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THE ROLE OF FARMING MOBILE APPLICATIONS IN COMMUNITY DEVELOPMENT

BY

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DECLARATION

This research project is my original work and has not been presented for a degree in this or any other university.

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APPROVAL

This research project has been submitted for examination with my approval as the university supervisor

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DEDICATION

То

My parents, my husband Moses and my loving daughter Rachael Njoki

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I praise God for the gift of life and provision without which I would not have made it this far in my academic pursuits.

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ABSTRACT

Mobile phones have become the fastest way of collecting and transmitting information. A lot of resources have been invested for the development and deployment of mobile applications. In the agricultural sector many farming mobile applications have been developed for use by farmers in Kenya and many farmers have adopted the use of these farming applications such as; Kilimo Salama, M-Farm etc. The success of these applications has largely been measured in terms of subscriptions to the services offered and also the success stories from the farmers. However, this doesn't tell the whole story of what impact or the lack of it thereof in community development.

The purpose of this study was thus to evaluate the impacts of these farming mobile applications on community development. The specific objectives were: to understand the factors that promote adoption and use of farming mobile applications, to understand barriers to increased adoption and use of farming mobile applications and evaluate the appropriateness of farming mobile applications on social, economic and cultural development of the community. This study was based on two theories; Viji, Srinivasan theory from ideology to technology and reflective practice model theory.

The information was collected from the farmers using the Mfarm and Kilimo Salama applications by use of structured interview schedules. Purposive sampling, simple random sampling and snowball sampling methods were used to select the respondents. The study established the factors promoting the adoption and use of farming mobile applications and also the barriers to more adoption and use. The study established that the use of farming mobile applications had a positive social, economic and cultural impact in the community bringing about development.

The study recommends that the farming mobile applications should be made affordable, customer care services improved, stakeholders to collectively educate the farmers on existence of farming mobile applications and their role in community development and train farmers on how to use mobile technology in agriculture.

More research should be carried out on how different partners in agriculture can collectively promote the use of technology in agriculture, development of a universal application and investigate how the ministry of agriculture can subsidize insurance premiums on farm inputs and expected harvests.

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CHAPTER ONE: INTRODUCTION

1.0 Background

Mobile communications technology has become the world's most common way of transmitting voice, data, and services and no other technology has spread faster than mobile technology before. Mobile phones have become a requisite of our day to day life such that we cannot imagine surviving without mobile phones (Kumar, 2012).

In Kenya today about 20 million people out of a population of about 41 million have access to mobile phones and this is an indication that about 90 percent of adults are connected. The growth of mobile phones adoption can be attributed to some of its characteristics such as; affordability, usability, mobility, wide ownership, voice communication, instant and convenient service delivery. As a result there has been a global explosion in the number of mobile applications facilitated by the rapid evolution of mobile networks, increasing functions and the falling prices of mobile handsets.

Mobile applications are becoming an everyday reality as mobile phones are one of the few devices reaching nearly all the people on the planet. It's important to be connected but that alone is not enough, value of it is that, it comes with different mobile applications and services available. According to Pyramid Research mobile innovations appear to be a combination of simple solutions for basic handsets and more sophisticated solutions for smarter devices which helps to ensure that mobile users of diverse socioeconomic backgrounds benefit from mobile applications. Mobile phones are said to be 'pro poor' service suggesting that 'mobile phones have and will continue to provide social benefits because it is becoming a favored means of communication for the less - privileged segments of the population'(Mariscal and Rivera, 2007).

A lot of resources both financial and otherwise have been invested in the development and deployment of mobile applications for use in many sectors of the economy the world over. The agricultural sector in particular has received a lot of attention because of its potential to improve livelihoods of millions of people. Agriculture is said to be typically crucial to the economies of developing countries and employs many people (World Bank, 2011). In Kenya a number of mobile applications have also been developed for use in the agricultural sector such as M-Farm,

Kilimo Salama, and I-cow. These applications are part of the greater array of complimenting mobile applications developed for other purposes such as money transfer and mobile marketing.

The success of these applications has largely been measured in terms of subscriptions to the services offered. However subscriptions cannot in themselves tell the whole story of what impact or the lack of it thereof. Another common approach to measure success has been by using case studies of farmers whose livelihoods have been changed for the better through increased production and incomes from their farm produce.

Individual stories and levels of uptake are important but they do not reveal the impact on the communities involved. Community level impact on the other hand is evaluated using indicators of development such as education, health, nutrition, housing, environment, safe and clean water, individual wealth and population.

As more and more resources continue to be dedicated to the development and deployment of mobile applications for the agricultural sector, there is a need to study the impacts of these applications from a community development perspective. An understanding of the impacts will serve to inform us on the magnitude of the impacts as well as possible misconceptions about their role in community development.

1.1 Statement of the problem

Farming mobile applications have been developed and adopted by many farmers in Kenya today. However, there is lack of an understanding of the appropriateness or the lack of it thereof, of farming mobile applications in community development. This understanding is critical to the organizations funding their development and deployment as well as the farmers who faithfully pay for and use these farming mobile applications with the aim of achieving social, economic, and cultural development. A continued lack of an understanding of the appropriateness of farming mobile applications is likely to lead to further investment of funds and time in projects whose appropriateness in community development are not well understood. In addition it's important to understand factors that promote the adoption and use of these farming mobile applications. It is therefore necessary to investigate the appropriateness of these farming mobile applications from a community development perspective in order to enable all stakeholders to make informed decisions.

1.2 Research Questions

- 1. What are the factors that influence the use of farming mobile applications?
- 2. What are the barriers to increased adoption and use of farming mobile applications to promote agriculture?
- 3. What is the appropriateness of farming mobile applications on the social, cultural and economic development of the community?

1.3 Objectives of the study

1.3.1 Main objective

The main objective of this study was to evaluate the appropriateness of farming mobile applications in community development.

1.3.2 Specific objectives

- 1. To understand the factors that influence adoption and use of farming mobile applications.
- 2. To understand the barriers to increased adoption and use of farming mobile applications.
- 3. To evaluate the appropriateness of farming mobile applications on the social, economic and cultural development of the community.

1.4 Significance of the study

The findings of this study will serve to inform the funding agencies and the application developers on the appropriateness of the farming mobile applications on the social, economic and cultural development of the community. This will help inform the donors on the best way forward regarding the future funding and the developers will be able to understand factors influencing the adoption and use of farming mobile applications and also the barriers that hinder their adoption, affecting the success of the farming mobile applications.

The findings will also inform the farmers on the appropriateness of these farming mobile applications which will help the farmers to make decisions on whether to increase or decrease the adoption of farming mobile applications

1.5 Scope and Limitations of the study

This study focused on the following farming mobile applications;

M-Farm - This farming mobile application focuses on market information, market links and distribution networks, links between farmers, suppliers and buyers and also enables the farmers to access agricultural extension services. (Jamila, 2011)

M-Farm was studied in Kinagop District.

Kilimo Salama - This farming mobile application focuses on the insurance of crops where the farmers insure their farm inputs, seeds and the expected harvest against drought and excess rainfall. This application also promotes collective buying and selling and access to information services, (Syngenta Foundation, 2010).

Kilimo Salama was studied in Nanyuki District.

This study focused on the factors such as; availability, accessibility, utilization, flexibility and affordability that promote the adoption and use of these farming mobile applications.

Availability: This factor addresses the issues touching on how easy it is for the farmers to acquire the mobile applications initially as well the ongoing usage after the farmers have adopted the mobile applications.

Accessibility: This factor addresses whether or not the mobile applications can be used on the different mobile networks such as Safaricom, Airtel, Orange and Yu as well as on different mediums such as SMS and data enabling different farmers from different geographic locations to acquire the services they need with ease.

Utilization: This factor addresses the perceived usefulness of the farming mobile applications. It refers to the variety and number of tasks that they enable the farmers to perform.

Flexibility: This factor addresses the adaptability of the mobile applications to their different intended uses. An example is M farm which can help a farmer get the real prices of the commodities in the market, connect with another farmer, access information from an agricultural officer and also be able to come together with other farmers to sell or buy collectively.

Affordability: This factor looks into whether or not farmers are able to meet the costs of the initial acquisition of the applications as well as their ongoing utilization.

This study also focused on evaluating the appropriateness of these farming mobile applications on the social, economic and cultural development of the community.

CHAPTER TWO: LITERATURE REVIEW AND THEORETICAL FRAMEWORK

2.0 Community Development

Community development is a combination of two words, community and development. The concept community can be defined as a group of people with shared identity; hence community development arises from the interaction between individuals and joint action rather than individual activity, what some sociologists refer to as collective agency (Flora and Flora, 1993). A community can also be defined as a people of the same origin, living in the same area, people with a common interest, people with similar occupation, and many others. In addition, as a result of development in technology all communities in the world can interact with each other and this has led to the formation of international communities such as the United Nations based on a common belief in equality, peace and universal development.

Development is a process of helping the community to attain new desirable social, economic, cultural, political and environmental status by participating in identifying and analyzing their needs and problems, prioritizing them, setting goals and objectives and making crucial decisions regarding their future (Hudson, 2009). Development increases choices meaning new options, diversification, thinking about apparent issues differently and anticipating change (Christenson et al., 1989).

The concept of community development refers to those measures which enable people to recognize their own ability to identify their problems and use the available resources to earn and increase their income in order to improve their living standards (Aspen Institute, 2000). The development should be sustainable development which meets the needs of the present without compromising the ability of future generations to meet their own needs. However, there have been abundant resources including people, land, minerals, water, natural resources, game reserves and livestock. Due to inadequate capacity in terms of knowledge, skills and poor application of science and technology, majority of the community members have not been able to utilize those resources effectively to bring about meaningful development. In order to achieve community development people must be in a position to develop their capacity, to identify their problems and plan ways of solving them. In addition, people must be helped in developing their capacity and hence the desire to participate in decision making related to greater social, cultural and economic development (Nyerer, 1973).

The concrete benefits of community development such as employment and infrastructure come through local people changing their attitudes, mobilizing existing skills and resources, improving networks, thinking differently about problems and using community assets in better ways. Community development builds the five capitals of community; physical, financial, human, social, and environment. It's through involvement and participation of community members in all activities being carried out that people rethink problems and expand contacts and networks building social capital. They learn new skills, building human capital, develop new economic options, building physical and financial capitals and also improve their environment (Cornelia and Flora, 2008).

2.1 Indicators of community development

Community development is a product of many elements including changes in thinking, cultural beliefs, traditions etc. Community development indicators can be defined as measurements that provide information about past and current trends which assist's community workers and community leaders in making decisions that affect future outcomes. They are measurements that reflect the interplay between social, cultural, environmental and economic factors affecting a community's wellbeing. These indicators have been in existence since 1910 when Russell Sage Foundation initiated the development of local survey for measuring industrial, educational, recreational, and other factors (Cobb and Rixford, 1998).

Today indicators are used to consider a full spectrum of community's wellbeing not just isolated factors, they now represent valuable mechanism to improve monitoring and evaluation of any project. Indicators are a necessary ingredient for sustainable development, which was first articulated by the World Commission of Environmental and Development also known as the Brundtland Commission in (1987).

Sustainable development is development that meets the needs of the present without compromising the ability of future generations to meet their own needs. Organizations frequently find it difficult to measure their success for two main reasons; lack of clear definition of success and measuring the wrong thing. Different indicators generate a picture of what is happening in a local system, whether it is improving, declining or stagnating or is some mix of all the three (Andrew, 1996). Indicators are the gauges of community development.

A combination of indicators can therefore provide a measuring system which can provide information about past trends, current realities, and future direction in order to help in the decision making (Oleari, 2000).

They are two basic types of indicators; System and performance indicators.

System indicators summarize individual measurements that describe multiple characteristics of a specific system. "They offer vital information providing a picture about the current state and corresponding viability of that system" (Bossel, 1999). System indicators are difficult to construct since many factors that contribute to community development are not easily quantifiable and are less verifiable (Bennett, 2002).

Performance indicators are similar to system indicators since both are descriptive, they describe a particular system. However, performance indicators are prescriptive; they include a reference value or policy target that allows comparison with local and national or international goals, targets and objectives. Thus performance indicators are particularly useful in the evaluation phase of decision making process (Hardi et al., 1997). Performance indicators are the preferred indicators that should be used to measure community development; education, health, nutrition, housing, environment, safe and clean water, citizen involvement, individual wealth, population.

A good indicator should be; relevant to the change being measured, specific, sensitive to diversity and uniqueness, timeliness, measurable and verifiable (Mulwa, 2008).

2.2 Review of interventions used before mobile applications.

2.2.1 Barter Trade

This trade involves the exchange of goods and services without the use of money. This is considered the oldest form of commerce. Goods may be bartered within a group as well as between different groups.

2.2.2 Direct Marketing

Direct marketing is a strategy that farmers use to sell their products directly to the end customers. They are different types of markets that farmers can use to directly reach their customers such as; farmer's market, roadside markets, subscription marketing, pick-your-own and community –supported agriculture. Direct marketing is essential to the profitability of small – farm business ventures. Most of the small scale farmers in Kenya prefer to sell directly to the consumers but this has been made difficult by the middle men who come to the farms buying the farm produce at meager prices and this leads to the exploitation of the farmers (Coleman, E. 1995).

2.2.3 Marketing through government bodies

The government of Kenya used to set prices, impose controls on the produce and this practice was evidenced by sometimes farmers reacting violently to what they see as a reduction in their incomes, loss of control of their organizations and political influence in the running of their affairs. The availability of reliable marketing intelligence to producers has been wanting. There is therefore need to disseminate market information to farmers (Peter, 2005).

2.3 Agricultural Advice

Most farmers in Kenya used to get agricultural advice from various channels;

2.3.1 Radio Programs

Many stations in Kenya do host shows that educate farmers on how to practice good and quality farming. These radio stations include; Milele FM, Coro FM, Radio Taifa, Sauti FM and many others. An important thing about radio is that farmers can get to listen to other farmers who have succeeded in the practice, (Cherubet, 2011). Farmers also get to know the likely weather changes through the radio broadcasts.

2.3.2 Agricultural officers

The ministry of agriculture does employ agricultural officers and deploy them to the different parts of the country where their role is to visit farmers and offer them advice on what they are supposed to do helping them solve some of the challenges they face. Also many industries that depend on raw materials from the farms also do have agricultural officers who visit the farmers. The main challenge is that the agricultural officers are not usually able to reach all the farmers in need on time.

2.3.3 Field Days

These are days that are set by different agricultural experts to bring farmers from a certain region together to educate them on different issues on how to improve their farming practices and as a result improve their yields. Farmers also visit agricultural shows to learn from other farmers by seeing what they have done in order to get good results. Farmers also get an opportunity to ask questions on the areas of interest.

2.4 Mobile applications

Mobile applications are software developed to take advantage of mobile technology enabling the collection and transmission of data for economic and social activities whether commercial, administrative, or entertainment purpose (McNamara, 2009). Moreover, mobile applications are not necessarily associated with specific access devices but focuses on providing information and facilitating activities. In the developed countries mobile applications are considered software that operates on smart phones such as I phone, black berry, and android devices rather than standard second generation (2G) devices.

Mobile operators particularly in the developing countries have been developing mobile applications that can be accessed by even the people living in the remote areas through their affordable simple mobile phones. Mobile applications also play an important role in expanding timely access to rural extension and advisory services to meet the immediate needs of farmers and other rural residents as they change their production and livelihood systems. Mobile applications provide advice to farmers on problems and opportunities in agricultural production, marketing, conservation, and family livelihoods; transfer new technologies and good practices or lessons; facilitate the development of local skills, organizations, and links with other programs and institutions; and address public interest issues such as resource conservation, food security monitoring, agricultural production monitoring, food safety, nutrition, family education, and youth development (World Bank, 2008)

A large number of mobile applications developed for agriculture and rural development focus on the improvement of supply chain integration and this has the greatest impact in the development since agriculture is said to be typically crucial to the economies of developing countries and employs many people (World Bank, 2011). Improvement in agriculture supply chains have impacts beyond the private sector, such as in the informal and public sector. Such improvements can be assumed to generate spin- offs that provide economic and social benefits factors such as employment creation, added value and reduced product losses (Van Roekel, Willems and Boselie, 2002). According to (World Bank, 2007) participation in efficient modern chain supply can increase the farmer income by 10-100 percent making economies globally competitive.

- 1. The mobile applications developed can help boost agriculture in the following ways. Mobile payment systems enable farmers to access to other financial services. This is an in expensive and secure way to transfer and save money using their mobile phones. By allowing smallholder farmers to save small amounts of money, receive payments quickly in times of need and pay for agricultural inputs through their mobile phones. Mobile payment systems have replaced the costly traditional transfer services and the need to travel long distances to collect and pay funds which is not safe.
- 2. Mobile micro-insurance systems safeguard farmers from incurring total losses as a result of bad weather, encouraging farmers to buy quality seeds, fertilizer and other farm inputs. This can help improve productivity and boost farmers' livelihoods as well as enable suppliers to expand their market among smallholder farmers.
- 3. Micro-lending platforms can help connect smallholder farmers with other agencies elsewhere willing to provide finance to help the farmers to buy much-needed agricultural inputs.
- 4. Through mobile information platforms, farmers can receive text messages with information which can help them to improve the productivity of their farms and boost their incomes. Governments and agricultural support organizations can use the platforms to distribute information about available subsidies, programs and also alerts.
- 5. Farmers can call a helpline and speak to agricultural experts who can provide answers to agricultural queries.

- 6. Smart logistics uses mobile technology to help distribution companies manage their fleets more efficiently, reducing costs for farmers and distributors, cutting fuel use and potentially preventing food losses.
- Mobile applications are used to improve product distribution and traceability using more sophisticated and less expensive tools. Sensors that track spoilage, density, light and monitor storage facilities improve product traceability and food safety in rural areas (RFID News, 2009).
- 8. Food buyers and exporters can use mobile phones to manage their networks with farmers and help field agents collect information also linking smallholder farmers directly with potential buyers through a mobile trading platform can help them to secure the best price for their produce.
- 9. Distributors of farming inputs such as seeds and fertilizer can use mobile technology to gather sales and stock data, improving availability for farmers and increasing sales.
- 10. Mobiles can help agricultural workers in rural areas exchange goods and services and improve communities' livelihoods. For rural people with little or no disposable income, exchanging goods, services and skills with community members is an important part of their livelihoods.

2.5 M-FARM

M-Farm is an agribusiness software that seeks to provide necessary information to farmers, clients, suppliers, manufacturers and many others by use of mobile phones helping farmers and agroprenuers improve their productivity, increasing their income. It helps farmers to connect with other farmers in virtual space any time and work together. M-Farm is a transparency tool for registered farmers where they simply SMS the number 3535 to get the information they are looking for which is related to farming, buying and selling. M-Farm enables farmers to enquire current market prices of different crops from different regions depending on cost analysis. This application aggregates farmers needs and connects them with farm input suppliers also agricultural extension officers and also enables farmers to sell and buy goods collectively at a fair price maximizing the profits. M-Farm saves the farmers from the exploitation they face from the middlemen who have always bought farm produce from the farmers at a through away price

making most of the farmers to incur heavy losses forcing them to remain poor despite the much effort they put in their farms.

This mobile application has also created links between the farmers and the manufacturers of the commonly used farm inputs enabling the farmers to buy directly from the manufacturers at a fair price and also in bulk and as a result avoid the exploitation by middlemen who also sell the inputs to farmers at a very high price. M-Farm enables farmers to connect with their clients through their mobile phones and even negotiate the prices of the different products without having to travel long distances looking for clients. This can be very expensive and time consuming. Farmers are also able to get alerts about the climate changes and this helps them plan to avoid risks associated with climate change, (Jamila, 2010).

2.6 KILIMO SALAMA

Kilimo Salama ('Safe Agriculture') is an insurance designed for Kenyan farmers so that they may insure their farm inputs, seeds and also their expected harvest against drought and excess rain. This can also be termed as a pay as you plant insurance program. Kilimo Salama is a product launched under the Agricultural Index Insurance Initiative, a partnership between UAP Insurance and the Syngenta Foundation for Sustainable Agriculture (SFSA). The product is furthermore implemented in partnership with the agribusinesses MEA limited, Syngenta East Africa limited, the telecommunications company Safaricom, the Kenya Meteorological Department and the NGO CNFA/AGMARK. (Syngenta Foundation, 2010).

The scheme is supported by the International Finance Corporation (IFC), Global Index Insurance Facility which is supported by the European Commission, and Syngenta Foundation for Sustainable Agriculture.

This program is available to farmers in the productive breadbasket regions in Kenya such as Kitale, Eldoret, Northern Rift, Nyanza, Busia as well as Embu and Nanyuki. Farmers can today insure a wide array of crops such as maize, beans wheat, and sorghum. Kilimo Salama uses the automated weather stations to determine whether there has been sufficient rain for the crops insured. When a shortage or excess rainfall is detected all farmers within the area covered by that automated weather stations receive payment within a very short time through their phones by use

of M-PESA a mobile money transfer provided by Safaricom. Since the introduction of Kilimo Salama, many farmers can now comfortably invest in quality seeds and inputs without the fear of the adverse weather changes causing total damage of their crops. (Syngenta Foundation, 2010).

2.7 THEORETICAL FRAMEWORK

The study is based on two theories, namely reflective practice model theory and Viji, srinivasan theory from ideology to technology in attempt to explain how farmers learn through experience and that technology reflects the community's ideological commitments.

2.7.1 From ideology- technology theory

An ideology is a set of ideas proposed by the dominant class of a society to all members of the society. In this study ideologies are the ways the farmers used to do things and what they termed as important. Technology can be defined as the practical application of modern knowledge and skills in the field such as agriculture. According to this theory external team makes a critical inter-displinary study of the collective discussion in the presence of the community. The team gives the feedback after examining the various levels which the community perceives reality and works out reality. The feedback is given as an opinion not a judgment and this should lead to further discussion. After the feedback is given the community drafts a proposal on the methodology or subsequent action which leads to suitable technology. The main focus of this theory is that public policy address social problems which can only happen by involving the community members in the decision making and as a result the development plan can be said to emerge from community ideology. After the decision is made and the development process starts, there could be need to modify the methodology which will be formulated as technology. This way the technology is meant to reflect the community's ideology and cannot happen without community's participation.

2.7.2 **Reflective Practice Theory**

According to reflective practice theory community development workers should thoughtfully consider their own experiences as they make the connections between knowledge and practice under the guidance of an experienced professional within the discipline (Schon, 1996). Reflection is said to be a human activity in which people recapture their experience, think about it, mull over it, evaluate it and then work with the experience (Boud, 1985: p43). A reflective

practice model which is made up of five elements is used to represent the reflection in community development practice.

The elements of the proposed model are:

Implicit practice based theory. In the course of working, community development workers tend to develop personalized and practice based theories based on field experiences. They formulate strategies and theories about community development work to inform their practice. These theories are labeled implicit because they are not articulated but influence their actions.

Belief's about community. Community development workers should assess the capability of a community to chart its own course and how they can assist them. Community development workers should appropriately blend the local knowledge by; involving external experts, accepting direction from local leaders and also adding their own knowledge in community development activities.

Literature based theory. Community development workers tend to read widely in other areas such as; business, agriculture, environment, law, policy studies and adult education. Community development workers are guided by a synthesis of multiple theories rather than a single theory derived from community developed literature.

Talking/Working together/Observing. Community development workers learn by working with each other and community residents working on the project, visiting other communities and soliciting ideas and suggestions from their colleagues.

Field experience and practice. This is the central component in reflective practice. It is through experience and ongoing practice in which community development workers attempts to assist communities. The community development worker reflects on his/her work and formulates his/her implicit practice theories.

Each of these elements of the model is described separately but do not exist in isolation. Community development worker's synthesis all the elements in the reflective practice model and use it as a guide to address community needs. Constant reflection is what links different elements in the model.

2.8 CONCEPTUAL FRAMEWORK

Farming mobile applications have been developed to assist farmers to access markets for their farm produce and to improve their access to insurance for their farm inputs, fertilizers, crops and harvests. These applications help to bridge the gap between farmers, consumers of the farm produce and manufacturers of various farm produce. Farmers have been exploited by middlemen (brokers) who have been going between the farmers and the markets and manufacturers buying farm produce at meager prices reaping all the profits leaving the farmer poor and also selling farm inputs, seeds, and fertilizer to farmers at very high prices.

This research will focus on the role of the farming mobile applications in the social, economic and cultural development of the community as well as the factors that promote the adoption of M-Farm and Kilimo Salama. The figure below represents the conceptual framework of the study which illustrates the variables under study and their relationships i.e. independent and dependent variables.



Figure 1: Conceptual Framework

Figure 1 represents a cause effect relationship between the dependent and independent variables under study. The intervening variables promote the adoption of mobile applications thus enabling the farmers to access the services offered by M Farm and Kilimo Salama applications. The farmers using the M Farm and Kilimo Salama applications are able to access services such as;

- Agricultural advice from agricultural extension officers
- Insurance for their farm inputs, seeds and even the expected harvest against bad weather
- Market information without having to go through the brokers who buy farm products from the farmers at meager prices
- Buying farm inputs, seeds, fertilizers collectively from the wholesalers and manufacturers.
- Selling their farm products collectively reaching the final consumers without having to sell to the middlemen who used to exploit them by offering very low pay for the products.

The availability, accessibility, affordability and utilization of the M Farm and Kilimo Salama applications have enabled the farmers who adopted the usage of these applications to make more profit from their harvests and also reduce the fear of risks caused by weather changes since the farmers can insure their crops and this makes them increase their farming activities which helps the farmers to develop economically. The ability of the farmers to buy and sell collectively helps to promote social development. The introduction of mobile technology and especially the farming mobile applications has enabled the farmers to acquire different services that have promoted the adoption of new ways of carrying out the farming activities and marketing which leads to cultural development.

On the other hand farmers who have not adopted the use of farming mobile applications have been practicing farming using the old methods and also selling their products to the middlemen who buy the products at meager prices causing the farmers to earn very little from their farms which does not improve their lives economically. Farmers also buy and sell individually and this does not promote social development. The use of the old methods of agriculture and marketing does not promote cultural development.

CHAPTER THREE: RESEARCH METHODOLOGY

3.0 Introduction

This chapter describes the research design that was used, population of the study, sampling procedure, sample size calculation method, instrumentation, data collection method and data analysis for the study.

3.1 Research Design

The study used both the descriptive and inferential research design. Descriptive research design was used to obtain information that describes the; role of M farm and Kilimo Salama in agriculture, factors that promote the adoption of these farming mobile applications and also the barriers to increased adoption and use of these farming mobile applications by other farmers and this information was obtained from target individuals through questionnaires (Gay, 1981). Inferential research design was used to help the researcher find out whether the farming mobile applications under the study had any impact on the social, economic and cultural development of the farming community already using these farming mobile applications.

3.2 Population of Study

The population of study was all the farmers using the M Farm and Kilimo Salama mobile based applications in Kinagop and Nanyuki Districts. These two applications were not being used together and as a result M-Farm was specifically studied in Kinagop District while Kilimo Salama was studied in Nanyuki District. There about 3,000 farmers using Kilimo Salama and M Farm application in Kinangop and Nanyuki Districts. These applications are also being used in other parts of Kenya such as Embu, Migori, Homa Bay, Busia and Eldoret. The reason why the researcher chose to study the farmers in Nanyuki and Kinangop is because these Districts were easier to access as compared to other Districts which are very far away. This was also done in consideration of the time and resources available. The population size of the farmers using these applications in the Nanyuki and Kinagop was obtained from Kilimo Salama and M Farm offices.

3.3 Sampling Procedure and Sample size

The purposive sampling method allowed the researcher to use cases that had the required information with respect to the objectives of the study; it also helped the researcher to identify the locations or districts in which the units of observation possessed the required characteristics. Simple random sampling method was used in areas where a group of farmers were found together e.g. when they were in a meeting, since all of them possessed the characteristics being studied.

Snowball sampling method was used where the identified farmers already using the farming mobile applications named others that they knew who were using the same application. This was of great help in the areas where the farmers using the application were not well known (Mugenda & Mugenda, 1999).

3.3.1 Sample Size Calculation

The sample size was calculated using Cochran's (1977) sample size calculation formula for categorical data.

Notation:

N = Population of the study obtained from the Kilimo Salama and M Farm offices.

$$n_o = initial \text{ sample size}$$

n = final sample size

t = t value for the selected alpha level of 0.025 = 1.96

(p)(q) = estimate of variance

d = margin of error

Formulae:

t = 1.65 where $\alpha = 0.10$

t = 1.96 where $\alpha = 0.05$

t = 2.58 where $\alpha = 0.01$

$$n_{o} = \frac{t^{2} \times p(q)}{d^{2}}$$
$$n = \frac{n_{o}}{1 + n_{o}/N}$$

Cochran's correction formula to determine the final sample size where $n_o > 5\%$ of N

Computation:

α = 0.05 t = 1.96 d = 0.05 N = 3,000 n₀ = $\frac{1.96^2 × 0.5 (0.5)}{0.05^2}$ = 384.16 ≈ 384 respondents

Since $n_o (384) > 5\%$ of N (150) use Cochran's correction formula to determine the final sample size

$$n = \frac{384}{1 + \frac{384}{3000}} = 340.42 \approx 340 \text{ respondents}$$

3.4 Sources of data

The study used primary data which was collected through direct interaction with the farmers using the Kilimo Salama and M Farm applications in Nanyuki and Kinagop Districts respectively. The data obtained directly from the farmers under the study helped the researcher to get firsthand information on the roles of the Kilimo Salama and M Farm applications in the development of the farming community.

3.5 Methods of data collection

Interviews were used to collect data from the farmers using the Kilimo Salama and M Farm applications in Nanyuki and Kinangop Districts.

3.6 Tools for data collection

Structured interview schedules were used to obtain data required to meet specific objectives of the study. The interviews were face-to-face and due to illiteracy levels of most farmers, the interviewer asked questions and recorded the respondent's response. The interviewer interpreted questions to respondents where necessary.

3.7 Data Analysis

The interview schedules were coded and the responses analyzed using appropriate statistical procedures. In this study both descriptive and inferential statistics were used to analyze the data.

- **Descriptive statistics** are indices that were used to describe the characteristics of farmers using the farming mobile applications under the study. Frequencies and percentages were used to study the nature of the data collected.
- **Inferential statistics** were used to draw inferences about the characteristics of the population under study. Correlation analysis was used to determine the relationship between the use of the various features of farming mobile applications and their perceived impacts on the various aspects of community development.

The software used for data entry and analysis was SPSS version 20

CHAPTER FOUR: DATA ANALYSIS, PRESENTATION AND INTERPRETATION

4.0 Introduction

This chapter presents the analysis and interpretation of the data obtained from the respondents in the study whose main objective was to evaluate the appropriateness of farming mobile applications in the community development.

4.1 Demographic Analysis

This section focused on the respondents' gender, age and level of education as per the filled interview schedules.

4.1.1 Gender

The study sought to establish gender of the respondents who are using M Farm and Kilimo Salama mobile applications in Kinagop and Nanyuki Districts respectively. The findings are presented in Table 1.

Gender	Frequency	Percent
Female	199	58.5
Male	141	41.5
Total	340	100.0

Table 1: Gender of the respondents

The researcher established that out of 340 respondents interviewed, 58.5 percent were female while 41.5 percent were male. Recent years have shown a new trend most prominent in Africa where male family members leave the rural households to try find waged labor in urban areas, leaving women in the rural areas to undertake the tasks previously done by men (Saito et al., 1994). This has further increased the responsibilities of women to provide for their families. The use of farming mobile applications has promoted the active participation of women in agriculture which is a great contribution to the development of Kenya's economy. Agriculture is the backbone of the Kenyan economy. It contributes approximately 25% of GDP, employing 75% of the national labor force. Over 80% of the Kenyan population live in the rural areas and make their living directly or indirectly from agriculture. (Alila & Otieno, 2006).

4.1.2 Age

The study sought to establish the age of the respondents who are using M Farm and Kilimo Salama mobile applications in Kinagop District and Nanyuki District respectively.

Age	Frequency	Percent
18 - 25 Years	23	6.8
26 - 35 Years	102	30.0
36 - 45 Years	157	46.2
46 - 55 Years	38	11.2
56 Years and above	20	5.9
Total	340	100.0

Table 2: Age of the respondents

The findings in Table 2 indicated that 46.2 percent of the respondents interviewed were between ages 36 - 45 years while 30.0 percent of the respondents were between 26 - 35 years old. A further 11.2 percent of the farmers interviewed were between ages 46 - 55 years, 6.8 percent were between ages 18 - 25 years and 5.9 percent were age 56 and above.

The findings indicated that all the farmers using mobile applications were above 18 years old. For a farmer to register the use of the farming mobile application he/she must have a cell phone line. In June 2010 the Kenyan Government issued a directive to mobile operators through the Communications Commission of Kenya (CCK) to ensure that all their subscribers Identity information are registered. To register a cell phone line, subscribers are required to give their full names, identity document number, physical/postal address, gender, date of birth and alternative contacts. Subscribers are also required to present their original identity cards or other official personal identification documentation including passports and Military IDs (Safaricom, 2012).

Majority of the respondents were between ages 36 - 45 years old. This was followed by those between ages 26 - 35 years old. This group is made of energetic youths who are much involved in farming activities that lead to development. They are many groups in support of the youth groups in the community. Those between 46 - 55 years old were not many because most of them have already raised their children who can take care of themselves and many have also invested

in other areas. Those between ages 18 - 25 years were few because most of the young adults in this age group are still in school or still pursuing white collar jobs without recognizing the potential in agriculture. The respondents aged 56 years and above were the minority (5.9%). This could because most of them were resistant to change and didn't want to adopt and use the farming mobile applications. Also the life expectancy for Kenyans was reported by the United Nations Population Fund Report to be 58 years (Siringi, 2011).

4.1.3 Level of Education

The study sought to establish levels of education of the farmers using farming mobile applications. The findings are shown in the Table 3.

Level of education	Frequency	Percentage
Primary	168	49.4
Secondary	140	41.2
College	22	6.5
University	10	2.9
Total	340	100.0

 Table 3: Education levels of the respondents

The researcher established that 49.4 percent of the respondents interviewed had acquired primary education and a further 41.2 percent had attained Secondary education level. The study also indicated that only few respondents had attained college and university education with 6.5 percent and 2.9 percent respectively. The reason for a small number of respondents having attained college or university education could be attributed to a number of factors.

- i. Most of the people who have attained college and university education move from the rural areas to urban areas in search for white collar jobs.
- ii. The number of college and university graduates from the rural areas is also low because of the limited access to quality education and resources. You therefore find that most of the people in the rural areas attain primary and secondary education only.
- iii. Lack of support and motivation to pursue higher levels of education is also another contributor to few college and university graduates in the rural areas.

iv. Most of the people in the rural areas belief that you do not need to be highly educated to became a good and productive farmer. They think that basic education is good enough.

Education is said to be the key to success. Most of the Kenyans living in the rural areas have attained primary education which is said to be the basic education and the very important. In January 2003 President Mwai Kibaki re-introduced free primary education which previously existed before the mid-80s when the government adopted cost sharing measures that led to a minor level of school fees charged by primary schools for text books, PTA, and extracurricular activities. Since 2003, education in public schools became free and compulsory (Kenya Constitution Article 53, 2010). This has enabled more Kenyans especially children to be able to attend school up to secondary level over the past ten years than before the year 2002 (Glennerster et al, 2011).

4.2 Types of mobile phones

All farmers using the farming mobile applications had their own phones. Different types of phones with varying features were used by the farmers. This study was used to establish the types of phones used by the respondents and this helped the researcher to understand the factors that promoted the adoption and use of the farming mobile application.

Type of Phone	Frequency (n)	Percentage (%)
Simple Phone	297	87.4
Feature Phone	16	4.7
Smart Phone	27	7.9
Total	340	100.0

Table 4: The types of mobile phones used by the respondents

This study established that 87.4 percent of the total respondents use simple phones while 7.9 percent and 4.7 percent use smart and feature phones respectively. The choice of simple phones by a majority of the farmers could be influenced by their relatively lower cost.

The use of these simple phones therefore implies that applications requiring relatively advanced features might be out of reach of these farmers. However, M Farm and Kilimo Salama are

accessible on simple phones given that they have SMS as one of their access methods making the application available to all the farmers interviewed in this study (Jamila, 2010; Syngenta Foundation, 2010).

		Rating							
Item	High		Average		L	ow	Total		
	n	%	n	%	n	%	n	%	
Cost of the application	142	41.8	168	49.4	30	8.8	340	100.0	
Cost of calling	143	42.1	105	30.9	92	27.1	340	100.0	
Cost of SMS	-	-	26	7.6	314	92.4	340	100.0	

Table 5: The affordability of the farming mobile applications

From the findings presented in Table 5, 49.4 percent of the respondents indicate that the cost of the application was average while 41.8 percent and 8.8 percent respectively indicate that the cost was high and low. A total of 42.1 percent of the respondents indicate that the cost of calling was high while 30.9 percent indicate that the cost of calling was average and a further 27.1 percent indicate that the cost of calling was low. The cost of the SMS was low according to 92.4 percent of the respondents, a further 7.6 percent indicate that the cost of SMS was average.

These findings imply that applications that utilize SMS are more likely to be adopted by the respondents due to the perceived affordability. The influence of costs has been observed by Christine et al., 2011). In their study, they reveal that the global explosion in the number of mobile applications has been facilitated by among other factors the falling prices of mobile handsets and communication costs. Kilimo Salama and Mfarm are relatively affordable given that they charge only KES 5 for SMS (Jamila, 2010; Syngenta Foundation, 2010).

4.3 The factors that influence the adoption and use of the farming mobile applications

The first objective of this study was to establish the factors that influence the adoption and use of farming mobile applications. All the 340 respondents indicated that the service was available on both smart and simple phones, the service had customer care and that they were all trained on how to use the service and the use of the application was easy. A total of 339 respondents

indicated that they were able to obtain the service from all regions. A further 338 respondents indicated that they had obtained the application at a cost. 328 respondents indicated that the service was available on all mobile networks. 327 respondents indicated that when they request for service they get response on time.

The results therefore indicate that overall the respondents felt that the service quality of farming mobile applications in this study was acceptable. These observations serve to reinforce previous findings on the key advantages of mobile phones and related services such as affordability, wide ownership, voice communications, instant and convenient service delivery; As a result there has been a global explosion in the number of mobile applications facilitated by the rapid evolution of mobile networks, increasing functions and falling prices of mobile handsets (Christine et al., 2011).

4.4 Barriers to the increased adoption and use of farming mobile applications to promote agriculture

	Rating									
Item	Excellent		Average		Poor		N/A		Total	
	n	%	n	%	n	%	n	%	n	%
Availability on all mobile	70	20.6	268	78.8	2	0.6	-	-	340	100.0
networks										
Cost	119	35.0	216	63.5	5	1.5	-	-	340	100.0
Accessibility	197	57.9	139	40.9	4	1.2	-	-	340	100.0
Availability on all types of	118	55.3	152	44.7	-	-	-	-	340	100.0
phones										
Customer care	107	31.5	101	29.7	132	38.8	-	-	340	100.0
Training	188	55.3	151	44.4	1	0.3	-	-	340	100.0
Usability	204	60.0	136	40.0	-	-	-	-	340	100.0
Response time	113	33.2	215	63.2	3	0.9	9	2.6	340	100.0

 Table 6: Rating of barriers to the increased adoption and use of farming mobile applications

From the findings presented in Table 6, 78.8 percent of the respondents indicate that the availability of the service on all networks was average, while 20.6 percent and 0.6 percent respectively indicate that the availability of the service on all networks was excellent and low. A total of 63.5 percent of the respondents indicate that the cost of the service was average while 35.0 percent and 1.5 percent respectively indicate that the cost of the service was excellent and poor. The study indicate that 57.9 percent of the respondents reported that the access of the service from different regions was excellent, with a further 40.9 percent and 1.2 percent of the respondents reported that the access was average and poor respectively. The availability of the service on all types of phones was excellent according to 55.3 percent of the respondents and a further 44.7 percent of the respondents indicate it was average. Customer care service was reported to poor by 38.8 percent of the respondents with 31.5 percent and 29.7 percent respectively indicate that the quality of the customer care services was excellent and average. The training on how to use the service was excellent according to 55.3 percent of the total respondents while 44.4 percent and 0.3 percent respectively indicate it was average and poor. The ease of use of the service was reported to be excellent by 60.0 percent of the respondents and a further 40.0 percent indicate it was average. The response time was reported average by 63.2 percent of respondents with a further 33.2 percent and 0.9 percent respectively indicate that the response time was excellent and poor.

These findings indicate that the main barriers to increased adoption of Kilimo Salama and Mfarm were mainly customer care, cost, training and response time. The need for training has been previously noted by Christine et al., 2011) who indicated that user onsite training is often required for rural populations in developing countries given the low literacy levels encountered in these areas. The critical role of customer care services in the adoption of mobile services such as Kilimo Salama and Mfarm has also been noted by Nokia (2010).

4.5 The appropriateness of farming mobile applications on the social, cultural and economic development of the community

4.5.1 Economic impact of farming mobile applications

The second objective of this study was to establish the economic impact of the farming mobile applications under study. The economic impact was defined by increased yields, increased incomes, reduced expenditure, savings and improved living standards. All the 340 respondents

indicated that their farm yields increased after using the application which had in turn increased their incomes enabling them to save some money since their expenditures had reduced and 339 of them reported that their living standards had improved.

These overall findings indicate that the use of farming mobile applications had an economic impact. The use of kilimo Salama and Mfarm have greatly reduced communication costs thereby allowing respondents to send and obtain information quickly and cheaply. Through this they have been able to reduce expenditure, increase savings and as a result their living standards have improved. These findings concur with those of Jensen, (2007) and Aker, (2007) who established that the reduction in communication cost associated with mobile applications has tangible economic benefits improving agricultural and labor market efficiencies and producer- consumer welfare in specific circumstances and countries.

	Rating									
Item	High		Average		Low		N/A		Total	
	Ν	%	Ν	%	n	%	n	%	n	%
How do you rate the yields	197	57.9	141	41.5	2	0.6	-	-	340	100.0
you get from your farm after										
using the application										
How do you rate the income	214	62.9	125	36.8	1	0.3	-	-	340	100.0
after using the application										
How do you rate the reduction	77	22.6	119	35.0	144	42.4	-	-	340	100.0
of expenditure after using the										
application										
How do you rate the savings	258	75.9	80	23.5	2	0.6	-	-	340	100.0
after using the application										
How do you rate the	139	40.9	198	58.2	3	0.9	-	-	340	100.0
improvement of living										
standards after using the										
application										

Table 7: Rating economic impact of farming mobile applications

From the findings presented in Table 7, 57.9 percent of the respondents indicate that their farm yields were high, a further 41.5 percent and 0.6 percent respectively indicate that the yields were average and low. A majority of 62.9 percent of the respondents indicate that their income was high and a further 36.8 percent indicate that their income was average and 0.3 percent which indicate that their income was low. A majority of 42.4 percent of the respondents indicate that the reduction of expenditure was low, while 35.0 percent indicate the reduction was average and further 22.6 percent of the respondents indicate that the reduction of expenditure was high. The findings indicate that 75.9 percent of the respondents had high levels of savings and a further 23.5 percent and 0.6 percent respectively indicate average and low saving levels. Living standards was reported average by 58.2 percent of respondent, while 40.9 percent and 0.9 percent respectively indicate it was high and low.

These findings show that the farming mobile applications have not had a significant impact in reducing expenditure but have helped to increase their yields. A reduction in expenditure as well as an increase in income would serve to increase their savings. This would in turn lead to improved living standards which are directly related to community development. The use of farming mobile applications has been found to lead to increased incomes and access to finance and provided benefits to other players through supply chain efficiency (Christine et al., 2011).

4.5.2 Social impact of farming mobile applications

The third objective of this study was to establish the social impact of farming mobile applications. The social impact was defined by improved social status, formation of SACCO's, exposure to new agricultural organizations, consultants and input providers, reduced incidences of joblessness and acquisition of social amenities. A total of 338 respondents indicated that the use of the application had exposed the farmers to previously unknown agricultural organizations, consultants and input providers. 337 respondents reported that their social status had improved after using the application. A further 326 respondents indicated that the use of the application had enabled them to acquire social amenities such as health and education. 318 respondents indicated that by using the application they learnt better farming practices that helped reduce the joblessness among the youth. 287 respondents indicated that the use of the application had contributed significantly to the formation of farmers groups and SACCO's.

The overall results therefore indicate that the use of farming mobile applications had a positive social impact. The use of Kilimo Salama and Mfarm has promoted the collective action of the farmers who join hands to work together among themselves and with the other external agencies in the agricultural sector. Community development is brought about by collective action. These findings concur with those of Flora and Flora, (1993) who argued that community development arises from the interaction between individuals and joint action rather than individual activity, what some sociologists refer to as collective agency.

		Rating								
Item	High		Average Lov		ow N/A		I/A	Total		
	n	%	n	%	n	%	n	%	n	%
How do you rate your social	114	33.5	221	65.0	2	0.6	3	0.9	340	100.0
status after using the mobile application										
How do you rate the formation	147	43.2	130	38.2	10	2.9	53	15.6	340	100.0
of farmer groups and										
SACCO's after using the										
mobile application										
How do you rate the exposure	171	50.3	160	47.1	7	2.1	2	0.6	340	100.0
to previously unknown										
agricultural organizations,										
consultants and input providers										
after using the mobile										
application										
How do you rate the reduction	147	43.2	154	45.3	17	5.0	22	6.5	340	100.0
of joblessness among the youth										
after using the mobile										
application										
How do you rate the	99	29.1	217	63.8	10	2.9	14	4.1	340	100.0
acquisition of quality social										
amenities such as water, health										
and education after using the										
mobile application										

Table 8: Rating of the social impact of farming mobile applications

From the findings presented in Table 8, 65.0 percent of the respondents had average social status while 33.5 percent and 0.6 percent respectively indicate high and low social status. The rate of formation of SACCOs was high according to 43.2 percent of the respondents while 38.2 percent and 2.9 percent respectively indicate that the formation rate of SACCOs was average and low. The level of exposure to previously unknown agricultural organizations, consultants and inputs was high according to 50.3 percent of the respondents, average and low according to 47.1 percent and 2.1 percent of the respondents respectively. A further 0.6 percent indicated it was not applicable to them.

The rate of reduction in joblessness levels among the youth was reported average by 45.3 percent of the respondents, high, not applicable and low by 43.2 percent, 6.5 percent and 5.0 percent respectively. The ability to access quality social amenities was average according to 63.8 percent of respondents, 29.1 percent indicate a high increase and a further 4.1 percent and 2.9 percent of the respondents indicate it was not applicable and low respectively.

From these findings the use of Kilimo Salama and Mfarm have promoted social development with most of the respondents rating the social impact as average and high, these findings concur with those of Aker and Mbiti, (2010) who established that mobile telephony has brought new possibilities across urban-rural and rich-poor divides as well as connected individuals to individuals, information, market and services.

4.5.3 Cultural impact of farming mobile applications

The forth objective of this study was to establish the cultural impact of farming mobile applications used by the respondents. The cultural impact is defined by adoption of new technologies, new ways of marketing, new ways of obtaining information, change of farming beliefs and involvement of women in farming activities. A total of 337 respondents indicated that the use of the farming mobile application had contributed significantly to the adoption of new technologies in farming, helped them to learn new ways of obtaining information about farming practices and that their belief about farming had changed. 336 farmers indicated that the use of the application had enabled them to learn new ways of marketing their farm produce and a further 335 respondents indicated that the use of the farming mobile application had promoted the involvement of women in the farming activities.

These results therefore indicate that the use of farming mobile applications had a positive cultural impact. The use of Kilimo Salama and Mfarm enabled the respondents to adopt the use of technology, use of new marketing strategies, change of beliefs and attitude and also involvement of women in farming practices. The adoption of these farming mobile applications has contributed to the cultural development of the farming community. Mobile phones have significantly reduced communication and information costs for the rural people. This technology has provided new opportunities for rural farmers to obtain knowledge and information about agricultural issues, problems and its usage for the development of agriculture. These findings concur with (Aker, 2011) who indicated that mobile phone services in the agriculture sector has provided information on markets, weather, transport and agricultural techniques and contacts with concern agencies and departments.

	Rating									
Item	High		Average		Low		N/A		Total	
	n	%	Ν	%	n	%	n	%	n	%
How do you rate the	169	49.7	166	48.8	2	0.6	3	0.9	340	100.0
adoption of new										
technologies										
How do you rate the	173	50.9	163	47.9	-	-	4	1.2	340	100.0
increase in the ways of										
marketing										
How do you rate the	313	92.1	24	7.1	-	-	3	0.9	340	100.0
increase in the ways of										
obtaining information										
How do you rate the change	183	53.8	153	45.0	1	0.3	3	0.9	340	100.0
of farming beliefs										
How do you rate the	154	45.3	177	52.1	4	1.2	5	1.5	340	100.0
involvement of women in										
farming										

 Table 9: Rating of the cultural impact of farming mobile applications

From the findings presented in Table 9 the adoption of new technologies was rated high by 49.1 percent of the respondents, average by 48.8 percent while 0.9 percent and 0.6 percent respectively indicate that the adoption rate was not applicable and low. A majority 92.1 percent of the respondents indicate that they obtained information by use of the farming mobile application, while 7.1 percent and 0.9 percent of the respondents respectively indicate it was average and not applicable. Change of farming beliefs as a result of using the mobile application was reported high by 53.8 percent of the respondents, average by 45.05 percent while 0.3 percent and 0.95 percent respectively indicate the change was low and not applicable. The involvement of women was average according to 52.1 percent of the respondents and 45.3 percent indicate the involvement was high. A further 1.5 percent and 1.2 percent respectively indicate that the involvement level was not applicable and low.

The results show that use of Kilimo Salama and Mfarm have had a positive cultural impact with a majority of the respondents rating the impact high and other indicating the impact was average. The farming mobile applications have enabled information access at reduced travel and opportunity costs. Mobile phones allow people to obtain information immediately and on regular basis rather than waiting for weekly radio broadcast and newspapers. They also allow farmers irrespective of gender to play an active role in the agricultural sector rather than playing a passive role. Mobile applications play an important role in expanding timely access to rural extension and advisory services to meet the immediate needs of farmers and other rural residents as they change their production and livelihood systems. Mobile applications provides advice to farmers on problems and opportunities in agricultural production, marketing, conservation, family livelihoods, transfer of new technologies and good practices, facilitated development of local skills, organization and links with other programs and institutions (Richard, 2012).

4.6 The Relationship between gender and cultural impact of farming mobile application

Women have in the past and even today been associated with community development. According to the World Bank (2008) women were said to be key contributors to agriculture- led growth. This study sought to establish if there was a significant difference between the perceptions of the cultural impact by men and women.

A chi square test for two independent variables was undertaken with $\alpha = 0.05$.

H₀: There is no relationship between gender and the perception of the cultural impact of farming mobile application.

H_a: There is a relationship between gender and the perception of the cultural impact of the farming mobile application.

The cross tabulation results are presented in Table 10.

Table	10: Cross	s tabulation	between (Gender an	d Perception	of the cul	tural impa	ict of
farmir	ng mobile	application	IS					

		Cultura	Total	
		High	Average	
Gender	Male	71	70	141
	Female	105	94	199
	Total	176	164	340

The chi-square test for independence of two variables was calculated using the formula

$$\chi^2 = \Sigma \left[\frac{(fo - fe)2)}{fe} \right]$$

Where;

fo is the observed frequency in a particular category

fe is the expected frequency in a particular category

Expected Frequency = $\frac{(Row total)(Column total)}{Grand total}$

Table 11: Chi Square computation – Gender vs Cultural Impact

Gender and cultural	fo	fe	(fo-fe)	(fo-fe)2	(fo-fe)2
impact					fe
1 (Male - High)	71	73	-2	4	0.055
2 (Male – Average)	70	68	2	4	0.059
3 (Female – High)	105	103	2	4	0.039
4 (Female – Average)	94	96	-2	4	0.042
					$\chi^2 = 0.195$

Therefore, the computed Chi square value is $\chi^2 = 0.195$

The degrees of freedom were obtained by;

Degrees of freedom = (number of rows -1) (number of columns -1)

$$= (r-1) (c-1)$$
$$= (1) (1)$$
$$= 1$$

Using 1 degree of freedom and (0.05) level of significance the chi square table value obtained was **3.841**. The calculated chi square value of 0.195 is less than the chi square table value at 1 degree of freedom and (0.05) level of significance. This indicates that there is no significant relationship between gender and perception of the cultural impact of farming mobile application. The perception of cultural impact of farming mobile applications is not influenced by gender

because the farming mobile applications developed are gender neutral. The perception is based on perceived usefulness and the perceived ease of use (Davis, 1989). This study found out that the factors that promote the adoption and use of farming mobile applications include; availability, accessibility, utilization, affordability and flexibility of the farming mobile applications to all the farmers irrespective of gender. These findings agree with the statement that the perceptions of adoption of technology in agriculture and their impacts on development are not influenced by gender (Cheryl, 1999).

4.7 The Relationship between age and cultural impact of farming mobile application

Mobile applications are becoming an everyday reality, as mobile phones are one of the few devices reaching nearly all the people in the planet. Mobile applications have been developed for the agricultural sector and many farmers have adopted the use. This study sought to establish if there is a significant relationship between the age of the farmers and the cultural impact of farming mobile applications.

A chi square test for two independent variables was undertaken with $\alpha = 0.05$.

H₀: There is no relationship between age and the cultural impact of farming mobile applications.

H_a: There is a relationship between age and the perception of the cultural impact of the farming mobile applications.

The cross tabulation results are presented in Table 12.

 Table 12: Cross tabulation between age and the cultural impact of farming mobile applications

Age Categories	Cultura	Total	
	High	Average	
18-25 years	13	10	23
26-35 years	46	56	102
36-45 years	90	67	157
46-55 years	20	18	38
56 and above	7	13	20
Total	176	164	340

The chi-square test for independence of two variables was calculated using the formula

 $\chi^2 = \Sigma \left[\frac{(fo - fe)^2}{fe} \right]$

Where;

fo is the observed frequency in a particular category

fe is the expected frequency in a particular category

Expected Frequency = $\frac{(Row total)(Column total)}{Grand total}$

Age and cultural impact	fo	fe	(fo-fe)	(fo-fe)2	(fo-fe)2
					fe
18-25 years (High)	13	11.9	1.1	1.21	0.102
18-25 years (Average)	10	11.1	-1.1	1.21	0.109
26-35 years (High)	46	52.8	-6.8	46.24	0.876
26-35 years (Average)	56	49.2	6.8	46.24	0.940
36-45 years (High)	90	81.3	8.7	75.69	0.931
36-45 years (Average)	67	75.7	-8.7	75.69	1.000
46-55 years (High)	20	19.7	0.3	0.09	0.005
46-55 years (average)	18	18.3	-0.3	0.09	0.005
56 years and above (High)	7	10.4	-3.4	11.56	1.112
56 years and above (average)	13	9.6	3.4	11.56	1.204
	1	1	I	1	$\chi^2 = 6.284$

 Table 13: Chi Square computation – Age vs Cultural Impact

Therefore the computed Chi square value is $\chi^2 = 6.284$

The degrees of freedom were obtained by;

Degrees of freedom = (number of rows - 1) (number of columns - 1)

$$= (r-1) (c-1)$$
$$= (5-1) (2-1)$$
$$= (4) (1)$$
$$= 4$$

Using 4 degrees of freedom and (0.05) level of significance the chi square table value obtained was **9.488**. The calculated chi square value of 6.284 is less than the chi square table value at 4 degrees of freedom and (0.05) level of significance. This indicates that there is no significant relationship between age and the cultural impact of farming mobile application. The cultural impact of farming mobile applications is not influenced by age because the farming mobile applications developed are accessible to all farmers who are 18 years and above. Majority of the

farmers using farming mobile applications were those between 25-45 years old. This group is mainly made up of energetic youths and adults who really on agriculture for their livelihoods and takes advantage of technology to improve their farming activities.

4.8 The relationship between education and cultural impact of farming mobile applications

Education is said to be the key to success. Most of the people living in the rural areas have attained primary education which is said to be the basic education. This study sought to establish if there was a significant relationship between the education and the cultural impact of the farming mobile applications.

A chi square test for two independent variables was undertaken with $\alpha = 0.05$.

H₀: There is no relationship between education and the cultural impact of farming mobile applications.

H_a: There is a relationship between education and the cultural impact of the farming mobile application.

The cross tabulation results are presented in Table 14

Table 14: Cross tabulation between education and perception of the cultural imp	pact of
farming mobile applications	

Education Level	Cultura	Total	
	High	Average	
Primary	94	74	168
Secondary	71	69	140
College	7	15	22
University	4	6	10
Total	176	164	340

The chi-square test for independence of two variables was calculated using the formula

$$\chi^2 = \Sigma \left[\frac{(fo - fe)^2}{fe} \right]$$

Where;

fo is the observed frequency in a particular category

fe is the expected frequency in a particular category

Expected Frequency = $\frac{(Row total)(Column total)}{Grand total}$

Education level and	fo	fe	(fo-fe)	(fo-fe)2	(fo-fe)2
cultural impact					fe
1 (Primary - High)	94	86.96	7.04	49.56	0.567
2 (Primary – Average)	74	81.04	-7.04	49.56	0.612
3 (Secondary– High)	71	72.47	-1.47	2.16	0.030
4 (Secondary – Average)	69	67.53	1.47	2.16	0.032
5 (College – High)	7	11.39	-4.39	19.27	1.692
6(College – Average)	15	10.61	4.39	19.27	1.816
7(University - High)	4	5.18	-1.18	1.39	0.268
8 (University – Average)	6	4.82	1.18	1.39	0.288
					$\chi^2 = 5.305$

Table 15: Chi Square computation – Education vs Cultural Impact

Therefore, the computed Chi square value is $\chi^2 = 5.305$

The degrees of freedom were obtained by;

Degrees of freedom = (number of rows - 1) (number of columns - 1)

$$= (r-1) (c-1)$$
$$= (4-1) (2-1)$$
$$= 3$$

Using 3 degrees of freedom and (0.05) level of significance the chi square table value obtained was **7.815**. The calculated chi square value of 5.305 is less than the chi square table value at 3 degrees of freedom and (0.05) level of significance. This indicates that there is no significant relationship between education and perception of the cultural impact of farming mobile application. The cultural impact of farming mobile applications is not influenced by education

because most of the highly educated people, those who have attained college and university education prefer white collar jobs in the urban areas leaving the less educated in the rural areas to do farming. The factor that promotes the adoption and use of farming mobile applications by the less educated population is that most of them use simple mobile phones which are easy to operate and have both English and Swahili language options making it possible for those who don't understand the English language.

CHAPTER FIVE: SUMMARY, CONCLUSIONS AND RECOMMENDATIONS

5.0 Introduction

This chapter presents a summary of the findings, conclusions and recommendations of the study. The findings were based on the interview schedules administered by the researcher. The interviews were conducted in line with the objectives of this study. The data was analyzed by use of SPSS version 20. Frequency tables were used to describe the data and draw conclusions on the findings.

5.1 Summary

5.1.1 Demographics

The study found out that majority (58.5%) of the farmers using the farming mobile applications were female with 41.5 percent of the total 340 respondents being male. This relates to a study done by (Saito et al. 1994) that in the recent years there has been a prominent trend in Africa where male family members leave their rural households in search for waged labor in urban areas, leaving women in the rural areas to undertake roles previously done by men. It was also established that majority of the farmers using the farming mobile applications were between ages 36- 45 years (46.2%) and 26 - 35 years (30.0%) of the respondents. In addition, it was also found out that most of the respondents had attained primary and secondary education with (49.4%) and (41.2%) respectively. The trend in the farmer's levels of education between those who had attained basic education and higher levels of education could be largely attributed to the fact that most of the educated people in Kenya prefer white collar jobs and only a very small percentage of them chose to do farming.

5.2 Factors that influence adoption and use of the farming mobile application

The factors that promoted the adoption and use of farming mobile applications were found out to be; availability, affordability, accessibility, utilization and flexibility. Majority of the farmers used simple phones with only a small percentage using feature and smart phones. This observation in the distribution of the type of phone used could be attributed to the fact that most of the farming in Kenya is done in rural areas by ordinary Kenyans. The cost of the application was rated average by 49.4 percent, high by 41.8 percent and low by 8.8 percent of the respondents. The cost of the SMS was reported to be the most affordable with 92.4 of the

respondents preferring to use the SMS medium. The overall perception of the farmers using the application was that these factors had a positive impact on the adoption and use of the farming mobile application. These findings concur with the study done by Aker & Mbiti (2010) that the rapid growth of mobile phones was promoted by falling handset prices, reduced calling rates and also the extension of networks even in the rural areas. These factors have in turn promoted the adoption and use of the farming mobile applications since most of the farmers in the rural areas have been able to afford mobile phones, access the services, trained on how to use the service, and are also able perform different tasks using their simple phones.

5.3 Barriers to increased adoption and use of farming mobile applications

The findings of this study indicated that there were a number of barriers to increased adoption and use of farming mobile applications to promote community development. The biggest barrier reported was the customer care service with (38.8%) of the total respondents indicating that the customer service was poor. This may cause many other farmers not to register to use the service if there are problems with reaching the customer care when in urgent need. The quality of the service was rated average which was also seen as a barrier to increased adoption and use of the farming mobile application. The findings indicated that there was need to improve on these factors so that the service quality may be high. The cost of the application and that of calling was also seen as a barrier. It was also found out that (2.6%) of the respondents were not able to get any response when they needed it. The study showed that the community should be made aware of the technologies related to agriculture, be educated on the importance and benefits of adopting farming mobile applications and also trained on how to use the applications. These findings concur with a study done by Abadi & Pannell (1999) that imperfect knowledge of technology can be a barrier to adoption and this decreases with experience.

5.4 Economic impact

The study found out that the adoption and use of farming mobile applications had a positive economic impact on the community. The interviewed farmers indicated that their farm yields had increased, income increased, expenditures reduced, able to save some money and that their living standards improved. These findings relate to a study by Christine et al (2011) that the use of farming mobile applications has been found to lead to increased incomes and access to finance

and benefits to other players through supply chain efficiency. The positive economic impact brought about by the use of farming mobile applications is a pillar to community development and this concurs with Aspen (2000) who stated that community development refers to those measures which enable people to recognize their own ability to identify their problems and use the available resources to earn and increase their income in order to improve their living standards.

5.5 Social Impact

The findings of this study indicated that the use of farming mobile applications led to improvement of social status. The use of Kilimo Salama and M farm applications promoted the collection action among farmers and also with the external agencies in the agricultural sector. The use of these farming mobile applications led to a positive social impact which is a major building block in developing a community. This collaborates with a study by Flora and Flora (1993) which states that community development arises from the interaction between individuals and joint action rather than individual activity.

5.6 Cultural Impact

The study established that the use of farming mobile applications had a positive impact on the cultural development of the community with most of the respondents reporting that the cultural impact was high. The use of Kilimo Salama and M farm enabled the farmers to access new markets, obtain information easily, timely and cheaply, change farming beliefs, and also created a favorable environment for women involvement in farming activities. The use of these farming mobile applications has contributed greatly to community development. These findings concur with the study done by Christenson et al, (1989) stating that development increases choices meaning new options, diversification, thinking about apparent issues differently and anticipating change.

5.7 Conclusion

This study shows that the adoption and use of the farming mobile application was promoted by the following factors; availability, accessibility, utilization, flexibility and affordability of the farming mobile applications. This was evidenced from the findings with the majority of the respondents indicating that the quality of the service was above average. Customer care service was reported to be the main barrier to the effective use of farming mobile applications. There should be an improvement in all the factors mentioned above since most of them were rated average. The improvement on these factors will promote more adoption and use of farming mobile applications. From the findings majority of the farmers interviewed indicated that there was a positive impact in the economic, social and cultural aspect which brings about development of the community. The study also established that the adoption and use of farming mobile applications was not influenced by gender, age or the level of education of the farmers.

5.8 Recommendation

Based on the study findings and conclusions the following recommendations are made;

- The farming mobile applications should be made more affordable.
- The customer care services should be made accessible at all time to the farmers using the farming mobile applications.
- The developers, funding agencies and the ministry of agriculture should collectively educate all the farmers on the existence of the farming mobile applications and the role they play in promoting community development.
- The farmers should be trained on how to use mobile phones and the mobile applications.

5.9 Recommendations for further research

The study recommends that further research be undertaken on the following;

- To explore how different partners can work together to promote the adoption and use of farming mobile applications.
- To develop a universal farming mobile application that can perform tasks of both Kilimo Salama and M farm.
- To investigate the role, the ministry of agriculture can play in subsidizing the insurance premiums on seeds, crops and harvests.

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Interview schedule

My name is Mary Mutiga. I am a student from University of Nairobi. I am carrying out a study to evaluate the appropriateness of farming mobile applications in community development.

Any information given will only be used for academic purposes and will be confidential.

What mobile application do you use?

M-farm

Kilimo Salama

What type of phone do you use? _____

Did you buy the application at a cost?

OYes O No

If your response is a yes, then rate the cost

 \bigcirc High \bigcirc Average \bigcirc Low

How did you find the cost of calling?

 \circ High \circ Average \circ Low

How do you find the cost of sending an SMS?

○ High ○ Average ○ Low

Please put a mark in the box that describes how you feel about each of the statements below. If your response is a yes rate the service.

The service is available on all mobile net	O Yes	O No	
If Yes, the availability is? \bigcirc Excellent	OAverage	O Poor	
The service is offered at a cost OYes	O No		
If Yes, the affordability is? O Excellent	OAverage	O Poor	

The service can be accesse	d from differen	t regions	O Yes	O No
If Yes, the accessibility is?	○ Excellent	OAverage	○ Poor	
The service is available on	both simple an	d smart phones	s O Yes	O No
If Yes, the accessibility is?	OExcellent	OAverage	O Poor	
There is a customer care se	rvice for the ap	plication I use	Oyes	O No
If Yes, the customer care se	ervice is?0Exc	cellent OAver	rage O Poo	or
I am trained on how to use	the service		O Yes	O No
If Yes, the training was?	OExcellent	OAverage	O Poor	
The use of the service is ea	sy O Yes	O_{No}		
If Yes, the usability is?	O Excellent	OAverage	O Poor	
When I request for a servic	e I get response	e on time	O Yes	O No
If Yes, the response is?	O Excellent	OAverage	O Poor	

Please put a mark in the box that describes how you feel about each of the statements below. If your response is a yes, then rate the impact. High Average Low

a. My farm yields increased after using the application O Yes O No

If Yes, the yields are? O High O Average O Low

b. My income increased after using the application OYes ONo

If Yes, the income is? \bigcirc High \bigcirc Average \bigcirc Low

c. My expenditures reduced after using the application O Yes O No

If Yes, the expenditures are? \bigcirc High \bigcirc Average \bigcirc Low

d. I am able to save some money after using the application O Yes ONo

If Yes, the savings are? \bigcirc High \bigcirc Average \bigcirc Low

e. My living standards improved after using the application O Yes O No If Yes, the living standards are? O High O Average O Low

Please put a mark in the box that describes how you feel about each of the statements below. If your response is a yes rate the social impact.

My social status improved after using the application. \circ Yes \circ No

If Yes, the social status is? \bigcirc High \bigcirc Average \bigcirc Low

The use of the application has contributed significantly to the formation of farmer groups and SACCO O Yes O No

If Yes, the formation of groups/SACCO is? \bigcirc High \bigcirc Average \bigcirc Low

The use of the application has exposed me to previously unknown agricultural organizations, consultants and input providers. \bigcirc Yes \bigcirc No

If Yes, the exposure is? O High O Average O Low

Better farming practices learnt from using the application have reduced the incidences of joblessness among the youth. O Yes O No

If Yes, the reduction of joblessness is? \bigcirc High \bigcirc Average \bigcirc Low

The use of the application has enabled me to acquire quality social amenities such as water, health and education. O Yes O No

If Yes, the social amenities are? OHigh OAverage O Low

Please put a mark in the box that describes how you feel about each of the statements below.

The application has contributed significantly to the adoption of new technologies in farming.

O Yes O No

If Yes, the adoption of new technologies is? \bigcirc High \bigcirc Average \bigcirc Low

The application has helped me to learn new ways of marketing my farm produce.

0 Yes ONo

If Yes, the ways of marketing are? \bigcirc High \bigcirc Average \bigcirc Low

The application has helped me to learn new ways of obtaining information about farming activities.

O Yes O No

If Yes, the ways of obtaining information are? O High O Average O Low

My farming beliefs changed through the use of the application.

O Yes ONo

If Yes, the change of farming beliefs is? \bigcirc High \bigcirc Average \bigcirc Low

The use of the application has promoted the involvement of women in the farming activities.

O Yes O No

If Yes, the involvement of women is? \bigcirc High \bigcirc Average \bigcirc Low