UNIVERSITY FOR DEVELOPMENT STUDIES

EFFECTIVENESS OF KNOWLEDGE MANAGEMENT APPROACHES ON AGRICULTURAL EXTENSION SERVICES DELIVERY IN SELECTED DISTRICTS OF NORTHERN REGION

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BY

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DISSERTATION SUBMITTED TO THE DEPARTMENT OF AGRICULTURAL EXTENSION, RURAL DEVELOPMENT AND GENDER STUDIES, FACULTY OF AGRIBUSINESS AND COMMUNICATION SCIENCES, UNIVERSITY FOR DEVELOPMENT STUDIES, IN PARTIAL FULFILLMENT OF THE REQUIREMENTS FOR THE AWARD OF MASTER OF PHILOSOPHY DEGREE IN INNOVATION COMMUNICATION

JULY, 2018

DECLARATION

Student

I hereby declare that this dissertation is the results of my own original work and that no part of it has been presented for another degree in this university or elsewhere:

Candidate's Signature:…….Date:……..

Name……...……

Supervisors'

I hereby declare that the preparation and presentation of the dissertation was duly supervised in accordance with the guidelines on supervision of dissertation/thesis laid down by the University for Development Studies:

Principal Supervisor's Signature: …… Date: ……..

Name: ……...

Co-Supervisor's Signature: ……..... Date: ……

Name: ……

ABSTRACT

Despite the extension policies and programmes put in place by government to change the face of agricultural extension delivery in Ghana, transfer of agricultural knowledge and information still remain critical. Current ratio of AEAs to farmers now stands at an average of 1:3000. This research therefore, presents results of a survey assessing the effectiveness of three Knowledge Management approaches on agricultural extension services delivery based on the responses of 450 farmers in selected districts of Northern Region. Correlation, Chi Square statistics, Theory of Planned Behaviour, multiple regression and SERVQUAL model were employed in analysing the data and results presented using frequency and percentage tables and graph. The study revealed that opinion leaders, agricultural extension agents, NGOs and religious leaders have strong influence on farmers' choice of knowledge management approaches. Age, gender and educational level have no influence on farmer's intention to use knowledge management approaches. However, factors such as, inability to interpret messages, untimely delivery of information, and misrepresented information can influence farmers' decision to use knowledge management approaches. Farmers were not satisfied in all the agricultural knowledge management approaches. The research thus recommend that MoFA should integrate use of Mobile phone and participatory video approaches to complement existing direct contacts with extension agents' approach to reach more farmers in the rural deprived areas of the Northern Region and beyond.

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DEDICATION

This work is dedicated to my dear parents, Hajj Suleiman Abubakr and Hajj Kulsum Ibrahim.

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LIST OF ACRONYMS

AEAs	Agricultural Extension Agents'
AKMA	Agricultural Knowledge management Approaches
CEAs	Community Extension Agents'
DAES	Department of Agriculture Extension Services
FASDEP	Food and Agriculture Sector Development Policy
FBOs	Farmer Based Organisations
GDP	Gross Domestic Products
ICT	Information and Communication Technology
IDS	Internet Database System
IPA	Innovation for Poverty Action
ISSER	Institute of Statistical, Social and Economic Research
KM	Knowledge Management
METASIP	Medium Term Agriculture Sector Investment Plan
MoFA	Ministry of Food and Agriculture
NCA	National Communication Authority
NGOs	Non-governmental organisations
PFJ	Planting for Food and Jobs
SDGs	Sustainable Development Goals
SERVQUAL	Service Quality
SPSS	Statistical Package for Social Sciences

T&V	Training and Visit
TPB	Theory of Planned Behaviour
UNDP	United Nations Development Project
YEA	Youth Employment Agency

CHAPTER ONE

1.0 Background

Agriculture is ranked third among the largest sectors of the Ghanaian economy and accounts for one third of the country's Gross Domestic Product (Kwadzo, 2014). It is a sector with great potential for influencing growth and employment and eradicating poverty. In 2015, the sector contributed 20.2% to the GDP of the country and employed 56% of the population (ISSER, 2016). The agricultural sector's contribution to the country's economy is as a result of multiple factors which include the vast abundance of fertile lands, large farming population, conducive and predictable climatic conditions, favourable market conditions and some governments support to the sector (MoFA, 2010).

The above mentioned contributions of agriculture are being threatened in so many ways, which is the available fertile lands are being subjected to degradation due to over cultivation, bad farming practices and limited fertility replenishment. The fertile lands are diminishing due to take-overs by ongoing commercial and residential infrastructural developments. The weather pattern is changing and increasingly becoming difficult to predict thus affecting farmers' ability to plan their farming operations (Moore et al., 2015). All these changes have culminated into low farm yields and addressing these challenges require some national level interventions.

The government of Ghana, as part of its investments in the sector, has funded the agricultural training institutions, provided accessible roads for easy transportation of agricultural commodities, instituted input subsidies, offered credit facilities to farmers and rallied development partners to deliver effective development aid to the sector (MoFA, 2012). MOFA, the lead agency responsible for the development of policies and programmes for the agricultural sector facilitated the preparation of the Food and Agriculture Sector Development Policy (FASDEP II) and the Medium-Term Agriculture Sector Investment Plan (METASIP), 2011-2015 as the overarching sector policy and investment frameworks. These frameworks provide the long-term objectives of government in relation to the development of the agriculture sector and are also aimed at ensuring that the sector's stakeholders are best positioned to take advantage of the emerging opportunities. The METASIP had as its targets, an agricultural GDP growth of at least 6% annually, halving poverty by 2015 in consonance with MDG 1 based on government expenditure allocation of at least 10% within the Plan period of 2011–2015 (MOFA, 2010).

In addition to policy development, one important requirement that is greatly needed to promote the growth and development of the agricultural sector is the provision of cost effective and efficient extension service. Extension provides technical guidance direction

for farmers and other actors along the agricultural value chain. Through the guidance direction, farmers achieve higher productivity, higher outputs at relatively lower cost, improved quality products, as well as higher incomes for themselves and other value chain actors. Agricultural extension ensures the transfer of improved agricultural technologies and information at the farm levels (Hasan et al., 2013). The development and dissemination of the right information at the appropriate time among farmers is key to providing change in agriculture (Asiedu-Darko, 2013).

Over-reliance on indigenous technologies to agricultural extension and the neglect of sustainable technological advancements that makes use of farmers' tacit knowledge, and researchers' and extension workers explicit knowledge in agricultural extension practice has long been identified as an impediment to increased agricultural productivity (Yadav et al., 2015). ICT as a modern technology is well suited for information dissemination with limited barriers. The role of ICTs to provide data and information in order to stimulate agriculture, enhance food security and support rural livelihoods is increasingly recognized and was officially endorsed at the World Summit on the Information Society (WSIS) 2003-2005 (InforBridge, 2017). In this sense, the rapid growth of information and communication technologies (ICT) in Africa offers unique opportunities to transfer knowledge and information by means of private and public electronic information systems.

ICT has generated a lot of hope to disseminated updated agricultural information to the farming community, overcoming the barriers of distance, socio-economic status, and gender difference just to mention a few (Palaiah et al., 2016). The strategic application of ICT to the agricultural industry which is the largest economic sector in most African countries, offers the best opportunity for economic growth and poverty alleviation on the continent (Zyl et al., 2012).

There are increasing examples of ICT usage in agricultural knowledge management on the African continent. The countries with the highest use of ICTs in agriculture in Africa are Kenya, Mozambique, Uganda and Ghana (UNDP, 2012).

The Kenyan Agriculture Commodity Exchange (KACE) for instance uses ICT to collect, update, analyse and provide reliable and timely marketing information and intelligence on a wide range of crop and livestock commodities, targeting actors in commodity value chains, with particular attention on smallholder farmers and small scale agribusinesses (UNDP, 2012). KACE project used ICT channels such as the Mobile Phone SMS, Internet Database System (IDS), National Radio, and Rural FM Radio to disseminate information to farmers. Through an IT system, using mobile phones, agricultural insurance products were also provided to smallholder farmers with the KACE project. A "pay as you plant" type insurance product was developed by UAP Insurance, the Syngenta Foundation for

Sustainable Agriculture and mobile operator Safaricom, enabled smallholder farmers to insure their agricultural inputs against adverse weather conditions, such as drought or too much rain. To be covered under the scheme, farmers only need to pay an extra 5% for a bag of seed, fertilizer or other inputs. The Mozambican Agricultural Marketing Service collects and disseminates nation-wide and provincial data on market prices, product processing and availability through a variety of media including emails, national and rural radios, television and newspapers as well as text messages delivered through mobile phones (UNDP, 2012).

In Uganda in the 'Rubaya' sub-county in Kabale district, village information centres were established and farmers given mobile phones to communicate with extension officers to receive information from the village information centres. The usage of mobile phone was found to benefit farmers in areas such as productivity, market access, natural resource management and knowledge base (Masuki and Tukahiwa, 2013). In Ethiopia, the Improving Productivity and Market Success (IPMS) project developed various ICT and non-ICT tools and established the Ethiopian agriculture portal-www.eap.gov.et, (Mekennon et al., 2012). In Ghana, Esoko, a local company, implemented Cocoalink programme, a pilot programme that provides cocoa farmers with useful information about improving farming practices, farm safety, crop disease prevention, postharvest production,

and crop marketing. In this program farmers receive information and specific answers to questions at no charge through voice and SMS messages in their local language or English (Sakyi-Dawson and Nudanu, 2013). In 2014, Innovation for poverty action (IPA) launched the DIRTS Community Extension Agents' (CEAs) Program whereby selected farmers have received 12,785 need sensitive extension messages in video and audio format. AGRA in collaboration with IFAC launched the mFarms platform hosted by imageAd to provide real-time price information to value chain actors.

Important factors that are driving the need for knowledge management are organisational survival, globalization effects and aging workforce (Omotayo, 2015). Knowledge management has become important because of the rising rate of innovation and ICTs. This creates the need to replace informal knowledge with formal knowledge in order for farmers to cope with the current farming techniques for maximum food production (Omotayo, 2015). Knowledge management is also of importance because of retirement of extension officers and increasing number of farmers leading to increasing demand for extension services in some specific areas. There is therefore the need for a strategic way of managing knowledge and making it available to farmers in demand basis with the limited number of extension agents'.

Following the growing trend in the use of ICT in global agriculture knowledge management, the Ministry of Food and Agriculture (MoFA) has commenced the implementation of an E-Agriculture program whiles several agricultural value chain projects are also mainstreaming the use of ICTs in agricultural extension. The current state of these interventions is that the E-Agriculture intervention is yet to fully take off and the adoption of ICTs have been largely pilots in limited geographical areas of the country. Considering the potential development benefits accrue from the adoption and use of these knowledge management technologies in agriculture and the several challenges that many countries have experienced, there is a need for evidence to understand the dynamics of the use these technologies in the country.

What would be the effect of knowledge management approaches on agricultural extension delivery services? What is the impact of farmers' attitude towards extension delivery services approaches? It is therefore imperative to understand the influence of demographic variables such as age gender and educational level on readiness to knowledge management approaches use for accessing agricultural extension delivery services.

The current research will therefore be of great use to policy makers, development partners, service providers and smallholder farmers in the rural communities who are deploying and patronizing agricultural knowledge management services. The research has a potential of

exposing extension gaps that exist within the extension knowledge management approaches. Extension service providers will be able to design interventions to address the gaps in order to make extension service delivery effective to the full benefit of the rural small-holder farmers.

1.1 Problem Statement

Agriculture is a major contributor to the Ghanaian economy, and has been given much attention by the previous and current government through policies and programmes implemented over the years. However, the sector faces many problems such as quality of agricultural inputs, access to reliable market and market information, credit support, relevant agricultural knowledge and information as well as adequate extension services. Due to the changes in climatic conditions, agriculture has become more complex, therefore farmers' access to reliable, timely, and relevant information has become increasingly important (Yadav et al., 2015). Farmers require access to more relevant varied information, related to best practices and technologies for crop production and weather, information about post-harvest aspects, including processing, marketing, storage, and handling (Yadav et al., 2015). As a result of the problems faced by the sector, agricultural productivity in Ghana is in the decline, and unable to provide adequate income and ensure food security, and meet increased demand for agricultural export commodities.

Knowledge and information are precursor of development of any organisation or nation, therefore extension organisations are established to transfer knowledge and information to farmers for improved agricultural practices and increased food production. It is noted that traditional forms of extension in Ghana have had challenges such as low AEA to farmer ratio and inability to incorporate business and value chain approaches to connect farmers to evolving market conditions. This situation has largely arisen due to fiscal challenges facing government. The old extension approaches such as "training and visits" and "farmer field schools" are being challenged with barriers such as distance and timely information delivery due to increasing populations and increasing demands for extension services (Masuki et al., 2013).

The World Bank recommended ratio of extension agent to farmers' ratio stands at 1: 500 (Obinna, and Agu, 2014). Meanwhile the current ratio of AEAs to small scale farmers stands at 1:3000 (PFAG and SEND-Ghana, 2016). The situation is even worse when considered on regional basis, especially, in Northern Ghana (Moore et al., 2015). A World Bank report provided guidelines for the number of extension officers per district, with recommended numbers ranging from 20 to 30 AEAs. Unfortunately, most districts in the northern region has less than 10 AEAs (Moore et al., 2015). Agricultural extension agents who are supposed to be in close and regular contact with farmers are inadequate in their

numbers, therefore are not able to cater for the large numbers of farmers. To bridge the extension gap, it requires innovative agricultural knowledge management approaches, for relevant knowledge to be created, captured and utilized, and stored for future use. Agricultural project can only be fostered through agricultural knowledge management system (Malekmohammadi, 2009).

The lack of knowledge management system in the traditional forms of extension services have made the past extension delivery approaches ineffective and inefficient, and have led several countries including Ghana to adopt ICT knowledge management approaches to improve extension delivery to enhance agricultural productivity and income generation for smallholder farmers to reduce the incidence of poverty. This development has become imperative to ensure that agriculture contributes effectively to socio- economic development. ICT is an important means of overcoming the challenges and bringing change to the face of agricultural extension delivery services (Palaiah et al., 2016). ICTs critically facilitate rapid, efficient, and cost-effective management and transmission of knowledge (UNDP, 2012). Effective extension service delivery should aim at promoting the use of cost-effective approaches that would capture, store and disseminate relevant extension information to a larger number of farmers in the shortest possible time (Fu and

Akter, 2012). With the passage of time, efficiency and impact issues are being raised concerning the delivery of these extension services.

Few research work has been done to assess knowledge management approaches in the area. Therefore, the main aim of this research is to assess the effectiveness of knowledge management approaches on agricultural extension services delivery in Northern Region.

Several thousands of farmers in Ghana do not have access to extension services due to the limited number of extension agents' in the country (MoFA, 2012). As part of government and other agricultural stakeholders, such as the World Bank effort to make extension delivery effective, several extension delivery approaches have been implemented, including the recent introduction of ICTs in extension delivery approach. There are still challenges as to which of the services is more effective in addressing farmers' extension needs.

There is the need for pragmatic policy formulation, particularly on the part of government and strong partnerships and cooperation developing partners in the agricultural sector for the potentials of ICT to be realized in transforming the agricultural sector of the economy. The purpose of this research is to find out and recommend strong policies that promote the use of cost-effective approach that can help deliver effectively extension service to farmers.

1.2 Research Questions

1) What are farmers' attitudes and behaviour towards knowledge management approaches?
2) What is the influence of demographic variables (gender, age and educational level) on farmers' readiness to use knowledge management approaches?
3) Which agricultural knowledge management approaches are commonly patronized by farmers?
4) What is the effectiveness of knowledge management approaches on agricultural extension services delivery?

1.3 General Research Objective

The goal of this research is to assess the effectiveness of knowledge management approaches on agricultural extension service delivery with the view of making informal policy recommendations.

1.4 Specific Research Objectives

1) To assess farmers' attitude and behaviour towards knowledge management approaches.
2) To examine the influence of demographic variables (gender, age and educational level) on farmers' readiness to use knowledge management approaches.

3) To examine the types of agricultural knowledge management approaches patronized by farmers to determine the most used approach.

4) To assess the effectiveness of knowledge management approaches on agricultural extension services delivery.

1.5 Significance of The Study

The potential ICT in agricultural extension knowledge management as an engine for accelerating agricultural development has long been recognized (Sekye-dawson and Nudanu, 2013). This is emphasized in Ghana by MoFA by the establishment of the E-extension unit to use innovative ICTs such as the internet, mobile phones and community radios for extension information delivery, with the ultimate aim of sharing extension knowledge and information with farmers in remote communities.

Appropriate agricultural knowledge and information is critical to farmers' production output (Aker, 2011). Innovation for poverty action (IPA) reported in 2014 that, the limited number of extension agents' in Ghana has made it difficult for farmers in marginalised communities to receive extension services to help boost their farm businesses. And that, rural farmers are privy to new knowledge and information that will help increase their farm production.

ICTs can be used effectively and practically to facilitate information delivery and knowledge sharing among farmers, extension agents' and other stakeholders (Annor-Frempong et al., 2014). ICT has the power to share knowledge and information that can help farmers in their farm for increased productivity and stable income, and eventually reduce their poverty level (Fu and Akter, 2012).

Since ICT tools such as the mobile phone can help capture, store and disseminate agricultural information to farmers beyond the reach of extension agents' through the use of its applications such as voice calls, voice messages and sms, it can foster effective flow of extension information among farmers, extension workers and agricultural researchers.

Considering the potential benefits ICT, it is critical to examine the extent of use of ICT in agricultural extension knowledge management, the factors that influence the perceptions of people on the use of such technologies and the current gaps in the provision of such ICT services by MoFA and the service providers in Ghana. Unearthing such evidence will go a long way to improve the delivery of agricultural extension using ICT.

CHAPTER TWO

LITERATURE REVIEW

2.0 Introduction

This chapter presents a theoretical framework and review of relevant agricultural knowledge management literature on the various concepts in the conceptual framework. The framework consists of concepts illustrated with a model to explain how these concepts affect the effectiveness of knowledge management approaches for extension work in Ghana. It also provides related literature on the various types of extension knowledge management approaches the researcher is investigating.

2.1 Theoretical Framework

The Theory of Planned Behaviour was adopted as the measuring tool for assessing attitude of farmers towards the three knowledge management approaches in the research.

2.1.1 Measuring Attitude of Farmers towards Knowledge Management Approaches

The theory of planned behaviour proposed by Icek Ajzen (1985) is found to be well supported by empirical evidence (Maio et al., 2007). The theory was developed from the theory of reasoned action, which was proposed by Martin Fishbein together with Icek Ajzen in 1980 (Cote et al., 2012). A core factor in the theory of planned behaviour is the individual's "intention" to behave in a certain manner. The theory suggests that intentions

to form a behaviour can be predicted from motivational factors such as attitudes toward the behaviour, subjective norms, and perceived behavioural control (Cote et al., 2012). These intentions together with perceptions of behavioural control, account for considerable differences in actual behaviour (Ajzen, 1991). Ajzen (1991), posits that intentions capture motivational factors such as how hard people are willing to try a behaviour and how much effort they are planning to exert in order to perform the behaviour. As a general rule, the stronger the intention of person to engage in a behaviour, the more likely the person will actually performance the behaviour.

The motivational factors that determine intentions includes attitudes toward the behaviour, subjective norms, and perceived behavioural control. From the point of view of social psychology, Palaiah et al. (2016), defined attitude as the degree of positive or negative relationship with some psychological objects towards which people can differ in varying degrees. Fishbein and Ajzen (1975), view attitude as a mental and neutral state of readiness, organized through experiences which exert a directive or dynamic influence upon the individual's response to all objects and situations. Attitudes are action tendencies and as such they can facilitate or hinder action at individual, group, community, state, and national levels. Individuals register an immediate and automatic reaction of "good" or "bad" towards everything they encounter in less than a second, even before they are aware of

having formed a behaviour. Attitude is reactional and quick whilst behaviour is formed over a longer time. An immediate and automatic reaction is driven by attitude but a person can decide at will to perform or not to perform a particular behaviour. The performance of most behaviours to some extent depends on availability of requisite opportunities and resources such as time, money, skills, cooperation of others (Ajzen, 1991).

Another factor that affect behavioural intention which intend determines behaviour is subjective norm. Subjective norm is the perceived social pressure to perform or not to perform the behaviour in question (Ajzen, 1991). Subjective norms are assumed to have two components which interact with each other and they are normative beliefs and motivation to comply.

Perceived behavioural control is another motivational factor that affect behaviour and it refers to the perceived ease or difficulty of performing the behaviour in question (Ajzen, 1991). Perceived behavioural control is assumed to reflect past experience as well as anticipated impediments and obstacles. It is determined by control beliefs about the power of both situational and internal factors to inhibit or facilitate the performing of the behaviour. Control beliefs and influence of control beliefs interact to determine perceived behavioural control which subsequently determines behavioural intention and behaviour. Perceived behavioural control is an external variable that has both a direct effect on actual

behaviour and an indirect effect on actual behaviour through intentions. Bandura (1977), provided empirical evidence that people's behaviour is strongly influenced by the confidence they have in their ability to perform the behaviour. The direct path from perceived behavioural control to actual behaviour is assumed to reflect the actual control an individual has over performing the behaviour. According to Ajzen (1985), if an intention is held constant, the effort needed to perform the behaviour is likely to increase with perceived behavioural control. For example, if two people have equally strong intentions to learn how to prepare compost, and both try to do so, the person who is confident that he or she can master this activity is more likely to prepare it than the person who doubts his or her ability.

The relative importance of attitude, subjective norm, and perceived behavioural control in the prediction of intention is expected to vary across behaviours and situations. Each of them influences behaviour differently. Similarly, the different combinations of these motivational factors influence behaviour differently.

The theory assumes that, human beings are basically rational and make systematic use of information available to them when making decisions (Ajzen 1991). The theory of planned behaviour is superior to the theory of interpersonal behaviour which was proposed by Triandis (1980). As noted by Triandis (1980), the theory of interpersonal behaviour

assumes that moral norm is a key determinant of behavioural intention. The moral norm refers to a person's feeling of moral obligation towards performing a given behaviour. The interpersonal behaviour has limitations such as a significant risk of confounding between attitudes and norms since attitudes can often be reframed as norms and vice versa and the assumption that an individual who formed an intention to act will freely do so without limitation. Meanwhile, the theory of planned behaviour overcomes these limitations as it acknowledges that in practice, constraints such as limited ability, time, environmental or organizational limits, and unconscious habits will limit the freedom to act irrespective of the intentions formed (Ajzen, 1991). Due to the superiority of theory of planned behaviour, this study adopted it as a measuring tool of farmers' attitude towards the use of mobile phone technology for agricultural extension delivery. Figure 2 shows a schematic diagram of the theory of planned behaviour.

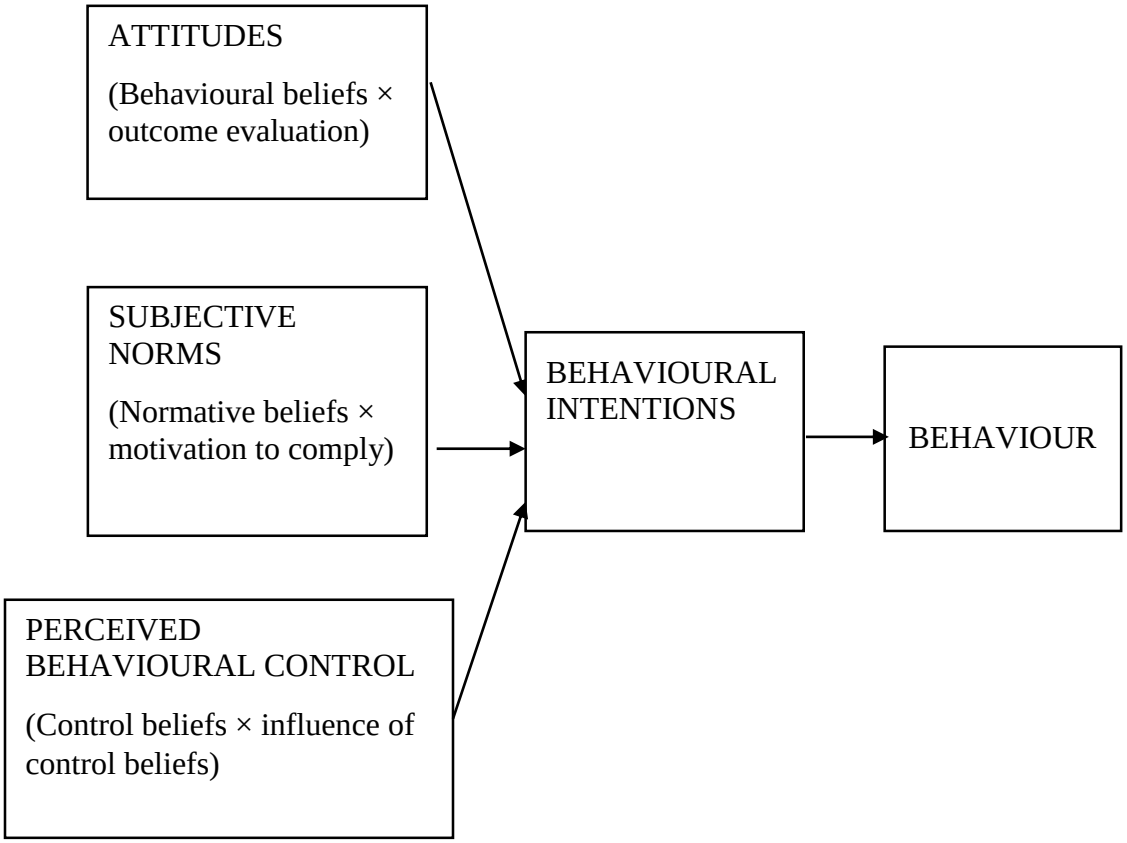

Figure 1: The theory of planned behaviour

Source: Adopted from Ajzen (1991)

2.2 Conceptual Framework

The conceptual framework illustrated in Figure 2 below provides the scope of the study and it is an adaptation of the theoretical framework in Figure 1 above. The detailed elements in each of the three components of the theoretical framework are: attitudes (geographical location, household size, age, gender, educational background, approaches farmers patronize), subjective norms (farmers' attitude towards mobile phone approach

and the perceived behavioural control (extension approaches - mobile phone extension, participatory video, direct contacts with extension agents' and gender, educational level of extension agent) are illustrated in the conceptual framework below. The elements in attitude component are geographical location, household size, age, gender, educational background, and type of extension delivery approaches farmers patronize. Farmer internal attitudes are driven by perceived behavioural control, subjective norm as explained in the theoretical framework. Lastly, the outward behaviour of the farmer towards the various extension approaches is influenced by external factors such as costs, availability of resources etc. The three various components are linked by arrows which show the influence of each components. The interaction of all three components results in the intention of the farmer to adopt and use a particular extension approach or a set of approaches. In the conceptual framework, the effectiveness of a particular approach can be assessed through the influence of enabling factors such extension strategy, the development of the requisite infrastructure. This framework helps to bring out issues that may act as drivers or barriers to positive or negative behaviour towards mobile phone adoption and use in extension as well to assess the its effectiveness in extension services delivery. This schematic diagram below illustrates the conceptual framework of the research.

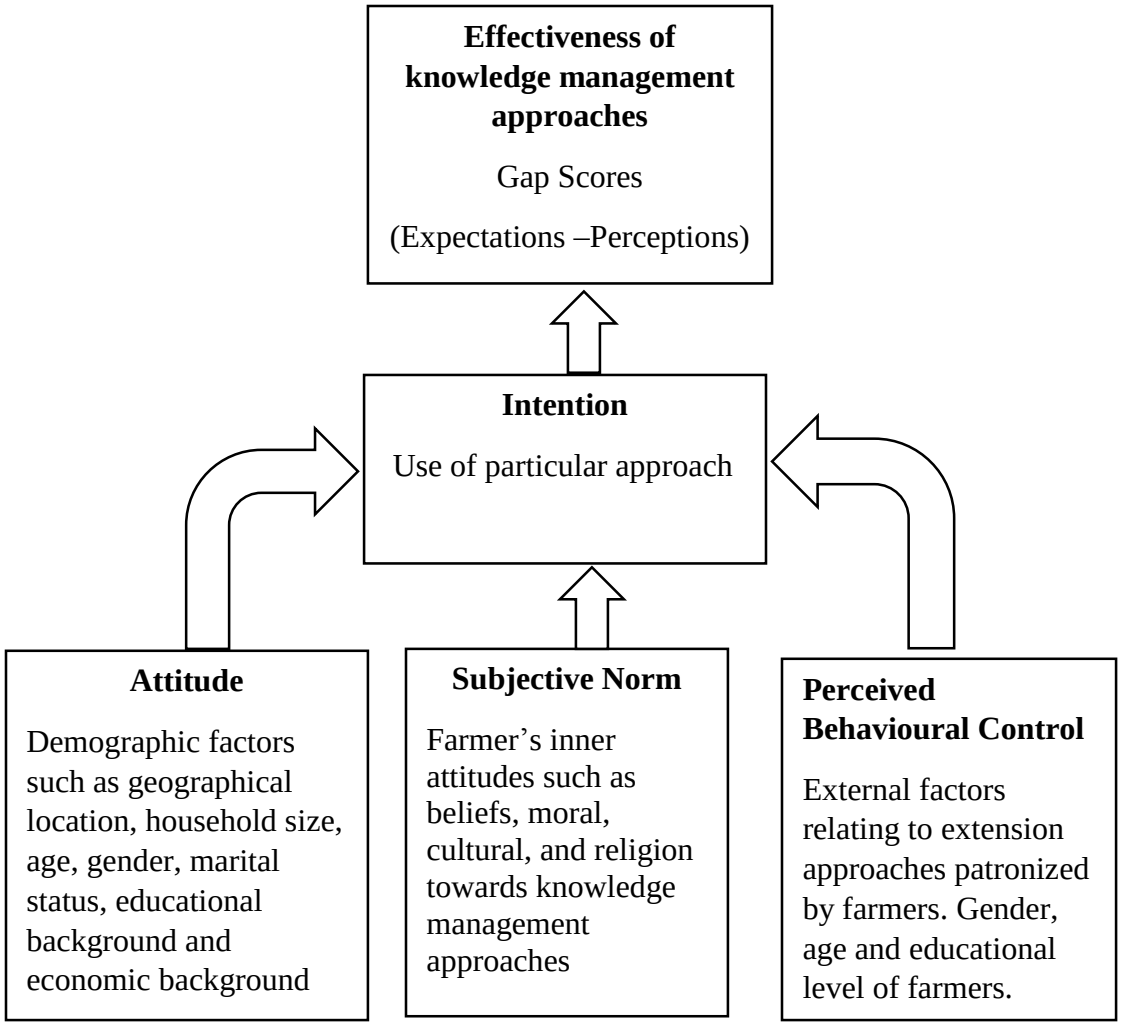

Figure 2: Conceptual Framework
Source: Author

2.3 Concept of Knowledge

Knowledge does not have precise and comprehensive definition. Knowledge basically refers to a collection or a body of information (Omotayo, 2015). The term "knowledge" is understood as the conscious or subconscious perception, information processing and

accumulation of experiences (Bergeron, 2003). It includes familiarity, awareness and understanding gained through experience or study, and results from making comparisons, identifying consequences, and making connections (Assefa, 2010).

2.4 Types Of Knowledge

There are basically two types of knowledge, namely tacit and explicit knowledge.

2.4.1 Tacit Knowledge

Tacit Knowledge inhabits the minds of people (Omotayo, 2015). Most knowledge is initially tacit in nature because it is laboriously developed over a long period of time through trial and error (O'Dell and Grayson, 1998). Most individuals are not aware of the knowledge they themselves possesses or of its value to others. Tacit knowledge is considered more valuable because it provides context for people, places, ideas and experiences (Omotoya, 2015).

2.4.2 Explicit Knowledge

Explicit knowledge refers to articulated knowledge that could be coded and stored in a certain media in an organization (Mekonnen, 2012). Tacit knowledge exists in the form of words, sentences, documents, organised data, and computer programs and in other explicit forms. Explicit knowledge can be categorised as either structured or unstructured.

Documents, databases, and spreadsheets are examples of structured knowledge, because the data or information in them is organised in a particular way for future retrieval. Examples of unstructured knowledge include e-mails, images, training courses, and audio and video selections.

Explicit and tacit forms of knowledge are the two forms of knowledge informing decision-making in almost all organisations (Mekonnen, 2012). Tacit Knowledge is action-oriented and has a personal quality that makes it difficult to communicate (Boateng, 2006). Accessing tacit knowledge, therefore, presents a number of challenges, due to factors such as the absence of an explicit scientifically repeatable process for eliciting such forms of knowledge. Explicit knowledge, however, can be communicated across time and space.

The main methods for the acquisition and the accumulation of these two knowledge forms also differ. Explicit knowledge can be generated through logical deduction and formal study. Tacit knowledge, in contrast, can be acquired only through practical experience in the relevant context. The difference between these two forms of knowledge, though evident, is not independent in the practical sense. These forms of knowledge are mutually dependent and reinforcing qualities of knowledge (Boateng, 2006). Fostering a dynamic interaction between tacit and explicit knowledge, therefore, generates new forms of knowledge vital for improved knowledge utilisation (Nonanka and Takeuchi, 1995).

Since, tacit and explicit forms of knowledge complement each other, it is imperative for agricultural extension experts to pay more attention in harnessing the tacit knowledge of farmers and complement that with their explicit knowledge (Mekennon, 2012). Achieving this implies that a knowledge management working tool be institutionalised to guide agricultural extension practice. Such a tool should aim at harmonising the communities and cultures of the agricultural extension experts and farmers as entities with a common course. This collaboration is critical because the two communities, although they may appear as distinct from each other in some regards, can hardly be functional without complementing each other's efforts. Extension services providers must take into consideration the existence of tacit and explicit knowledge in order to disseminate knowledge and information without distance and time barriers.

2.5 Knowledge Management

The term "knowledge management" was first introduced in a 1986, but emerged as a scientific discipline in the earlier 1990s (Assefa, 2016). From mid-1990s, there has been rapid growth of interest across the world in knowledge and how it might be managed within and between organizations (Assefa, 2016).

Knowledge management is the process of using tools and techniques and method, and a set of activities for gathering information and making it available to others (Assefa, 2016).

Knowledge management is the collection of processes that govern the creation, dissemination and leveraging of knowledge to fulfil organizational objectives (Lee et al., 2000). Knowledge Management is a framework within which the organization views all its processes as knowledge processes. Davenport and Prusak (2000), define Knowledge management as the process of identifying, managing, and valuing items that the organization knows or could know. For most knowledge-managing companies today, the challenge that lies ahead is to integrate knowledge management with the familiar aspects of business: strategy, process, culture, behaviour (Davenport and Prusak, 2000).

(Davenport and Prusak (2000), later listed five challenges of knowledge management if resolved can lead to an effective knowledge management in organisations:

1) Linking knowledge management (KM) and fundamental business strategy, making KM the link between business strategy and business performance. For some organizations this means making knowledge the product of the organization. For organizations where knowledge is not the product this means formulating a business strategy supported by knowledge.

2) Linking knowledge to work process. This should be done by ‘baking’ the KM process into key knowledge work processes.

3) Linking knowledge to culture, by installing measures to stimulate knowledge development and sharing.

4) Linking knowledge to behaviour, by promoting the use of knowledge instead of only 'stocking knowledge on the shelves'.

5) Linking knowledge to the physical business environment, by creating a physical workspace that stimulates knowledge creation and transfer. They recall Thomas Allen's 'thirty-meter rule': two scientists or engineers whose desk are more than thirty meters apart have a communication frequency of almost zero. Davenport and Prusak, (2000) stated that pure technology alone is not enough and that technologists should have a strong focus on how to make knowledge content appealing and how to persuade those who have knowledge to put it into a rich knowledge base.

Knowledge management is essentially about getting the right knowledge to the right person at the right time (UNDP, 2012). Knowledge management is based on two critical activities: (1) capture and documentation of individual explicit and tacit knowledge, and (2) its dissemination within the organization (Mekonnen, 2012). Perceiving knowledge management as a condition of organizational success makes it crucial for agricultural extension experts to embrace and engage in it (Omotayo, 2015).

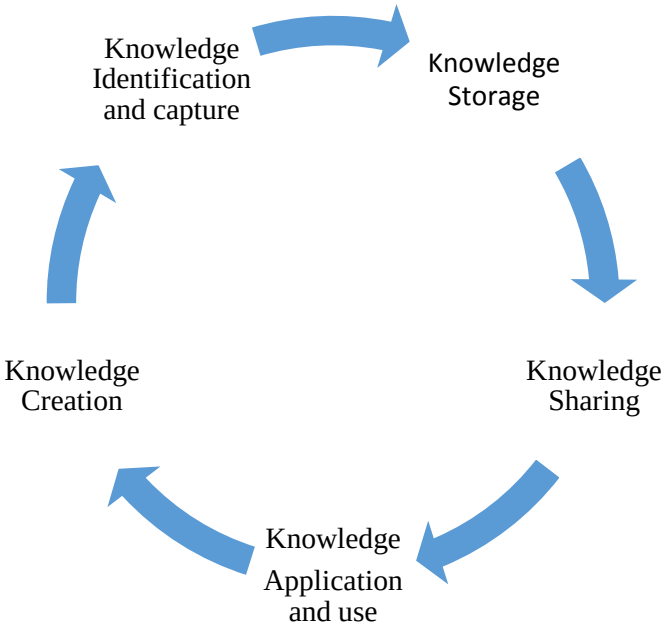

Figure 3: Knowledge Management Process
Source: Field Survey 2017

2.6 Agricultural Extension Provision in Northern Region

Agricultural extension is generally defined as the delivery of information inputs to farmers (Aker, 2011). Numerous research works have identified agricultural extension as a potential propeller of agricultural growth and economic development in developing countries (Aker, 2011). In Ghana, agricultural extension provision is dominated by the public sector with few of the services provided by private agencies (MoFA, 2012).

Although over 90% of the country's food production comes from smallholder farmers, a majority of the small-scale farmers were found to lack the appropriate skills and knowledge

required for efficient and effective farm productivity. The cause of farmers' lack of skills and knowledge was that, the extension approaches used by the public sector were been criticized as ineffective, thus failed to meet farmers' needs (Kwadzo, 2014).

Governments and international organizations have attempted to overcome some of the perceived failures related to agriculture via agricultural extension services in Ghana. ICT was later recognized by the government of Ghana as the appropriate means of ending the extension services provision problems (MoFA, 2014). The evidence of government effort was the establishment of the E-extension unit of MoFA which purpose was to provide extension services using ICTs such as mobile phone and radio.

The primary provider of extension services in the Ghana is the Ministry of Food and Agriculture (MoFA) Department of Agriculture Extension Services (DAES). MoFA has district offices across the region with its extension officers representing communities at the districts. In the drive to decentralize government services, the national government shifted budgetary resources directly to District Offices. The aim was to give district assemblies the power and mandate of managing and hiring extension field officers.

In the northern Region of Ghana MoFA and private agencies provide extension services to farmers. Some of the organisations include Presbyterian Agriculture, ADVANCE Ghana,

ACDEP, Isoko, IPA, Farm Radio International (FRI), Care International and SEND-GHANA.

MoFA extension agents' deliver extension services by establishing direct contacts with farmers through a popular approach known as the training and visit (T&V) approach (Kwadzo, 2014). In this approach extension officers contact farmers directly through community visit to teach farmers new technologies and suggest solutions to problems facing them in their farming occupation. MoFA extension agents' also help farmers to form farmer groups which aids the extension agents' to easily transfer technologies and new knowledge through organized field demonstrations and field visits (Kwadzo, 2014).

IPA deliver extension services using mobile phone and participatory video approaches. Trained community extension agents are provided with mobile phones, digital flat screens, and power generators and have practical agricultural technology practices recorded on external media storage devices. During off-farm seasons, trained agents' organise video streaming sessions for farmers. These trained agents also received weather information and market specific information relating to agricultural inputs and other outputs all year round. The agents intend communicate the information they receive on their mobile portal to farmers under their service communities (Udry et al., 2014).

Isoko which is a profit making organisation provides agricultural information on markets and weather to farmers at a cost by means of voice messages, voice call and sms (David-West, 2010). This is facilitated by mobile service network providers such as MTN and Vodafone.

2.7 Farmers' Attitudes towards Knowledge Management in Agriculture

Palaiah et al. (2016), define attitude as the degree of positive or negative effect with some psychological objects like symbol, phrase, slogan, person, institutions, idea towards which people can differ in varying degrees from the point of view of social psychology. It is the preparedness of people to respond in a certain way towards social object or phenomena. Further, the attitude towards agricultural knowledge management can be operationalized as the positive or negative mental predisposition of respondents towards the use of the knowledge management tools. It is possible to change someone's attitude through persuasion. Attitude can be strong predictors of behaviours (Ajzen, 1991). Policy makers noted that farmers' adjustment to changes in agriculture is influenced by their attitude and mindset (Hothongcum et al., 2014).

Advertising, political campaigns, and other persuasive media messages are all built on the premise that behaviour follows attitude, and attitude can be influenced with the right message delivered in the right way (Savitha and Kannadas, 2014). Kelly's theory of

attribution is the idea that individuals can seek new experiences and practice and adapt new behaviours in order to change their attitudes (or constructs) towards the world (Malle, 2011). Therefore, knowledge of behaviour changes in people can help extension agents' study the attitude of farmers and determine how to approach them with new innovations and technology in order to facilitate adoption.

2.8.1 Gender and Access to Agricultural Knowledge Management Approaches

Gender is an integral component of every aspect of the economic, social, daily and private lives of individuals and societies. Gender comprises a range of differences between men and women extending from the biological to the social practical roles (Bakkabulindi and Sekabembe 2011). The roles ascribed for both men and women differ from societies and cultures. Some societies assign roles and responsibilities to men and women based on their physical capabilities. For instance, roles like caring for the children, cooking, fetching water and firewood, in some societies are seen as women work. Similarly, roles such as ploughing with tractor, fetching firewood, cultivating crops are perceived as men work. These gender roles may hinder men and women from easily adopting to technology use.

Gender equality is crucial to knowledge management strategies that will help to improve food security and nutrition, living conditions, agricultural productivity, and to ensure that rural populations - women, men, and young people - have equal access to resources, goods

and services (Treinen et al., 2010). Several past studies have identified a number of possible reasons why people do not like to share knowledge, including differences in terms of gender and age (Bakkabulindi and Sekabembe 2010).

Women interaction with men rather than their husbands is perceived as an abomination in most rural communities in Ghana. Hence women in Northern Ghana are more likely not to subscribe to knowledge management approaches that involves interactions with other men who are not their husbands. The society perceive women who engage in activities with men rather than their husbands or close relatives are as prostitutes. More men than women patronize direct contacts with extension agents'' knowledge management approach. Women fare poorly when services are delivered through group or community meetings held by extension agents' in Ghana, 0 to 6 percent of women-headed households and 5to 9 percent of women spouses versus 11 to 24 percent of men-headed households participate in meetings. Also 2 to 5 percent of female spouses and only 3 to 7 percent of female-headed households belonged to a CBO (Manfre et al., 2013).

Women's burden of responsibility for productive household and community activities is double or triple of men (Manfre et al., 2013). In many developing countries, women are primarily responsible for household chores including cooking, cleaning, and childcare. This is often in addition to tasks such as collecting water and firewood, cooking, and

informal income-generating activities, and the expectation that they will contribute their labour to the production and processing of crops or livestock under their spouses' management (Manfre et al., 2013). This amounts to a disproportionate amount of time spent on certain types of activities by women. All this women engagements have the tendency of limiting women participation in agricultural knowledge management activities due to time constrains.

An effective knowledge management strategy for agricultural extension practice must hope to bring the communities of extension experts and farmers together in all the knowledge management phases – from knowledge creation to utilization. Any attempt at bridging the knowledge divide between the two communities must be rooted in a knowledge management model that recognizes the significance and complementary roles of both tacit and explicit knowledge in decision-making (UNDP, 2012). Examples of such models are the knowledge conversion model by Nonanka and Takeuchi (1995) and the codification-personalization model by Hansen et al. (1999). These models emphasize the importance of both tacit and explicit forms of knowledge in decision-making. Essentially, they both provide a systematic understanding, development and utilization of knowledge in such a manner that all the processes involved in knowledge management are pursued in a systemic fashion (Boateng, 2006). The multidisciplinary nature of knowledge management makes

it applicable for disseminating agricultural information to farmers. Knowledge management is a continuous process and is it represented in the figure below.

For the circular flow of knowledge management to take place in a revolving motion, the knowledge that will be transferred must be far better than the existing knowledge, and the channel for transmitting it must be both available. Knowledge must be feasible enough to attract consumer's interest to use it. Knowledge is considered fourth to labour in the list of production factors, and is critical in all aspects of management, most especially in the agricultural sector (UNDP, 2012).

2.8.2 Age and Access to Agricultural Knowledge Management Approaches

Age is significant and positively related to adoption of extension services in northern Ghana. Older farmers are more likely to access different types of extension services, but only at a certain age. Because older farmers have comparative advantage in terms of capital accumulated, extension visits and credit worthiness. (Abdul-Hanan and Abdul-Rahaman, 2016).

The application of technological tools in knowledge management though they're not age specific is highly influenced by age of the user. Younger people are most likely to adopt new technologies than older consumers because many of the products selected for research attention, example mobile phone, are particularly attractive to young consumers (Bakkabulindi and Sekabembe 2010). While older farmers may have more experience,

education and farm resources which can be an incentive to try out a technology, young farmers tend to have more schooling and exposure to new ideas that may help to adopt a technology (Bakkabulindi and Sekabembe 2010).

2.8.3 Level of Education and Access to Knowledge Management Approaches

Education is the acquisition of knowledge, skills and values and habit. Education enhances a persons' communication skills, and the ability to elicit meaning out of messages and make informed judgments. Access to agricultural knowledge is associated with acquiring skills and techniques for improving farming practices, sustaining the environment, and optimising production. For this to take place, a strong link between agricultural research and farmers is required (Mtega et al., 2016).

Numerous studies have confirmed that there is a relationship between education and access to agricultural knowledge. Farmers who have better education tend to have greater probability of accepting new ideas than their illiterate counterparts (Abdul-Hanan and Abdul-Rahaman, 2016).

2.9 Knowledge Management in Agricultural Extension

New knowledge among farmers can be promoted, if their extensive tacit knowledge is captured, processed and made available to end users. Agricultural extension can be seen as

a knowledge management process since it is potentially responsible for assessing needs and transferring applicable new knowledge, information and technologies to the end users (Malekmohammadi, 2009). In agriculture, knowledge management is the process of systematically and actively managing and leveraging the stores of knowledge and also the process of transforming information and intellectual assets into enduring values within agricultural knowledge and information system (Malekmohammadi, 2009).

The role of knowledge management in facilitating and influencing decision-makers at all levels to increase extension prioritization and ensure continuous and equitable service delivery is critical. Knowledge management therefore is used for connecting agricultural extension experts and farmers as a precursor to improved knowledge utilization in agricultural practice (Boateng, 2006).

Boateng (2006), emphasized in his paper "Knowledge management working tool for agricultural extension: the case of Ghana", that in order to inform farmers' decisions regarding improved technologies or new ways of farming, it is recommended that agricultural extension experts adopt the circular knowledge management model as it reflects both tacit and explicit forms of knowledge.

2.10 Agricultural Knowledge Management Approaches in Ghana

The technology oriented economy of the 21st century focuses on sharing, organizing, managing and creating information (Cheng and Huang, 2010). This indicates that competition will be driven by knowledge revolution in the future. Evolving use of knowledge management plays an important role to enhance problem solving skills. Previously, knowledge management approaches were focused on business aspects rather than education (Cheng and Huang, 2010).

Agricultural knowledge management approaches in Ghana are the World Bank's Training and Visit (T&V), decentralized extension system, the farmer field schools (FFSs), and the innovative ICT based approaches (IFPRI, FAO and IICA, 2011). The E-extension approach implemented by MoFA and private extension organisations provide advice to farmers on-line, and the promotion of mobile phones and community radio stations (IFPRI, FAO and IICA, 2011). With the E-extension approach, extension service providers use ICT tools such as mobile phones, computers, radios, projectors, LCD/LED screens as their platform for disseminating information to farmers. Several other private organisations have adopted the application of ICTs knowledge management approaches in extension provision. Esoko, a technology-based market information system classified as agricultural informatics or e-agriculture, provides agricultural stakeholders like farmers and traders

with market information such as prices, and a platform for advertising and negotiating buy/sell offers (David-West, 2010). In 2013, Innovation for poverty action (IPA) launched the Disseminating Innovative Resources and Technologies to Smallholders (DIRTS) project in northern region whereby Community Extensions Agents' (CEAs) are being trained to use smart phones to receive messages in rural communities which aid farmers in their year round farming activities (Udry et al., 2014).

The modified T&V system known as the unified extension system was the extension approach that replaced the General Agricultural Extension Approach. The T&V System was adopted in Ghana in 1992 and was designed to address some weaknesses associated with the general agricultural extension Approach (MoFA, 2011). The T&V System assumes that extension workers were not properly trained and, thus, there was a lack of extension staff supervision and regular visitation of farmers. The T&V System prescribes a fixed number of visits to farmers, regular supervision, and in-service training of extension field staff. The T&V System was also found to be characterized by a top-down approach (MoFA, 2011).

The decentralized extension system was adopted and implemented in 1997 to address the problems associated with the previous extension approaches (Kwadzo, 2014). The decentralized extension system assumes that farmers' challenges could be understood and

solved better at a local level. With the decentralized extension system, the power and decision to plan and implement extension programs have been transferred from the national and regional levels to the district level. The main objectives of this approach are to promote responsibilities, participation, and program ownership at the district level. However, the Decentralized Extension System does not emphasize decision making by key stakeholders, the farmers (Kwadzo, 2014).

2.10.1 Mobile Phone Knowledge Management access and use in Extension Delivery

A mobile phone is a portable telephone that can make and receive calls over a radio frequency carrier while the user is moving within a telephone service area. The radio frequency link establishes a connection to the switching systems of a mobile phone operator, which provides access to the Public Switched Telephone Network (PSTN) (Heeks and Richard, 2008). Most modern mobile telephone services use cellular network architecture. Mobile phones support a variety of other services such as text messaging, MMS, email, internet access, short-range wireless communications (infrared, Bluetooth), business applications, gaming, and digital photography. Mobile phones which offer these and more general computing capabilities are referred to as smartphones. The International Telecommunication Union indicates that there has been a rapid growth of mobile phone networks in developing countries over the decade. In Ghana, the National Communication

Authority (NCA) reported that mobile phone subscriptions have increased over time, with overall subscription of 36,534,611 as at the end of May, 2016.

A study by Research ICT Africa Network has shown that Africans are willing to pay a higher proportion of their income for access to telephone than in developed countries indicating among other things, a significant, unfulfilled demand for telephone (Masuki and Tukahirwa. 2010) in Africa. For over two decades now in Ghana, mobile telephony is the predominant mode of communication.

Mobile phone technology has diffused rapidly in the rural areas of the developing countries in recent years. It has an advantage over other ICT tools in terms of its appropriateness for the under-developed local conditions (Fu and Akter, 2012). Unlike mobile phones, other ICT tools suffer from the problem of accessibility and high cost to the poor in geographically disadvantaged areas because of lack of enabling environments such as infrastructure and capital (Fu and Akter, 2012). The information and communication capabilities of the mobile phone can be more valuable to rural populations who are dispersed and isolated from knowledge centres (Sakyi-Dawson and Nudanu, 2013). Aker (2008) studied the impact of the mobile phone rollout on grain markets in Niger and found out that mobile phone service has reduced grain price dispersion across markets by a

minimum of 6.4 percent and reduced intra-annual price variation by 10 percent (Fu and Akter, 2012).

Mobile phones, beyond basic connectivity, offer benefits such as mobility and security to users. Mobile phones as a conduit for accelerated development, particularly in developing and marginalised communities (Global Information Technology report, 2012). The report further established that mobile phones overcome physical infrastructure constraints such as roads, telephone lines. With the pre-paid method, the use of mobile phones has become increasingly affordable to the poor and can therefore be used as a means to ensure greater participation of the poor and marginalised in the development process (Sakyi-Dawson and Nudanu, 2013).

Rural people must be able to respond productively to the opportunities and challenges of economic and technological change, including those that can improve agricultural productivity and food security (FAO, 2003). Innovation is more successful when actors in the sector can communicate with and be heard by their peers and local institutions.

Farmers require relevant knowledge and information, and for that information to be useful, it must be available in a timely manner and o meet the needs of the farmers appropriately (Sakyi-Dawson and Nudanu, 2013).

Development workers have been able to respond productively to the opportunities presented by mobile phone technology, for improved agricultural productivity and food security. In most developing countries now, mobile phones, projectors, television, and radios are the most common ICT tools used for extension services delivery. Uganda for instance has a rapidly growing ICT market with several internet service providers (ISP), privately owned radio and television stations, several ICT training institutions and many donor-funded ICT initiatives (Masuki and Tukahirwa, 2010). In Ghana, MoFA, Isoko, IPA and other extension development organisations provide extension services through ICT tools such as the mobile phone and projectors.

Findings from a research on mobile phones use in agricultural information delivery for rural development in Uganda revealed that, the usage of mobile phone benefit farmers in areas such as productivity, market access, natural resource management and knowledge base (Masuki and Tukahirwa, 2010). In the Northern Region of Ghana, IPA, a development organisation aimed at reducing poverty in rural areas launched an agricultural extension programme which helped farmers learn about the benefits of using agricultural inputs effectively. This programme particularly targeted inputs like improved seeds which have more complicated planting procedures. Mobile phones were given to Community Extension Agents' (CEAs) to access information on weather and commodity market prices

which they in turn were to deliver quickly to farmers via mobile phones. This means mobile phones are increasingly recognised world-wide as a necessary tool for accessing information and knowledge. (Omotesho et al., 2012) reported that mobile phone can promote access to and sharing of information in agriculture and other sectors.

Following the revelations on the importance of mobile phone, there is clear evidence to prove that mobile phone can be effectively used as a tool for knowledge generation, acquisition, absorption and diffusion of farming technology and information.

2.10.2 Participatory Video Knowledge Management access and use in Extension Delivery

Participatory video is just one among the ICT tools that are used for disseminating agricultural Information. Participatory video is an audio-visual tool that conveys information by sound and motion pictures with the help of external storage devices (Wikipedia). Participatory video use started in the late 1960s by Donald Snowden, the then Director of the extension Department at Memorial University of Newfoundland (Fancy, 2015). Participatory video first began in Fogo Island, where poverty was at its peak, with not much communication between the communities that occupied the Island. Snowden and other scientist decided that for the Islanders to survive there is need to form co-operatives that will be used to bring people together so that they share their problems and protect their

cultures. Snowden and his colleagues through the consultation of the communities, therefore, introduced the use of film so that people can be able to tell their stories and also share their problems with others. The film was introduced so that the people could know that they share common problems and therefore, jointly, they could develop solutions to the problems. Since then the use of participatory video expanded to various regions and now it has been applied in various projects around the globe (Fancy, 2015).Participatory videos cannot do all the job of extension. They cannot offer personal advice and support, or answer questions immediately. Participatory video serves better when used for spreading awareness of new ideas and creating interest in farming innovations such as; multiplying the impact of extension activities, sharing experiences with other individuals and communities, reinforcing or repeating information and advice.

Extension agents' can contribute to the successful participatory video by providing materials such as, photographs, recorded interviews with farmers, items of information about extension activities or ideas for new extension films to media producers. In the Northern Region of Ghana, Innovation for poverty action used participatory video approach to educate farmers about general farm management practices and compost preparation in their input use strategies programme implemented in 2014. Participatory video uses both visual and verbal communication methods thus appear to be an appropriate

extension tool for less developed countries (Fancy, 2015). In Ghana, Participatory video was used as a tool to empower innovative farmers to share their innovations to others. Zossou et al., (2009) posits that participatory video is a form of farmer to farmer diffusion since it is the presentation of technical messages from a farmer to another farmer to encourage innovation and trust.

2.10.3 Direct Contacts Knowledge Management Approach in Extension Delivery

Direct contacts with extension agents'' approach refers to the face-to-face interaction between the farmer and extension agent. The direct contacts with extension officers approach is provided by means of the traditional training and visit method. The T&V System is the extension approach that replaced the General Agricultural Extension Approach. The T&V System was first adopted in Ghana in 1978 and was designed to address some weaknesses associated with the General Agricultural Extension Approach (DAES, 2011). MOFA adopted the modified training and visit system for extension management in 1992. This was referred to as the Unified Extension System (UES) whereby all technical subjects were coordinated by the most senior technical officer reporting to a regional and national director for extension (Amezah and Hesse, 2002). The approach is characterised by allocating a whole geographical area to one extension officer. The extension officer provides extension services by making personal visits to farmers. Due to

the large extension worker-to-farmer ratio, an extension worker often meets farmers in groups to deliver extension information. The approach was characterised by problems such as unmatched ratio of field staff to farmers; low levels of training, poor reward systems; gender and transfers (Amezah and Hesse, 2002).

2.11 Effectiveness of Agricultural Knowledge Management Approaches

Effectiveness is defined as the extent to which planned activities are realised and planned results achieved (Carmichael, 2001). Also 'quality' is the degree to which a set of "inherent" characteristics fulfils requirements (Carmichael, 2001). Parasuraman, Zeithaml and Berry (1988) defined perceived quality as "global judgement, or attitude, relating to the superiority of the service".

In order to appropriately deliver effective services, service stakeholders must constantly demonstrate to customers that their services are customer-focused and that continuous performance improvement is being delivered. Given the financial and resource constraints under which service organisations must manage, it is essential that customer expectations are properly understood and measured and that, from the customers' perspective, any gaps in service quality are identified. This information then assists a manager in identifying cost-effective ways of closing service quality gaps and of prioritizing which gaps to focus on given scarce resources. In the case of this research, farmers are the perceived customers.

Majority of the research work to date has attempted to use the SERVQUAL methodology in an effort to measure service quality (Parasuraman et al., 1985). Parasuraman et al. (1988), stated that "service quality perceptions result from a comparison of consumer expectations with actual service performance, and quality evaluations are not made solely on the outcome of service; they also involve evaluations of the process of service delivery". Bitner (2000), implied that customer expectations are beliefs regarding a service that serve as standards against which service performance is judged.

CHAPTER THREE

METHODOLOGY

3.0 Introduction

The chapter described the type of data, the study area, the sampling technique and sampling procedures used for in the study. A description of methods of data collection and data analysis is also presented in this chapter.

3.1 Sources of Data

The research made use of both primary and secondary data. The primary data on effectiveness of various knowledge management approaches patronized was mainly from individual respondents from Tolon, Kumbungu and Sagnarigu districts. The secondary data include published articles from journals on the internet.

3.2 Study Area/ Population

The study was carried out in the Tolon, Kumbungu, and Sagnarigu districts located in the Northern region of Ghana. The three districts were selected due to presence of knowledge management approaches assessment in the area. This was appropriate since these three districts will ascertained the effectiveness of the Knowledge management approaches on agricultural extension delivery.

Tolon district is situated the west of the Northern regional capital, Tamale. It is bounded by North Gonja, West Gonja, Central Gonja and Kumbungu districts. The district capital, Tolon, is 26 Kilometres away from Tamale. The district was part of the then Tolon/Kumbungu district before it was split into two and named Tolon district by the local government act – 1993 (ACT 462), under the 1992 constitution of Ghana, with Tolon named as the district capital. Farming is the major occupation of the people in the communities. The population of Tolon district according to 2010 Population and Housing Census, is 72,990, constituting 49.8 percent males and 50.2 percent females. More than nine out of ten of the population (92.4%) of households in the district are engaged in agriculture. Crop farming is the main agricultural activity with almost ten out of ten (97.5%) households engaged in it (GSS, 2014). The district forms part of the savannah areas with mean annual rainfall ranging between 950mm-1200mm. The major crops grown in the area include maize, rice cassava, and groundnuts. Pepper tomato and okra are also grown massively under the Golinga irrigation scheme in the area.

The Kumbungu district is bounded on the north by Manprugu Moagduri, Tolon and North Gonja district to the West, Savelugu-Nantong and West Mamprusi district to the East and Sagnarigu district to the South. All the people in the district live in rural areas. The population of Kumbungu, according to the 2010 Population and Housing Census, is

39,341, constituting 50.0 percent males and 50.0 percent females (GSS, 2014). Among the employed population of the district, about 88.3 percent are engaged as skilled agricultural, forestry and fishery workers, 6.0 percent in craft and related trades, and 3.1 percent are engaged in services and sales work. The district lies in the savannah zone with an average annual rainfall of 1000mm. The main crops grown in the area include rice, maize, yam, pepper, okra and watermelon. Fishing is a minor occupation in the district undertaken by communities closer to the White Volta which are at the boundaries of the district. The district inhabits one of the largest irrigation schemes (Butanga irrigation scheme) in Ghana which cover's over 2000 hectares of land.

The population of Sagnarigu District, according to the 2010 Population and Housing Census, is 148,099 representing 6 percent of the region's total population. Males constitute 50.6 percent and females represent 49.4 percent with an urban population of 93,550, representing 63.2 percent of the total population (GSS, 2014). The district is bounded by the tamale metropolis, Kumbungu, Savelugu Nantong and the Tolon districts. The district lies within the Savannah Woodland region with average rainfall ranging from 600mm to 1100mm, the peak being usually between July and August. Most part of the District is urban. In the rural localities, 47.9 percent of the households are agricultural households while in the urban localities, 29.9 percent of households are into agriculture. Most

agricultural households in the district (84.2%) are involved in crop farming. The main crops cultivated are cereals like maize, rice and millet, and some local and exotic vegetables like tomatoes, pepper, onions, carrot, cabbage, onions, lettuce, and cucumber. The vegetables are grown in the dry season along the major drains in the area.

3.3 Sample Size

Since there is no adequate resource and time to study the whole population, a sample size was selected to represent the whole population of concern.

The total farmer population in the three districts was estimated to be over 50,000 (GSS, 2014). This justifies the application of the Godden formula (2004) to select the sample size for the research. Following Godden (2004), the sample size can be determined using the formula:

$$ss = \frac{z^2 \times (p) \times (1-p)}{c^2} \qquad (1)$$

Where; SS = Sample Size, Z = Z-value[A] (e.g., 1.96 for a 95 percent confidence level)

P = Percentage of population picking a choice, expressed as decimal[B] and

C = Confidence interval, expressed as decimal (e.g., .04 = +/- 4 percentage points)

If P = 60% (0.6), C = 45% (0.04 = ± 4), Z = 1.96 for 95% confidence level (1.69)

$$ss = \frac{1.96^2 \times (0.6) \times (1-0.6)}{0.04^2}, \quad SS = 455.3$$

For the purpose of proportionate allocation, the sample size of 450 respondents among the three selected districts was used for the study. A sample of 450 respondents among the three selected districts was for the study.

3.4 Sampling Procedure

A multistage sampling technique was employed to select 450 farmers for interview during the 2015/2016 cropping season. In the first stage of the sampling process three districts including Tolon Municipality, Kumbungu district and Sagnarigu district were purposively selected. In the second stage of the sampling process, 30 communities were randomly selected out of the three districts, 10 communities from each district for the sample population. Based on the district local area council zoning, 10 communities were randomly selected from each of the districts. Finally, 15 respondents were randomly selected from each of the 10 communities to represent the sample size for the research. 150 farmers were selected from each district, thus making up the total sample selected for the research. The sampling was based on the fact that three of the agricultural knowledge management approaches assessed in this research are fully operational in these three districts managed by MoFA and other extension stakeholder organizations. It was therefore pertinent to select the farmers from these operational areas for the study.

3.5 Methods of Data Collection

Different data collection techniques were employed to collect data for the survey. Semi-structured questionnaire, interviews, and focus group discussions were employed to collect data for the study. Secondary data on agricultural knowledge management approaches available in the study area was obtained from journals, articles on the internet, the Tolon district department of Agriculture, and libraries.

3.6 Pretesting of Questionnaires

Initial elicitation studies were conducted on the Theory of Planned Behaviour to ascertain the behavioural profiles of farmers. Twenty-five (25) respondents were used for the elicitation study. The complete questionnaire for the study was then designed from the responses from the elicitation study.

It is widely assumed that no matter how much developmental and pretesting work is done on a questionnaire, the instrument must still be tested under field conditions (Fowler, 1993; Czaja and Blair, 1996). Field testing generally means administering a questionnaire to respondents selected from the target population using the procedures that are planned for the main study. Respondents were selected using simple random sampling and 20 questionnaires tested on the respondents from the population of the study. All the twenty questionnaires were printed on paper and administered by enumerators. Enumerators

approached farmers in their homes, sort famer's attention and explained the questions to famers in their local languages. Response from farmers were equally transcribed in the questionnaire by the enumerators. Farmers who could read and write were handed over the questionnaire to respond directly by themselves. The pretest questionnaire were edited, coded, entered into a computer using SPSS version 20 and cleaned to ensure accuracy consistency, validity and reliability. The validity and reliability of data were tested separately on each part of the questionnaire using SPSS, and the results obtained showed that the data was adequately valid and reliable for analysis. After the pretest, 19 questions out of 20 were considered suitable for the SERVQUAL model. The reason for removing the question was that farmers' response showed they were not interested in the visual appearance of the personnel delivering the services. Some famers who patronize mobile phone approach stressed that they cannot see the one delivering the service so they do not care about personal appearance of service providers. So the tangibility question, "is the appearance of the service personnel visually appealing?" was removed from the questionnaire.

3.7 Data Analysis

Each objective of the research was analyzed employing appropriate statistical analytical tools. The demographic data was analyzed using descriptive statistics and results are presented in the form of tables and percentages.

The first objective was to assess intention of farmers towards agricultural knowledge management approaches. A five point Likert scale containing items with response categories ranging from Strongly Agree (SA) with a score of five to Strongly Disagree with a score of one for each statement was developed. Each of the statements indicates the intention of farmers using any of the three agricultural knowledge management approaches. Spearman's rank correlation which is an inferential statistical tool was used for the analysis. This is because it has the ability to determine the level of correlation between farmers' attitude and intention towards agricultural knowledge management approaches.

In order to determine the effects of theory of plan behaviour predictors thus attitude (ATT), perceived behavioural control (PBC), subjective norm (SN) on farmers' intention to patronize agricultural knowledge management approaches, this study used multiple linear regression as indicated in equation (1) below:

$$Y_i = \alpha_o + \alpha_1 ATT_i + \alpha_2 PBC_i + \alpha_3 SN_i + \varepsilon_i \quad \ldots\ldots (2)$$

Where: Y_i is the overall intention of the ith farmer to patronize agricultural knowledge management approach, α_o is the intercept whilst α_1, α_2, and α_3, represent the standardised regression coefficients which respectively measure the magnitude of impacts of attitude (ATT), perceived behavioural control (PBC) and subjective norm (SN) on farmers' intention to patronize agricultural knowledge management approach.

ATT_i, PCB_i, and SN_i, represent attitude, perceived behavioural control and subjective norm ε_i represents the error term which measures the factors that affect ith farmer's intention to patronize agricultural knowledge management service delivery but not included in the model. Multiple linear regression was used because the research measurement was between intention predictors which are continuous variables, and Intention which is the only dependent variable.

The second objective was analyzed using Pearson Chi–square statistical test in order to test the significance of relationships between respondents' personal characteristics (Age gender, educational level) and farmers' intention to patronize agricultural knowledge management approaches. Pearson Chi Square was used because it can measure well respondents' personal characteristics (age gender, educational level) fit into expected variables. A significance level of 5% was used for the test. Results are presented in the form of frequencies, tables, and are used to simplify the understanding of the findings.

The third objective was analyzed using descriptive statistics and results presented in tables, frequencies and percentages.

The fourth objective was analyzed using the SERVQUAL methodology. The SERVQUAL instrument was used to ascertain any actual perceived gap between customer expectations and perceptions of the services offered. Service gaps were recorded for five (5) main SERVQUAL dimensions. These are,

1. Tangibility. Physical facilities, equipment and appearance of personnel.
2. Reliability. Ability to perform the promised service dependably and accurately.
3. Responsiveness. Willingness to help customers and provide prompt service.
4. Assurance. Knowledge and courtesy of employee and their ability to inspire trust and confidence (including competence, courtesy, credibility and security).
5. Empathy. Caring and individualised attention that the service providers provides to its customers (including access, communication, understanding the customer).

After an initial elicitation study and discussions with farmers during the focus group meetings, all the five SERVQUAL dimensions were deemed appropriate for the research. Farmers were pretested with nineteen (19) questions (see appendix 1) to gauge the effectiveness of extension service delivery. The rationale for some of the statements are provided as follows: The tangibility statement was included to measure the attractiveness

of the physical facilities used by the service provider since it could also be a means to attract farmer's patronage to a particular extension approach. However, the statement on how neat the service provider appears was removed because, for instance under mobile phone extension, the farmer cannot see the service provider. The empathy dimension was included to measure how caring service providers are, and the individualized attention extension providers provide to customers. The reliability statements measured the ability of the service providers to perform the promised service dependably and accurately. The responsiveness statements measured willingness of service providers to help customers and provide prompt service. And finally, the assurance statement measured the knowledge and courtesy of service providers and their ability to inspire trust and confidence.

A five point Likert scale containing items with response categories ranging from Strongly Agree (SA) with a score of five points to Strongly Disagree with a score of one point for each statement was developed. Reliability of the questionnaire data was tested and the Cronbach's alpha coefficient value was 0.771, indicating the high reliability of the SERVQUAL questionnaire data. This shows that the items on the subscales were internally consistent when compared to the minimum of 0.50 suggested by Nunnally (1967). Farmers' responses were analyzed using SPSS. The average of expected service quality and perceived service quality statements were estimated, after which the resultant value of

perceived statements subtracted from the expected statements. The value obtained after estimating the difference was then taken as the gap score. The total weighted SERVQUAL value was then used to determine whether farmers are satisfied with the knowledge management approach or not. The interpretation of the gap values (Parasuraman et al. 1985) were analyzed considering the following statements:

a) "When Expectations (ES) > Perceptions (PS); perceived quality is less than satisfactory and will tend toward totally unacceptable quality, with increased discrepancy between ES and PS".

b) "When ES=PS; perceived quality is satisfactory

c) When ES< PS; perceived quality is more than satisfactory and will tend towards ideal quality, with increased discrepancy between ES and PS"

Multiple linear regression analysis was used to assess the impact of SERVQUAL dimensions on the intention to use extension approaches. The equation was represented below as

$$Y_i = \beta_o + \beta_1 X_{1i} + \beta_2 X_{2i} + \beta_3 X_{3i} + \beta_2 X_{4i} + \beta_5 X_{5i} + e_i \quad \text{..... (3)}$$

Where Y_i is the overall intention of ith farmer to use knowledge management approach, β_o is the intercept and $\beta_1, \beta_2, \beta_3, \beta_4$ and β_5 represent the standardised regression coefficients which respectively measure the magnitude of impacts of tangibility, reliability,

responsiveness, assurance and empathy on farmers' intention to use agricultural knowledge management approach. $X_{1i,}$ $X_{2i,}$ $X_{3i,}$ X_{4i} and X_{5i} represent tangibility, reliability, responsiveness, assurance and empathy respectively of ith farmer, e_i represents the error term which measures the factors that affect farmers' intention to patronize agricultural knowledge management approach but not included in the model.

Although SERVQUAL was developed within the marketing sector, it is also used in a variety of organizational settings, including libraries and information centers.

CHAPTER FOUR

RESULTS AND DISCUSSIONS

4.0 Introduction

This chapter discusses the socio-demographic characteristics of farmers and their responses towards the agricultural knowledge management approach they patronize. The socio-demographic characteristics examined included age, gender, marital status, household size, educational level and farm group. The chapter also presents analysis and discussions of objectives stated in this research.

4.1 Farmers Socio-demographic Characteristics

Findings as shown in Table 4.1 below shows the percentage distribution of the socio demographic characteristics of farmers included in the study. The socio-demographic characteristics of the farmers include age, sex, marital status, household size, educational level and farmer group.

Within the age categories, 33.6% of respondents fell within 31-40 years, 28.2% of the respondents were 21-30 years; 18.7% were 41-50 years; and 51-60 years were 7.8% while 6.0 %were within 18-20. Those who are 60 years and above constituted 5.8% of the respondents.

Among the farmers who were interviewed, 92% of the farmers were male whilst 8% of the farmers were female. The percentage distribution indicating large number of male farmers and small number of female farmers was for a reason that respondents were randomly selected and few women willingly responded to the questionnaire.

Three hundred and sixty-six (81.3%) of the farmers were married, eighty (17.8%) were single, one (0.2%) was divorced, and three (0.7%) were widowed.

The household size of farmers in the area are (0-10 members) representing 314 (69.8%), 11-20 members making up 116 (25.8%) and greater than 20 members constituting 20 (4.4%).

Regarding levels of education, the study revealed that 240 (53%) of the farmers had no formal education, 66 (14.7%) had primary education, 66 (14.7%) had junior high school education, 56 (12.4%) had senior high school education, and only 22 (4.9%) percent of the farmers had tertiary education.

In terms of membership to farmer group, the survey showed that 196 (43.6%) of the farmers belong to a farmer group whilst 254 (56.4%) do not belong to any farmers' groups. This is reported in table 4.6 below.

Table 4.1: Socio-Demographic Characteristics of Farmers

Characteristic	Frequency	Percentage
Age		
11-20	27	6.0
21-30	127	28.2
31-40	151	33.6
41-50	84	18.7
51-60	35	7.8
60 and above	26	5.8
Farmers' sex		
Male	413	92%
Female	37	8%
Marital Status		
Married	366	81.3%
Single	80	17.8%
Divorced	1	0.2%
Widowed	3	0.7%
Household Size		
0-10	314	69.8%
11-20	116	25.8%
20 and above	20	4.4 %
Education		
Primary School	66	14.7%
Junior High School	66	14.7%
Senior High School	56	12.4%
Tertiary	22	4.9%
No formal education	240	53.3%
Farmer group		
Yes	196	43.6%
No	254	56.4%

Source: Field survey 2017

4.2 Farmers' Intention to Patronize Knowledge Management Approaches

Spearman Correlation was used to assess whether or not there is a relationship between intention and the behaviour using the predictors of behaviour (attitudes, subjective norm, and perceived behavioural control). The condition for using the Spearman correlation is that data should be ordinal.

4.2.1 Intention and Attitude towards Mobile Phone (AKMA)

Findings as shown in Table 4.2 shows Spearman correlation coefficients obtained after computing to assess the strength of the relationship between: (1) easy access to relevant agricultural information and farmers' intention to use mobile phone(2) ability of farmers to use extension messages from mobile phone to plan farming activities well and farmers' intention to use mobile phone (3) farmers' ability to learn good farming practices through the use of mobile phone to access agricultural information and farmers' intention to use mobile phone(4) accessing agricultural extension information through mobile phone to help farmers increase yield and farmers' intention to use mobile phone(5) the easy with which farmers can use mobile phone to link with consumers of farm produce and farmers' intention to use mobile phone (6) the easy with which farmers can use mobile phone to link with input dealers and farmers' intention to use mobile phone(7) ability of farmers to use extension messages from mobile phone to reduce cost of farming operation and farmers'

intention to use mobile phone (8) the easy understanding of voice agricultural extension messages received through mobile phone and farmers' intention to use mobile phone.

All the correlation coefficients were statistically significant at 5% implying there are relations between the farmers' attitudes and their intention to use mobile phone.

Table 4.2: Relationship between Intention and Attitude under Mobile Phone (AKMA)

Attitude * Intention	Correlation Coefficient (r)	Coefficient of determination (r^2)	Barrier or a driver
1. Easy access to relevant agricultural information easily	0.607**	0.368	Driver
2. Mobile phone messages helps me plan my farming activities well	0.856**	0.733	Driver
3. mobile phone messages helps me develop my knowledge on good farming practices	0.814**	0.663	Driver
4. mobile phone messages helps me increase my yield	0.451**	0.203	Driver
5. mobile phone helps me have easy link to consumers of my farm products	0.317**	0.100	Driver
6. mobile phone helps me have easy link to input dealers	0.246	0.060	Driver
7. mobile phone helps reduce my cost of farm operation	0.359**	0.129	Driver
8. voice messages makes me understand better using mobile phone	0.540**	0.292	Driver

Note: ** Correlation is significant at the 0.05 level (2-tailed).

Source: Field survey, 2017

The Spearman correlation coefficients of 0.856 and 0.814 indicates that there are strong positive correlations between ability of farmers to use extension messages from mobile phone to plan farming activities well and farmers' intention to use mobile phone; and ability of farmers to learn good farming practices through the use of mobile phone to access agricultural extension and farmers' intention to use mobile phone respectively. The indicative statements which have intermediate positive correlation with farmers' intention to use mobile phone are easy access to relevant agricultural information through the use of mobile phone, accessing agricultural extension information through mobile phone to help farmers increase yield, the ease with which farmers can use mobile phone to link with consumers of farm produce, ability of farmers to use extension messages from mobile phone to reduce cost of farming operation and the easy understanding of audio agricultural extension messages received through mobile phone. From Table 4.2, it was only correlation between the ease with which farmers can use mobile phone to link with input dealers and farmers' intention to use mobile phone that recorded a weak positive correlation.

4.2.2 Relationship between Intention and Perceived Behavioural Control under Mobile Phone (AKMA)

A Spearman correlation coefficient was computed to assess the relationship between "finding difficulty in interpreting and understanding extension messages using mobile

phone" and farmers' intention to use mobile phone. Even though, a correlation coefficient of -0.401 was statistically significant at 5%, it showed a negative relationship between difficulty in interpreting and understanding extension messages using mobile phone and farmers' intention to use mobile phone. This implies that if farmers have difficulty in interpreting or understand extension messages using the mobile phone, then their intention to use mobile phone for agricultural extension information will decrease. As seen in the Table 4.3, a coefficient of determination was 0.160 indicating that 16% of the variation in farmers' intention to use mobile phone is explained by the difficulty farmers' face in interpreting and understanding agricultural extension messages using mobile phone. It was reported in Uganda (Masuki and Tukahirwa, 2010) that the main challenges that impeded rural farmers' mobile phone usage was language barrier due to illiteracy.

Also a correlation coefficient recorded in table 4.3 for the relationship between the statement "I do not get information on time using mobile phone for receiving extension information" and intention to use mobile phone was -0.381. This value was statistically significant at 5% indicating an intermediate negative relationship between the two variables. It therefore implies that an increase in farmers' inability to obtain agricultural extension messages on time using mobile phone decreases their intention to use mobile phone for agricultural extension information.

Table 4.3: Relationship between Intention and Perceived Behavioural Control under Mobile Phone (AKMA)

Perceived Behavioural Control * Intention	Correlation Coefficient (r)	Coefficient of determination (r^2)	Barrier or a driver
1. difficulty to interpret or understand information from Mobile phone	-0.401**	0.160	Barrier
2. not getting information on time using Mobile phone	-0.381**	0.145	Barrier
3. difficulty to get exact information on my crop type using Mobile phone	-0.374**	0.139	Barrier

Note ** Correlation is significant at the 0.05 level (2-tailed).

Source: Field survey, 2017

The statement "I find it difficult to get exact information on my crop type using mobile phone for extension information" and farmers' intention to use mobile phone are correlated since the Spearman correlation coefficient was statistically significant at 5%. The correlation coefficient value of -0.374 indicates an intermediate negative relationship between the two variables. This means that if a farmer had difficulty in obtaining exact information on the type of crop he or she cultivates using mobile phone for agricultural extension information, then his or her intention to use mobile phone for agricultural extension information will decrease.

4.2.3 Relationship between Intention and Subjective Norm under Mobile Phone (AKMA)

A correlation coefficient of 0.740 was obtained from the Spearman's correlation test in SPSS to establish the strength of the association between the personal belief statement "NGOs think that I should use mobile phone for accessing agricultural information" and farmers' intention to use mobile phone. The association between these two variables had an intermediately negative association since the correlation coefficient was positive and statistically significant, within $0.25 \leq r < 0.75$. This indicates that if NGOs recommend the use of mobile phone for accessing agricultural information to farmers, it will increase their intention to use mobile phone for such purposes.

The correlation coefficient between the statement "religious leaders think I should use mobile phone to access agricultural information" and intention to use mobile phone was 0.825 and statistically significant. Since the value was greater than 0.74, the correlation between religious leaders convincing farmers to use mobile phone to access agricultural information and their actual intention to use mobile is strong and positive. The positive sign means that if religious leaders recommend the use of mobile phones for extension to farmers, the latter will feel more inclined to use mobile phone for agricultural extension information. Therefore, religious leaders' recommendation of mobile phones for extension

to farmers is a driver of farmers' intention to use mobile phone for agricultural extension information.

Table 4.4: Relationship between Intention and Subjective Norm under Mobile Phone (AKMA)

Subjective Norm * Intention	Correlation coefficient (r)	Coefficient of determination (r^2)	Barrier/ a driver
1. NGOs think that I should use Mobile phone to access agricultural Information	0.740**	0.548	Driver
2. Religious leaders think that I should use Mobile phone to access agricultural Information	0.825**	0.681	Driver
3. Extension agents' think that I should use Mobile phone to access agricultural Information	0.873**	0.687	Driver
4. Opinion leaders think that I should use mobile phone to access agricultural information	0.808**	0.400	Driver

Note: ** Correlation is significant at the 0.05 level (2-tailed).

Source: Field survey, 2017

The statement "agricultural extension agents' think I should use mobile phone to access agricultural information" and intention to use mobile phone strongly correlates. This is because a correlation coefficient of 0.873 is greater than 0.74 and statistically significant at 5%. The positive sign between the two variables indicates that, if extension agents' recommend the use mobile phone to farmers for access to agricultural extension

information, it will indeed increase farmers' intention to use mobile phone for agricultural extension information.

The statement "opinion leaders think I should use mobile phone to access agricultural information" is a driver to farmers' intention to use mobile phone to access agricultural extension information. The correlation coefficient value of 0.808 indicates a strong positive and significant relationship between opinion leaders' recommendation to farmers to use mobile phone to access agricultural information and farmers' actual intention to use mobile phone to access agricultural extension information.

4.2.4 Relationship between Intention and Behaviour Predictors under Mobile Phone (AKMA)

The results of the Spearman correlation as shown in Table 4.10 indicates the association between intention and three predictor variables; attitude (ATT), perceived behavioural control (PBC) and subjective norm (SN), recorded correlation coefficients of 0.851, -0.323 and 0.846 respectively. The results showed that both attitude and subjective norm were statistically significant at 5%. Also, they were strongly and positively associated with farmers' intention to use mobile phone to receive agricultural extension information. Conversely, perceived behavioural control was negatively associated with farmers' intention to use mobile phone to receive agricultural extension information since a

correlation coefficient of -0.323 fall between $0.25 \leq r < 0.75$. Even though the association is negative, it was statistically significant.

Table 4.5: Relationship between Intention and Behaviour Predictors under Mobile Phone (AKMA)

Intention * TPB predictors	Correlation coefficient (r)	Coefficient of determination (r^2)
Attitude (Att)	.851**	0.724
Perceived Behavioural Control (Pbc)	-.323**	0.104
Subjective Norm (Sn)	.846**	0.715

Note: ** Correlation is significant at the 0.05 level (2-tailed).
Source: Field survey, 2017

The positive signs show that as attitude and subjective norm increases, farmers' intention to use mobile phone to receive agricultural extension information also increases. Therefore, attitude and subjective norm contribute greatly to the overall intention of farmers to use mobile phone to access agricultural extension information. The negative value recorded for perceived behavioural control means, as farmers perceived behavioural control increases, their intention to use mobile phone decreases. As shown in the Table 4.5, the coefficient of determination for attitude, perceived behavioural control and subjective norm were 0.724 and 0.715 respectively. This means that 72.4% of the variations in farmers' intention to use mobile phone to receive agricultural extension information is determined by farmers' attitude towards mobile phone knowledge management approach. 71.5% of the variations

in farmers' intention to use mobile phone to receive agricultural extension information is determined by the influence of other people such as opinion leaders,

NGOs, extension agents' and religious leaders. 10.4% of the variation in intention to use mobile phone is determined by the perceived behavioural control statements.

4.2.5 The Impact of Behaviour Predictors on Intention to use Mobile Phone (AKMA)

Multiple linear regression analysis was used for predicting farmers' intention towards mobile phone provision from their attitude, subjective norm and perceived behavioural control. The regression coefficients are shown in table 4.6 below.

Table 4.6: Impact of Behaviour Predictors on Intention towards Mobile Phone (AKMA)

Predictor	**β**	**Sig**	**r^2**
Attitude	0.425	0.0**	0.106
Perceived behavioural control	0.101	0.0**	0.032
Subjective Norm	0.429	0.0**	0.108
$R^2 = 0.693$, F = 339.047			

**$p < .05$

Source: field survey, 2007

The multiple regression model recorded an overall fit value (F) of 339.047, which was significantly different from zero, hence the null hypothesis that attitude, subjective norm and perceived behaviuoral control has no joint influence on intention to use mobile phone

was rejected. From the results all the three predicted factors were statistically significant at 1%. This implies that attitude, perceived behavioural control and subjective norm are all making significant and unique contributions to the prediction of farmers' intention to use mobile phone for agricultural extension delivery. The R-square value of 0.693 implies, about 69.3% variation in intention is determined by the behaviour predictors (attitude, subjective norm and perceived behavioural control). 30.7% of the variation in intention may be attributed to other factors.

As shown in the Table 4.6, the partial correlation values show that subjective norm recorded the highest impact with a coefficient of determination of 10.8%, followed by attitude (10.6%) and perceived behavioural control contributed the least (3.2%).

4.2.6 Relationship between Intention and Attitude under Participatory Video (AKMA)

From the Table 4.12, Spearman correlation coefficients were computed to assess the strength of the relationship between (1) easy access to relevant agricultural information and farmers' intention to use participatory video, (2) ability of farmers to use extension messages from participatory video to plan farming activities well and farmers' intention to use participatory video(3) ability of farmers to learn good farming practices through the use of participatory video to access agricultural information and farmers' intention to use

participatory video(4) accessing agricultural extension information through participatory video to help farmers increase yield and farmers' intention to use participatory video(5) the ease with which farmers can use participatory video to link with consumers of farm produce and farmers' intention to use participatory video(6) the ease with which farmers can use participatory video to link with input dealers and farmers' intention to use participatory video (7) ability of farmers to use extension messages from participatory video to reduce cost of farming operation and farmers' intention to use participatory video and (8) the ease in understanding of video agricultural extension messages received through participatory video and farmers' intention to use participatory video.

Table 4.7: Relationship between Intention and Attitude under Participatory Video (AKMA)

Attitude * Intention	Correlation Coefficient r	Coefficient of determination r^2	Barrier/ Driver
1. Participatory video helps me to access relevant agricultural information easily	0.563**	0.316969	Driver
2. Extension messages from participatory video helps me plan my farming activities well	0.556**	0.309136	Driver
3. Extension messages from participatory video helps me develop my knowledge on good farming practices	0.519**	0.269361	Driver
4. Participatory video helps me increase my yield through reliance on agricultural information from this source (4)	0.444**	0.197136	Driver
5. Participatory video helps me have easy link to consumers of my farm products	0.154**	0.023716	Barrier
6. Participatory video helps me have easy link to input dealers	0.047	0.002209	Barrier
7. Participatory video helps reduce my cost of farm operation	0.208**	0.043264	Driver
8. On-farm demonstrations makes me understand better using participatory video	0.512**	0.262144	Driver

Note: ** Correlation is significant at the 0.05 level (2-tailed).

Source: Field survey, 2017

All the correlation coefficients were statistically significant at 1% except for participatory video helping farmers to have easy link to input dealers and farmers' intention to use

participatory video. Implying there are relationships between farmers' attitudes and their intention to use participatory video except in the statement, "participatory video helps me to have easy link to input dealers and farmers' intention to use participatory video". The Spearman correlation coefficients of 0.563 and 0.556 indicates that there are strong positive correlations between access to relevant agricultural information using participatory video and farmers' intention to use participatory video; and extension messages helping farmers to plan their farming activities well and farmers' intention to use participatory video respectively. The indicative statements which have weak positive correlations with farmers' intention to use participatory video were: using participatory video helps me develop my knowledge on good farming practices, participatory video helps me increase my yield, participatory video showing on-farm demonstrations helps me understand better, participatory video help me have easy link to consumers of farm produce, participatory video reduce farming operational cost. As shown in the Table 4.7, there was no correlations between easy link to input dealers and farmers' intention to use participatory video.

The coefficient of determination in the Table 4.7 showed the percentage contribution of participatory video statements to the variation in intention to use participatory video for accessing agricultural information. The highest coefficient of determination recorded was 0.316969. Which means that about 31.7% of the variation in intention to use participatory

vide was determined by "using participatory video helps me have relevant agricultural information". The lowest coefficient of determination recorded was 0.002209, which means that 0.2% of the variation in intention was determined by participatory video helps me have easy link to input dealers.

4.2.7 Relationship between Intention and Perceived Behavioural Control under Participatory Video (AKMA)

A Spearman correlation coefficient was computed to assess the relationship between the statements "finding difficulty in interpreting/understanding extension messages using participatory video" and farmers' intention to use participatory video. Even though, the correlation coefficient of -0.536 was statistically significant at 5%, it shows a negative relationship between difficulty in interpreting/understanding extension messages using participatory video and farmers' intention to use participatory video. This implied that if farmers had difficulty in interpreting or understand extension messages using the participatory video, then their intention to use participatory video for agricultural extension information will decrease.

Table 4.8: Relationship between Intention and Perceived Behavioural Control under Participatory Video (AKMA)

PBC * Intention	Correlation coefficient r	Coefficient of determination r^2	Barrier/Driver
1. I find it difficult to interpret/understand information from Participatory video	-0.536**	0.287	Driver
2. I do not get information on time using Participatory video for receiving extension information	-0.708**	0.503	Driver
3. Sometimes I find it difficult to get exact information on my crop type using Participatory video for extension information	-0.453**	0.205	Driver

Note: ** Correlation is significant at the 0.05 level (2-tailed).

Source: Field survey, 2017

As shown in the table 4.8, the coefficient of determination was 0.287 indicating that 28.7% of the variation in farmers' intention to use participatory video is largely due to the difficulty farmers' face in interpreting/understanding agricultural extension messages using participatory video.

The correlation coefficient recorded in Table 4.8 for the relationship between the statements "I do not get information on time using participatory video for receiving extension information" and intention to use participatory video is -0.708. This value was statistically significant at 5% indicating a strong negative relationship between the two

variables. It therefore implies that increase in farmers' inability to get agricultural extension messages on time using participatory video decreases their intention to use participatory video for agricultural extension information.

The statement "I find it difficult to get exact information on my crop type using participatory video for extension information" and farmers' intention to use participatory video are correlated since the Spearman correlation coefficient is statistically significant at 5%. The correlation coefficient value of -0.453 indicated an intermediately negative relationship between the two variables implying that if a farmer finds it difficult to get exact information on the type of crop he or she cultivates using participatory video to access agricultural extension information, then his or her intention to use participatory video for agricultural extension information will decrease.

4.2.8 Relationship between Intention and Subjective Norm under Participatory Video (AKMA)

A correlation coefficient of 0.302 was obtained after estimating Spearman's correlation test in SPSS to establish the strength of the association between the personal belief statement "NGOs think that I should use participatory video for accessing agricultural information" and farmers' intention to use participatory video. The association between these two variables is positive but weak association. The correlation coefficient was

positive and statistically significant between $0.25 \leq r < 0.75$. The statistically significant positive coefficient value recorded between the two variables meant that, if NGOs recommend the use of participatory video for accessing agricultural information to farmers, it will increase their intention to use participatory video for such purposes. This implied that NGO's recommendations can promote farmers' intention to use participatory video for agricultural information.

The correlation coefficient between "religious leaders think I should use participatory video to access agricultural information" and intention to use participatory video was 0.443 and statistically significant and positive. The positive sign meant that if religious leaders recommend the use of participatory video knowledge management approach to farmers, the latter will feel more inclined to use participatory video for agricultural extension information. Therefore, religious leaders' recommendation of participatory video knowledge management approach to farmers increased their intention to use participatory video for agricultural extension information.

The statement "agricultural extension agents' think I should use participatory video to access agricultural information" and the farmer's intention to use participatory video was positively correlated. This was because the correlation coefficient value of 0.494 was statistically significant at 5%. The strong positive correlation between the two variables

meant that, if extension agents' recommended farmers use of participatory video to access agricultural extension information, it would have indeed increased farmers' intention to use participatory video for agricultural extension information.

The statement "opinion leaders think I should use participatory video to access agricultural information" increased farmers' intention to use participatory video to access agricultural extension information. The correlation coefficient value of 0.417 indicated a positive and significant relationship between opinion leader's recommendation to farmers' use of participatory video to access agricultural information and farmers' actual intention to use participatory video to access agricultural extension information.

Table 4.9: Relationship between Intention and Subjective Norm under Participatory Video (AKMA)

Subjective Norm*Intention	Correlation Coefficient r	Coefficient of determination r^2	Barrier/Driver
1. NGOs think that I should use participatory video to access agricultural Information	0.302**	0.091	Driver
2. Religious leaders think that I should use participatory video to access agricultural Information	0.443**	0.196	Driver
3. Extension agents' think that I should use participatory video to access agricultural Information	0.494**	0.244	Driver
4. Opinion leaders think that I should use participatory video to access agricultural information	0.417**	0.174	Driver

Note: ** Correlation is significant at the 0.05 level (2-tailed).

Source: Field survey, 2017

4.2.9 Relationship between Intention and Behaviour Predictors under Participatory Video (AKMA)

The results of the Spearman correlation for the relationship between intention and behaviour predictors are shown in Table 4.10. The association between intention and three predictor variables; attitude (ATT), perceived behavioural control (PBC) and subjective norm (SN), recorded correlation coefficients of 0.520, -0.612 and 0.485 respectively.

The results showed that all behaviour predictors were statistically significant at 5%. Attitude and subjective norm were strongly and positively associated with farmers' intention to use participatory video to receive agricultural extension information. Perceived behavioural control was negatively associated with farmers' intention to use participatory video to receive agricultural extension information since the correlation coefficient recorded was -0.612. Even though the association is negative, it is still statistically significant. The negative correlation sign showed that as perceived behavioural control increases, farmers' intention to use participatory video decreases. The positive correlation signs of attitude and subjective norm showed that as attitude and subjective norm increases, farmers' intention to use participatory video to receive agricultural extension information also increases. Therefore, attitude and subjective norm statements contributeed positively to the overall intention of farmers to use participatory video to access agricultural extension information while perceived behavioural control statements contributed negatively to farmers' overall intention to use participatory video for accessing agricultural information.

As shown in the table 4.10, the coefficient of determination for attitude and subjective norm were 0.270 and 0.235 respectively. This means that 27.0% of the variations in farmers' intention to use participatory video to receive agricultural extension information was determined by attitude statements. 23.5% of the variations in farmers' intention to use

participatory video to receive agricultural extension information was determined by subjective norm statements. The coefficient of determination for perceived behavioural control recorded 0.374. This means that 37.4% of the variation in farmers' intention to use participatory video was determined by the perceived behavioural control statements. This corroborates with a study by (Fancy 2015) on the effectiveness of participatory video in dissemination of agricultural extension information where he found out that challenges that impeded farmers' intention to patronize participatory video ranged from lack of capital to untimely and unreliable information.

Table 4.10: Relationship between Intention and Behaviour predictors under Participatory Video (AKMA)

Intention *TPB predictors	Correlation coefficient (r)	Coefficient of determination (r^2)
ATT	0.520**	0.270
PBC	-0.612**	0.374
SN	0.485**	0.235

Note: ** Correlation is significant at the 0.05 level (2-tailed).

Source: Field Survey, 2017

4.2.10 The Impact of Behaviour Predictors on Intention to use Participatory Video (AKMA)

The multiple linear regression model stated under the methodology chapter was used to predict farmers' intention to use participatory video from the attitude, subjective norm and

perceived behavioural control variables. The regression coefficients of the variables were shown in Table 4.11.

The multiple regression model recorded an overall fit value (F) of 339.047, which is significantly different from zero, hence the null hypothesis that attitude, subjective norm and perceived behavioural control has no joint influence on intention to use participatory video is rejected. From the results, all the three predicted factors are statistically significant at 5%. This implies that attitude, perceived behavioural control and subjective norm are all making significant unique contributions to predict farmers' intention to use participatory video for agricultural extension information. The R-square value of 0.693 implies, 69.3% of variation in intention is contributed b by the statements for the behaviour predictors (attitude, subjective norm and perceived behavioural control). 30.7% of the variation in intention can be attributed to external factors other. The partial correlation values in the table shows that, attitude recorded the highest impact with a coefficient of determination of 16.6%, followed by subjective norm (5.0%) and perceived behavioural control contributed the least (0.9%).

Table 4.11: Impact of Behaviour Predictors on Intention towards Participatory Video (AKMA)

Predictor	β	Sig	r^2
Attitude	0.705	0.0*	0.166
Perceived behavioural control	-0.062	0.0*	0.009
Subjective Norm	0.328	0.0*	0.050
$R^2 = 0.693$, F = 339.047			

***$p < .001$

Source: field survey, 2017

4.2.11: Relationship between Intention and Attitude under Direct Contacts with Extension Agents' (AKMA)

Spearman correlation coefficients were computed to assess the strength of the relationship between: (1) easy access to relevant agricultural information and farmers' intention to use direct contacts with extension agents (2) ability of farmers to use extension messages from direct contacts with extension agents to plan farming activities well and farmers' intention to use direct contacts with extension agents'(3) ability of farmers to learn good farming practices through the use of direct contacts with extension agents to access agricultural information and farmers' intention to use direct contacts with extension agents'(4) accessing agricultural extension information through direct contacts with extension agents' to help farmers increase yield and farmers' intention to use direct contacts with extension agents (5) the ease with which farmers can use direct contacts with extension agents' to

link with consumers of farm produce and farmers' intention to use direct contacts with extension agents (6) the ease with which farmers can use direct contacts with extension agents to link with input dealers and farmers' intention to use direct contacts with extension agents (7) ability of farmers to use extension messages from direct contacts with extension agents to reduce cost of farming operation and farmers' intention to use direct contacts with extension agents (8) and the ease of understanding extension information through on-farm demonstrations from direct contacts with extension agents' and farmers' intention to use direct contacts with extension agents.

Table 4.12: Relationship between Intention Attitude under Direct contacts with Extension Agents (AKMA)

Attitude*Intention	**Correlation Coefficient r**	**Coefficient of determination r^2**	**Barrier/Driver**
1. Direct contacts with AEAs helps me to access to relevant agricultural information easily	0.711**	0.506	Driver
2. Direct contacts with AEAs helps me plan my farming activities well	0.791**	0.626	Driver
3. Direct contacts with AEAs helps me develop my knowledge on good farming practices	0.765**	0.585	Driver
4. Direct contacts with AEAs helps me increase my yield through reliance	0.758**	0.574	Driver

Note: ** Correlation is significant at the 0.05 level (2-tailed).

on agricultural information from this source			
5. Direct contacts with AEAs helps me have easy link to consumers of my farm products	0.168**	0.028	Barrier
6. Direct contacts with AEAs helps me have easy link to input dealers	0.266**	0.071	Barrier
7. Direct contacts with AEAs helps reduce my cost of farm operation	0.452**	0.204	Barrier
8. On-farm demonstrations makes me understand better through AEAs	0.699**	0.489	Driver

Source: Field survey, 2017

All the correlation coefficients were statistically significant at 5% except, implying there are relations between the farmers' attitudes and their intention to use direct contacts with extension agents. The Spearman correlation coefficients of 0.711, 0.791, 0.765, 0.758 and 0.699 indicates that there are strong positive correlations between access to relevant agricultural information using direct contacts with extension agents and farmers' intention to use direct contacts with extension agents, extension messages helps me plan my farming activities well and farmers' intention to use direct contacts with extension agents, extension messages helps me develop my knowledge on good farming practices using direct contacts with extension agents, extension messages helps me increase my yield patronizing direct contacts with extension agents' approach and on-farm demonstrations helps me understand better using direct contacts with extension agents'. The indicative statements which have

weak positive correlations with farmers' intention to use direct contacts with extension agents are; direct contacts with extension agents' help me have easy link to consumers of farm produce and direct contacts with extension agents helps me have easy link to input dealers. Using direct contacts with extension agents helps me reduce cost of my farm operations recorded an intermediate correlation value of 0.452 indicating a strong relationship with intention to use direct contacts with extension agents.

In the Table 4.12, the coefficient of determination which showed the percentage contribution of direct contacts with extension agents' statements to the variation in intention to use direct contacts with extension agents for accessing agricultural information. The highest coefficient of determination recorded was 0. 626. Which indicated that 62.6% of the variation in intention was determined by "direct contacts with extension agents' helps me plan my farming activities well". The lowest coefficient of determination recorded was 0.169, which meant 16.9% of the variation in intention was determined by direct contacts with extension agents' helps me have easy link to consumers of my farm produce.

4.2.12: Relationship between Intention and Perceived Behavioural Control under Direct contacts with Extension Agents' (AKMA)

A Spearman correlation coefficient was computed to assess the relationship between "finding difficulty in interpreting and understanding extension messages using direct contacts with extension agents' knowledge management approach" and farmers' intention to use direct contacts with extension agents' knowledge management approach. All the correlation coefficients were statistically significant at 5%, and shows an intermediate negative relationship throughout their relationship with intention to use direct contacts with extension agents'' knowledge management approach.

Table 4.13: Relationship between Intention and Perceived Behavioural Control under Direct contacts with Extension Agents (AKMA)

Intention * PBC	Correlation Coefficient (r)	Coefficient of determination (r^2)	Barrier/Driver
1. I find it difficult to interpret/understand information from AEAs	-0.476	0.227	Driver
2. I do not get information on time having direct contacts with AEAs for receiving extension information	-0.528	0.279	Barrier
3. Sometimes I find it difficult to get exact information on my crop type through contacts with AEAs	-0.477	0.228	Driver

Note: ** Correlation is significant at the 0.01 level (2-tailed).
Source: Field survey, 2017

The coefficient value of -0.476 implies that if farmers have difficulty in interpreting and understand extension messages using the direct contacts with extension agents, their intention to use direct contacts with extension agents for agricultural extension information will diminish. As shown in the Table 4.13, the coefficient of determination is 0.227, indicating that 22.7% of the variation in farmers' intention to use direct contacts with extension agents' is determined by the difficulty farmers' face in interpreting/understanding agricultural extension messages using direct contacts with extension agents. Similarly, the coefficient value of -0.528 implies that if farmers do not get information on time using direct contacts with extension agents, their intention to use direct contacts with extension agents (AKMA) will decrease. Also the coefficient of determination was 0.279, meaning that 27.9% of the variation in farmers' intention to use direct contacts with extension agents' approach was contributed by the inability of farmers to get information on time using direct contacts with extension agents' knowledge management approach. The coefficient value of -0.477 means that if farmers did receive the exact information on their crop type using direct contacts with extension agents, it will decrease their intention to use direct contacts with extension agents' knowledge management approach. And the coefficient of determination of 0.228 implied, 22.8% of

the variation in intention to use direct contacts with extension agents' approach was determined by the inability of farmers to get information on their crop type using direct contacts with extension agents' agricultural knowledge management approach.

4.2.13 Relationship between Intention and Subjective Norm under Direct contacts with Extension Agents (AKMA)

A Spearman's correlation test was estimated to establish the strength of the association between the personal belief statement "NGOs think that I should use direct contacts with extension agents'' knowledge management approach for accessing agricultural information" and farmers' intention to use direct contacts with extension agents'' knowledge management approach. A correlation coefficient of 0.747 was recorded. The association between these two variables was strong positive association since the correlation coefficient was statistically significant, positive and lies between $0.25 \leq r < 0.75$. The statistically significant positive coefficient recorded between the two variables meant, if NGOs recommend the use of direct contacts with extension agents' for accessing agricultural information to farmers, it will increase their intention to use direct contacts with extension agents' for accessing agricultural information.

The correlation coefficient between "religious leaders think I should use direct contacts with extension agents' to access agricultural information" and intention to use direct

contacts with extension agents' is 0.716. It means the association is very strong and highly statistically significant. The correlation between religious leaders convincing farmers to use direct contacts with extension agents' to access agricultural information and their actual intention to direct contacts with extension agents' is strong and positive. The positive sign means that if religious leaders recommend the use of direct contacts with extension agents' to farmers, the latter will feel more inclined to use direct contacts with extension agents' for agricultural extension information. Therefore, religious leaders' recommendation of direct contacts with extension agents'' knowledge management approach for to farmers is a driver of farmers' intention to use direct contacts with extension agents' for agricultural extension information.

The statement, "agricultural extension agents' think I should use direct contacts with extension agents' knowledge management approach to access agricultural information" and intention to use direct contacts with extension agents strongly correlated. This was because a correlation coefficient of 0.757 was greater than 0.74 and statistically significant at 5%. The positive sign between the two variables meant that, if extension agents' recommend to farmers to use direct contacts with extension agents' to access agricultural extension information, it will indeed increase farmers' intention to use direct contacts with

extension agents'' knowledge management approach for agricultural extension information.

For the statement "opinion leaders think I should use direct contacts with extension agents' to access agricultural information" will increase farmers' intention to use direct contacts with extension agents' to access agricultural extension information. A correlation coefficient of 0.687 indicated a strong positive and significant relationship between opinion leaders' recommendation to farmers to use direct contacts with extension agents' to access agricultural information and farmers' actual intention to use direct contacts with extension agents to access agricultural extension information.

In Table 4.14, the coefficient of determination was used to show the percentage of the variation in intention determined by the subjective norm statements. From the table NGO's think that I should use direct contacts with extension agents' determined 55.9% of the variation in intention to use direct contacts with extension agents'' knowledge management approach. Religious leaders think that I should use direct contacts with extension agents' determined 51.3% of the variation in intention to use direct contacts with extension agents'' knowledge management approach. Extension agents' think that I should use direct contacts with extension agents' determined 57.3% of the variation in intention to use direct contacts with extension agents'' knowledge management approach. And opinion leaders think that

I should use direct contacts with extension agents' determined 47.2% of the variation in intention to use direct contacts with extension agents'' knowledge management approach.

Table 4.14: Relationship between Intention and Subjective Norm under Direct contacts with extension Agents (AKMA)

Subjective Norm*Intention	Correlation Coefficient (r)	Coefficient of determination (r^2)	Barrier/driver
1. NGOs think that I should use direct contacts with extension officers to access agricultural Information.	0.748**	0.559	Driver
2. Religious leaders think that I should use direct contacts with extension officers to access agricultural Information.	0.716**	0.513	Driver
3. Extension agents' think that I should use direct contacts with extension officers to access agricultural Information	0.757**	0.573	Driver
4. Opinion leaders think that I should use direct contacts with extension officers to access agricultural information	0.687**	0.472	Driver

Note: ** Correlation is significant at the 0.05 level (2-tailed).

Source: field survey, 2017

4.2.14 Relationship between Intention And Behaviour Predictors under Direct contacts with Extension Agents (AKMA)

The results of the Spearman correlation for the relationship between intention and behaviour predictors for direct contacts with extension agents'' knowledge management approach were shown in Table 4.15. The association between intention and the three predictor variables; attitude (ATT), perceived behavioural control (PBC) and subjective norm (SN), recorded correlation coefficients of 0.905, -0.569 and 0.801 respectively. The results show that all behaviour predictors were statistically significant at 5%. Attitude and subjective norm were strongly and positively correlated with farmers' intention to use direct contacts with extension agents' to receive agricultural extension information. Perceived behavioural control was negatively associated with farmers' intention to use direct contacts with extension agents' to receive agricultural extension information since the correlation coefficient recorded was -0.569.

The negative correlation sign showed that as perceived behavioural control increased, farmers' intention to use direct contacts with extension agents decreased. The positive correlation signs of attitude showed that as attitude increased, farmers' intention to use direct contacts with extension agents' to receive agricultural extension information also increased. The positive correlation sign of subjective norm show that as subjective norm

increased, farmers' intention to use direct contacts with extension agents' increased. Therefore, attitude and subjective norm statements contribute positively to the overall intention of farmers to use direct contacts with extension agents' to access agricultural extension information while perceived behavioural control statements contribute negatively to farmers' overall intention to use direct contacts with extension agents' for accessing agricultural information. As shown in the Table 4.15, the coefficient of determination for attitude and subjective norm were 0.819 and 0.642 respectively. This means that 81.9% of the variations in farmers' intention to direct contacts with extension agents' to receive agricultural extension information was determined by attitude statements. Also, 64.2% of the variations in farmers' intention to use direct contacts with extension agents' to receive agricultural extension information was determined by subjective norm statements. The coefficient of determination for perceived behavioural control recorded 0.323. This means that 32.3% of the variation in farmers' intention to use direct contacts with extension agents' is contributed by the perceived behavioural control statements.

Table 4.15: Relationship between Intention and Behaviour Predictors under Direct contacts with Extension Agents' (AKMA)

Intention *TPB predictors	Correlation coefficient (r)	Coefficient of determination (r^2)
ATT	0.905**	0.819
PBC	-0.569**	0.323
SN	0.801**	0.642

Note: ** Correlation is significant at the 0.05 level (2-tailed).

Source: Field survey, 2017

4.2.15 Impact of Behaviour Predictors on Intention to use Direct contacts with Extension Agents' (AKMA)

The multiple linear regression model stated under the methodology chapter was used to predict farmers' intention to use direct contacts with extension agents' from the attitude, subjective norm and perceived behavioural control variables. The regression coefficients of the variables are shown in table 4.16 below.

Table 4.16: Impact of Behaviour Predictors on Intention towards Direct contacts with Extension Agent's (AKMA)

Predictor	β	Sig	r^2
Attitude	0.328**	0.000	0.082
Perceived behavioural control	-0.051	0.135	0.005
Subjective Norm	0.514**	0.000	0.176
$R^2 = 0.693$, F = 339.047			

**$p < .05$

Source: Field survey, 2017

The multiple regression model recorded an overall fit value (F) of 339.047, which was significantly different from zero, hence the null hypothesis that attitude, subjective norm and perceived behavioural control had no joint influence on intention to use direct contact with extension agents' knowledge management approach was rejected. From the results, only attitude and subjective norm were statistically significant at 5%. Perceived behavioural control was not statistically significant. This implied attitude and subjective norm were all making significant unique contributions to predict farmers' intention to use direct contacts with extension agents' for agricultural extension information. The R-square value of 0.693 implies, 69.3% of variation in intention was contributed by the statements for all the behaviour predictors (attitude, subjective norm and perceived behavioural control).

As is indicated in Table 4.16, the partial correlation values showed that, subjective norm recorded the highest impact with a coefficient of determination of 17.6%, followed by attitude (8.2%) and perceived behavioural control contributed the least (0.5%).

4.3 Relationship between Demographic Variables and Intention to use Mobile Phone (AKMA)

In this section, cross tabulation and chi-square (X^2; chi square) statistical tests are used to test the significance of relationship between respondents' personal characteristics and their

perceived intention to use various knowledge management approaches for accessing agricultural information. The Chi square test is used because it can measure well respondents' personal characteristics (age gender, educational level) fit into expected variables.

4.3.1 Relationship between Respondents' Gender and Intention to use Mobile Phone (AKMA)

From Table 4.17, the chi square test was statistically significant at 5%. As a result, the null hypothesis that gender has no influence on farmers' intention to use mobile phone for agricultural extension information is rejected in favour of the alternate hypothesis. This implies that there is significant difference between farmers' gender and intention to use mobile phone agricultural knowledge management approach. As shown in the Table 4.17, more males (150) have intention to use mobile phone for extension information than females (11). This inference maybe as a result the fewer number of females included in the data sample. This situation is as a result of low female participation in agriculture in the area.

Table 4. 17: Relationship between respondents' Gender and Intention to use Mobile Phone (AKMA)

Gender	Readiness to use mobile phone		
	(frequency)	(frequency)	Total
	Yes	No	
Male	150	263	413
Female	11	26	37
Total	161	289	450

$\chi^2 = 0.387$, df = 1, p =0.038

Source: Field survey, 2017

4.3.2 Relationship between Respondents' Age and Intention to use Mobile Phone (AKMA)

From the Table 4.18, the chi square value of 13.999 was statistically significant at 5% indicating that the null hypothesis; there was no significant difference between farmers' age and the intention to use mobile phone in agricultural Knowledge management extension provision. This means that there is a significant difference in farmers' intention across different age groups. As it is in the Table 4.18, the frequency for the age group of 21-30 was the highest followed by 18-20, 31-40, 60+, 51-60, and 41-50 age ranges. This means that the age group 21-30 had the highest intention to use mobile phone followed by 18-20, then 31-40, 60+, 51-60 and 51-60 age categories. It was noticed that, even though the age group of 31-40 had a frequency higher than the 21-30 age group, it recorded a frequency less than the latter. This implied, young farmers with some years of experience

and relatively high curiosity to innovate have more intention to use mobile phone than old farmers. Also, the results obtained indicate that intention for mobile phone usage decreases as age increases.

Table 4.18: Relationship between Respondents' Age and Intention to use Mobile Phone (AKMA)

Age	Frequency		Total Frequency
	Yes	No	
18 - 20	12	15	27
21 - 30	44	83	127
31 – 40	61	90	151
41 – 50	23	61	84
51 – 60	9	26	35
60+	12	14	26
Total	161	289	450

$\chi^2 =$ 7.694, df = 5, P = 0.016

Source: Field Survey 2017

4.3.3 Relationship between Respondents' Educational Level and Intention to use Mobile Phone(AKMA)

The probability value of 0.016 obtained from the chi-square test implied, the test was statistically significant at 5%. Hence, the null hypothesis that there is a relationship between farmers' intention to use mobile and educational level is rejected in favour of the alternate hypothesis. This means that intention to use mobile phone is related with educational level of the farmer. As shown in the in the Table 4.19, farmers with formal

education (87) were more ready to use mobile phones in agricultural extension than farmers without formal education (74). Also, within farmers who had no intention to use mobile phone for extension provision, farmers who had no formal education were more than those with formal education. This implied, farmers' intention to use mobile phone for accessing agricultural information depends on their educational level.

Table 4.19: Relationship between Respondents' Educational Level and Intention to use Mobile Phone (AKMA)

Education	Yes	No	Total
Primary school	23	43	66
Junior high school	24	42	66
Secondary/vocational school	31	25	56
Tertiary institution	9	13	22
No formal education	74	166	240
Total	161	298	450

$\chi^{2} =$ 12.183, df = 4, P = 0.016

Source: Field Survey, 2017

4.3.4 Relationship between Respondents' Gender and Intention to use Participatory Video (AKMA)

From Table 4.20, the chi square test was not statistically significant at 5%. As a result, the null hypothesis that gender has no relationship with farmers' intention to use participatory video for accessing agricultural extension information was not rejected in favour of the alternate hypothesis. This implied there was no significant difference between farmers'

gender and intention to use participatory video for agricultural extension information. As shown in Table 4.20, more males (56) had intention to use participatory video for extension provision than females (4). This inference maybe as a result of the fewer number of females included in the data sample. This situation arose because they did not make themselves available for the interview.

Table 4.20: Relationship between respondents' Gender and Intention to use Participatory Video (AKMA)

Gender	Frequency (Yes)	Frequency (No)	Total
Male	56	357	413
Female	4	33	37
Total	60	390	450

$\chi^2 = 0.387$, df = 4, p =1.000

Source: Field Survey, 2017

4.3.5 Relationship between Respondents' Age and Intention to use Participatory Video (AKMA)

From table 4.21, the probability value of 0.095 was not statistically significant at 5% indicating that the null hypothesis; there is no significant difference between farmers' age and the intention to use participatory video in agricultural knowledge management extension provision is not rejected. This means that there was no significant difference in farmers' intention across different age groups. As shown in Table 4.21, the frequency for the age group of 21-30 was the highest followed by 31-40, then 41-50, 51-60, 18-20 and

the least 60+. The age group with the highest frequency have the highest intention to use participatory video agricultural knowledge management extension provision. This implied age group 21-30 had the highest intention to use participatory video followed by, 31-40, then 41-50, 51-60, 18-20 and the least 60+. Following the trend of the frequencies in the Table 4.21, it was noticed that there was no significant difference between the youngest age group and the oldest age group. This meant both young and old farmers have similar intentions to use participatory video for accessing extension information.

Table 4.21: Relationship between Respondents' Age and Intention to use Participatory Video (AKMA)

Age	Frequency (Yes)	Frequency (No)	Total frequency
18 - 20	3	24	27
21 - 30	18	109	127
31 – 40	16	135	151
41 – 50	14	70	84
51 – 60	7	28	35
60+	2	24	26
Total	60	390	450

$\chi^{2 =}$ 4.042, df = 5, P = 0.095

Source: Field survey, 2017

4.3.6 Relationship between Respondents' Educational Level and Intention to use Participatory Video (AKMA)

The probability value of 1.005 obtained from the chi-square test implied the test was not statistically significant at 5%. Hence, the null hypothesis that, farmers' intention to use participatory video agricultural knowledge management extension provision did not depend on their educational level was not rejected. This implied intention to use participatory video did not depend on the educational level of the farmer. As shown in the in the Table 4.22, farmers with no formal education (31) had intention to use participatory video for accessing agricultural extension information while 29 farmers with formal education had intentions to use participatory video for accessing agricultural extension information. Also, within farmers who had no intention to use participatory video for extension information, farmers who had formal education were (181) whilst farmers with no formal education (209). Considering the frequencies of across educational level, there is no definite trend of educational level as against intention to use participatory video approach. This means that, farmers' intention to use participatory video does not depend on their educational level.

Table 4.22: Relationship between Respondents' Educational Level and Intention to use Participatory Video (AKMA)

Educational level	(Frequency)		Total (frequency)
	Yes	No	
Primary school	14	52	66
Junior high school	6	60	66
Secondary/vocational school	6	50	56
Tertiary institution	3	19	22
No formal education	31	209	240
Total	60	298	450

$\chi^{2} =$ 530.768, df = 10, P = 1.005

Source: Field Survey, 2017

4.3.7 Relationship between Respondents' Gender and Intention to use Direct Contacts With Extension Agents' (AKMA)

From Table 4.23, the probability value of 1.001 from the chi square test indicated that test was not statistically significant at 5%. As a result, the null hypothesis that gender has no influence on farmers' intention to use direct contacts with extension agents' agricultural knowledge management approach was not rejected. This implied there was no significant difference between farmers' gender and intention to use direct contacts with extension agents' agricultural knowledge management approach. As shown in the Table 4.23, more males (207) had intention to use direct contacts with extension agents'' for accessing extension information than females (22). This inference maybe as a result the fewer number

of females included in the data sample. This situation arose because they did not make themselves available for the interview.

Table 4.23: Relationship between Respondents' Gender and Intention to use Direct contacts with Extension Agents' (AKMA)

Gender	(frequency)	(frequency)	Total
	Yes	No	
Male	207	206	413
Female	22	15	37
Total	299	221	450

χ^2 = 526.382, df = 4, p =1.001

Source: Field survey, 2017

4.3.8 Relationship between Respondents' Age and Intention to use Direct Contacts with Extension Agents' (AKMA)

The probability value of 0.065 from the qi-square test was not statistically significant at 5%, therefore not rejecting the null hypothesis that; there is no significant difference between farmers' age and the intention to use direct contacts with extension agents' in agricultural knowledge management extension provision. This meant, there was no significant difference in farmers' intention to use direct contacts with extension agents' agricultural knowledge management approach across different age groups.

As shown in Table 4.24, the frequency for the age group of 21-30 was the highest followed by 31-40, then 41-50, 51-60, 18-20 and the least 60+. The age group with the highest

frequency had the highest intention to use direct contacts with extension agents'' agricultural knowledge management extension provision. This implied, the age group 21-30 had the highest intention to use participatory video followed by, 31-40, then 41-50, 51-60, 18-20 and the least 60+. Following the trend of the frequencies in the Table 4.24, it was noticed that there was no significant difference among the age groups alike who has the intention to use direct contacts with extension agents' in agricultural extension knowledge management. This means both young and old farmers alike have similar intentions to use participatory video for accessing extension information.

Table 4.24: Relationship between Respondents' Age and Intention to use Direct contacts with Extension Agents'' (AKMA)

Age	Frequency (Yes)	Frequency (No)	Total
18 - 20	12	15	27
21 - 30	65	62	127
31 – 40	74	77	151
41 – 50	47	37	84
51 – 60	19	16	35
60+	12	14	26
Total	229	221	450

$\chi^{2} =$ 1.924, df = 5, P = 0.065

Source: Field Survey 2017

4.3.9 Relationship Between Respondents' Educational Level And Intention to use Direct contacts with Extension Agents' (AKMA)

The probability value of 1.012 obtained from the chi-square test implied the test was not statistically significant at 5%. Hence, the null hypothesis that farmers' intention to use direct contacts with extension agents' agricultural knowledge management extension provision did not depend on their educational level was not rejected. This meant that intention to use direct contacts with extension agents for accessing agricultural extension information did not depend on the educational level of the farmer. As shown in Table 4.25, farmers with no formal education (135) had intentions to use participatory video for accessing agricultural extension information while 94 farmers with formal education had intentions to use participatory video for accessing agricultural extension information.

Also, within farmers who had no intention to use participatory video for extension information, farmers who had formal education were (116) whilst farmers with no formal education (105). Considering the frequencies of across educational level, there is no definite trend of educational level as against intention to use participatory video approach. This means that, farmers' intention to use participatory video does not depend on their educational level.

Table 4.25: Relationship Respondents' Educational Level and Intention to use Direct contacts with Extension (AKMA)

Educational level	(Frequency)		Total (frequency)
	Yes	**No**	
Primary school	29	37	66
Junior high school	36	30	66
Secondary/vocational school	19	37	56
Tertiary institution	10	12	22
No formal education	**135**	**105**	**240**
Total	229	221	450

χ^2 = 537.943, df = 10, P = 1.012

Source: Field survey, 2017

4.4 Means of Agricultural Knowledge Acquisition by Farmers

As sown in Table 4.26, farmers patronized mobile phone, participatory video and direct contacts with extension officers agricultural knowledge management approaches. 161 farmers (representing 35.8%) patronized mobile phone approach, 60 farmers (representing 13.3%) patronized participatory video approach, and 229 farmers (representing 50.9%) patronized direct contacts with extension officers' approach. The combined ICT knowledge management percentages is 49.1% almost equal to the 50.9% for direct contacts with extension agents'' knowledge management approach. This indicated that ICT based knowledge management approaches which were launched not too long ago are catching up with the old approaches to extension.

Table 4.26: Means of agricultural knowledge Acquisition by Farmers

Knowledge management Approach	Number of Farmers	Percentage
Mobile phone	161	35.7%
Participatory video	60	13.3%
Direct contacts with extension agents'	229	50.9%
Total	450	100

Source: Field survey, 2017

4.5 Effectiveness of Mobile Phone (Akma) Using Servqual Gap Scores

Table 4.27 represents the gap analysis score on mobile phone extension approach. The table represents (perceptions and expectations) statements under the SERVQUAL dimensions.

Table 4.27: SERVQUAL Gap Scores of Mobile Phone (AKMA)

Statement	Expectation (E)	Perception	Service Gap (P)
Tangibility			
Physical facilities	4.5	3.0	1.5
		Average gap score	1.5
Reliability			
Deliver services on promised time	5.0	4.0	1
Accurate market information	5.0	3.6	1.4
Trustworthy information	5.0	4.3	0.7
Reliable weather information	5.0	4.3	0.7
		Average gap score	0.95
Responsiveness			

Time space on giving feedback	4.7	3.5	1.2
Readiness and willingness to help	4.4	3.6	0.8
Prompt response to needs	4.9	4.0	0.9
Teaches improved practices	4.9	4.3	0.6
		Average gap score	0.88
Assurance			
Store information	4.9	4.0	0.9
Assurance of solving problem	4.4	3.5	0.9
I have gained more knowledge	5.0	4.0	1.0
Up-to-date information	5.0	3.3	1.7
Satisfied with the approach	5.0	3.8	1.2
		Average gap score	1.14
Empathy			
Difficulty to interpret message	5.0	2.6	2.4
Service providers are polite	4.9	3.3	1.6
Personal attention	4.8	2.8	2.0
Access to information on inputs	5.0	3.6	1.4
Access to information on improved practices	5.0	4.0	1.0
		Average gap score	1.68

Source: Field survey, 2017

The difference between the mean of customer's expectation statements and perception statements of service is the 'service gap' (Gap score = expectation – perception) and these values are then averaged for each dimension to compute the average gap score. The statement with a gap score equal to zero means service is satisfactory. The statement with the highest gap score was the most unsatisfactory and the statement with the least gap score

was the least unsatisfactory. As shown in Table 4.27, the responsiveness statement 'Teaches improved practices' recorded the least gap scores (0.6), indicating that it was the most satisfactory among all the SERVQUAL statements. In the same vain, the Assurance statement 'up-to-date information' recorded the highest gap scores (1.7), indicating that it was the most unsatisfactory among all the SERVQUAL statements.

4.5.1 Weighted Average Servqual Scores For Mobile Phone (AKMA)

From Table 4.28, it is seen that Empathy is the dimension with the highest gap score (1.68), followed by Tangibility (1.5), Assurance (1.14), Reliability (0.95) and Responsiveness with the least gap scores (0.88). This means that empathy dimension was the most unsatisfactory, followed by tangibility, assurance, reliability and responsiveness being the least. Using the gap score analysis, farmers are most dissatisfied with the dimension of empathy, followed by tangibility, assurance, reliability and responsiveness in the order of least dissatisfaction.

Table 4.28: Weighted Average SERVQUAL scores for Mobile Phone (AKMA)

Dimension	Expectations	Perceptions	Gap scores	Weightings	Weighted Average
Tangibility	4.5	3.0	1.5	12.1	0.18
Reliability	5	4.05	0.95	20	0.19
Responsiveness	4.73	3.85	0.88	18.9	0.17
Assurance	4.86	3.72	1.14	24.3	0.27
Empathy	4.94	3.26	1.68	24.7	0.41

Overall Average weighted SERVQUAL score = 1.22

Source: Field survey, 2017

In order to obtain weighted SERVQUAL score, respondents were asked to allocate points summing up to 100 among the five dimensions according to the relative importance they place on each of them. Allocation of the points among the dimensions is shown in Table 4.28.

From Table 4.28, it was seen that empathy was deemed very important by the respondents since it had the highest weight (24.7%), followed by assurance (24.3%), then reliability (20%), responsiveness (18.9%) and with tangibility given the least weight (12.1%).

The weighted SERVQUAL score is achieved by multiplying the average scores of each dimension by farmers' weightings. The weighted SERVQUAL score for the various dimensions really explains the level and magnitude of satisfaction or dissatisfaction as compared to the gap score since the respondents are given the opportunity to score dimensions with points in order of importance.

With regards to the weighted SERVQUAL score, the empathy dimension was the least (0.41) contributor to overall service quality of mobile phone extension approach followed by assurance (0.27), reliability (0.19), tangibles (0.18) and responsiveness (0.17). Decreasing weighted SERVQUAL scores mean less deficiencies or shortcomings for the dimension. The values for the weighted SERVQUAL score show how much each dimension was deficient in contributing to the satisfaction of mobile phone extension users. Service quality is satisfactory if perception meets expectation, hence overall SERVQUAL gap score equal to zero (0) means service is satisfactory. Alternatively, overall SERVQUAL score above zero denotes unsatisfactory services. The higher the weighted average SERVQUAL score for a dimension, the more deficient that dimension is in contributing to service quality and vice versa. The overall weighted SERVQUAL score of positive 1.22, means services delivered by extension providers is unsatisfactory. This means that farmers who receive agricultural extension services from mobile phone are highly dissatisfied with the services received. This means that mobile phone extension provision has not been effective in delivering extension services. In solving the issue of effectiveness, all the SERVQUAL dimensions should be thoroughly worked on to reduce the service gap and make mobile phone extension more effective.

4.5.2 Relative Impact of each Dimension in Predicting Overall Service Quality of Mobile Phone (AKMA)

A regression analysis was performed to examine the relative importance of each of the five dimensions of SERVQUAL on the overall satisfaction of mobile phone knowledge management services. The multiple regression model had an F value of 547.179 and a p value of 0.000. All the SERVQUAL dimensions are making significant contributions to the prediction of intention with $p < 0.01$.

Below was the estimated representation of the model:

$$Y_i = 0.05X_{1i} + 0.107\,X_{2i} + 0.013X_{3i} + 0.314\,X_{4i} + 0.547X_{5i}$$

Y_i = Overall service quality of mobile phone agricultural knowledge management approach, $X_{1i,}$ $X_{2i,}$ $X_{3i,}$ $X_{4i\ and}$ $X_{5i\ =}$ Tangibility, Reliability, Responsiveness, Assurance and Empathy respectively.

The Adjusted R-square value was 0.859, it implies 85.9% of variation in intention can be determined by all the five dimensions (Tangibility, reliability, responsiveness, assurance and empathy). The remaining 14.1% may be attributed to other factors. As shown in the Table 4.29below, Empathy (0.547) provided the highest contribution to the overall service quality, second to empathy is assurance (0.314), then reliability (0.107), responsiveness (0.013) and tangibility (0.005) being the least.

Comparing the significant values of the independent variables to a p value of 0.05, empathy, assurance and reliability variables make a unique significant contribution to the prediction of Intention to use mobile phone in extension provision while responsiveness and tangibility did not. Empathy contributed (21.3%), followed by assurance (7.7%), then reliability (1.5%), responsiveness (0.0%), and tangibility (0.0%).

Table 4.29: Relative Impact of SERVQUAL Dimensions in predicting Overall Quality of Mobile Phone (AKMA)

Predictor	β	Sig	r^2
Average Tangibility	0.005	0.873	0.00006
Average Reliability	0.107**	0.010	0.01464
Average Responsiveness	0.013	0.773	0.00019
Average Assurance	0.314***	0.000	0.07728
Average Empathy	0.547***	0.000	0.21344
$R^2 = 0.859$, F = 547.173			

**$p < .05$

Source: Field survey, 2007

4.5.3 Effectiveness of Participatory Video Using Servqual Gap Scores

Table 4.30 represents the gap score analysis of participatory video extension approach. The table represents (perceptions and expectations) statements under the dimensions of tangibility, reliability, responsiveness, assurance and empathy. The difference between the mean of customer's expectation statements and perception statements of service is the 'service gap' which is then averaged for each dimension.

Table 4.30: SERVQUAL Gap score Analysis of Participatory Video (AKMA)

Statement	Expectation (E)	Perception	Service Gap (P)
Tangibility			
Physical facilities	4.7	4.0	0.7
		Average gap score	0.7
Reliability			
Deliver services on promised time	4.9	3.6	1.3
Accurate market information	4.9	3.0	1.9
Trustworthy information	5.0	4.0	1.0
Reliable weather information	5.0	3.8	1.2
		Average gap score	1.1
Responsiveness			
Time space on giving feedback	4.9	3.0	1.9
Readiness and willingness to help	4.7	3.4	1.3
Prompt response to needs	4.9	3.5	1.4
Teaches improved practices	4.9	4.3	0.6
		Average gap score	1.3
Assurance			
Store information	5.0	3.4	1.6
Assurance of solving problem	4.9	3.0	1.9
I have gained more knowledge	5.0	4.2	0.8
Up-to-date information	5.0	4.1	0.9
Satisfied with the approach	5.0	3.3	1.7
		Average gap score	1.38
Empathy			
Difficulty to interpret message	5.0	2.7	2.3

Service providers are polite	6.0	4.0	2.0
Personal attention	4.9	3.4	1.5
Access to information on inputs	5.0	5.0	0
Access to information on improved practices	5.0	4.0	1.0
		Average gap score	1.36

Source: Field survey, 2017

From table 4.30, gap scores between expectations and perceptions in some of the statements are very high; which means that farmers are not satisfied with the service relating to these issues. The following statements that relate to reliability include: deliver services on promised time (1.3), trustworthy information (1), reliable weather information (1.2), For responsiveness, the scores for the following statements are; Time space on giving feedback (1.9) , readiness and willingness to help (1), prompt response to needs (1.2). With regard to Assurance, the scores for the following statements are; Store information (1.6), Assurance of solving problem (1.9), I have gained more knowledge (0.8), Up-to-date information (0.9), satisfied with the approach (1.7) For the dimension of Empathy, the scores for the different statements are; difficulty to interpret message (2.3), service providers are polite (2.0), personal attention (1.5), access to information on improved practices (1.0).

It is observed that more gaps are observed in reliability, responsiveness, assurance and empathy dimensions. Service providers therefore need to work extensively to reduce these gaps in order to improve upon quality of participatory video services to farmers.

Also, in Table 4.30 lower gap scores are found between expectations and perceptions in the following dimensions; Tangibility - physical facilities (0.7), Reliability - accurate market information (0.9), responsiveness - teaches improved practices (0.6), Assurance - I have gained more knowledge (0.8), Assurance- up-to-date information (0.9). The lower gap score means that farmers are somehow satisfied with the service in these dimensions. However, service providers need to put some effort to improve upon the services with gaps.

4.5.4 Weighted Average Servqual Scores for Participatory Video (AKMA)

From Table 4.31, it is seen that assurance is the dimension with the highest gap score (1.38), followed by empathy (1.36), then reliability (1.35), responsiveness (0.85) and tangibility with the least gap scores (0.88). This means that assurance dimension is the most unsatisfactory, followed by empathy, reliability, responsiveness and tangibility. Using the gap score analysis, it means that farmers are most dissatisfied with the dimension of assurance, followed by empathy, reliability, responsiveness and tangibility being least dissatisfied.

To obtain the weighted SERVQUAL score, respondents were asked to allocate points summing up to 100 among the five dimensions according to the relative importance they place on each of them. Allocation of the points among the dimensions is shown in the table 4.20. From Table 4.31, it was seen that assurance was deemed very important by the respondents since it had the highest weight (24.3%), followed by responsiveness (21.9%), then reliability (20%), empathy (18.7%) and with tangibility given the least weight (15.1%). The weighted SERVQUAL score is achieved by multiplying the average scores of each dimension by farmers' weightings. The weighted SERVQUAL score for the various dimensions really explains the level and magnitude of satisfaction or dissatisfaction as compared to the gap score since the respondents are given the opportunity to score dimensions with points in order of importance.

Analyzing the weighted SERVQUAL score, assurance has a score of 0.34 meaning it is most deficient followed by reliability (0.27), then empathy (0.25), responsiveness (0.18) and with tangibility being the least deficient (0.11). The values for the SERVQUAL weighted score show how much each dimension was deficient in contributing to the satisfactory delivery of participatory video extension services to users. Service quality is satisfactory if perception meets expectation, hence overall SERVQUAL gap score equal to zero (0) means service is satisfactory. Alternatively, overall SERVQUAL score above zero

denotes unsatisfactory services. The overall weighted SERVQUAL score is 1.15. Since the overall weighted SERVQUAL value is greater than zero, it means farmers who receive agricultural extension services from providers using participatory video are highly dissatisfied with the services received. This means that participatory video extension provision has not been effective in delivering extension services. In solving the effectiveness of this approach, all the SERVQUAL dimensions should be thoroughly worked on based on the magnitude of the scores in order to reduce the service gap and make participatory video extension more effective.

Table 4.31: Weighted Average SERVQUAL Scores for Participatory Video (AKMA)

Dimension	Expectations	Perceptions	Gap scores	Weightings	Weighted Average
Tangibility	4.7	4.0	0.7	15.1	0.11
Reliability	4.95	3.6	1.35	20	0.27
Responsiveness	4.48	3.63	0.85	21.9	0.18
Assurance	4.98	3.6	1.38	24.3	0.34
Empathy	5.18	3.82	1.36	18.7	0.25

Overall Average weighted SERVQUAL score = 1.15

Source: Field survey, 2017

4.5.5 Relative Impact of Servqual Dimensions in Predicting Overall Service Quality Of Participatory Video (AKMA)

To examine the relative importance of each dimension in predicting the overall service quality of participatory video extension delivery services, a regression analysis was performed.

Table 4.32: Relative Impact of SERVQUAL Dimensions in predicting Overall Service Quality of Participatory Video (AKMA)

Predictor	β	Sig	r^2
Average Tangibility	0.008	0.790	0.00017
Average Reliability	0.083**	0.031	0.01040
Average Responsiveness	0.003	0.930	0.00002
Average Assurance	0.356***	0.000	0.11156
Average Empathy	0.556***	0.000	0.24701
$R^2 = 0.049$, F = 4.6			

**$p < .05$

Source: Field survey, 2017

The multiple regression model had an F value of 654.480 and a p value of 0.000 meaning that all the SERVQUAL dimensions are making significant unique contributions to the prediction of intention towards participatory video. The p value of 0.00 is lower than 0 .01. The Adjusted R-square value was 0.879, it implies 87.9% of variation in intention was determined by all the five dimensions (Tangibility, reliability, responsiveness, assurance and empathy). The remaining 12.1% cannot be attributed to other factors.

Below was the estimated representation of the model:

$Y_i = 0.008X_{1i} + 0.083\ X_{2i} + 0.003X_{3i} + 0.356\ X_{4i} + 0.556X_{5i}$

Y_i = Overall service quality of participatory video agricultural knowledge management approach, $X_{1i,}$ $X_{2i,}$ $X_{3i,}$ $X_{4i\ and}$ $X_{5i\ =}$ Tangibility, Reliability, Responsiveness, Assurance and Empathy respectively.

As shown in the Table 4.30, Empathy (0.556) provided the highest contribution to the overall SERVQUAL dimension. This was followed by assurance (0.356), then reliability (0.083), tangibility (0.008) and responsiveness (0.003). Comparing the p values of the independent variables to at a significance level of 0.05, assurance, empathy and reliability made a unique significant contribution to the prediction of intention to use participatory video provision while reliability, tangibility and responsiveness did not. Empathy contributed 24.7%, followed by assurance (11.1%), reliability (1.0%), responsiveness (0%), and tangibility (0%).

4.5.6 Effectiveness of Direct Contacts with Extension Agents' (AKMA)

Table 4.33 represents the gap score analysis of direct contacts approach by extension agents'. The table represents (perceptions and expectations) statements under the dimensions of tangibility, reliability, responsiveness, assurance and empathy. The difference between the mean of customer's expectation and perception statements of

service is the 'service gap' which is then averaged for each dimension. From Table 4.33 gap scores between expectations and perceptions in some of the statements were very high; which means that farmers were not satisfied with the direct contact service. The dimensions of the respective statements are: Reliability - deliver services on promised time (1.3), trustworthy information (1), reliable weather information (1.23), accurate market information (1.63), and reliable weather information (1.13). With responsiveness - Time space on feedback (1.24), prompt response to needs (1.14). On Assurance- store information (1.53), assurance of solving problem (1.21), Up-to-date information (1.21), satisfied with the approach (1.0). Regarding Empathy- difficulty to interpret message (2.20), access to information on improved practices (1.31). Looking at the high gap scores, service providers have to work to reduce these gaps in order to improve upon quality of direct contact extension delivery to farmers.

Table 4.33 also shows lower gap scores between expectations and perceptions; which means that farmers are somewhat satisfied with the service in these dimensions and statements. For the reliability dimension and its respective statements, the scores are Tangibility - physical facilities are visually appealing (0.67), Reliability - trustworthy information (0.80), Responsiveness- ready and willing to help (0.93), Assurance - I have gained more knowledge (0.92), Empathy - service providers are polite (0.74), personal

attention (0.93) and teaches improved practices (0.89). Even though the gap scores are low, the service providers need to put effort to improve upon these services.

Table 4.33: Gap score analysis of Direct contacts with Extension Agents' (AKMA)

	Expectation (E)	Perception (P)	Service Gap
Tangibility			
Physical facilities are visually appealing	4.48	3.81	0.67
		Average gap score	0.67
Reliability			
Deliver services on promised time	4.96	3.73	1.23
Accurate market information	4.93	3.30	1.63
Trustworthy information	4.97	4.17	0.80
Reliable weather information	4.98	3.85	1.13
		Average gap score	1.20
Responsiveness			
Time space on feedback	4.88	3.64	1.24
Ready and willing to help	4.87	3.94	0.93
Prompt response to needs	4.94	3.80	1.14
Teaches improved practices	4.94	4.13	0.81
		Average gap score	1.03
Assurance			
Store information	4.91	3.38	1.53
Assurance of solving problem	4.86	3.65	1.21

I have gained more knowledge	4.97	4.05	0.92
Up-to-date information	4.98	3.77	1.21
Satisfied with the approach	5.00	4.00	1.00
		Average gap score	1.17
Empathy			
Difficulty to interpret message	5.00	2.80	2.20
Service providers are polite	4.94	4.20	0.74
Personal attention	4.77	3.84	0.93
Access to information on inputs	4.99	3.68	1.31
Access to information on improved practices	5.0	4.11	0.89
		Average gap score	1.21

Source: Field survey, 2017

4.5.7 Servqual Scores for Direct contacts with Extension Agents' (AKMA)

From Table 4.34, it is seen that assurance is the dimension with the highest gap score (1.24), followed by empathy (1.24), then reliability (1.20), responsiveness (1.03) and tangibility with the least gap scores (0.66). This means that assurance dimension is the most unsatisfactory, followed by empathy, reliability, responsiveness and tangibility being the least. Using the gap score analysis, these high values mean farmers are most dissatisfied with the dimension of assurance, followed by empathy, reliability, responsiveness with tangibility being the least dissatisfied dimension.

In calculating the weighted SERVQUAL score, respondents were asked to allocate points summing up to 100 among the five dimensions according to the relative importance they place on each of them. The weighted scores for the dimensions are shown in the Table 4.34.

It is seen from the Table that responsiveness was deemed very important by the respondents since it had the highest weight (26.8%), followed by assurance (24.3%), then reliability (23.2%), empathy (17.5%) and with tangibility given the least weight (8.2%). The weighted SERVQUAL score is computed by multiplying the average scores of each dimension by farmers' weightings. The weighted SERVQUAL score for the various dimensions explains the level and magnitude of satisfaction or dissatisfaction as compared to the gap score since the respondents are given the opportunity to score dimensions with points in order of importance.

Analysis of the weighted SERVQUAL score, indicates that assurance (0.3) is most the deficient dimension in contributing to the overall service quality followed by reliability (0.28), then responsiveness (0.27), empathy (0.21) and tangibility been least deficient (0.05). The values for the SERVQUAL weighted score show how much each dimension was deficient in contributing to the satisfaction of direct contacts with extension agents'' provision users. Service quality is satisfactory if perception meets expectation, hence

overall SERVQUAL gap score equal to zero (0) means service is satisfactory. Alternatively, overall SERVQUAL score above zero denotes unsatisfactory services. The overall weighted SERVQUAL score is 1.11. This means that farmers who receive agricultural extension services from direct contacts with extension agents'' provision are dissatisfied with the services received. This means that direct contacts with extension agents'' extension provision has not been effective in delivering extension services.

To tackle the issue of effectiveness of extension service delivery, all the SERVQUAL dimensions and related scores should be looked at and those with the highest scores worked on based to reduce the service gap and to improve the impact of direct contacts of extension agents with farmers.

Table 4.34: SERVQUAL Scores for Direct contacts with Extension Agents' (AKMA)

Dimension	Expectations	Perceptions	Gap scores	Weightings	Weighted Average
Tangibility	4.47	3.81	0.66	8.2	0.05
Reliability	4.96	3.76	1.20	23.2	0.28
Responsiveness	4.91	3.88	1.03	26.8	0.27
Assurance	4.94	3.7	1.24	24.3	0.30
Empathy	4.94	3.73	1.21	17.5	0.21

Source: Field survey 2017

4.5.8 Relative Impact of Servqual Dimensions on Direct contacts with Extension Agents' (AKMA)

Regression analysis was performed to assess the impact of each of the five dimensions of SERVQUAL on the overall satisfaction of direct contacts extension approach used by extension agents' in extension provision. The multiple regression model had an F value of 398.740 and a p value of 0.000. This means that all the SERVQUAL dimensions make significant unique contributions to the intention to use mobile phones as the p is less than 0.05.

Below was the estimated representation of the model:

$$Y_i = \beta_o + 0.003X_{1i} + 0.127\,X_{2i} + (-0.104)\,X_{3i} + 0.424\,X_{4i} + 0.503X_{5i}$$

Y_i = Overall service quality of direct contacts with extension agents agricultural knowledge management approach, β_o is the constant and X_{1i}, X_{2i}, X_{3i}, X_{4i} and X_{5i} = Tangibility, Reliability, Responsiveness, Assurance and Empathy respectively.

The Adjusted R-square value was 0.816 and it implies 81.6% of variation in intention to use direct contact was determined by all the five dimensions (Tangibility, reliability, responsiveness, assurance and empathy). 18.4% cannot be attributed to other factors. As shown in the table 4.38, Empathy with a value of 0.503 provided the highest contribution to the overall SERVQUAL dimension. This is followed by assurance (0.424), then

reliability (0.127), responsiveness (-0.104), and tangibility (0.003). Comparing these values of the independent variables at the significance level of 0.05, assurance, empathy and reliability can be said to have made a significant contribution to the prediction of Intention to direct contacts in extension provision while tangibility and responsiveness did not. Empathy contributed (15.0%), followed by assurance (10.5%), reliability (1.6%), responsiveness (0. %), and tangibility (0%).

Table 4.35: Impact of SERVQUAL Dimensions on Direct contacts with Extension Agents' (AKMA)

Predictor	β	Sig	r^2
Average Tangibility	0.003	0.938	0.00002
Average Reliability	0.127	0.008*	0.01588
Average Responsiveness	-0.104	0.036**	0.00980
Average Assurance	0.424	0.000*	0.10498
Average Empathy	0.503	0.000*	0.14977
$R^2 = 0.049$, F = 4.6			

**$p < .05$; *$p < .01$

Source: field survey, 2007

4.5.9 Comparing Effectiveness of Knowledge Management Approaches

Comparing the three agricultural knowledge management approaches in terms of effectiveness, "Tangibility" under direct contacts with extension agents' approach (0.05) is found to be very effective, followed by participatory video (0.11), then mobile phone (0.18). In terms of 'Reliability', mobile phone (0.19) is said to more reliable, followed by

participatory video (0.27), and the least reliable being direct contacts with extension agents' (0.28). Mobile phone was also high "Responsiveness" (0.17), followed by participatory video (0.18), then direct contacts with extension agents' (0.27). Mobile phone was also higher than the other two approaches in terms of "Assurance" (0.27), followed by direct contacts with extension agents' (0.3), and the least being participatory video (0.34). From the Figure 4, the perceptions of farmers were that direct contacts with extension agents' (0.21) have more "Empathy" than and participatory video ((0.25) and mobile phone (0.41). This means that farmers are highly not satisfied with the level of empathy they experience through mobile phone extension approach.

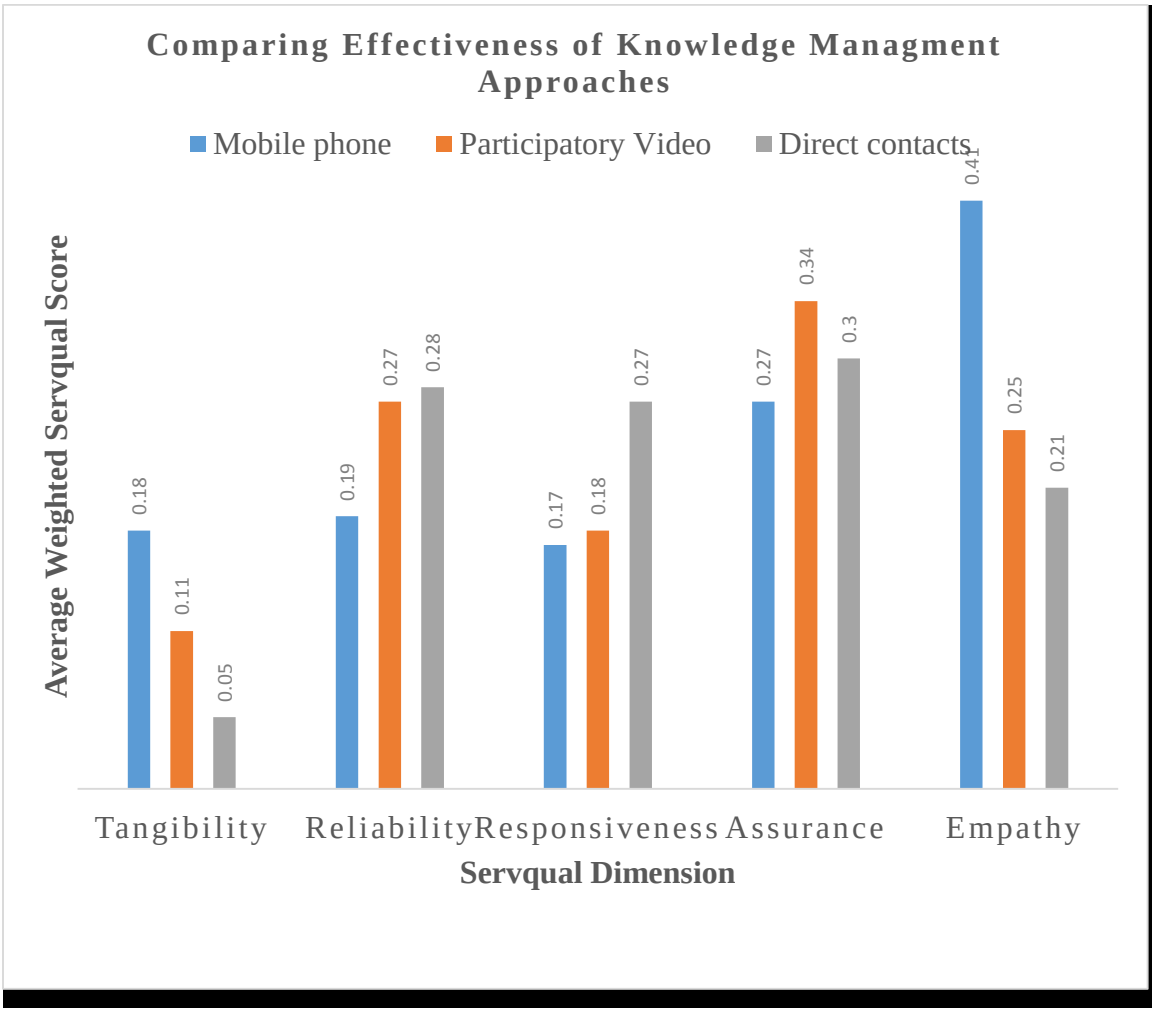

Figure 4: Comparing Effectiveness of Knowledge Management Approaches
Source: Survey, 2017

CHAPTER FIVE

SUMMARY, CONCLUSION AND RECOMMENDATIONS

5.0 Introduction

Summary, conclusions and recommendations as well as the implications of the present study findings are presented in this chapter. The conclusions presented in this chapter are derived from the research findings and seek to provide answers to the research questions. In the recommendations, propositions are made with regard to the findings of the research. From these major findings, several conclusions are made regarding this study and its application to effectiveness of agricultural knowledge management approaches on extension services delivery, specifically within the facets of agriculture extension based organisations.

5.1 Summary

Analysis of the means by which farmers in the survey areas acquire agricultural knowledge show that direct contact extension approach was highly patronised (50.3%) followed by mobile phone (35%) and then participatory video approach which was 13.3%.

In using regression to analyse the relationship between the intention to use mobile phone agricultural knowledge management approach and the behaviour predictors (Attitudes, Perceived Behavioural Control and Subjective Norms), the study shows that attitudes and

subjective norms significantly influenced the intention to use mobile phone extension. On other hand, perceived behavioural control did not influence the intention to use mobile phone extension approach. Regression analysis of intention to use participatory video influence on behaviour predictors shows that attitude and subjective norm significantly influenced the intention to use participatory video whiles perceived behavioural control did not influence intention to use participatory video.

After analysing the relationship between intention to use direct contacts with extension agents' knowledge management approach and behaviour predictors using regression, results show that attitude and subjective norm significantly influenced the intention to use direct contacts with extension agents' for accessing agricultural information. Perceived behaviourl control did not influence intention to use direct contacts with extension agents'. Using the SERVQUAL methodology, the overall weighted SERVQUAL score for the intention of farmers to use direct contact extension agents'' agricultural knowledge management approach is 1.11. This figure implied farmers in the study areas surveyed showed great dissatisfaction with the services provided through the direct extension approach. From the figure 4, the chart results indicated that the most deficient dimensions contributing to the dissatisfaction to direct contact extension were assurance (0.3)

reliability (0.28), responsiveness (0.27). Farmers' perception on effectiveness through Tangibility (0.05) was satisfactory.

Under participatory video extension approach, all the five dimensions -Tangibility, Reliability, Responsiveness, Assurance and Empathy explained the intention to use this extension approach. For the participatory video approach, the overall weighted SERVQUAL score was 1.15 implying farmers were dissatisfied with this approach to extension services provision. The SERVQUAL dimensions contributing to the disaffection of the farmers were assurance (0.34), reliability (0.27), empathy (0.25), responsiveness (0.18) and tangibility (0.11) in terms of decreasing importance.

Finally, under mobile phone approach, all the five dimensions strongly influenced intention to use mobile phones in seeking for agricultural information. The overall average weighted SERVQUAL score for mobile phone extension approach was 1.22, indicating a dissatisfaction in the approach. For the farmers surveyed in the study areas, tangibility, empathy, assurance, reliability, and responsiveness significantly influenced farmers' intention to use mobile phone in that increasing order of importance. From the figure 4, mobile phone approach was more effective than participatory video and direct contacts with extension agents'' approaches in reliability (0.19) responsiveness (0.170) and

assurance (0.27) dimensions, but least effective in tangibility (0.18) and empathy (o.41) dimensions.

The research results showed that demographic variables such as gender, age and educational level had significant influence on the farmers' intention to use mobile phone for accessing agricultural information. Respondents' age and educational level were more influential than gender in terms of intention on mobile phone usage. The age group 21-30 had the highest intention to use mobile phone followed by 18-20, then 31-40, 60+, 51-60 and 51-60 age categories. Among farmers who were ready to use mobile phone in agricultural extension service provision, farmers with formal education had more intention to use mobile phones than farmers without formal education. Results from the research also revealed that gender, age and educational level had no influence on participatory video and direct contacts with extension agents' knowledge management approaches. Age group of 21-30 had the highest intention to use participatory video and age group of 31-40 had the highest intention to use direct contacts with extension agents'.

5.2 Conclusion

The study results indicated that opinion leaders, extension agents' and NGOs have significant influence on farmers' decision to use mobile phone in agricultural knowledge

management extension service provision. NGOs were more influential in increasing farmers' intention to use mobile phones to access agricultural information.

Considering the role of ICT (mobile phone and video) in agricultural extension knowledge management recent times, the increase farmer patronage shows a growing trend which must be acknowledged by policy makers. The two ICT approaches 49.1%, almost equal to the old traditional form of direct contacts extension (50.9%). This implies, the ICT approaches are meeting the growing demand of farmers.

Behaviour predictors are important factors to be considered in developing mobile phone knowledge management approach. In this regard, specific demographic factors have to be taken into account in developing the approach. Extension service providers should therefore make sure that extension messages are relevant, easy to interpret and understand before it is delivered to farmers. Also, if messages sent to farmers through any of the three knowledge management approaches are not related to farmers' cultivated crops, it will diminish farmers' interest in patronizing that knowledge management approach.

The SERVQUAL weighted average scores showed generally that farmers are generally dissatisfied with all the extension approaches. The most dissatisfied being the ICT approaches. This means that these ICT approaches including the mobile phone approach have not been very effective due to inadequate services provided by the telecommunication

service providers. The individual SERVQUAL dimension values indicates that farmers in the research area perceive mobile phone knowledge management approach as more reliable, more responsive and much assuring than participatory video and direct contacts with extension agents'' knowledge management approaches.

5.3 Recommendations

There is the need for institutional collaboration between MoFA, the telecommunication networks and key stakeholders in agriculture to develop a strategy to speed up and to implement effective mobile phone technology in agricultural extension. As has been indicated in the conclusion, opinion leaders, extension agents and NGOs are key stakeholders in agricultural extension with influence on the behaviours of farmers so their perspectives are very important in developing an all-encompassing mobile phone package for agricultural extension.

Since ICT extension approaches are in vogue and are becoming highly patronised, policy makers should review and update the E policy in agriculture. For instance, voice and video messages in local languages should be used as part of integrated means of transferring knowledge. In addition, the range of information provided should be expanded to include weather and marketing extension messages. For these measures to be effective and to achieve their intended objectives, MoFA, Development Partners and agricultural projects

should mount vigorous campaigns to sensitize and educate farmers on the use of ICT in agricultural extension. This recommendation is more critical at this period when the government is implementing very ambitious agricultural interventions such as the Planting for Food and Jobs programme (PFJ) and developing a new agricultural investment plan. Agricultural extension agents' who generally assist farmers in the use of mobile phone technology also must have their capacities enhanced. They should be provided with smart phones/tablet computers and their technical skills built. This will enable them to effectively support farmers.

As Shown in Fig 2, an enabling environment is critical to enhancing the effectiveness of ICT used in agricultural extension service provision. Also, all the average weighted SERVQUAL scores indicate that the five dimensions which contribute to service quality relate to the services provided by telecommunications networks. In this regard, government must provide the enabling environment for the service providers to install the requisite infrastructure and software to aid the effectiveness of ICT services in agricultural extension.

REFERENCES

Annor-Frempong, F., Kwarteng, J., Agunga, R., Zinnah, M. M. (2014). Challenges and Prospects of Infusing Information Communication Technologies (ICTs) In Extension for Agricultural and Rural Development in Ghana. AIAEE 22nd Annual Conference Proceedings Clearwater Beach, Florida36.

Assefa, H. (2016). Agricultural Knowledge Management: The Case of Dairy Production Improvement in Bure Woreda, West Gojjam Zone, Amhara Region. www.researchgate.net. 05/03/16.

Asiedu-Darko E. (2013). Agricultural extension delivery in Ghana: A case study of factors affecting it in Ashanti, Eastern and Northern regions of Ghana. Journal of Agricultural Extension and Rural Development, 5(2), pp. 37 –41,

Bakkabulindi, F.E.K., and Sekabembe, B. (2011). Age, Gender and Culture as Correlates of Use of Knowledge Management Systems in Makerere University. East African Institute of Higher Education Studies & Development, Makerere University, IFIP AICT 348, pp 30-42.

Boateng W, (2006). Knowledge management working tool for agricultural extension: the case of Ghana. Knowledge Management for Development Journal 2 (3), 19-29.

Carmichael, R. M., (2002). Measures of Efficiency and Effectiveness as Indicators of Quality. Journal of Institutional Research South East Asia, 1(1).

Cote F., Gagnon J., Houme, P. K., Abdeljelil, A. B., and Gagnon M. (2012). Using the Theory of Planned Behaviour to predict nurses' intention to integrate research evidence into clinical decision-making. Journal of Advance Nursing, 68 (10).

Essay UK (2017). Measuring Customer Satisfaction with SERVQUAL for Quality Service. http://www.essay.uk.com.30/07/17

Fancy, C. (2015) Analysis of the Effectiveness of Participatory video in Dissemination of Agricultural Information among Smallholder Farmers of Bungoma County, Kenya. University of Nairobi, Agricultural Education and Extension.

Fu X. and Akter S. (2012). The impact of ICT on Agricultural Extension Services Delivery: Evidence from the rural e-services project in India. TMD Working Paper Series, No. 046.

Hasan, F. Md., Imai, S. K and Sati T. (2013). Impacts of Agricultural Extension on Crop Productivity, Poverty and Vulnerability: Evidence from Uganda. Research Institute for Economics and Business Administration, Kobe University.

Hothongcum, K., Suwunnamek, O., and Suwanmaeepong, S. (2014). Assessment of Farmers Knowledge and Attitudes towards the Commercialisation of Talor-made fertilisers in Thailand. Asian Journal of Scientific research 7 (3), pp. 354-365.

InfoBridge (2017). The Role of ICTs in Agricultural Development Regional Media Forum: Special focus on community telecentres (Southern Africa). http://www.infobridge.org. 03/09/17

IPA (2014). Disseminating Innovative Resources & Technologies to Smallholders: Community Extension Agents' Update. http://www.poverty-action.org. 03/09/17

ISSER (2016). State of the Ghanaian economy. Institute of Statistical, Social and Economic Research, University of Ghana, Legon.

James, M. O., Emmanuel, D. O., and Robert, A. (2012). Assessing Farmers' Satisfaction of Agronomic Services Received in Ghana Using the SERVQUAL Model- a Case Study of Kumasi Metropolis. International Journal of Business and Social Science, (3) 9.

Kannadas, P. and Savitha, R. (2014). Attitude and Behavioural Problems among Students. Global Journal of Finance and Management.6 (9) pp. 847-852.

Kettinger, W.J. and Lee, C.C. (1994). Perceived service quality and user satisfaction with the information services function. Decision Sciences, 25(6), 737-76.

Knabe A. (2009) Applying Ajzen's Theory of Planned Behaviour to a Study of Online Course Adoption in Public Relations Education. http://epublications.marquette.edu. 12/10/16.

Kwadzo, M. (2014). Emerging Agricultural Extension Approach among Local Ghanaian Farmers: Application of Paulo Frère's Empowerment Education Model in Supervised Extension Projects. Journal of Emerging Trends in Educational Research and Policy Studies (JETERAPS) 5(6): 650-655.

Maio, G. R., Verplanken, B., Manstead, A. S. R., Stroebe, W., Abraham, C., Sheeran, P., Conner, M. (2007). Social Psychological Factors in Lifestyle Change and Their Relevance to Policy. Social Issues and Policy Review, 1 (1).

Malekmohammadi, I. (2009). Interpretive Perspective of Knowledge Management Stance in Agricultural Knowledge Information System to Fostering Research/Extension Linkage. American Journal of Agricultural and Biological Sciences 4 (3): 230-24.

Malle, B. F. (2011). Attribution theories: How people make sense of behaviour. Theories in Social Psychology (PP. 72-95).

Manfre, C., Rubin, D., Allen, A., Summerfield, G., Colverson, K., Akeredolu, M. (2013). Reducing the Gender Gap in Agricultural Extension and Advisory Services: How to find the best fit for Men and Women Farmers. Modernizing Extension and Advisory Services Discussion Paper 2.

Masuki, K.F., and Tukahirwa J. (2010.). Mobile phones in agricultural information delivery for rural development in Eastern Africa: Lessons from Western Uganda. www.worldagroforestry.org 02/03/17

Mekonnen, F. Sehai, E. and Hoekstra, D. (2012). Innovative approaches of knowledge management in agriculture: case of IPMS. Ethiopia.gspace.cgiar.org. 02/03/17

MOFA, (2010). Medium Term Agriculture Sector Investment Plan (METASIP) 2011-2015. https://www.grain.org. 13/06/17

MoFA, (2011). Agric sector annual progress report. http://mofa.gov.gh. 10/10/16

Moore, A., Ferguson, O., and Lolig, V. (2015). Assessment of Extension and Advisory Services in Ghana's Feed the Future Zone of Influence. http://www.dev.meas.illinois.edu. 12/09/16

Mtega, P., Ngoepe, M. & Dube, L. (2016). Factors influencing access to agricultural knowledge: the case of smallholder rice farmers in the Kilombero district of Tanzania. South African Journal of Information Management 18(1).

Norman, G. (2010). Likert scales, levels of measurement and the "laws" of statistics. Advances in health sciences education, 15(5), 625-632.

Nyamba, S. W. and Mlozi M., (2012). Factors Influencing the Use of Mobile Phones in Communicating Agricultural Information: A Case of Kilolo District, Iringa, Tanzania. International Journal of Information and Communication Technology Research, 2 (7).

Obinna, L. O. and Agu-Aguiyi, F. N. (2014). Group Dynamics and Innovation Dissemination among Female Cassava Farmers in Ikwuano Local Government Area of Abia State, Nigeria. Discourse Journal of Agriculture and Food Sciences, 2(10), pp 284-290.

Omotayo, F. O. (2015). Knowledge Management as an important tool in Organisational Management: A Review of Literature. Library Philosophy and Practice (e-journal), Paper 1238.

Omotesho, K. F., Ogunlade I. O. and Muhammed Lawal (2012). Assessment of Access to Information and Communication Technology among Agricultural Extension

officers in Kwara State, Nigeria. Asian journal of Agricultural Development, 2 (2), pp. 220-225.

Palaiah, R. K., Bharatesh, S. H., Dechamma, S. Devaraj K. (2016). Attitude of Farmers about use of ICT Tools in Farm Communication. International Academic Conference, 19 (9).

Pallant J., (2011). SPSS survival manual: A step by step guide to data analysis using SPSS 4th edition. www.allenandunwin.com. 02/11/17.

Parasuraman, A., Zeithaml, V. and Berry, L.L. (1985). A conceptual model of service quality and its implications for future research. Journal of Marketing, 49(4), 41-50.

Parasuraman, A., Zeithaml, V. and Berry, L.L. (1988). SERVQUAL: A Multiple-item Scale for measuring Consumer Perception of Service Quality. Journal of Retailing, 64 (1).

Pew Research Center (2015). Cell Phones in Africa: Communication Lifeline. http://www.pewglobal.org. 01/09/17

PFAG, and SEND-Ghana., (2016). Agriculture Extension Services necessary for Agriculture modernization – PFAG, SEND-Ghana. http://www.myjoyonline.com. 01/09/17

Qamar, M. K., (2005). Modernizing National Agricultural Extension Systems: A practical Guide for Policy-makers of Developing Countries. www.fao.org. 17/02/16.

Sakyi-Dawson, O. and Nudanu, K. M. (2013). Extension worker attitude toward information communication technology for extension work. http://ugspace.ug.edu.gh. 02/09/15.

Shahin, A. (2010) SERVQUAL and Model of Service Quality Gaps: A Framework for Determining and Prioritizing Critical Factors in Delivering Quality Services. www.researchgate.net. 02/08/16.

SIS newslog, (2011). UN Team Approves ICT Goals as East Africans Speed Lags. www.itu.int. 17/09/15.

Smits, M.T., and de Moor, A.R.E.M., (2013). Effective Knowledge Management in Project-Based Organizations. www.doc.telin.nl/dscgi/ds.py. 02/08/16

Treinen, S., Najros, E., Wondim, R. N., Gegenbauer, I. (2010). Knowledge management and Gender. Capitalize and Share Knowledge on Food Security and Empowerment of Rural People. Knowledge fair, Niamey, Niger. www.fao.org. 11/11/16

UNDP, (2012). Promoting ICT based agricultural knowledge management to increase production and productivity of smallholder farmers in Ethiopia. http://www.et.undp.org 12/11/16.

Yadav, K., R. Sulaiman V., N.T. Yaduraju, V. Balaji and T.V. Prabhakar. (2015). ICTs in knowledge management: the case of the Agropedia platform for Indian agriculture. Knowledge Management for Development Journal, 11(2). pp. 5-22.

Zossou, E., Van Mele, P., Vodouhe, S. D., & Wanvoeke, J. (2009). Comparing farmer-to-farmer video with workshops to train rural women in improved rice parboiling in central Benin. Journal of agricultural education and extension, 15 (4). pp. 329-339.

Zyl, V., Alexander, T., De Graaf L., Mukherjee, K. (2012). ICTs for Agriculture in Africa.worldbank.org. 01/07/16.

APPENDICES

APPENDIX 1: SURVEY QUESTIONNAIRE

QUESTIONNAIRE ON EFFECTIVENESS OF KNOWLEDGE MANAGEMENT APPROACHES ON EXTENSION SERVICES DELIVERY IN NORTHERN GHANA.

As you know, Agricultural extension delivery approaches vary widely. Some farmers receive extension through personal visits, others received through ICT-based extension approaches by use of tools such as mobile phone and participatory video. The present survey is part of an investigation that tries to discover the effectiveness these knowledge management approaches on extension services delivery. Please read each question carefully and answer it to the best of your ability. There are no correct or incorrect responses; we are merely interested in your personal point of view. However, all responses to this survey are completely confidential.

A. Demographic data

1. Name of community? ……...

2. Name of farmer: ……

3. Gender 1. Male [ ] 2. Female [ ]

4. Age. a. 18-20 b. 21-30 c. 31-40 d. 41-50 e. 51- 60 61 and above

5. Marital status. 1. Married [ ] 2. Single [ ] 3. Divorced [ ] 4. Widowed [ ]

6. What's the size of your household? ……..

7. Educational level? 1. a. primary school 2. Junior high school 3. Secondary/vocational institute 4. Tertiary 5. No formal education

8. Are you a member of a farm group? a. Yes [ ] b. No [ ]

B. Effectiveness of Extension Services Delivery

1. Have you ever receive/patronized extension service using one of the following knowledge management approaches?

a) Mobile phone **Yes = 1** **No = 2**

b) Participatory video **Yes = 1** **No = 2**

c) Direct contacts with extension officers **Yes = 1** **No = 2**

2. For how long have you received/patronized extension services using this approach? __

3. How are these knowledge management services provided to you?

a. Through periodic sms/voice messages b. through demonstrations c. Through community video streaming session d. Others (specify)……

4. What perceived need does the service address for you? _____

5. In what areas do you think the knowledge management approaches should address your needs? _____

6. Before adopting one of these extension approaches, how did you plan your farming activities? _____

7. Are you willing to pay for the approach you have chosen? a. Yes b. No

8. Do you plan to continue patronizing knowledge management service/s? a. Yes b. No

C. Farmers' Expectations and Perceptions with regards to Knowledge Management Approach patronized

Please indicate your response to the following statements which describes the possible outcomes from your engagement in the following Knowledge Management approaches (mobile phone, participatory video, direct contacts with extension officers)

C1. Farmers' Perception					
The physical facilities used by the knowledge management approach are visually appealing.	Strongly disagree (-2)	Disagree (-1)	Don't know (0)	Agree (+1)	Strongly Agree (+2)
I do get personal attention as an individual patronizing the knowledge management approach	Strongly disagree (-2)	Disagree (-1)	Don't know (0)	Agree (+1)	Strongly Agree (+2)
It does not take more time than I expect before I receive feedback from the service, when I request certain information.	Strongly disagree (-2)	Disagree (-1)	Don't know (0)	Agree (+1)	Strongly Agree (+2)
Service providers are always willing and ready to help me solve my problems	Strongly disagree (-2)	Disagree (-1)	Don't know (0)	Agree (+1)	Strongly Agree (+2)
This approach helps me store information already delivered to me and can be retrieved when the need arises.	Strongly disagree (-2)	Disagree (-1)	Don't know (0)	Agree (+1)	Strongly Agree (+2)
The approach provides its services at the time it promises to do so.	Strongly disagree (-2)	Disagree (-1)	Don't know (0)	Agree (+1)	Strongly Agree (+2)

The knowledge management approach provides me with accurate and timely market information	Strongly disagree (-2)	Disagree (-1)	Don't know (0)	Agree (+1)	Strongly Agree (+2)
The knowledge management approach provides me with weather information which helps me plan my planting activities	Strongly disagree (-2)	Disagree (-1)	Don't know (0)	Agree (+1)	Strongly Agree (+2)
The knowledge management approach provide services that promptly addresses my concerns	Strongly disagree (-2)	Disagree (-1)	Don't know (0)	Agree (+1)	Strongly Agree (+2)
The knowledge management approach has helped me in the use of improved practices (e.g. fertilizer application, storage etc.)	Strongly disagree (-2)	Disagree (-1)	Don't know (0)	Agree (+1)	Strongly Agree (+2)
When I present my problems to the service provider, I have assurance that it shall be solved immediately	Strongly disagree (-2)	Disagree (-1)	Don't know (0)	Agree (+1)	Strongly Agree (+2)
The information provided by the knowledge management approach is trustworthy	Strongly disagree (-2)	Disagree (-1)	Don't know (0)	Agree (+1)	Strongly Agree (+2)
Service providers are always polite in communicating with me	Strongly disagree (-2)	Disagree (-1)	Don't know (0)	Agree (+1)	Strongly Agree (+2)
I am able to source improved farm machinery (e.g. tractor, harvester etc.) since I have started patronizing this knowledge management approach	Strongly disagree (-2)	Disagree (-1)	Don't know (0)	Agree (+1)	Strongly Agree (+2)

I have expanded my scale of production since I started patronizing this knowledge management approach	Strongly disagree (-2)	Disagree (-1)	Don't know (0)	Agree (+1)	Strongly Agree (+2)
I have access to agricultural information on inputs patronizing this Knowledge management approach	Strongly disagree (-2)	Disagree (-1)	Don't know (0)	Agree (+1)	Strongly Agree (+2)
I receive agricultural information on improved practices/new technologies patronizing this Knowledge management approach	Strongly disagree (-2)	Disagree (-1)	Don't know (0)	Agree (+1)	Strongly Agree (+2)
I have gained more knowledge in managing my farm and increased in income patronizing this knowledge management approach	Strongly disagree (-2)	Disagree (-1)	Don't know (0)	Agree (+1)	Strongly Agree (+2)
I find it difficult interpreting messages from the knowledge management approach	Strongly disagree (-2)	Disagree (-1)	Don't know (0)	Agree (+1)	Strongly Agree (+2)
The knowledge management approach gives me up-to-date information	Strongly disagree (-2)	Disagree (-1)	Don't know (0)	Agree (+1)	Strongly Agree (+2)
I am satisfied with the knowledge management approach I patronize	Strongly disagree (-2)	Disagree (-1)	Don't know (0)	Agree (+1)	Strongly Agree (+2)

C2 Farmers' Expectations

The physical facilities (materials) used by the knowledge management	Strongly disagree (2)	Disagree (-1)	Don't know (0)	Agree (+1)	Strongly Agree (+2)

approach should be visually appealing.

I should get personal attention as an individual patronizing the knowledge management approach	Strongly disagree (-2)	Disagree (-1)	Don't know (0)	Agree (+1)	Strongly Agree (+2)
It should not take more time than I expect before I receive feedback from the service, when I request certain information.	Strongly disagree (-2)	Disagree (-1)	Don't know (0)	Agree (+1)	Strongly Agree (+2)
Service providers should always be willing and ready to help me solve my problems	Strongly disagree (-2)	Disagree (-1)	Don't know (0)	Agree (+1)	Strongly Agree (+2)
This approach should help me store information already delivered to me and should be retrieved when the need arises.	Strongly disagree (-2)	Disagree (-1)	Don't know (0)	Agree (+1)	Strongly Agree (+2)
This approach should provide its services at the time it promises to do so.	Strongly disagree (-2)	Disagree (-1)	Don't know (0)	Agree (+1)	Strongly Agree (+2)
This knowledge management approach should provide me with accurate and timely market information	Strongly disagree (-2)	Disagree (-1)	Don't know (0)	Agree (+1)	Strongly Agree (+2)
The knowledge management approach should provide me with weather information which helps me plan my planting activities	Strongly disagree (-2)	Disagree (-1)	Don't know (0)	Agree (+1)	Strongly Agree (+2)
The knowledge management approach should provide	Strongly disagree (-2)	Disagree (-1)	Don't know (0)	Agree (+1)	Strongly Agree (+2)

services that promptly addresses my concerns					
The knowledge management approach should help me in the use of improved practices (e.g. fertilizer application, storage etc.)	Strongly disagree (-2)	Disagree (-1)	Don't know (0)	Agree (+1)	Strongly Agree (+2)
When I present my problems to the service provider, I should have assurance that it shall be solved immediately	Strongly disagree (-2)	Disagree (-1)	Don't know (0)	Agree (+1)	Strongly Agree (+2)
The information provided by the knowledge management approach should be trustworthy	Strongly disagree (-2)	Disagree (-1)	Don't know (0)	Agree (+1)	Strongly Agree (+2)
Service providers must be always polite in communicating with me	Strongly disagree (-2)	Disagree (-1)	Don't know (0)	Agree (+1)	Strongly Agree (+2)
I should be able to source improved farm machinery (e.g. tractor, harvester etc.) since I have started patronizing this knowledge management approach	Strongly disagree (-2)	Disagree (-1)	Don't know (0)	Agree (+1)	Strongly Agree (+2)
I should expanded my scale of production always, patronizing this knowledge management approach	Strongly disagree (-2)	Disagree (-1)	Don't know (0)	Agree (+1)	Strongly Agree (+2)
I should have access to agricultural information on inputs patronizing this Knowledge management approach	Strongly disagree (-2)	Disagree (-1)	Don't know (0)	Agree (+1)	Strongly Agree (+2)
I should receive agricultural information on improved practices/new technologies	Strongly disagree (-2)	Disagree (-1)	Don't know (0)	Agree (+1)	Strongly Agree (+2)

patronizing this Knowledge management approach					
I should gain more knowledge in managing my farm and increased in income patronizing this knowledge management approach	Strongly disagree (-2)	Disagree (-1)	Don't know (0)	Agree (+1)	Strongly Agree (+2)
I should not find it difficult interpreting messages from the knowledge management approach	Strongly disagree (-2)	Disagree (-1)	Don't know (0)	Agree (+1)	Strongly Agree (+2)
The knowledge management approach should give me up-to-date information	Strongly disagree (-2)	Disagree (-1)	Don't know (0)	Agree (+1)	Strongly Agree (+2)
I should be satisfied with the knowledge management approach I patronize	Strongly disagree (-2)	Disagree (-1)	Don't know (0)	Agree (+1)	Strongly Agree (+2)

D. Farmers' Intention

1a. I intend to use Mobile phone/Participatory video/Direct contacts with extension officers for accessing agricultural information next year

Strongly Disagree (-2)	Disagree (-1)	Don't Know (0)	Agree (+1)	Strongly agree (+2)

1b. For me, to use Mobile phone/Participatory video/Direct contacts with extension officers for accessing agricultural information next year is

Extremely unlikely (-2)	Unlikely (-1)	Don't Know (0)	Likely (+1)	Extremely likely(+2)

E. Farmers' attitudes

What do you see as the advantages of your use of mobile phone/participatory video /direct contacts with extension officers?

1a. Using mobile phone/participatory video /direct contacts with extension officers helps me to access relevant agricultural information easily

Strongly Disagree (-2)	Disagree (-1)	Don't Know (0)	Agree (+1)	Strongly agree (+2)

1b. For me, having easy access to relevant agricultural information, using Mobile phone/Participatory video/Direct contacts with extension officers is

Extremely undesirable (-2)	Undesirable (-1)	Don't Know (0)	Desirable (+1)	Extremely Desirable (+2)

2a. Extension messages from Mobile phone/Participatory video/Direct contacts with extension officers helps me plan my farming activities well

Strongly Disagree (-2)	Disagree (-1)	Don't Know (0)	Agree (+1)	Strongly agree (+2)

2b. For me, to plan my farming activities well using extension messages from Mobile phone/Participatory video/Direct contacts with extension officers is

Extremely undesirable (-2)	Undesirable (-1)	Don't Know (0)	Desirable (+1)	Extremely desirable (+2)

3a. Extension messages from Mobile phone/Participatory video/Direct contacts with extension officers helps me develop my knowledge on good farming practices.

Strongly Disagree (-2)	Disagree (-1)	Don't Know (0)	Agree (+1)	Strongly agree (+2)

3b. For me, to develop my knowledge on good farming practices using Extension messages from Mobile phone/Participatory video/Direct contacts with extension officers is

Extremely undesirable(-2)	undesirable (-1)	Don't Know (0)	Desirable (+1)	Extremely desirable(+2)

4a. Using Mobile phone/Participatory video/Direct contacts with extension officers helps me increase my yields through reliance on agricultural information from this source.

Strongly Disagree (-2)	Disagree (-1)	Don't Know (0)	Agree (+1)	Strongly agree (+2)

4b. For me, to increase yields using Extension messages from Mobile phone/Participatory video/Direct contacts with extension officers is

Extremely undesirable(-2)	Undesirable (-1)	Don't Know (0)	Desirable (+1)	Extremely desirable(+2)

5a. Using Mobile phone/Participatory video/Direct contacts with extension officers helps me have easy link to consumers of my farm products

Strongly Disagree (-2)	Disagree (-1)	Don't Know (0)	Agree (+1)	Strongly agree (+2)

5b. For me, to have easy link to consumers Using Mobile phone/Participatory video/Direct contacts with extension officers is

Extremely undesirable(-2)	undesirable (-1)	Don't Know (0)	Desirable (+1)	Extremely desirable(+2)

6a. Using Mobile phone/Participatory video/Direct contacts with extension officers helps me have easy link to input dealers.

Strongly Disagree (-2)	Disagree (-1)	Don't Know (0)	Agree (+1)	Strongly agree (+2)

6b. For me, to have easy link to input dealers using Mobile phone/Participatory video/Direct contacts with extension officers is

Extremely undesirable(-2)	undesirable (-1)	Don't Know (0)	Desirable (+1)	Extremely desirable(+2)

7a. Using Mobile phone/Participatory video/Direct contacts with extension officers helps reduce my cost of farm operation.

Strongly Disagree (-2)	Disagree (-1)	Don't Know (0)	Agree (+1)	Strongly agree (+2)

7b. For me, to reduce my cost of farm operation using Mobile phone/Participatory video/Direct contacts with extension officers is

Extremely undesirable(-2)	undesirable (-1)	Don't Know (0)	Desirable (+1)	Extremely desirable(+2)

8a. On-farm demonstrations makes me understand better using Mobile phone/Participatory video/Direct contacts with extension officers.

Strongly Disagree (-2)	Disagree (-1)	Don't Know (0)	Agree (+1)	Strongly agree (+2)

8b. For me, to understand better during on-farm demonstrations using Mobile phone/Participatory video/Direct contacts with extension officers is

Extremely undesirable(-2)	undesirable (-1)	Don't Know (0)	Desirable (+1)	Extremely desirable(+2)

F. Perceived Behavioural Control

1a. I find it difficult to interpret/understand information from Mobile phone/Participatory video/Direct contacts with extension officers.

Strongly Disagree (-2)	Disagree (-1)	Don't Know (0)	Agree (+1)	Strongly agree (+2)

1b. For me, the difficulty associated with interpreting/understanding information using Mobile phone/Participatory video/Direct contacts with extension officers is

Extremely undesirable(-2)	Undesirable (-1)	Don't Know (0)	Desirable (+1)	Extremely desirable(+2)

2a. I do not get information on time using Mobile phone/Participatory video/Direct contacts with extension officers

Strongly Disagree (-2)	Disagree (-1)	Don't Know (0)	Agree (+1)	Strongly agree (+2)

2b. For me, not getting information on time using Mobile phone/Participatory video/Direct contacts with extension officers is

Extremely undesirable(-2)	Undesirable (-1)	Don't Know (0)	Desirable (+1)	Extremely desirable(+2)

3a. Sometimes, I find it difficult to get the exact information on my crop type using Mobile phone/Participatory video/Direct contacts with extension officers.

Strongly Disagree (-2)	Disagree (-1)	Don't Know (0)	Agree (+1)	Strongly agree (+2)

3b. For me, to find it difficult getting the exact information on my crop type using Mobile phone/Participatory video/Direct contacts with extension officers is

Extremely undesirable(-2)	Undesirable (-1)	Don't Know (0)	Desirable (+1)	Extremely desirable(+2)

G. Normative referents

1a. NGOs think that I should use Mobile phone/Participatory video/Direct contacts with extension officers to access agricultural information

Strongly Disagree (-2)	Disagree (-1)	Don't Know (0)	Agree (+1)	Strongly agree (+2)

1b. For me to use Mobile phone/Participatory video/Direct contacts with extension officers to access agricultural information, as recommended by NGOs is

Extremely unlikely (-2)	Unlikely (-1)	Don't Know (0)	Likely (+1)	Extremely likely(+2)

2a. Religious leaders think that I should use Mobile phone/Participatory video/Direct contacts with extension officers to access agricultural information

Strongly Disagree (-2)	Disagree (-1)	Don't Know (0)	Agree (+1)	Strongly agree (+2)

2b. For me to use Mobile phone/Participatory video/Direct contacts with extension officers to access agricultural information, as recommended by religious leaders is

Extremely unlikely (-2)	Unlikely (-1)	Don't Know (0)	Likely (+1)	Extremely likely (+2)

3a. Extension agents' think that I should use Mobile phone/Participatory video/Direct contacts with extension officers to access agricultural information

Strongly disagree (-2)	Disagree (-1)	Don't know (0)	Agree (+1)	Strongly agree (+2)

3b. For me to use Mobile phone/Participatory video/Direct contacts with extension officers to access agricultural information, recommended by extension agents' is

Extremely unlikely (-2)	Unlikely (-1)	Don't Know (0)	Likely (+1)	Extremely likely (+2)

4a. Opinion leaders think that I should use Mobile phone/Participatory video/Direct contacts with extension officers to access agricultural information

Strongly disagree (-2)	Disagree (-1)	Don't Know (0)	Agree (+1)	Strongly agree (+2)

4b. For me to use Mobile phone/Participatory video/Direct contacts with extension officers to access agricultural information, recommended by opinion leaders is

Extremely unlikely (-2)	Unlikely (-1)	Don't Know (0)	Likely (+1)	Extremely likely(+2)

5. Please list the individuals or groups who are most likely to use mobile phone/participatory video/direct contacts with extension officers for accessing farming information. [ ] commercial farmers [ ] my friends/Peers [ ] opinion leaders

H. Influence of Knowledge Management approaches on farmers' adoption

1. Do you use mobile phone to seek extension services? a. Yes b. no

2. Do you always receive the information required on time using mobile phone? a. Yes b. no

3. Are you able to interpret the messages you receive on your mobile phone? a. Yes b. no

4a. Are you satisfied with the mobile phone extension services? a. Yes b. no c. don't know

4b. If you are not satisfied with the services provided, what do you expect from the services that you don't get?.....

5. How will you rate the mobile phone knowledge management approach?

6. Very bad b. bad c. good d. extremely good e. don't know

7. How do you find the use of mobile phone technology? Very Easy b. easy

c. fairly difficult d. extremely difficult e. don't know

Do you patronize participatory videos for extension information? a. Yes b. no

8. Are you able to interpret messages from participatory video? a. Yes b. no

c. Don't know

10a. Are you satisfied with the participatory video knowledge management approach? a. Yes b. no c. don't know

10b. If you are not satisfied with the services provided by this approach, what do you expect from the services that you don't get? _____

11. How will you rate participatory video approach? Very bad b. bad

c. good d. extremely good e. don't know

12. Do you contact extension officers for your agricultural information? a. Yes b. no

13. Do you always receive the information required on time when you are contacting extension officers? a. Yes b. no

14a. Are you satisfied with the direct contact with extension officers system? a. Yes b. no c. don't know

14b. If you are not satisfied with the services provided by this approach, what do you expect from the services that you don't get? _____

15. How will you rate the direct contacts with extension agents'' delivery system?

a. Very bad b. bad c. good d. extremely good e. don't know

16. Where do you gain extension knowledge to manage your farm?

17. Through Mobile phone b. through participatory video c. through direct contacts with extension agents'

18. What are the advantages of the approach you have mentioned? ……

19. What are the disadvantages of the approach you have mentioned? ……

20. What are the outcomes of the use of the knowledge management options available to you?.....

21. What are the things that will place an impediment on the use of the Knowledge management approaches?.....

22. What are the things that would facilitate the use of the knowledge management options available to you? .....

……

Thank you!