants usually travelled to sell their produce.

Traders may also travel to the villages, allowing farmers to conduct their market transactions in their villages. With the mobile phone such market transactions have become easier and more efficient for the farmers. Instant communication has provided the rural farmers with new possibilities to contact, or be contacted by traders from the bigger regional markets. Traders are the usual middlemen when agricultural produce is brought from villages to the urban markets (Zanello et al., 2014). If the trader travels to a village, the trader will pay all the transportation costs from village to the urban centres, thus deciding the gross margin on the produce. Gross margin for a trader is the difference between what she pays for the produce and what she sells it for (Farris et al., 2010, p. 216). If a farmer transports his or her product to an urban market, the farmer may demand a better price for their produce due to transportation time or costs, which increase the agricultural produce's gross margin.

In this chapter I have presented important actors and contexts in the regional farming system in the Kassena-Nankana districts. In the next chapter I will present the research findings concerning mobile phone utilization.

5. Mobile Phone

This study's research findings demonstrate many ways that farmers can utilize their phones, though many of the utilizations I learned about were not directly related to their work with agriculture. In this chapter I will first discuss mobile phone accessibility, after that I will present results on five areas of usage of the mobile phone that has proved helpful for farmers. These are reoccurring use areas; every respondent talked about at least one of these in their interview. The first use area is the ability to get price information. The second is about organizing transport of their produce to the market. I have chosen to call the third area of usage for call for help. The help can be to call a friend that can bring pesticides from the town to the village, call the chemical dealer for information or veterinary services. The fourth will be about documentation of new information farmers can bring back to their villages. The final use area is the Mobile Money Transfer (MMT). MMT is an electronic monetary service that allows the users to instantly send money between MMT accounts, which only requires you to have a registered mobile phone number.

5.1 Mobile Phone Accessibility

Of the local cellular network operators, none of the informants owned Tigo, Expresso or Globacom number, but a few had Airtel. Most of the informants had Vodaphone while MTN was the second most common. Vodaphone had supposedly the best network coverage, but I did not observe any noticeable difference between these two networks with my mobile phone. The network coverage was not good in either of the research communities. If you had automatic search for network provider, farmers could automatically switch to Burkina Faso network from their respective network provider. This could increase the mobile credit costs, and some farmers did not know how to change this setting. The network coverage could make it difficult for the farmers to be reached by others at all times, but if the farmer wanted to talk to someone, everyone knew about a spot with reliable good network coverage where they could make calls.

Table 5.1: Mobile Phone Ownership

Mobile phone status	Informants. (n)=59
Their own	49
In the household	8
No access	2

Source: Fieldwork 2016

Before I came to UER I was unsure about how widespread and accessible the mobile phone was. The table above illustrate that it is common for a farmer to own his own mobile phone in the two communities. Table 5.1 shows that 49 of the 59 informants own their own mobile phone, while only two of the 59 informants did not have access to one, even within their household. Eight of the 59 respondents answered that they did not have their own mobile phones but at least one household member would have one. The other family members could be their wife, brother, oldest child or their father.

Several of the informants who answered that they didn't own their own mobile phone said it was because their old one got spoiled and they would buy a new one soon. For others it was more important to have their own mobile phones. One farmer (43 years) told me that "I have spoiled one, but I bought a new one right away", and another bought a new one in the period between the pilot survey and the interview. The cheapest handsets could be bought for 35 Cedi, about \$8 USD, at Navrongo market. In Navrongo I met several people who had a smart phone, but none of the informants had one. They usually had small simple handsets, often with slots for two or three sim-cards. The extra slots make it easy for the ones that have a sim-card from several operators, they can simply choose which operator to use during each call, and could be reached on both number simultaneously. These small handsets have colour displays and cameras.

Another reason which makes the mobile phone accessible to many is that it does not require the users to be literate (Maddox & Overå, 2009). With training, most illiterate people can learn the technical skills required to operate a mobile phone. This contrasts to other ICT's like computers and tablets, which require that the users have substantial reading capabilities and technical understanding in order to utilize them effectively.

Image 5.1: A popular mobile phone in Ghana.



The X-Tigi model S18 was a popular mobile phone in the study area. It has slots for three sim-cards, and a 10 000 mAh Battery with an USB outlet to charge other electronic devices. It costs 90 Ghanaian Cedi (\$23 USD).

Source: Mobofree.com

5.2 Price Information

Information about prices is probably the main innovation that the mobile phone has brought to UER, as almost every informant talks about how knowledge on market prices may help them. How they use this information varies, depending on how they conduct their sales.

From the interviews I learned that farmers could call traders in the market early in the morning to ask about prices for different crops that day. If there would be a good price for crops that the farmer had ready, he could harvest them and travel to the market to sell it. Market prices fluctuate in UER, informants told me that prices can change during a single day. With access to price information with the mobile phone they reduce the uncertainty by being able to get approximate daily prices before they harvest their crops. With information about the demand for a crop at a market, the farmers reduce the risk of arriving at a market where there would be an abundance of their harvested crop. If there is abundance of a

perishable crop, the prices will be reduced that day and farmers increase the risk of not being able to sell their products, resulting in spoiled crops.

Above I mentioned I travelled with a male farmer to Navrongo on a market day. He brought Kenaf, okra and pepper to sell that day, and was stopped by three women who recognized him on his way to Navrongo. He told me he had made a mobile phone call to the market for price information before he travelled from Kazugo. This may have proved helpful to discuss prices when he sold some of his produce to these women before he arrived at the market.

One informant told me that it was usually his wife who travelled to the market to sell the products. For this couple, the mobile phone helped them communicate when she was at the market. If she found a buyer she could call her husband and discuss the prices that she was offered. This is an example of how the mobile phone may have increased income and reduced household conflicts since they can agree to prices over the phone before she sells it.

Another scenario that I observed was when a trader came to the community and bought a big load of peppers. The trader had called one of the farmers and asked if the community could supply her with the amount of pepper she wanted, before she travelled to the community. In this case, the trader wanted to send the pepper with the bus to Accra. When the farmers have mobile phones, the key informant, who had previously lived in Accra, called a friend Accra and asked about prices for pepper there. When the farmers know the prices of a product where the trader is planning to sell, it may help the farmer get a better price than what he would if he did not know the prices where the crops would be sold. This example shows how the mobile phone can reduce price asymmetries between the markets and the villages.

If the farmer wants a trader to come to his farm and buy their products, the mobile phone is used to contact the buyer. The buyer does not need to be the same person every time, but they will have relations to some of the farmer's friends. One farmer (31 years), who clearly preferred to sell his produce this way, told me "We have many friends at the market (Navrongo), so there are different persons to call". Other farmers told me that they could get different people to come to their farms every time. If the farmer gets in contact with a trader that is willing to travel to his or her farm, the prices are seldom settled on the mobile phone beforehand. The appearances of the crops also affect the price. Therefore, the final price of the produce is usually decided in face-to-face conversations between the farmer and the

trader. The reason the farmer (31 years) prefers to do business this way was simple “When I know the price, it is more economical to make them come here to transport the crop themselves”. He would discuss the market price on the mobile phone the day he wanted to do business, so he would always know the market price.

Another way in which improved access to market information through mobile communication may increase a farmer’s profit is that it may reduce spoilage of the crops. This information reduces the farmer’s risk of harvesting a perishable crop and bringing it to a market that is oversaturated. One female farmer (40 years) in Pungu told me of another way in which the mobile phone could help her reduce spoilage: “Maybe when we have harvested tomato and pepper, but cannot sell it in *Navro* (Navrongo), then I can call different people in different towns to hear if they can buy it there”. This supports the findings of Boadi et al. (2007) and Overå (2006) that better coordination between farmers and traders may reduce the amount of crops that get spoiled.

5.3 Transportation

The mobile phone has also helped the farmers to organize the transportation of their products. Regarding transportation, the mobile phone has been more time-saving than money-saving for most.

When the household knows that they will go to the market with a large quantity of crops, they will contact someone they know who has a tricycle and ask whether or not the person could come and help him the next day. The farmer will make contact the day before. This benefits farmers in two ways. First, their products will be transported straight from their garden to the market, second, the transporter is known to the farmer and that reduces the risk of being cheated to pay too much for the transportation.

With organization of transportation it is important to note that there were differences between the two communities that I studied. In the small community of Kazugo, all the informants lived close enough to one of the two owners of a tricycle. They would rather walk to the driver compound and ask face-to-face the day before if the driver could help them, instead of calling. This may also be because of the poor mobile network coverage in large parts of the community. In Pungu many informants said that they would use the mobile phone to call the

tricycle driver the day before to organize transportation. In Pungu they had a tricycle station by the asphalt road. To this station, farmers could come with their products and wait to be picked up by a driver, either by a tricycle or a motorcycle. The station is there, but the informants told me they rather preferred to call and organize transportation with a friend. Hence, the mobile phone may have helped the farmers in Pungu more than the farmers in Kazugo in the case of transportation.

Image 5.2: Harvested pepper ready to be transported to the market.



One of the informants said he sold rice and groundnut in Bolgatanga during the rainy season. When he did this, the entire sale would happen over the phone. The farmer would call the trader, a personal friend of the farmer, in Bolgatanga to ask if she was interested. If the buyer needed products, the farmer would put his products on a *Trotro*, a mini-bus, and give the *Trotro* driver's number to the trader. The trader could then contact the driver if the driver would not meet her at the *Trotro* station or their planned meeting spot. When the trader receives her products, the farmer will receive his payment on his MMT account. This is arguably one of the most evident innovations I observed, this reduces transportation cost and

time use for the farmer and buyer, but more importantly this is a sale of products outside the institutionalized market structures.

5.4 Call for Help

I have chosen to call this sub-chapter “Call for Help”. Here I will present some evident advantages for the farmers with access to long-distance instant communication. One way, which was mentioned by many informants, was how they could call a friend who would be in town that particular day and ask him or her to bring something to them. If the farmer would suddenly realize that he needed pesticide, petrol or equipment, he could call someone he knew was in town and ask if they could bring what he wanted. For the farmers in Pungu, who had an MMT outlet, they could send money to their friend in town if he or she was short on money to buy the things the farmer wanted.

One of the informants was a part-time mechanic as well as a farmer, and I saw him mostly work with water pumps. When I asked him how the mobile phone helped him with his mechanical work, the phenomenon mentioned above was even more helpful. When he receives a defect water pump, he does not know what is wrong with it. When he understands what is defect, he can call someone he knows is in town that day and ask the person to bring the new parts. This farmer lived in Pungu and had access to a local MMT stand.

Another way in which the farmers could call someone for help was when their plants had got a new disease. Even though most informants said they would go to the pesticide dealer and ask him for help there, some mentioned that it was easier for them to describe the disease over phone while they could see the plant. In this way the farmer could more accurately describe the plant’s symptoms than what he would do from his memory if he went to the dealer in person.

The veterinary services are also reliant on the mobile phone. Even though there presumably was a system where they would visit the village up to two times a year, I received conflicting answers when I asked about it. Most people said yes, but some people answered no to my question about whether the veterinary services could come even though the farmer had not called them. For the ones that are not visited by the veterinary services, the mobile phone is their main way of communicating with the veterinary. With the mobile phone, the farmer can

tell the veterinary about their livestock's problem, and then arrange a meeting if necessary. The type of animal and type of disease, will decide whether the farmer has to travel to the veterinary's office or the veterinarian will come to the community. The farmers in Kazugo used the veterinaries in Paga, while the farmers in Pungu mostly used a veterinary in Navrongo. This is due to the district that the community is a part of.

5.5 Documentation of Information

Even simple handsets have various functions today. Recording and photography are some functions that farmers mentioned as useful in various occasions. Some farmers with a camera on their phone said they would take a picture of their diseased plant and show it to the chemical retailer when they met one. This improves the reliability of information the farmer brings to the pesticide dealer. Oral representations from memory may miss important details when describing a disease. When farmers can add a picture to their descriptions, it will reduce the risk of receiving the wrong pesticide.

One farmer mentioned that he used the photo function at agricultural meetings and conferences, to take a picture of an overhead slide for example. Another informant told me he would use the record function as well. By recording a lecture, he could bring it back to the village and let other people listen as well. This allows more people to acquire the knowledge, but arguably more important is that the knowledge will be more reliable when people hear it from the source. If a farmer were to retell a lecture, he could have misunderstood something or forgotten some important details. The recording function may increase reliability of information shared to the villages.

5.6 Mobile Money Transfer

Another technology that the mobile phone has brought to the farmer is Mobile Money Transfer. MMT is a service provided by the network operator, MTN was the first to introduce it in Ghana in 2009 (Business Day Ghana, 2015). On a MMT account they can store, transfer and withdraw money. The account is accessible with your phone number and four-digit personal code, much similar to a credit card and its four-digit code. In order to access your

account, you have to contact a MMT dealer that is authorized from the same network operator that provides your phone number.

These dealers are people sitting by a small trolley under a parasol that shows what network operator they work for. This trolley and a mobile phone, is all a MMT dealer needs to deliver his services. Due to the low material requirement for an MMT outlet, they can be located widespread across towns, and even in some of the communities. This is a big contrast to the banks which needs a branch in a building and electricity for their ATM's. Farmers deliver and withdraw the money directly through the MMT dealers. When someone withdraws money from MTN, the MMT dealer will get between 1-3 % of the transfer and the network provider will take between 0.5-3 % of the transferred money, depending on how much money is transferred (MTN.com, 2017). The more they withdraw, the lower is the percentage the dealer and network operator will get.

It was not everyone who had their own MMT account, of my 23 semi-structured interview informants, 10 had their own account. The most common way that these farmers used MMT was to receive remittances from friends and family working in different parts of Ghana. And for many, that was the only way they used it. This is not directly linked to farming, but the money they receive can be used for agricultural investments.

There were diverging opinions about the safety of using their MMT account to store money. Some people thought it was very safe, some people thought it was safer than to carry the money with them, while some said they did not feel safe saving money there at all. One respondent rolled his eyes and said that “thieves only need your phone number and your code and then they can take everything”. One informant who did not like to store money on his MMT over longer periods said he could use it when he travelled. If he were to travel far with much money. He would put the money on his MMT account and withdraw it when he arrived at his destination, rather than to carry the money in his pockets. One woman I talked to with MMT said she could put her money on her account right away on the market after a sale. She felt it was safer than to carry and save the money at home. She was from Kazugo and told me that she could also call a friend of her, who was an authorized MMT dealer, and make that person come to Kazugo and let the farmer withdraw or save money.

One of the informants also told me that he did not have his own MMT account, but he was able to receive remittances through MMT anyway. That was because in Navrongo there are people who provide MMT services for people without their own account. In this example, the farmer would give his relatives the number for the serviceman's MMT account, and they would transfer money to him. Since this service happens instantly, the farmer can be together with the MMT serviceman when he is sharing information and the transfer will happen.

This chapter have presented various ways that the mobile phone may change the local farmer's agricultural and marketing practices. It has also proved useful for farmers to acquire and share information. It is clear that some of these changes constitutes innovations, and may bring profitable outcomes for rural farmers. In the next chapter I will discuss these innovations and some of their implications in the regional farming system.

6. Theoretical Discussion

As the empirical findings of this study have shown, it is clear that the mobile phone has produced some distinct improvements for the farmers interviewed. In this chapter I will discuss the research findings with the presented theories, and try to see what types of innovations the mobile phone has produced. It will also contain a discussion of the farmers' position in an Agricultural Innovation System, and how the mobile phone has increased the efficiency in distributing knowledge to rural areas. The final part of the chapter will discuss how the mobile phone may affect some of the institutions in place in UER.

6.1 Market Interactions

There are two main changes that the mobile phone has brought to farmers when they want to conduct a sales transaction. The first important change a farmer may experience is the ability to make direct contact with the market from their village. The latter change has created various opportunities for the farmers, and in this sub-chapter I will address these opportunities. The second one is that Ghana's network operators offers Mobile Money Transfer, and this service provides the farmer with some new ways to store and transfer money and in some cases conduct sales.

6.1.1 Price Information

The possibility to get information about a crop's prices before the farmer harvests his or her product was something all the informants mentioned, and is the most widespread change that I observed. This allows the farmers to choose which market they want to go to, or if they should wait a couple of days with the harvest and see if there will be a better price. This market information will increase the farmers' profits from the crops they sell because they can choose a more suitable time and the most suitable market for their crops. One farmer (43), who spent much money on mobile phone credits every week, told me "I call every day and ask people at the different markets if they need some of my products". He was one of the two informants who told me he cultivated cassava, and the only one I met who cultivated cucumber. He was a well-farmer in Kazugo, so he was not affected by pumping days or petrol prices, and the well allowed him to cultivate water-demanding crops.

To gain knowledge about demand and availability for different crops is an innovation according to Schumpeter's types, because it changes the way farmers may organize their harvesting and sales (McCraw, 2007). The mobile phone has improved the efficiency of how a farmer can get this information (Aker & Fafchamps, 2013). Before the farmers had mobile phones, many of the informants told me they would talk to the farmers returning from the market that day, to get information about the supply and demand of different crops at the market. Furthermore, it is worth noting that the markets the informants used have fluctuating prices, meaning that the prices for a crop may change during a day if the supply of the crop would decrease or increase. These fluctuating prices have created price asymmetries that some traders who travel to villages have used to trick farmers to sell their produce at relatively low prices (Egyir et al., 2013). The mobile phone has helped reduce price asymmetries between markets (Zanello et al., 2014; Egyir et al., 2013), and it also reduces asymmetries between prices in villages and markets. It is safe to assume that if the farmers would be literate, the price asymmetries may be even more reduced. Overå (2006) mention that wholesale fish-traders may check the internet for global fish prices before they conduct business with exporting companies (p. 1310), such utilization can in the future help rural farmers get access to regional, national and international prices on their crops.

6.1.2 The Transportation and Sales Process

The organization of transportation to the market has become better, especially for the farmers in Pungu. I have not designed this thesis as a comparative study between the two villages, but in the case of transporting produce to the market there is a noticeable difference that needs to be addressed. The people in Kazugo usually use a friend from their community to transport their produce to the market, and they did that even before the mobile phone was adopted. But in Pungu which is a bigger community closer to Navrongo with paved road stretching through the community, to the solar power plant, the informants were more dependent on random and unknown drivers before they adopted the mobile phone. In Pungu there is a transportation station, where farmers could go with their produce and wait for a driver to pick them up. At this station different tri-cycle and motorcycle drivers regularly pick up people and their products. Usually, the farmers did not know the persons who transported them from this station, and these people could try to trick the farmers into paying more than usual. Farmers in Pungu who had a friend that owned a tri-cycle would walk to the person the day before and

ask if he or she could help. When these farmers in Pungu have adopted the mobile phone, it is easier for them to contact drivers that they know even though they might live outside of the farmer's walking distance. In Kazugo there were two tri-cycle drivers who the local farmers contacted the day before, usually by walking to their house, to arrange transport to the market if necessary. There is no transportation station in Kazugo where random drivers will come. With the case of farmers organizing transportation to the market of their own crops, it does not seem that Kazugo have experienced significant changes.

Another way in which the mobile phone has reduced the transportation costs for farmers is by providing farmers with different methods to sell their crops. The most common way to conduct a sale is that the farmer travels to the market area and sell their produce there. Now farmers can make contact with traders at the market by using the mobile phone, and vice versa as a trader may contact farmers and ask if they can supply her with the crops she wants. The latter change is arguably more significant for the traders, than for the farmers, who would occasionally visit villages to buy produce. Now they remove the risk of travelling to a village that can not supply them with what they need. They will not settle the prices for the crops over the mobile phone. It will be settled in a face-to-face conversation in the village after visual inspection by the trader. Now with the mobile phone, farmers may know the prices for their crops at the market, making it less probable for them to be cheated. This has made many informants prefer this way to sell their products. That the mobile phone has reduced the price asymmetries between villages and markets, makes this way for a farmer to conduct a sales transaction both money and time saving. Even with this development in sales transactions, there is no indication that the mobile phone has affected the gross margin on agricultural produce (Aker & Fafchamps, 2013).

I observed a trader who came to Kazugo to buy chilli peppers. She bought pepper for more than 1400 Cedis (\$327 USD). She paid for the transport to Paga, and she travelled to Accra with the pepper. The farmers who sold this pepper did not get paid until a week later. One of these farmers told me they called the trader regularly. That the mobile phone allows regular contact between the farmers and traders, and allow them to monitor each other activities, may make it easier for the persons involved to create personal trust (Bachmann, 2003). Similar findings were done by Overå (2006) during her fieldwork, the possibility to have regular contact between buyers and sellers with the mobile phone may increase the personal trust between the different actors in the farming system. This may make it easier for farmers and

traders, previously unknown to each other, to trust each other. Such personal trust can create long term relationship between the persons based on positive reciprocity.

These new ways to transport does also affect how a farmer may organize their sales, effectively making these changes innovations as well (McCraw, 2007). But if we regard the mobile phone as the main innovation, we can categorize the changes encapsulated in the last two sub-chapters as Rosenbergs post-innovation improvements (Mytelka & Smith, 2002, p. 1472). These post-innovation improvements are some small changes in marketing practices that the mobile phone have facilitated in the study area. If we single out each change, they do not always constitute much profit gain or time spared, but if we look at all these incremental changes (Lipsey et al., 2005) they cumulate to make the mobile phone a very beneficial tool for the local farmers.

6.1.3 Mobile Money Transfer

I will argue that MMT can be regarded as a GPT in itself. This service is helpful in every sector and used for various purposes in various settings, and created spillover effects for farmers in Ghana. From one network provider offering this service in 2009 (BusinessDayGhana.com, 2015), there are now five network providers in UER, as well as all the commercial banks, that offer this service. This service provides a significant change for many of the farmers as it has provided “unbanked” people in Ghana with new saving and transaction possibilities, regular banking (BusinessDayGhana.com, 2015). According to Schumpeter’s types of innovations this service can be regarded as a new product that is available to farmers (McCraw, 2007). The *Susu* accounts allowed farmers in Kazugo to save money electronically, but they would only be able to withdraw this money once a year. With MMT they have access to personal accounts where they can transfer and store money easily through interactions with MMT dealers.

I received varied responses on whether the informants would store money or not on MMT. For one of the female informants, MMT seemed to be where she kept most of her money. She told me she would put the money she made at a market straight into her MMT account, unless the money was needed at home for example for school fees. These new ways to handle money reduces the risk for farmers to lose money by theft. This is similar to what Overå (2006) observed among wholesalers of fish. Through instant mobile phone communication with

banks, companies could check if the wholesaler had transferred money into their bank account, and the wholesaler removed the necessity to carry or transport physical money to do the transaction (p. 1311). MMT have simplified and made this way to do monetary transactions more accessible. Users of the service will automatically receive a SMS notification when money is transferred into their account, removing the necessity to call the bank or network provider to check if the money is transferred. Some of the informants felt it still was safer to keep the money physically. One informant said it is possible for a thief to force the farmer to reveal the pin-code for his or her MMT account, as the reason he did not save money on MMT, but it may also be because informants have other alternative ways to save money, for example on *Susu* accounts. However, in my view if a thief gets that close to someone, the thief would probably be able to rob that person for any physical money anyway. Money saving and transferring have become safer with MMT for the farmers that utilize it.

I also talked to a farmer that would market his crops over the mobile phone and receive the payment for his products through MMT. Visual inspection of the crop by the traders is important in UER, but this guy had a special arrangement with a personal friend in Bolgatanga. I only talked to one informant who used MMT in this way. Another female farmer (35 years) told me that the lack of technical skills was one of the reasons she did not want to do sales with MMT. Because “If you buy or sell without knowing your phone very well, you can be tricked and lose money”. This comment suggests that training in mobile phone and MMT usage may facilitate more sales transactions to be done electronically.

Every informant I talked to who had a MMT account in their family said that they used it for remittances from family and friends, making this the most valued and widespread service provided by MMT. From the data it seemed like most informants would receive money from friends and relatives working in Accra or other big towns. When the money is transferred electronically it removes the travel time that would be necessary to transfer physical money. This technological innovation improving the transferability of money may be very important and helpful for entrepreneurs who want to try out new technologies or techniques in farming. To try out something new is inherently a risky action because you do not know for sure how the results will be. Due to such risk, there might be farmers who do not dare to adapt new technology or techniques. With easier access to money from relatives and friends if an emergency would arise, I will argue that MMT can prove useful to help people dare to make more investments in agriculture-enhancing products.

6.2 The Mobile Phone in the Agricultural Innovation System

The mobile phone has a potential to enhance the regional agricultural innovation system in various ways due to its different functions that will be addressed in this sub-chapter.

6.2.1 The Mobile Phone as a GPT

I have categorized the Mobile Phone as a GPT throughout this thesis. Before the fieldwork, I did not know how widespread the mobile phone was in the Kassena-Nankana districts. I learned that 57 of the 59 households had access to their own mobile phone. This is a dramatic increase compared to the 8 % of the population in 2004 (ITU, 2004, in: Overå, 2008, p. 43). A criterion for a GPT is that it will be gradually improved (Jovanovic & Rousseau, 2005; Lipsey et al., 2003). The gradual improvements of a technology will make earlier products and production processes cheaper (Lipsey et al., 2003, p. 97). So the prices of the technology will continue to decrease, and as stated in a Business Day Ghana (2015) article, the mobile phone has changed from being a luxury for the few into “an affordable essential” for many people. There have never been any subsidies or programs that can reduce the financial barriers for farmers to acquire a mobile phone.

The impact of the mobile phone is considerable in the study area. Overå (2006) shows that there has been network coverage in the study area for more than a decade (p. 1306). A few informants said they have had their mobile phone in more than a decade, and that the network coverage had not improved much during that time. But before the farmers had mobile phones, there was no way for the farmers in the rural villages to make contact with the towns and markets. Due to this earlier situation, the mobile phone may be regarded as a transforming GPT for the rural farmers in UER. There are no main line telephones that can be utilized in the study area, due to the lack of infrastructure. The rural farmers in UER have leapfrogged the main line telephone development phase. When the mobile phone was adopted in western developed economies, the main line telephone infrastructure was sufficiently developed that even rural farmers in these countries were connected. For rural farmers in the study area the mobile has been a transforming GPT because it provides previously unavailable ways to interact with people. These possibilities have transformed how the farmers talk with distant relatives, market their crops and receive remittances.

That the mobile phone has become so widespread in all sectors and in people's social life also supports the criteria for a GPT. Due to the main use of the mobile phone – instant communication over geographical distances – it can be used for various purposes depending on the reasons why people want to communicate. The handsets and smartphones also offer different functions, like allowing people to record sound, take photos, browse internet, use MMT and SMS services. These functions further diversify utilizations of the mobile phone and produce spillover effects, or promotes innovation spawning (Jovanovic & Rousseau, 2005, p. 1185). For example, MMT is an innovation that have directly spawned from the mobile phone, and the photo function have decreased the probability to receive the wrong pesticide by providing farmers with a new way to describe the disease for the dealers. Some of these functions would require the informants to literate before they can fully utilize them, but they still make the mobile phone a beneficial tool for some farmers in an agricultural innovation system.

6.2.2 Acquiring and Sharing Information and Knowledge

Most of the mobile phones offer a radio function, but that function was hardly mentioned by my informants. The radio seemed so important that almost everyone had their own portable battery-driven radio. These radios would be used at home and in their gardens. The loud speakers on the mobile phones would not produce enough volume for many of the farmers who wanted to listen and work at the same time. Here it is also worth mentioning that the farmers in Kazugo who need to go to the neighbour village to charge their mobile phones, had access to cheap batteries for their radios in the village store. The power source for their radios is more accessible than for their mobile phones.

Another important aspect about the radio is, as mentioned above, that the radio hosts talk in the local language. It was two out of my 23 interview informants who knew enough English to answer almost all of my questions without the help of the interpreter. This language barrier also affects how useful the television is for the informants, most TV stations in Ghana are in English. I also learned that television commercials seldom were about agricultural products, and those who were often focused on farmers in southern Ghana. There was no television present in Kazugo, but there was one farmer there who had a smart phone. The smart phone was not used for internet or applications, because the user was not literate and cellular data is

expensive, but the owner used it to watch movies and music videos that friends had transferred from a computer.

Before the fieldwork, I had learned about a MIS company called Esoko. It provided farmers with weather forecasts, market prices, crop tips and other farmer relevant information. This service was unknown to all my informants, and when I discussed it with them and mentioned that they needed to register for it, many would automatically look uninterested. An important factor is that Esoko is a SMS service and requires the user to be able to read. Most of my informants were illiterate and replied that they would not be able to use this service. However, with substantial training in reading and mobile phone usage, it is possible for farmers to learn how to make use of Esoko and the mobile phone to get relevant information (Nikkoi, 2016).

The radio is far more useful than the mobile phone for the farmers in the study area to acquire new information. Due to weak loud speakers, low technological knowledge and the language and literacy barriers, the mobile phone proved to be an unimportant tool for the farmers to access new information from public or private organisations or companies in the study area. The ways I observed that farmers would acquire information through the mobile phone was through conversations, recordings and photos. Some farmers said they could discuss farming related topics with friends over the mobile phone, but that did not seem like common practice. Most of the farmers said they discussed farming with their friends and neighbours in face-to-face conversations.

During a group discussion someone mentioned that he could use the recording function on his mobile phone. It became evident that some farmers who attend various kinds of meetings may record the sound from the meetings on their mobile phone. This was not a widespread activity, but it may have a significant potential to help spread knowledge to the villages. By recording presentations, debates and conferences, a single farmer can come back to his village and share the new knowledge significantly easier. An important thing to note here is that this recording can be done by literates and illiterates alike, so far they know how to start a recording on their phone. Farmers could of course take notes or focus on remembering the most important things they would learn at a meeting. But when they are recording, it may reduce the risk of interpreting and conveying information incorrectly.

The photo function on the mobile phone is also a function that potentially increases the credibility of the information shared between actors in Ghana. There were many different uses of the photo function on the mobile phone. One farmer used it to take pictures of his sick plants to show them to the pesticide dealer, and that made it easier for the dealer to provide the right kind of pesticides. I also talked to people saying that they would take pictures from meetings they attended. Especially if there was a presentation in the meeting, it was possible for them to take a picture of the slides. Due to the small monitor on the mobile phone it was very difficult to read the slides. Most of the mobile phones currently in the Kassena-Nankana districts now, may only take photos and record, but smartphones are gradually being introduced. With the smartphones the farmers may also be able to record videos of the meetings they participate in, this will further increase a farmer's possibilities to expose fellow farmers to new information and knowledge which may enhance the local agricultural innovation system.

The two latter paragraphs illustrate how regular farmers can take the role as brokers in an agricultural innovation system. Farmers that bring such information and knowledge back to the village farmers can be regarded as either a "process promotor" or a "power promotor" (Hermans et al., 2012, p. 118-119), depending on the nature of the information that he or she brings. The mobile phone has made it easier for farmers to share the information that they would gather at different meetings, effectively making it possible for them to enact roles as information brokers. This can affect farmers' position positively in the agricultural innovation system, consequently enhancing the regional farming system.

6.3 Institutional Changes

6.3.1 Markets

There are norms that guide how people conduct business in Ghana. One of them is that the marketplace is the central place where farmers and traders conduct business (Overå, 2006). A second one is that there is little standardization on quality of products, making visual inspections by buyers an important aspect of a trade that everyone is used to. There are also no fixed prices, as prices of products may continually adjust after supply and demand, and can always be negotiated. These are some unwritten rules that are embedded in the market system, making them norms that market actors must adhere to in market transactions.

The mobile phone has not made any big changes to these institutions, but I will argue that it has affected them to some extent. The market place as an area may be losing its central place for farmers to conduct agricultural marketing. Many informants said they preferred that a trader came to their farms to buy their produce. Then the market place would only need to be a small place where traders gather and the farmers could get in contact with them, it does not need to be a large field like the one in Navrongo. That traders can contact farmers in their communities may also make it easier for traders to travel directly to the farmers when they want to buy in big quantities. This shows that the market place as a geographic area is to some extent affected by the mobile phone. This technology has provided the farmers with new ways to organize the marketing and the market interactions. It reduces their work time and travel expenses, and it constitutes an organizational innovation that may become more common in the future.

There is no standardization on quality of products in Ghana. This makes visual inspection of a farmer's produce in a face-to-face conversation necessary for a trader before she decides whether or not she wants to finish the transaction (Overå, 2006; Egyir et al., 2013). The mobile phone does not directly affect this institution, but through the mobile phone's ability to enhance personal trust relationships it may in turn reduce the importance of the visual inspections. The farmer who could sell rice and groundnuts to Bolgatanga, and receive payment over MMT, has managed to skip this norm during these sales. The mobile phones ability for farmers to keep contact with friendly traders can make the trust building process less time-consuming. They can easier create a reciprocal relationship where they trust each other enough to conduct the sales transaction over the phone with no visual inspection, and conduct payment electronically over MMT. This removes both parties' necessity to meet each other, which reduces time spent and travel costs for the transaction. Such changes may in turn reduce gross margins on produce when all parties utilize new and more efficient ways to conduct market transactions (Farris, 2010).

There are almost no fixed prices in UER, and the price asymmetries between markets and villages have made price negotiations a normal part of a sales transaction. I will argue that the mobile phone may indirectly affect this norm as well. When price information is so easily accessible for farmers, the farmers can become more selective. The mobile phone allows farmers to decide whether or not they want to harvest their crops based on each day's market

price. If a farmer decides that he or she will never harvest and sell their produce when prices are below a certain amount, that farmer may create his or her own standard minimum price. At one point the farmer will have to harvest the crops before they become overripe, and if it is a perishable crop, like tomato, the farmer may still have to accept lower prices. This may be a small step towards regional fixed prices, even though that would probably require farmers to organize into fruitful organizations and unions.

As pointed out in Eenhoorn & Becx (2009) survey, “lack of farmer organizations that can defend farmers’ interest” (Hounkonnou et al., 2012, p. 79) was a challenge facing the farmers, and such organizing is still not evident in the study area. I asked all the interview informants whether they knew about any organizations, programs or unions who support the local farmers, but the responses were generally negative. Many informants complained that local organizations did not support them with anything they would regard as valuable. This coincides with statements in Laube et al. (2011) that farmers in Ghana, and Africa in general, are sceptic and try to avoid government-driven agricultural modernizations due to forceful and top-down implementation of the new technologies and techniques (p. 755). The responses I received show no indications that the mobile phone may have affected how farmers would organize in the study area, but the MIS company Esoko offers services that can link farmers and buyers (Esoko.com). Such services may contribute to farmer organization if the rate of literacy would increase in the study area.

3.6.4 Banking

Other institutional changes that may be facilitated by the mobile phone are the commercial banking institutions. MMT provides banking services through the farmers’ mobile phones (Kirui et al., 2010; Comminos et al., 2008). It allows farmers to transfer money electronically within their network, and some farmers preferred to save their money on their MMT accounts electronically instead of physically in their homes. These two services affect the local norms and practices of handling money.

MMT’s most commonly used service by the farmers were to send and receive money from friends, family and traders. Mostly this was to receive remittances from relatives and friends that had moved away from the communities. It was also used by a few to transfer money to a friend that was in town, when the friend was asked to bring something to the farmer. This

instant and secure way to transfer money is an innovation that farmers are becoming used to. It is a serious improvement from physical money transfers done by drivers (Overå, 2006). The latter way to transfer money is risky because the money is physically exposed to drivers and thieves. People risked being cheated by others who could take some, or all, of the transferred money. The fact that MMT has almost removed risk and time as a factor for money transfers, may have implications on the norms guiding how monetary transactions should be conducted in the UER. MMT has also removed the cost of transporting physical money, but on the other hand it has added a new cost to the consumers when they want to withdraw money from their accounts. The farmers seem to think that this service's advantages is worth the costs they pay the MMT dealer and the network operator.

MMT also allows the farmers to store money on personal accounts electronically, similar to a bank account. There are some differences between a MMT account and a bank account. One is that money in commercial bank accounts generate profitable rents for the consumers, another is that commercial banks may offer loans to their consumers. A clear majority of the informants never had a personal bank account, but they had possibility to borrow small amounts of money lending from *Susu* accounts. In Kazugo, most of the informants were part of a *Susu* project which offer some commercial banking services. *Susu* projects have become more recognized by researchers, and have proved to be effective for female entrepreneurs (Quartey et al, 2012, p. 5). The local *Susu* projects in Kazugo have not yet started to utilize mobile phone technology, but it is not too bold to suggest that this service can be developed further, for example in collaboration with MMT services.

Because MMT retailers require low infrastructure, and MMT consumers only require a mobile phone number to be able to register an account, this service have far surpassed commercial banks in terms of accessibility. The commercial banks in Ghana have also started to offer their customers MMT accounts. This service has affected the banking institutions in Ghana, and its rapid expansion (businessdayghana.com, 2015) will probably continue to move monetary services away from the commercial banks over to the network operators. MTN was Africa's sixth largest company by revenue in 2015, and the second largest company that is not state funded (theafricanreport.com, 2015).

It is free to register, and the registrant only needs a registered number from a Ghanaian network provider who offers MMT. Nonetheless, when I started to talk to my informants

about MMT, I realized that far from everyone has it. When I asked people why they didn't have their own MMT account, the process of registration seemed to be a little cumbersome for some. This reluctance toward registration was also noticeable when I explained the MIS company Esoko for the informants. A registration process would generally require a person to be literate, a skill few of the informants possessed. This seemed to me to be an important explanation for why the informants did not want to register. Some argued that they did not need it, and others said that someone else in their family had it so they didn't need a personal account. But from the responses of the informants that seemed reluctant to register, I also noticed a fear that an unknown person who would have to help them register could not always be trusted.

There are some barriers to full utilization of the mobile phone in UER, and most of them are evident when I discuss why MMT is not as widespread as I initially thought. The education level is low in the study area, most of the informants are illiterate. To be able to fully utilize MMT and the mobile phone the users should know how to read. There is also a language barrier as many informants did not speak English. This is the official language in the country and is therefore the language that formal institutions use, and it is also the language in the menus on the mobile phone. Lack of general technical skills is also a barrier for full utilization of the mobile phone. Some farmers were afraid of using MMT to conduct transactions with unknown people due to fear of being tricked. Sufficient technical skills by the farmers would make it possible for them to monitor the transaction and reduce the risk of being cheated. Simple handsets are cheap in UER, but they also seemed to get spoiled easily. This resulted in some farmers being without mobile phones for some time, since they could not afford a new one right away. This shows that there are also economic barriers to full mobile phone adaptation by farmers in UER. All these barriers have been identified, and project started by Esoko and Consultative Group for International Agricultural Research (CGIAR) provide farmers with a handset, education and technical skills training (Nikkoi, 2016).

In this discussion chapter I have presented the various changes the mobile phone has produced for farmers in UER. I have reasoned why some of these changes may be regarded as innovations. Then I have discussed how the mobile phone handset and its functions may help farmers acquire and share knowledge within the regional agricultural innovation system. The final subchapters discussed how the mobile phone has affected norms and unwritten rules that

guide actors in the market transactions in UER. In the final chapter in this thesis I will present my conclusions.

7. Conclusions

The objective of this thesis has been to map the different utilizations of the mobile phone by farmers in UER in Ghana. I have observed various innovations that have affected how farmers conduct their sales, organize their transportation of crops, store and transfer money and acquire and distribute information. I have also observed how innovations affected trust on both a personal and a system level. In this chapter I will conclude the thesis with some summary paragraphs answering the three research questions and my problem statement. At last I will finalize with some personal concluding remarks.

7.1 Research Question 1

What kind of innovations have the mobile phone produced?

According to Schumpeter's types of innovation (McCraw, 2007), it is empirical data showing that the mobile phone has created various types of innovations. "A new way of organizing in the industry" (ibid, p. 73) is the type of innovation that I observed the most. Farmers now have essential new ways to organize transportation, harvesting and sales of their crops, and organize their handling of money. The second part of the first type of innovation, "[introducing] a new quality of a product" is also evident as a result of the mobile phone. That farmers can coordinate better with traders and the markets, reduces the risk of harvesting perishable crops in times where the market is saturated. This will, in turn, increase the overall quality of the products the farmers sell.

By allowing farmers to receive agricultural information from friends over the mobile phone, it may affect how the farmer produces his crops. This, "The introduction of a new way to produce a product", is also an innovation that the mobile phone may facilitate. With the various functions that a mobile phone handset has, easier access to credible knowledge may also result in new production methods in the study area. When the educational level will rise, I am confident that the farmers will find even more help from the mobile phone. Some of those helpful changes will also be regarded as innovations.

7.2 Research Question 2

Has the mobile phone influenced how a farmer gather new information and knowledge?

To acquire new information and knowledge from a mobile phone, would mostly require the user to be literate. This is an important reason for why the mobile is not very efficient in providing informants with new information and knowledge. Such new knowledge would be generated through telephone calls with friends, chemical dealers and veterinarians, but the research findings indicate that this is not a very widespread activity. The radio was the main source of new agricultural information and knowledge. And while some said that they could discuss farming related activities on the mobile phone, most of the informants would have these informing conversations with friends when they meet face-to-face.

However, the mobile phone has influenced how some farmers document information they receive in various meetings. By recording conversations and taking photos, the mobile phone may help farmers bring more reliable information back to their communities. This makes the mobile phone useful to teach new farming practices to rural areas. Previously they used to receive this information from a conversation with the farmer who had attended a meeting, but now the farmers may get that information by listening to recordings on the mobile phone. This show that the mobile phone has influenced how a farmer gather information and knowledge, and the smartphone will probably provide the farmers with even more new ways of acquiring knowledge.

7.3 Research Question 3

Has the mobile phone affected local institutions?

Markets are still the central place for a farmer to conduct sales. But the communication opportunities that the mobile phone has provided, have made some farmers prefer to sell their crops from their farm, instead of travelling with their produce to the market. I also registered a case where a farmer conducted the sales over phone, and would receive the payment electronically without any face-to-face contact. These are developments that may reduce the importance of the market place as the main place where people conduct business and the

norm that visual inspections are necessary. These new market transactions may continue to affect local norms and practices that guide the market interactions amongst farmers and traders in the study area.

Reciprocity as a norm has not been affected much by the mobile phone. But trust, that is vital for positive reciprocity, has become easier to establish by the simplification of maintaining communication.

The banking institutions have clearly been affected by the introduction of MMT. MTN was the first in Ghana to offer this kind of service, but today even the commercial banks offer this service. The fast, secure and efficient way for farmers to handle money transactions and save money makes MMT valuable for farmers to send and receive remittances and store money electronically. These were practices that normally were done through commercial banking institutions, but mobile network operators have clearly made such services a central part of their product to the consumers. Commercial banking institutions will have to adopt and change in this new competitive banking market.

7.4 Overarching Research Question

Has the adoption of the mobile phone led to innovations in production, organization or marketing of crops for farmers in Northern Ghana?

It is evident that that the mobile phone has provided the farmers in the study area with new opportunities. With access to information about the supply and demand at a market, farmers are able to organize harvesting in more efficient ways that reduce spoilage and may increase profits on produce. The communicative possibilities to the markets that farmers now access, is a major organizational innovation which allows farmers to change the way they organize sales transactions. The new marketing possibilities have reduced transportation costs and time considerably for the farmers who no longer prefer to travel to the markets with their produce. For households where the wife would go to the market, it has helped the farmers to organize their sales better, because the wife and husband can communicate when the wife is at the market. The MMT service that mobile phones convey has also provided substantial new ways for farmers to save and transfer money.

It is less evident how the mobile phone has affected the production process, but some farmers said they could discuss farming practices with friends over the mobile phone. In that way, information received through the mobile phone may affect the production process. The mobile phone's possibilities to document knowledge and information presented at meetings and workshops may also contribute to the production process for farmers. By allowing some farmers to become information brokers it may, further help diffusion of agricultural innovations in the study area. I will state that yes, this study indicates that the mobile phone has led to innovations in marketing, organization and production of crops for those who have adopted it.

7.5 Personal Concluding Remarks

During the fieldwork I learned that the mobile phone has proven to be an invaluable tool for the farmers in UER. The ability to do instant communication across geographical distances has already facilitated various innovations for the farmers, and I believe that it will continue to create new innovations in the future. The study area is a marginalized area with a low education level, but education infrastructure is developing. In Kazugo, the youths that were younger than 18 years could talk a little English. They were generally too shy to talk to me, but I saw that some of them could understand me when I spoke.

With increasing rates of literacy, and the continuing reduction on prices for smartphones, the mobile phone technology will continue to produce innovations for farmers in UER. Like the wholesale fish traders who would use internet to look at global fish prices (Overå, 2006, p.1310) to reduce price asymmetries with the companies they do business with. The smartphone will introduce internet to the literate farmers here, and this will allow local farmers in UER to check prices for crops on regional, national and international levels. That is only one of the potential changes the smartphone may bring, but I am sure that local farmers will find even more efficient ways to utilize a smartphone when it becomes widespread and accessible for them in the region.

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Appendix 1: The Pilot Survey

- 1) What is your name?
 - a. Age?
- 2) How many people are you who share this piece of land?
- 3) Do you have a mobile phone?
- 4) What kind of crops do you produce in this garden?
- 5) What kind of livestock do you have?
- 6) Is there anyone in your household who have a job that is not related to farming?

Appendix 2: Group Discussion

1. Which markets do you usually travel to?
2. How do you get access to seeds?
3. How do you get information and access to fertilizers?
4. How do you get information and access to pesticides?
5. Where do you usually buy water pumps?
6. How is the mobile phone helpful to you as farmers?
7. How do you get information about new farming practices and technologies?
8. Do you know of any public or private organizations or unions that help farmers in this area?

Appendix 3: Semi structured interview

Semi-Structured Interview

During my semi-structured interviews, I will begin with an introduction phase where I will present myself, and a detailed explanation of my study subject. I will tell them that the participation is voluntarily, and that they will be anonymized.

Questions:

1. Personal information
 - a. Name
 - b. Age
 - c. Marital status
 - i. Children
 - d. For how long have you lived here (in the community)?

2. What is your work related to agriculture?
 - a. What do you produce?
 - i. Rainy season crops
 - ii. Dry season crops
 - iii. Cattle
 - iv. Any cash-crops?
 - v. What do they produce to sell and what do you produce to eat?
 - b. Do you live here all of the year, or does your work require you to travel sometimes?
 - c. From who have you gotten the control of this land?

3. Do you have a mobile phone?

If Yes on Question 3:

4. How do you utilize the mobile phone(s) in your household?
 - a. For how long time has it been a mobile phone in your household?
 - i. Do you remember any differences that you experienced after you adopted a mobile phone?
 - b. How often do you use it?
 - c. What is your most common utilization of the mobile phone?
 - d. How much do you spend on mobile credits each week?

5. How does the mobile phone help you in relation to work?
 - a. Do you access information about prices and demand at different markets?
 - b. Does it help you plan the transportation of your produce?
 - c. Has information received through the mobile phone affected what crops you produce?
 - d. Is there any other mobile phone usage that is work related?

If No on Question 3:

6. How do you get information about market prices?
7. How do you organize transportation of your product to the market?
8. Why do you not have a mobile phone?
9. What do you think is the most positive thing about the mobile phone?

To everyone:

10. What is your most common way to get information related to agriculture and farming?
 - a. Friends?
 - b. Media?
 - i. Mobile Phone
 - ii. Radio
11. Have relatives, friends and neighbors affected the production, organizing and transportation of your products?
 - a. Have you received information from others that have made you change your production methods?

- i. Do you know where your friend got this new knowledge?
- b. Is it common for people you talk with to share positive farming experiences?
- c. Have you ever shared knowledge or information that have affected some of your relatives, friends or neighbors' production or transportation of their products?

- i. Where did you learn this knowledge?

- d. Do you usually share positive farming experiences to friends or relatives?

12. Are there any public or private programs, policies or organizations that have affected or affect your work?

- a. Any subsidies?
- b. Workshops?
- c. Technological support like tractor or water pumps for irrigation?
- d. Esoko or any other MIS?

