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EXTENSION WORKER ATTITUDE TOWARD INFORMATION COMMUNICATION TECHNOLOGY FOR EXTENSION WORK

BY

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DECLARATION

I, KWAKU – MENSAH NUDANU do hereby declare that, except for the references made to other people's work which have been duly cited, this thesis is the result of my own research. I hereby declare that this thesis has neither been presented in whole or in part for the award of another degree elsewhere.

.....	**……...**
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DATE……...	**DATE……**

DEDICATION

I dedicate this thesis first and foremost to the Lord Almighty who in his infinite mercies and loving kindness inspired me and granted me the grace to complete this thesis. I also dedicate this thesis to my loving wife for her love and support as well as for provoking me positively to finish this work. Last but not the least I dedicate this thesis especially to my late mother, father and my brothers and sisters.

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TABLE OF CONTENTS

Contents **page**

DECLARATION…….. i

DEDICATION……. ii

ACKNOWLEDGEMENT……iii

TABLE OF CONTENTS……..... iv

LIST OF TABLES……vii

LIST OF FIGURES……... viii

ABBREVIATIONS……... ix

ABSTRACT……...xi

CHAPTER ONE – INTRODUCTION TO STUDY…..…….. 1

1.0 Introduction……..……1

1.1 Background of study……...……1

1.2 The concept of attitude…….....3

1.3 ICTs and its use in development work……..……5

1.4 Problem statement……..……..13

1.5 Research questions……..……16

1.6 Research objectives……..……16

1.7 Relevance of study……..……..17

CHAPTER TWO - LITERATURE REVIEW..... 18

2.0 Introduction……...……...18

2.1 Conceptual framework ……..……..18

2.2 Use of TORA and TAM as a tool for measuring the adoption of new technology….....20

2.3 Availability, access and use of ICTs……..……...23

2.3.1 Mobile phones……..... *27*

2.3.2 Internet……..... *30*

CHAPTER THREE – METHODOLOGY……34

3.0 Introduction……..……34

3.1 Description of study area……..……... 34

3.2 Study population and sampling size…… 36

3.3 Research design and method of data collection…….. 37

3.4 Method of data analysis……...…… 39

CHAPTER FOUR – RESULTS AND DISCUSSIONS..... 40

4.0 Introduction……..……40

4.1 Socio- economic and demographic characteristics of respondents……..40

4.1.1 Age of respondents……..*41*

4.1.2 Sex of respondents……. *41*

4.1.3 Educational background of AEAs……..*42*

4.1.4 Work experience of AEAs……..... *.42*

4.2 Extension worker attitude towards the use of ICTs…….…… 44

4.3 Effects of demographic factors on extension workers perception of access to ICTs….. 48

4.3.1Age and access to mobile phone……..*49*

4.3.2 Age and access to internet……..*49*

4.3.3 Gender and access to mobile phone……..*50*

4.3.4 Gender and access to internet……..*51*

4.3.5 Education and access to mobile phone……..*52*

4.3.6 Education and access to internet……..*53*

4.3.7 Work experience and access to mobile phone……..*54*

4.3.8 Work experience and access to internet……..*54*

4.4 Extension workers intention to harness the potential of ICTs……55

4.5 ICTs available to extension workers……...56

4.6 Frequency of use of telecomm. services by extension workers……...57

4.7 Training needs of extension workers……59

CHAPTER FIVE – SUMMARY, CONCLUSIONS AND RECOMMENDATIONS.. 61

5.0 Introduction……61

5.1 Summary……61

5.2 Conclusion…..……62

5.3 Recommendation…..64

LIST OF REFERENCES……66

APPENDIX 1: Survey Questionnaire..... 76

LIST OF TABLES

Table 1: Telecom voice subscription trends for 2013……28

Table 2: Mobile enabled solutions for food and agriculture……..29

Table 3: Market share information for data subscription……...31

Table 4: AEAs level of education……..42

Table 5: Work experience of AEAs……...43

Table 6: Intensions of extension workers to use ICTs……...45

Table 7: Usefulness of ICTs…….. 46

Table 8: Social encouragement……..47

Table 9: Factors hindering extension workers use of ICTs……... 48

Table 10: Age and access to mobile phone……49

Table 11: Age and access to mobile phone……50

Table 12: Gender and access to mobile phone……...51

Table 13: Gender and access to internet…… 51

Table 14: Education and access to mobile phone…….. 52

Table 15: Education and access to internet……53

Table 16: Work experience and access to mobile phone……... 54

Table 17: Work experience and access to internet……55

Table 18: Harnessing potential of ICTs by extension workers……..56

Table 19: Availability of ICTs……...57

Table 20: Frequency/percentage distribution of respondent's use of telecom. services…...58

LIST OF FIGURES

Figure 1: Conceptual framework of extension workers demographics, availability, access and use of ICTs for extension work……...…….19

ABBREVIATIONS AND ACRONYMS

AEAs	Agricultural Extension Agents
AMITSA	Regional Agricultural Input Market Information and Transparency System For East and Central Africa
APRTC	Asia Pacific Regional Technology Centre
CIDA	Canadian International Development Assistance
COMESA	Common Market for Eastern and Southern Africa
CTA	International Centre for Agricultural and Rural Cooperation
E- EXTENSION	Electronic Extension
EAC	East Africa Community
ECX	Ethiopian Commodity Exchange
FAO	Food and Agricultural Organization of the United Nations
FARA	Forum for Agricultural Research in Africa
FVR	Farmer Voice Radio
GDP	Gross Domestic Product
GHC	Ghana Cedi
GIZ	German International Assistance
GSGDA	Ghana Shared Growth and Development Agenda
ICT	Information communications Technology
ICT4AD	Information Communications Technology for Agricultural Development
IFDC	International Fertilizer Development center
IRRI	International Rice Research Institute
ISSER	Institute for Statistical, Social and Economic Research

IT	Information Technology
ITU	International Telecommunications Union
JSS	Junior Secondary School
KACE	Kenya Agricultural Commodity Exchange
MAKWACHA	Money transfer service in Malawi
MDGs	Millennium Development Goals
METASIP	Medium Term Agricultural Sector Investment Plan
MLI	Market Linkages Initiative
MoFA	Ministry of Food and Agriculture
M-PESA	(M for mobile, pesa is Swahili for money) Mobile money transfer service
NGOs	Non – Governmental Organizations
NMRICE	International Rice Research Institute's Nutrient manager for Rice
RML	Reuters Market Light
SDLEARN	Sustainable Development e-Learning Network
SMS	Short Message Service
SPSS	Statistical Package for Social Sciences
SSS	Senior Secondary School
TAM	Technology Acceptance Model
TORA	Theory of Reasoned Action
USAID	United States Agency for International Development
WACS	West Africa Cable System

ABSTRACT

Although Information Communication Technology (ICT) integration in agriculture is changing the tempo of the sector globally, Ghana's agricultural sector has lagged behind in harnessing this potential. A survey was conducted to seek the views of agricultural extension agents (AEAs) in the Ga East and Tema municipal districts of the Ministry of Food and Agriculture to ascertain the potential of ICT use in extension work. Data was collected using structured interviews and questionnaires and were analyzed by using computer software Statistical Package for Social Sciences (SPSS), using frequency counts, percentages and chi square analysis. Analysis of the data shows that majority of the respondents were between the ages of 25-45, majority were male and had a tertiary degree and 50% of the respondents had work experience up to 7years. Availability, access and use of mobile phones and the internet was high. All the respondents had mobile phones available to them, 80% owned and had access to a computer while 43.3% had access to the internet. Results from the study showed that 63.7% of the respondents use mobile phones mainly to communicate orally with farmers, family and friends while less than half use SMS. It was observed that more than half of the respondents use e-mail but limited use of it for communication with farmers. In addition to the main constraints to the use of these ICTs such as high cost of recharge cards (units) and poor network connectivity loss of information, use of these ICTs by fraudsters and power cuts were also identified as specific constraints faced by AEAs. Access to mobile phone and internet were not dependent on the ages, sex, educational background and work experience of the respondents. Results showed that 30% of the AEAs expressed strong intention to use mobile phones, 56.7% expressed very strong intention to use mobile phones while 46.7% expressed very strong intentions to use SMS in carrying out their work. From the service delivery point of view there is therefore great potential for extension workers and agricultural

extension services to harness the potential of mobile phones and the internet to access, store and deliver timely and relevant agricultural information to farmers. It is concluded that with AEAs expressing strong intention to use ICTs for extension work, the capacity of AEAs should be built in basic computer and internet skills to reap the full benefit of e-extension and for it to be successful.

CHAPTER ONE

INTRODUCTION TO THE STUDY

1.0 Introduction

This thesis aims at investigating extension workers attitude towards ICT for extension work, the extension workers readiness to use ICT and barriers towards the implementation of ICT programme. The study also seeks to examine the prospects of infusing ICTs in extension for agricultural and rural development. Included are the research problems, research questions, research hypothesis and the significance of the study.

1.1 Background of study

The sheer size of the agricultural sector points to the fact that agriculture can be the engine of accelerated growth and poverty reduction if the right policies are formulated and implemented in an enabling environment. Historically, agricultural growth was the forerunner to the industrial revolution that spread across the world from England in the mid – 18th century to Japan in the late 19th century. More recently, rapid agricultural growth in China, India and Vietnam has been recognized as the basis to the rise of industrialization, (ISSER, 2011).

The Ministry of Food and Agriculture (MoFA) is therefore tasked to develop a progressive, dynamic and viable agricultural economy that will ensure food security, income generation and hence poverty reduction by promoting sustainable agriculture and thriving agribusiness. These are to be achieved through research and technology development, effective extension and other support services to farmers, processors and traders for improved living standards for all, (ibid). In promoting sustainable development and poverty reduction, Ghana has succeeded in registering sustained positive growth in per capita food production since 1990 compared to many Sub –

Saharan African countries. It is therefore worth noting that the agricultural sector accounts for over 40% of Ghana's GDP employs about 58% of the economically active population and 53% of export earnings (FAO, 2013). Also government expenditure for the agricultural sector has steadily increased from a low of 1.36 percent in 2000 to a peak of 10.32 percent in 2006, currently government expenditure for the agricultural sector is GHC340.8 million. This is in fulfillment of government's adoption of the Maputo Declaration by African governments to allocate at least 10 percent of national budgetary resources to agriculture. In 2008, government expenditure on agriculture stood at 10.21 percent thereby exceeding the 10 percent mark.

Ghana's strategy for the development of the agricultural sector rests on the Medium Term Agricultural Sector Investment Plan (METASIP) which runs from 2011 – 2015. Its goals are aligned with global, regional and national development strategies such as the Millennium Development Goals (MDGs) and the Ghana shared Growth and Development Agenda (GSGDA). The government is therefore focusing on advancing agricultural modernization in order to transform the economy through various initiatives. The fertilizer subsidy programme of the Ministry of Food and Agriculture (MoFA) is one such initiative supplying 114,160 metric tons of chemical fertilizer at a total cost of GHC 57.7 million in 2012 as against GHC 34 million in 2010, (MoFA, 2012). Irrigation rehabilitation works are being carried out at Tono irrigation scheme and dams in the Upper East, Upper West and Northern regions to shift farmers over dependence on rain – fed agriculture. Another initiative is the E – extension programme being rolled out by (MoFA) to make available timely and relevant agricultural information for actors in the sector.

Crucial to the economy of Ghana, the agricultural sector is the country's largest employer and a significant contributor to the gross domestic product. Together with economic growth opportunities, a push for a stronger food security policy has created a drive to modernize farming

practices in recent years. The aim is to boost yields. Increasing production is a major challenge facing Ghana's agriculture. Smallholder farmers who dominate agriculture production in the developing world need to improve farming practices through the acquisition of adequate and appropriate knowledge and information. Agricultural extension services provide critical access to knowledge, information and technology that farmers require to improve productivity, thus increasing incomes and improving livelihoods. It is therefore crucial that farmers are provided with accurate knowledge and information in a timely manner (Arokoyo, 2005, Jirli, 2011).

Considering the growing rapidity of mobile phone penetration even in the most remotest areas, its potential of contributing to the spread of innovative technology as well as extension workers utilization of these technologies in carrying out their activities need to be critically looked at. What would be the impact of mobile phone technology on agricultural extension delivery services? What is the wider impact on extension workers attitude to new agricultural technology in the future? It is therefore important to understand the influence of the experience on extension workers knowledge of agricultural technology and their attitude towards future adoption of new technologies (Aker, 2010).

1.2 The concept of attitude

Fishbein and Ajzen (1975), view attitude as a mental and neutral state of readiness, organized through the experience exerting a directive or dynamic influence upon the individuals response to all objects and situations with which it is related. Attitude is a predisposition or tendency to respond positively or negatively towards a certain idea, object, person or situation. Attitude influences an individual's choice of action and responses to challenges, incentives and rewards. Based on the Theory of Reasoned Action (TORA), a person's attitude toward behaviour consists of a belief that that particular behaviour leads to a certain outcome and an evaluation of the

outcome of that behaviour. If the outcome seems beneficial to the individual he or she may then intend to actually participate in a particular behaviour. Also is ones concept of the subjective norm, which is a person's perception of what others around them believe that the individual should do. This is a kind of peer pressure – friends, peer groups, family, co- workers, church members, farmer based organizations and community leaders.

Psychologists agree that an attitude involves at least three things:

(a) An attitude object which is not necessarily a physical object. It may range from rice exports to globalization.

(b) A set of beliefs, in that the object is either good or bad.

(c) A tendency to behave so as to keep or reject the object or belief.

For one thing it is important to know how intensely a person feels about the attitude object – how deeply committed is the person to the adoption of a new farm practice or technology. Is it important to him or her personally as in self gratification, improvement or esteem?

Social pressures make ones commitment seem irreversible. The very nature of an innovation sometimes makes it impossible to turn back from a decision to accept it. For instance for extension workers to place greater premium on the benefits of building their capacity they may need to bear some if not all the cost. Another example is that one cannot tear down his silo as easily as he can take back a new knapsack sprayer borrowed on a trial basis. The issue here is commitment, (Sherifs, 1965).

Extension workers knowledge levels and skills are crucial to carrying out effective and efficient extension work. Meera et al; (2004), note that as a result of the emerging new paradigm of agricultural development, old ways of delivering important services to clients are being transformed. Also as dynamic and complex as the world has become, the extension worker must

look ahead and align himself so as to take advantage of opportunities when they present themselves and to deal with challenges when they come. Equally important should the extension worker think out side the box by continually updating and building on their information needs to enhance their service delivery. Does he or she think globally or restrict attention to his or her own hometown, family and friends? Here as with time span, the extension worker who can take a broader view is usually best informed (Kessel, 1965).

Based on the Theory of Reasoned Action (TORA), an organization will succeed in achieving its declared objectives only to the extent that its personnel behave in accordance with the norms, goals and set policies of the organization and when personnel develop in themselves, attitudes, values and beliefs which reflect a concern for the development of the people. It can be stated that the relative success of an extension service can be determined by assessing in part the attitude which the extension personnel hold toward their work.

1.3 ICT and its use in development work

ICTs are known to bring about social and economic development by creating an enabling environment. Almost every activity in today's world is dependent on the application of ICTs for one use or the other. With over a billion small scale farmers worldwide, extension is urgently innovating ways to support these farmers in terms of information, technology, advice and empowerment through ICT based agricultural extension and advisory services, (Davis and Asenso – Okyere, 2010).

There are a vast number of ICT based initiatives which cater for a variety of needs of farmers for information for development and extension services, including financial, agricultural best

practices, research, weather forecasts, climate, distribution and supply chain management. Some of these initiatives are KenCall Farmers Helpline, Kilimo Salama, M – PESA and Mali Shambani – all in Kenya, Cocoalink and Radio Ada in Ghana and MAKWACHA in Malawi, also is the Farmer Voice Radio (FVR) in Kenya, Malawi, Tanzania, Mali, Ghana and Zambia (Payne et. al; 2010). Also in Ghana is Rite FM in Dodowa and Farm Channel International, all these provide agricultural information, advice and support to smallholder farmers over the phone using SMS, voice and voice call – back to farmers.

The contribution of information and knowledge in bringing about social and economic development has been well recognized globally in various sectors including agriculture. For instance, the availability of markets and market information enable farmers to bargain and improve their incomes, seize market opportunities and access to factors of production and to use the information to make choices about their activities. ICT enables the inventive Ethiopian Commodity Exchange (ECX) to transmit commodity price information in real time, (World Bank, 2011). Market data feeds directly to farmers via electronic display boards in 31 centers across Ethiopia as well as on the exchanges website. Market data is also provided via text messaging to interested clients using mobile phones. The Kenya Agricultural Commodity Exchange (KACE) and the Malawi Agriculture Commodity Exchange (MACE) also have exchange services through offers and bids which are displayed on blackboard and also disseminated via SMS and the internet, (KACE, 2011). Updates, analysis, reliable and timely market information and intelligence on a wide range of crops and livestock are accessible through these ICTs.

Again in Kenya, market information is provided through SMS to smallholder farmers so as to access daily agricultural commodity prices, extension messages and opportunities to sell or bid

for commodities through SMS and/or voice mail, (Muriithi et al; 2009, Davis and Addom, 2010). Manobi in Senegal provides access to price data on various crops compiled from different markets across the country through the use of mobile phones, (ITU, 2010).

The Grameen Foundation has developed SMS based systems to help deliver market information to farmers in Uganda, (Pyramid Research, 2010). Cassava growers in Nigeria receive market information through a new initiative called the Integrated Cassava Project, through mobile phones, the internet and online market place, the project aims to disseminate market information through market information centers and trade agents, (ibid).

Natural resource management is another area where ICTs contributed greatly in conserving the environment through a community radio in Obane, a rural community in the Dangme East district of Ghana. Participatory approaches adopted by Radio Ada through their broadcasts where listeners determine the content of the programme, facilitated the mobilization of people over a period of four years to dredge a clogged 10km long river which has been neglected for 40 years providing once again the chance to channel water to the irrigation canals of riverside farms, (Larweh, 2006).

In Tanzania radio stations are incorporating ICTs (mobile phones) as recording tools, listening devices and as a catalyst for dialogue for agricultural advisory services, (Gakuru et. al; 2009). Reuters Market Light (RML) is an example of ICT initiative in agriculture in India. RML sends four to five SMS messages a day to its subscribers in 10 different states in India at a cost of US$1.50 per month. The farmers have access to information on prices, commodities and advisory services from a data base with information on 150 crops and more than 1,000 markets, evidence

suggests that the service may have generated about US$2-3 billion in income for farmers with over 50 percent of them significantly reducing spending on agricultural inputs (Mehra, 2010, Hardikar, 2010). Farmers have access to information about weather, crops and current and projected commodity prices at different markets. An initiative by Digital Green in partnership with private extension providers, use video – based processes with local content for disseminating technology and best agricultural practices, (Gandhi et al; 2009).

The International Rice Research Institute's nutrient manager for rice mobile (NMRICEmobile) provides Philippine rice farmers with advice via their mobile phones by SMS on timing, amount and type of fertilizer to apply to their rice crop to maximize production and profit and to reduce waste, (IRRI, 2011).

Waterhole monitoring for livestock is another innovative project implemented by Texas A&M University in northwestern Kenya and Southwestern Ethiopia. Pastoral communities in this region depend heavily on small water bodies for domestic use and for their livestock; this is because shortage of water affects their survival usually leading to conflicts among rival communities (NASA LEWS, 2011).

The satellite – based estimates are free on daily basis over the internet and due to the success of this project a similar project was initiated in the pastoral regions of Mali (Senay, 2010). A project called Masiluleke, which in Zulu means "lending a helping hand" launched in South Africa in October 2008, aims to increase awareness of HIV and AIDS among South Africans by SMS. My Question My Answer, a similar programme that was launched in Nigeria in 2007, built a direct link with the population through ICTs. My Question is an HIV counseling and education service that allows individuals to ask AIDS related questions by sending free SMS to a short code, calling a toll – free phone number or through email. These questions are then answered by trained

counselors. My Answer on the other hand is a monthly competition that engages young people by asking HIV/AIDS related questions which are then answered through a mobile phone or SMS (Pyramid Research, 2010).

In Kenya, Malawi and South Africa mobile phones are being used to send reminders on a daily basis to HIV positive patients about their anti – retroviral medication and also to facilitate community health workers update information on HIV patients status (Aker and Mbiti, 2010). In Kenya, mobile phones are also being used to deliver animal health services which has led to a reduction in transaction costs of farmers and increased the efficiency of animal care (Kithuka et al; 2007).

Experiences from Ghana show that ICTs can be used by farmers to obtain production and marketing information as evidenced in the cocoa sector by the Cocoalink programme. Cocoalink, a programme launched by the Ghana Cocoa Board, provides cocoa farmers with useful information about improved farming practices, farm safety, crop disease prevention, post harvest production and crop marketing. Here farmers receive information and specific answers to questions at no charge via voice and SMS messages in their local language or English. It is therefore not surprising that the role of ICT in agriculture is increasingly being recognized in Ghana.

The trend towards knowledge and service based economies is increasingly advancing among emerging markets and institutions whether they are resource rich or poor. Ghana's economic and political stability combined with its status as a regional standout in information technology

development are positive signs that its efforts in the development and promotion of ICT initiatives will pay off.

Ghana is one of the leaders when it comes to IT penetration, as a result of this broadband connectivity has increased dramatically over the past three years due to the new Undersea Links, the West Africa Cable System (WACS), Main One and Glo – 1: while these new landings have had an impact in Accra and other urban centre's, fixed connectivity is still limited and the national fibre- optic backbone has yet to have a measurable effect (The Reporter Ghana, 2012; ITU, 2012).

Ghana's ICT4AD initiative is the governments long – term strategy for expanding the sector. Initiated in 2003, the ultimate goal is to transform Ghana into a middle – income, information rich, knowledge based and technologically driven economy and society. Many of the programmes objectives focus on the betterment of individuals which calls for the inclusion of ICT in human resource development, education, health and the country's largest employer the agricultural sector, (The Report, Ghana, 2012). It offers the benefit of increasing access to information for the rural poor.

Esoko, a private extension delivery service provider, currently operating in 16 African countries, has over 10,000 farmers receiving price alerts on their mobile phones through Esoko SMS which creates the perfect opportunity to farmers to get the right prices for their crops.

Esoko a Mobile based – Market Information Exchange service provider aims at changing the way markets work in Africa through innovative mobile solutions, individuals and businesses access information in a quick and affordable way using text messaging.

A research conducted by the French National Institute for Agricultural Research found that smallholder farmers in the Northern region of Ghana in 2011, saw a 10% increase in revenue using Esoko SMS market prices.

Banking on success stories Esoko in 2011 partnered with MTN the largest mobile operator in Ghana to reach traders and farmers in the Ghanaian agricultural sector through a partnership call "Farmer First". This has made it possible for farmers who are largely marginalized to have the ability to better negotiate prices and to take their goods to new markets. With about 70% of the population making its living through agriculture and with high mobile penetration rates as at April 2013 in Ghana, this partnership between MTN and Esoko is timelier than ever (Esoko, 2012).

Using Esoko, grain farmers in Malawi now have the means of checking prices through an SMS based market information exchange introduced by USAID's Market Linkages Initiative (MLI). This programme aims to promote growth in food staples and food security by integrating smallholder farmers into more efficient national and regional markets. And with over 90% mobile coverage in the country, Esoko's information system will be able to reach even the remotest parts of Malawi.

Also a joint initiative of IFDC, the East African Community (EAC) and COMESA, AMITSA, through Esoko is improving farmers and others players access to market and technical information on agricultural inputs (fertilizers, seeds and crop protection projects) in Eastern and Southern Africa. This is because the lack of accurate, timely and up – to – date information on agro – inputs is one of the major constraints farmers face in increasing agricultural productivity and developing linkages and trade in the sub – region. The AMITSA network for instance covers

eight country's (Burundi, Kenya, Malawi, Mozambique, Rwanda, Tanzania, Uganda and Zambia). Accordingly, Ballantyne et al; (2011), have indicated that agricultural extension which depends to a large extent on information exchange between and among farmers has been identified as one area in which ICT can have a significant impact. Further, Annor – Frimpong et al; (2006), noted that these technologies are increasingly being used as practical tools to facilitate information delivery and knowledge sharing among farmers, extension agents and other stakeholders.

ICTs according to the Technical Centre for Agricultural and Rural Cooperation (CTA, 2003), are technologies which facilitate communication and thus the processing and transmission of information electronically. Quoting the United States Agency for International Development, (USAID), Akpabio et al; (2007), clarify that ICT includes technologies and methods for storing, managing and processing as well as communicating information. ICT is an umbrella term that includes anything ranging from radio to satellite imagery to mobile phones or electronic money transfers, (McNamara et al; 2011).

ICTs are ideally suited to the task of enhanced interaction because they can expand communication, cooperation and ultimately innovation among actors in the agricultural sector. ICTs especially mobile phones can and do drive participatory communication. It empowers individuals and institutions to create access and use knowledge and to communicate in unprecedented ways (Heeks and Molla, 2009). It therefore suffices that ICT types range from web enabled network technologies as well as technologies comprising computers, telecommunications and audio visuals. It includes mobile phones, e-mail, television, radio, personal computers and the internet. As stated earlier by Annor- Frimpong et al; (2006) ICTs as a practical tool of facilitating

information delivery and knowledge sharing can be seen the world all over and this is exemplified by experiences in Ghana and in other parts of Africa by Esoko. For the purpose of this research the focus will be on computers, internet and mobile phones.

1.4 Problem statement

Today a new pattern of agricultural development is fast emerging, in both developing and developed countries, over all development of rural areas is expanding in new directions. Old ways of delivering important services to rural folks are being challenged and traditional societies are being transformed into knowledge societies all over the world. It is therefore necessary to develop the capacity of both human and technical resources to generate, absorb, disseminate and protect knowledge and exploit it as a powerful tool to transform society. ICT can and is an important means of achieving such a transformation. When used as a tool for providing local farming communities with scientific knowledge, ICT can give a new impetus to social organizations and productive agricultural activities. The extension worker in the current scenario of a rapidly changing world has been recognized as an essential means for delivering knowledge (information) and advice as an input for modern agriculture. If this can be achieved with the help of ICT, extension will become more diversified, more knowledge intensive, demand driven and more effective in meeting farmer's information needs. Extension delivery services need to move from a narrow mind set of transferring technology packages to a more pragmatic and scientific way of transferring knowledge or information packages (Meera et al. 2004).

However, in spite of the numerous potentials that ICT has to offer, the agricultural sector in Ghana has lagged behind both in terms of the percentage of people with access to the full range of

communications services and the amounts and ways in which they can be used (Alexander et. al; 2010, ITU, 2010, Asian development Bank, 2004, Alexander, 2009).

The extension worker to farmer ratio has been an issue of great concern, currently at 1:1500, (MOFA, 2012). This means that the personal face- to- face contact as a means of reaching farmers is inadequate hence the need for innovative information systems to address this gap (FARA, 2008). Rural communities in Ghana are emerging from isolation in this era of global integration through ICTs. Accordingly Jeffrey Sachs, who directed the United Nations Millennium Development Project, states that "mobile phones and wireless internet end isolation and will therefore prove to be the most transformative technology of economic development of our time" (The Economist, 2008).

Extension workers require knowledge and information to be able to carry out their duties efficiently and effectively. A strong extension linkage complimented by smooth information flow enhanced by the effective use of ICTs will significantly boost agricultural production and improve livelihoods in developing country's (Arokoyo, 2005).

A research conducted by Rogers, (1998), shows that around 58% to 65% of any organizations employees are generally uncomfortable with new technology and is even technophobic to some degree. It is for this reason that Rogers, (2003), states that employees should have basic computer and internet skills to get the full benefit of e – learning and for it to be successful. The rational here is that an organization might have the resources for using ICTs but if the employees lack the basic skills that are necessary to use these resources, the result might be failure. Accordingly, to Guglielmino and Guglielmino, (2003), technical readiness and readiness for self – improvement

are two major components for successful e – readiness to occur and these components can be examined under knowledge, attitude, skills and habits of extension workers. Without appropriate hardware and easy access, it is quite difficult if not impossible to implement any ICT focused extension work, (Oliver and Towers, 2000).

Organizations that do not believe in the power of self - development and whose employees have negative attitudes towards self - development would find it difficult to adopt innovations than others who have positive attitudes, Minton, (2002). Swanson, (2001), reveals that the more skilled an organizations work force the more likely the organization is to be successful. Individuals who have high levels of education are more likely to adopt an innovation than others, (Rogers 2003). Hence educational levels of employees can be used as predictors of ICT adoption for extension work.

Even though research and experiences have shown that ICTs can make a significant contribution to accelerated agricultural productivity, leading to increased incomes, poverty reduction and improved livelihoods in rural areas, this potential is yet to be fully harnessed and realized for accelerated economic growth and poverty reduction. There is therefore the need for institutional restructuring and capacity building, pragmatic policy formulation particularly on the part of government and strong partnerships and cooperation among the major stakeholders in the agricultural sector for the potentials of ICT to be realized in transforming the agricultural landscape.

1.5 Research questions

Though research and experiences have shown that ICTs can make a significant contribution to accelerated agricultural productivity, this potential is yet to be realized.

In order to use verifiable data the researcher has posed the following questions that relate to knowledge, attitude, access to and use of ICTs and availability.

Specific questions

- What is the attitude of extension workers toward ICTs in agriculture?
- What are the barriers as perceived by extension workers towards ICT usage?
- How do demographic variables (region, district, gender, age, education) influence extension workers readiness to use ICTs?
- What is the extent of access and use of ICT by extension workers in the greater Accra region?

1.6 Research objectives

The main objective of this study is to identify factors that influence or hinder the adoption of ICTs by extension workers in carrying out their work.

Study objectives

- Identify extension workers attitude about the use of ICTs.
- Identify factors that might hinder extension workers use of ICTs.
- To determine if demographic factors affect extension workers perception of access and use of ICTs.
- To determine the extent to which extension workers intend to harness the potential of ICTs in carrying out their work.

1.9 Relevance of study

Central to achieving Ghana's agricultural development agenda is the cross sectoral promotion of ICT use in Ghana. This is emphasized in Ghana's ICT4AD initiative with the ultimate goal of transforming Ghana into a middle income, information rich, knowledge based and technologically driven economy and society.

The outcome of this study will further contribute to the understanding of the role of ICTs and determinants of its use in agriculture. It will also provide insights into the importance of investing in the education and training of people has in changing attitudes of people.

Investing into ICT has the potential of uprooting rural communities from isolation. ICT therefore has the potential to inform and empower rural people leading to rural transformation and poverty alleviation.

In this era of economic integration and communities having transitioned from industrialization to an information age, there is the need for Ghana's agriculture to align itself so as to be competitive on the global market by having access to appropriate, fast and reliable information for increased agricultural productivity.

This study wishes to bring to the fore the potential ICT has in resourcing agricultural extension delivery by re-orienting itself towards the overall development of the agricultural sector. It is also worthy to note that for all these benefits of ICTs to be realized requires that grass roots workers – extension workers to be at the cutting edge of extension work. ICTs helps by enabling extension workers to gather, store, retrieve, adapt, localize and disseminate a broad range of information needed by farmers.

CHAPTER TWO

LITERATURE REVIEW

2.0 Introduction

This chapter presents a review of literature on the various concepts in the conceptual framework. Here the concepts are explained and illustrated with a model to explain how these concepts affect extension workers attitude towards the adoption of ICTs for extension work in Ghana. It also provides related literature on the various types of ICTs the researcher is investigating.

2.1 Conceptual framework

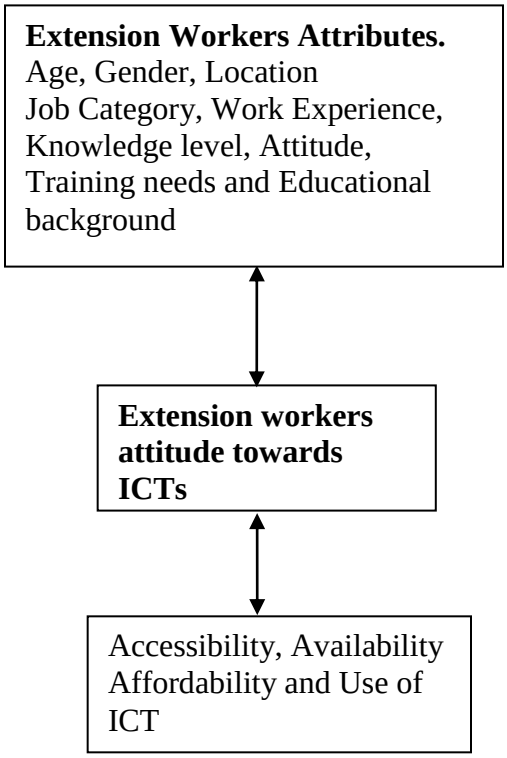
The framework presents a theoretical view of the researchers' scope of study. The components of the conceptual framework are as follows: personal and vocational characteristics of extension workers (age, gender, geographic location, job category, prior experience with ICTs, the availability, extent of ICT accessibility and use, its affordability and training needs of extension workers). It also seeks to analyze the Ministry of Food and Agriculture's (MoFA) policy on ICT for extension work and building the capacity of its human resource particularly its frontline staff (extension workers). The various components are linked together by arrows to show how these components using the TORA tool influence adoption and use of ICT to effectively and efficiently carry out extension work. The TORA tool also helps in bringing out issues that may act as drivers or barriers to positive behaviour, (Mckemey et al., 2002).

Figure 1 shows a diagrammatic representation of the conceptual framework and the influence these components might have on the attitude of extension workers in carrying out a successful ICT programme for extension work. From figure 1 below, the researcher proposes that the

demographic characteristics of extension workers have a direct influence on the adoption levels of innovations (ICTs) for extension work.

Other components such as availability, affordability as well as extension worker's knowledge level of ICTs and their educational background makes it more likely for extension workers to access and use ICTs to gather and disseminate information. There is therefore a higher propensity to get timely and reliable information on good agricultural practices to the farmers. Also organizational policy on ICT for agricultural development has tremendous influence on the success of the programme (Guglielmino and Guglielmino, 2003).

Figure 1: Conceptual Framework



Source: Author

2.2 Use of the Theory of Reasoned Action and Technology Acceptance Model as a tool for measuring the adoption of new technology

Fishbein and Ajzen (1975), view attitude as a mental and neutral state of readiness, organized through the experience exerting a directive or dynamic influence upon the individuals response to all objects and situations with which it is related. Attitude is a predisposition or tendency to respond positively or negatively towards a certain idea, object, person or situation. Attitude influences an individual's choice of action and responses to challenges, incentives and rewards.

Based on the Theory of Reasoned Action (TORA), a person's attitude toward behaviour consists of a belief that that particular behaviour leads to a certain outcome and an evaluation of the outcome of that behaviour. If the outcome seems beneficial to the individual he or she may then intend to actually participate in a particular behaviour. Also is ones concept of the subjective norm, which is a person's perception of what others around them believe that the individual should do. This is a kind of peer pressure – friends, peer groups, family, co- workers, church members, farmer based organizations and community leaders.

Psychologists agree that an attitude involves at least three things:

(a) An attitude object which is not necessarily a physical object. It may range from rice exports to globalization.

(b) A set of beliefs, in that the object is either good or bad.

(c) A tendency to behave so as to keep or reject the object or belief.

For one thing it is important to know how intensely a person feels about the attitude object – how deeply committed is the person to the adoption of a new farm practice or technology. Is it important to him or her personally as in self gratification, improvement or esteem? Guttman and Suchman, (1947), Guttman and Benbasat, (2001), Lee, (2012).

Social pressures make ones commitment seem irreversible. The very nature of an innovation sometimes makes it impossible to turn back from a decision to accept it. For instance for extension workers to place greater premium on the benefits of building their capacity they may need to bare some if not all the cost. Another example is that one cannot tear down his silo so easily as he can take back a new knapsack sprayer borrowed on a trail basis. The issue here is commitment, (Sherifs, 1965).

Extension workers knowledge levels and skills is crucial to carrying out effective and efficient extension work. Meera et al; (2004), Bonne et at; (2007), Gillwald et at; (2010), note that as a result of the emerging new paradigm of agricultural development, old ways of delivering important services to clients are being transformed. Also as dynamic and complex as the world has become, the extension worker must look ahead and align himself so as to take advantage of opportunities when they present themselves and to deal with challenges when they come.

Is the extension worker predisposed to think globally or restrict attention to his or her own hometown, family and friends? Here as with time span, the extension worker who can take a broader view is usually best informed Kessel, (1965). Based on the (TORA), an organization will succeed in achieving its declared objectives only to the extent that its personnel behave in accordance with the norms, goals and set policies of the organization and when personnel develop in them attitudes, values and beliefs which reflect a concern for the development of the people. It can be stated that the relative success of an extension service can be determined by assessing in part the attitude which the extension personnel hold toward their work.

Based on the TORA, Davis, (1986), developed the Technology Acceptance Model (TAM), which deals with the prediction of the acceptability of an information system (innovation). It also seeks to identify the modifications which must be done so as to make the innovation acceptable to users.

The Technology Acceptance Model suggests that the acceptability of an innovation is determined by two main factors, extension workers perceived usefulness and perceived ease of use of the technology. Perceived usefulness is defined as being the degree to which a person believes that the use of a technology will improve his performance. Perceived ease of use refers to the degree to which a person believes that the use of a technology will be effortless. Both the TORA and TAM states that the use of a technology is determined by the behavioural intention which is in turn determined by the person's attitude towards the use of the technology and also by the person's perception of its utility. According to Davis (1986), the attitude of a person is not the only factor that determines his use of a technology, but also based on the impact it may have on his performance. Therefore even if an employee resists the introduction of a new technology the probability that he or she will use it will be high if he or she perceives that the technology will improve his or her performance at work. Davis's (1986), initial TAM has undergone various refinements by many authors trying to find the latent factors underlying perceived usefulness and ease of use of a technology.

(Venkatesh et al; (2003), in TAM 2 showed that social influence (subjective norm, voluntarity, image) and cognitive processes (job relevance, output quality, result demonstrability) affected perceived usefulness and perceived ease of use. McFarland and Hamilton (2006), assume that six contextual variables (prior experience, others use, computer anxiety, system quality, task structure and organizational support) affect the perceived usefulness and perceived ease of use of a

technology. From its original model, TAM has evolved over time and has proven to be a useful theoretical model in helping to understand and explain peoples use behaviour in the adoption and implementation of technology.

2.3 Availability, Access and Use of ICTs

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. 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 to meet the needs of the farmers appropriately. It must at the same time be current and communicated through the appropriate channels Christopolos, (2010). It is therefore increasingly being recognized the world over and in developing countries in particular that ICT is necessary for accessing required information and knowledge Aker, (2010). Nkwocha et al; (2009), reported that ICT can promote access to and sharing of information in agriculture and other sectors. The inherent benefits in the pluralistic nature of information flow through ICT if properly harnessed will have a positive effect on the productivity of extension workers. Although it is expected that extension workers will rise up to this challenge, the fact that there is little or no change in farmers agricultural practices call to question the quality of extension workers who may not be aware of agricultural information most of which are available on-line, due probable to inadequate access to ICTs.

By using ICT, particularly the internet, mobile phones, e-mails and SMS, agricultural information is accessed more easily and coverage also expands Woods et al; (2002). There are experiences

gained from the world such as the International Rice Research Institute (IRRI) and Asia Pacific Regional Technology Centre (APRTC) and Sustainable Development e – Learning Network (SDLEARN). It was found that application of ICT on e – learning in particular is an effective alternative in addressing the continuing educational needs of agricultural knowledge especially in the areas of sustainable agriculture and natural resource management (Abdon et al; 2006). The benefits of utilizing ICT as an e – learning tool for agricultural extension and training purposes are well documented (Hafkin & Odame; 2002, Richardson, 2005; Asenso – Okyere, 2012). Shea-Shultz & Fogarty, (2002), pointed out that one of the significant reason for the increase in e – learning as related to cost of training, citing that PriceWaterhouseCoopers reduced the cost of training per person by approximately 87% through its e – learning initiative. The same authors state that "e – learning is saving 33% to 50% from the cost of training while cutting 50% off the time invested and allowing better results".

In addition to cost benefits, organizations prefer e – learning for its promises to increase employee retention, development, deploy and update content provide effective training anywhere and anytime (Minton, 2002). Bork, (2002), states that e – learning boost worker productivity, broadens training opportunities, stays competitive, improves motivation and morale and facilitates the implementation of strategic initiatives. Chamala & Shingi, (1996, 2010), confirm that ICT use for extension activities will ultimately transform extension workers into catalysts who will play roles of empowering community organizations, human resource development, problem solving and educating farmers. Further, Richardson, (2005), emphasizes that extension organizations have a key role in being a link between communication technologies, providing technologies and service to the farmers they serve. The role of the extension worker in bridging the technological gap between existing and evolving scientific knowledge and farmer's knowledge can not be

glossed over. It is therefore appropriate to state that the most critical target learners of ICT initiatives are knowledgeable, skilled and committed extension workers.

Implementation of ICT programmes also depend on various factors such as infrastructure, organizational policy, government policy and the human factor/human resource. Developing countries in implementing ICT programmes face challenges such as infrastructure, internet connectivity, human resource, policy support and institutional framework, (Soekartawi, 2005). Soekartawi stresses that human resources is an important factor in harnessing the benefits of ICTs. In analyzing readiness of diffusion of ICTs, Kauffman & Kumar, (2005), argue that when the technology is new to a country, region or organization, the readiness of its people to adopt it is a crucial issue. Kaur & Abas, (2004), noted that an assessment of ICT readiness allow an organization to draw up comprehensive strategies and effectively implement and achieve ICT goals and also make it possible to identify areas where future attention is required.

Since the concept of e – readiness is relatively new, it can be visualized at different levels. Because the dynamic natures of ICTs force the end users to always be updated with the latest development, the dearth of this causes the individual, institution and State to lag behind. Hence an attempt has been made to define the concept of e – readiness at the three levels (individual, institution and State). So & Swatson, (2006), define e – readiness as being "prepared mentally or physically for some experience or action". In terms of e – learning, Borotis & Poulymenakou (2004), defined e- learning readiness as "the mental or physical readiness of an organization for some e- learning experience or action".

"Individual e – readiness is the degree to which an individual is able to access and use the ICT tools and has the necessary skills to get himself/herself updated with the technological infrastructure.

"Institutional e – readiness" on the other hand is the degree to which an institution possesses infrastructure, network accessibility, policy support and affordability to acquire and effectively utilize ICTs. It should also possess sufficient skilled manpower to efficiently and effectively utilize the available ICT infrastructure.

Further, "National e – readiness" is the degree to which a nation possesses necessary infrastructure, network accessibility, affordability, policy support and the human resource with the necessary skills to acquire, access and utilize ICTs, (Jirli, 2011). A study by Trinidad (2002), proposes an initial assessment of technical factors such as computer, internet, telephone lines and educational factors such as network learning, network policy, English proficiency and computer/ internet literacy. Other factors are human resources, attitude, costs, technological skills, equipment and content readiness (Chapnick, 2000). In identifying barriers faced in implementing ICT programmes, Muilenberg & Berge, (2005), identified eight barriers namely administrative/instructor issues, social interactions, educational background, technical skills, motivation, time and support for cost of capacity building, access to the internet and technical problems. Ali & Magalhaes, (2008), divided the barriers in the adoption of e – learning into two factors: technical and organizational barriers. Technical barriers which are the most commonly cited consist of system crashes, bandwidth issues, infrastructural upgrade and usability, technical support and perceived difficulties in using such technology. The organizational barriers include lack of time available for training, cost in relation to value, lack of appropriate content in relation

to specific needs, language barrier (as most of the content is in English). A study by Baldwin – Evans (2004), mentioned difficulties in measuring effectiveness of the initiative, lack of strategic planning and direction, politicizing initiatives, lack of e – learning awareness and lack of organizational support as some of the cited barriers to a successful ICT programme implementation.

2.3.1 Mobile phones

The potential benefits of using mobile phones to improve efficiencies in agriculture are central to the challenges that the sector face. For rural populations who are dispersed and isolated from knowledge centers', the information and communication capabilities of the mobile phone can be even more valuable (Halewood & Surya, 2012). Close to six billion phones were in use and accessible to 70% of the worlds poor according to the World Bank, (2012), whose main source of income comes from the agricultural sector. Today there are 6.8 billion mobile – cellular subscriptions world wide ITU, (2013). Of great import is the fact that the mobile revolution in agriculture is not driven by mobile phones alone, other devices such as smart phones and tablets have already begun to have an impact as information delivery channels. In 2013, there are almost as many mobile – cellular subscriptions as people in the world, with more than half in the Asia – Pacific region (3.5 billion out of 6.8 billion total subscriptions). ITU, (2010), stated that although mobile phones have not yet reached total geographical coverage, it expects "complete mobile coverage of all rural areas around the world by 2015 or even earlier". As at April, 2013 total cellular/mobile voice subscription base in Ghana stood at 26, 591, 124 (National Communications Authority, 2013). ITU, (2012), reported that mobile – cellular telephone subscriptions at the end of 2012 in Ghana was 25,618, 427. Mobile – cellular subscriptions per 100 inhabitants for the same period was 100.28, fixed (wired) broadband subscriptions for 2012 was 64, 436, fixed

(wired) broadband subscriptions per 100 inhabitants was 0.25 as compared to 0.00 in 2001. Fixed telephone subscriptions in Ghana increased from 212,548 in 2000 to 284,981 in 2012.

Table: 1: Telecom Voice Subscription Trends in Ghana For 2013

Mobile Operators	**January**	**Febuary**	**March**	**April**
EXPRESSO	212,804	163,762	162,661	156,721
MILLICOM (TIGO)	3,669,472	3,712,082	3,676,457	3,721,722
SCANCOM (MTN)	11,857,772	11,941,887	12,024,068	12,039,527
VODAFONE MOBILE	5,423,932	5,551,139	5,609,122	5,672,287
AIRTEL	3,273,048	3,341,715	3,341,715	3,346,543
GLO MOBILE	1,614,117	1,614,117	1,607,907	1,654,324
TOTAL MOBILE	26,086,117	26,324,702	26,464,964	26,591,124
MONTH OVER MONTH GROWTH		0.9%	0.5%	0.5%

Source: National Communications Authority, 2013

Table: 2: Mobile enabled solutions for food and agriculture

Improving access to financial Services*	Mobile payment platform Micro – insurance system Micro – lending platform	Increasing access and afford-ability of financial services tailored for agricultural purposes
Provision of agricultural information	Mobile information platform Farmer helpline	Delivering information rele-vant to farmers, such as agricultural techniques, com-modity pricing and weather forecasts
Improving data visibility for Supply – chain efficiency	Smart logistics Traceability and tracking System Mobile management of Supplier networks Mobile management of Distribution networks	Optimizing supply – chain Management across the sector And delivering efficiency im-provements for transporting logistics
Enhancing access to markets	Agricultural trading platform Agricultural tendering plat-form Agricultural bartering plat-Form	Enhancing the link between Commodity exchanges traders, Buyers and sellers of agric-ultural produce

*The role of mobiles in finance

Source: ITU, 2013

While developing countries are still lagging behind high – income countries in overall ICT usage and applications, mobile phones are more accessible and inexpensive means of narrowing the digital gap (Wade, 2004). To this, Donner, (2006), states that there are many reasons why mobile phones are considered as important tools for development. Mobile phones beyond basic connectivity offer benefits such as mobility and security to users. As a conduit for accelerated development, particularly in developing and marginalized communities the mobile phone works within the scope of over coming technical constraints such that there is no need to rely on physical infrastructure such as roads, telephone lines, and sub – stations can be powered by generators in places with no electricity (The Economist, 2008). Mobile phones only require basic literacy and are accessible to a large proportion of the population. Also mobile phones allow for the flow of data to be used in other sectors such as health, education, commerce or governance. Last but not the least, with the pre – paid method, mobile phones are increasingly affordable to the poor and can therefore be used as a means to ensure greater participation of the poor and marginalized in the development process.

2.3.2 Internet

The rapid diffusion of computers and internet use has been a feature of the global landscape over the past decade. The increase in computer and internet use rates are considerably higher now than they used to be a few years ago for almost every country in the world (Chin & Fairlie, 2006).

The emergence of wireless and broadband connectivity is placing the country in a position to take advantage of the benefits to be derived from ICTs (Cohbinah, 2003).

While the number of internet users in Ghana increased from 30,000 in 2000 to 1,297,000 in 2011,the Percentage of individuals using the internet in Ghana rose from 0.15% in 2000 to 17.11% of the population in 2012 (ITU, 2012).

Table: 3: The market share information per operator for data subscription in Ghana (2013)

Mobile Data Operator	March	April	Percentage of market Share as at April 2013
EXPRESSO	49,270	47,092	0.54%
MILLICOM (TIGO)	1,288,496	1,114,850	13.16%
SCANCOM (MTN)	5,819,634	5,820,168	66.93%
VODAFONE MOBILE	590,567	611,367	7.03%
AIRTEL	867,386	843,899	9.70%
GLO MOBILE	280,077	229,058	2.63%
TOTAL MOBILE	8,895,430	8,696,434	100.00%

Source: National Communications Authority, 2013

Computers and the internet have made it possible for ICTs to reach even those who do not have first hand access to them. Through ICTs for example, a veterinarian in the remotest rural village can access up to date information on diseases and can use that information to treat and advice livestock farmers, extension workers can also use this medium to acquire knowledge, / information and to advice farmers (Asenso – Okyere & Mekonnen, 2012).

The importance of ICTs in development has long been recognized and access to ICTs was made one of the targets of the Millennium Development Goals No. 8 (MDG 8), which stresses the benefits of new technologies, especially ICTs in the fight against poverty. The World Bank report on information and communication for development estimated that "with 10 percent increase in high speed internet connections, economic growth increases by 1.3 percent" (World Bank, 2009).

The same report also noted that "connectivity be it internet or mobile phones is increasingly bringing market information, financial services and health services to remotest areas and in unprecedented ways". There is growing evidence that the use of computers and internet is being effectively used in some African countries with great success on market price information, transport information, live stock diseases, weather forecasts, information on storage facilities and general advice on agriculture (Gakuru et al; 2009).

While the use of ICTs in extension has a lot of benefits in relation to traditional media, ICT projects come with a vast array of challenges such as availability of hardware, lack of accessible communication infrastructure in many rural and remote areas, cost of technologies, cost of access and support, inherent need for capacity building, difficulty in integrating with existing media and indigenous methods, lack of conducive policy environment and lack of stakeholders commitment in the planning process (Richardson, 2009). In addition to income, educational background and social and cultural barriers, the likelihood of an individual having the necessary computer skills can affect the use of new ICTs (Gillwald et al; 2010; Hafkin & Odame, 2002). Muto & Yamano, (2009), found that the total value of assets and the educational background are directly related to the possession of mobile phones and computers.

Prior studies have also demonstrated that demographic characteristics such as age, gender, marital status, educational background, prior experiences with computers and the internet influence ICT and or electronic learning adoption (Durndell & Thomson, 1997; Teo & Lim, 2000; Muilenberg & Berge, 2005; Ong & Lay, 2006). Therefore, this study which examines some key variables which influence the readiness and barriers towards ICT programme implementation in Ghana will be a significant contribution to knowledge in this area. It is therefore significantly worthy to

acknowledge H.E. Ellen Johnson Sirleaf, president of Liberia, addressing the Science with Africa Conference (March 3 – 7, 2008) in Addis Ababa, Ethiopia said that, "no country on earth have developed without deploying, harnessing and utilizing science and technology, whether it is through technology transfer or home grown. The African continent needs to think seriously about stepping up efforts in using science and technology for decision support and for making a difference in the lives of ordinary people. By harnessing science and technology, African countries have a stronger chance for sustained economic growth, for addressing poverty, disease and environmental destruction. Therefore building national science and technology capacities are critical indicators of the future well – being of a country's citizens and how well a country can compete in the global market", (Asenso – Okyere and Mekonnen 2012).

CHAPTER THREE

METHODOLOGY

3.0 Introduction

This chapter describes the methodology of the study that is used to answer the research questions and objectives. It covers the research design, research population, a description of the data collection process and subsequent analysis of the data. Finally statistical tools for data analysis are explained.

Methodological procedures and ways of analyzing data are important considerations for social investigation. Methodology basically has to do with the tools used in carrying out the study, enquiries about what is possible for researchers to know and how to ascertain the validity of their claims (Fisher, 2007).

3.1 Description of study area

The study was carried out in the Ga East and Tema municipal districts located in the Greater Accra region, Ghana. These two districts were selected because at the time of this study, the Directorate of Agricultural Extension Services (DAES) under MoFA was piloting the e-extension programme in the Greater Accra Region.

The researcher therefore thought appropriate to select these two districts to ascertain the attitude of the extension workers toward ICT for extension work.

Ga East District

The Ga East District is bounded on the north by Akwapim North District of the eastern region, on the south by Accra Metropolitan Authority, on the west by Tema Metropolitan district and on the east by Ga west district. The district has a total land size of about 166km^2 with about 107.90 for

agricultural production (MoFA, 2013). The district is further divided into four (4) zones with sixteen (16) operational areas consisting of forty – two (42) communities. The Ga east district lies in the coastal savannah agro – ecological zone with a bi – modal rainfall pattern, average annual temperatures range between 25.1^0c in August and 33^0c in February and March. The main crops grown in the district are maize, cassava, okra, pepper, tomatoes and garden eggs. Animal production includes sheep, goats, pigs, rabbit rearing, grass cutter and poultry farming. Also women mostly farm and process cassava into gari and cassava dough.

Tema municipality

Tema municipality on the other hand is a coastal area situated about 30 kilometers east of Accra, the capital city of Ghana. It shares boundaries on the north by Ledzekuku Krowor municipal, northwest by Adenta municipal and the Ga east municipal, north by the Akwapim south district and the south by the Gulf of Guinea. The metropolis covers an area of 396km and lies within the coastal savannah zone. The Greenwich Meridian (Longitude 0) passes through the metropolis, which meets the equator or latitude 0 in the Ghanaian waters in the Gulf of guinea. Notable in the metropolis is the Tema habour due to its proximity to the sea. The vegetation zones in the metropolis comprise of scrublands, grassland and few deciduous forests. The grassland in areas such as Appolonia, Gbetsile, Santeo, Katamanso and Katamansu supports livestock farming. Total land coverage of the Tema metropolitan area is approximately 369sq.km of which agriculture takes about 20%. Agricultural practice in general in the metropolis is more subsistence farming and undertaken mainly at the peripheral areas. Major crops grown are maize and cassava alongside animal rearing. Vegetables such as onions, okra, tomatoes, pepper, cabbage, carrots, lettuce, cucumber and cauliflower are also cultivated.

3.2 Study population and sampling size

The population of the study consisted of 113 agricultural extension agents (AEAs) in the Greater Accra region. According to Bailey (1987), a sample is a subset or a portion of the total population. A sampling technique basically involves the manner in which a researcher selects size, type and representativeness of the sample. This involves the selection of units of interest so as to make a fair generalization on the population from which the sample was chosen (Trochim, 2006). This makes it possible to make observations, measurements of these units and conclusions drawn regarding the entire population.

Since it is practically impossible to study the whole population, sampling is therefore that part of statistical work concerned with the selection of individual observations intended to yield some knowledge about a population of concern. According to Barreiro & Albandoz, (2010), the sample size is influenced by the purpose of the study, population size, the risk of selecting a "bad" sample and allowable sampling error.

For this study, purposive sampling technique was used, this was based on the fact that MoFA was running a pilot e-extension programme at the time and 113 AEAs had been trained. It was therefore pertinent to select the AEAs from the pilot region for this study. Thirty (30) AEAs were selected from two districts in the Greater Accra region, namely Ga east and Tema municipal districts.

The justification for selecting thirty AEAs can be made citing Barreiro & Albandoz, (2001). They used two concepts in authenticating the selection of a sample size, elevation factor and sampling factor.

The elevation factor is the quotient between the size of the population and the size of the sample N/n. This represents the number of elements existing in the population for each element of the

sample. The sampling factor on the other hand, is the quotient between the size of sample and the size of the population n/N. If this quotient is multiplied by 100, we arrive at the percentage of the population represented in the sample.

Based on the above, the elevation factor for selecting 30 AEAs out of the 113 would be –

E = N/n = 113/30 = 3.7, where N = total population and n = sample size. From this 3.7 indicate that each AEA interviewed represents four (4) of their colleagues. The sampling factor f = n/N = 30/113 = 0.2654. Multiplying 0.2654 by 100 gives us the percentage of the population represented in the sample. Thus the 30 AEAs sampled represent 26% of the population.

3.3 Research design and method of data collection

Research design is considered as a blue print for research dealing with which questions to answer, which data are relevant, what data to collect and how to analyze the results (Babbie, 2005, 2010). The research design describes the procedure for conducting the study, such as when, from whom and under what conditions data were obtained. Its objective is to provide valid and accurate answers as possible to research questions (McMillan and Schumacher, 2006).

Surveys are used to derive qualitative estimates reflecting the research under consideration. It also enables the researcher to accept lower levels of precision because of resource limits and to make maximum use of prior knowledge with purposive sampling. Again data collected could be used as a benchmark data to assess trends and therefore makes the method repeatable with a high degree of confidence. With regard to qualitative data such as descriptions and analysis of situations,

events, people, interactions and observed behaviours, surveys are appropriate to make a decision when researching characteristics, cultural patterns, motivations and attitudes (Longhurst, 1992).

A survey was used to gather qualitative and quantitative data such as demographic and socio – economic characteristics of AEAs, communication characteristics – access, use and availability of ICTs, access to and use of ICTs in extension work and factors that serve as drivers and barriers to the use of ICTs from 30 AEAs in two districts in the greater Accra region to investigate perceptions of readiness and barriers towards e- extension programme implementation. The research questionnaire titled "Extension Worker Attitude toward ICT for Extension Work" consisting of three parts was used to collect data for the study.

The first part seek to solicit information on personal data of respondents such as age, sex, marital status, educational background while the second part solicit information from respondents on their attitude toward the adoption of ICT products.

The third part consists of questions designed to solicit information regarding AEAs perceived ease of use and perceived usefulness factors of ICT products on a 5 – point linkert scale. Secondary data essential to the study were collected from journals, reports, articles and books.

3.4 Method of data analysis

Data processing involves the transformation of data into information by collating, sorting, classifying, retrieving, disseminating information manually or through the use of computer software (Bourque, 2006). The goal is to highlight useful information, suggest conclusions and supporting decision making. After primary data from the field had been checked for completeness and accuracy the responses were coded and entered into the Statistical Package for Social Sciences (SPSS) version 20 and analyzed, using frequencies and percentages.

Cross tabulation and chi – square statistical test were used to test the significance of relationships between respondents personal characteristics and their perceived ease of use and usefulness of ICTs for extension work. A significance level of 5% was used for the test. Results were presented in the form of frequencies and percentages were used to simplify the understanding of the findings.

Content analyses and interpretation of responses from respondents were used to analyze qualitative data.

CHAPTER FOUR

RESULTS AND DISCUSSION

4.0 Introduction

This chapter presents and discusses the empirical results of the study in relation to the specific objectives of the study. Section 4.1 presents findings on the socio – economic and demographic characteristics of the AEAs for this study, while section 4.2 deals with the first objective which is assessing extension workers attitude about the use of ICTs in carrying out their duties. The second objective which is to assess factors that might hinder extension workers use of ICTs is dealt with in section 4.3, this is followed by the third objective which seeks to determine if demographic factors affect extension workers perception of access and use of ICTs is discussed in section 4.4. Section 4.5 discusses the fourth objective which seeks to determine extension workers intention to harness the potential of ICTs in carrying out their work; the fifth objective which is the identification of ICTs available to extension workers is discussed in section 4.6. Ascertaining the frequency and use of ICTs the seventh objective is discussed in section 4.7 and last but not the least, section 4.8 discusses the eight objectives which seeks to identify the training needs of extension workers.

4.1 Socio – economic and demographic characteristics of respondents

The socio – economic and demographic characteristics of respondents described in this section include respondents' age, educational background, sex, and work experience.

4.1.1 Age of respondents

The age distribution of respondents has been categorized in this study into those between the ages of 25-45years and those between 46-60years. This study revealed that majority of the respondents

25-45years constituted the highest number of 24 respondents which could be described as a youthful work force, while those between the ages of 46-60 are only 6 respondents. The average age of the respondents was 38 years with the maximum and minimum ages being 55 years and 25 years respectively. From the results, it can be said that majority of the respondents fall within the active working age, since 83.4% of them are within the 25-45 year group, this may be due to the fact that the study area is in the Greater Accra region and not far from the capital where mainly young people from all parts of the country come to search for jobs. Also the youth are being encouraged and motivated to engage in agriculture and its allied activities through various government initiatives such as the Youth in Agriculture Programme in order to contribute towards the development of their communities and the country as a whole. Usually such an active age group has the zeal to work hard to achieve the objectives of the organization they work with.

4.1.2 Sex of respondents

Majority of the respondents representing 83% were males whilst the remaining 16.3% were females. Extension service delivery in Ghana has always been dominated by males, this has been the trend since the colonial era and it is therefore not surprising that this study confirms this trend. FAO, (2009); MoFA, (2008) observed that extension delivery services in Ghana is a male dominated occupation.

4.1.3 Educational background of AEAS

Levels of education were categorized as Basic, Secondary, and Tertiary. The findings are presented in Table 4 and show that as high as 90% of the respondents had Tertiary education. This is followed by 6.7% of respondents who had Secondary education while 3.3% constituted one AEA who had Basic education. The high level of education among the respondents would

likely make them more receptive to adopt new and innovative ICTs in carrying out their work. Literature by Bonati & Gelb, (2005); Bell, (2004) and Rogers, (2003) indicate that knowledge and educational levels of AESs place them in a more receptive position in adopting innovations. This also necessitates an effective and efficient way of communicating to farmers. Hence, educational levels of AEAs can be used as one of the predictors of their attitude towards the use of ICTs in their extension work.

Table 4: AEAs level of education

Level of Education	Frequency	Percentage%
Basic	1	3.3
Secondary	2	6.7
Tertiary	27	90.0
Total	30	100

Source: field survey, 2013

4.1.4 Work experience of AEAs

This sub – section discusses results on the experience level of AEAs with regards to the use of ICTs for extension work. Research has found that most studies used time on the job or tenure to measure work experience. This is further supported by some researchers suggesting that experience is the job – relevant knowledge gained over time, (Fiedler, 2007; McCall et. al; 2004). Since individuals are products molded by every experience in life, our past and present experiences continuously affect the development and shape of knowledge, skills, attitudes, ambitions, beliefs and behaviours, (Tesluk and Jacobs, 1998; Sardeshmukh, 2008). McDaniel et al; 1988, (2007), found the relationship between work experience and job performance to be

influenced by two variables: length of experience and job complexity. Work experience is therefore a central force of influence on performance and behaviour. The results of the study shows that majority of the respondents (15) have 1 – 7 years of working experience followed by 9 of the respondents having 8 – 15 years of working experience. Four (4) of the respondents however have 24 – 31 years of working experience with only 2 with 16 – 21 years of working experience. Since the majority (24) of the respondents fall within 1 – 15 years of working experience shows that the AEAs are likely to adopt new technologies and to use ICTs in extension work.

Table 5: Work experience of AEAs

Years of experience	Frequency	Percentage %
1 – 7	15	50
8 – 15	9	30
16 – 23	2	13.3
24 – 31	4	6.7

Source: Field survey, 2013

4.2 Extension workers attitude towards the use of ICTs

Attitudes are important determinants of human behaviour and performance. They provide direction and purpose to behaviour and performance. Theoretical and research considerations suggest that an increased attitude strength, knowledge level, commitment and intensity may sometimes be a legitimate goal in extension delivery (Liaghati et al; 2008). An attitude high in intensity, strength and knowledge is apt to be a good predictor of bahaviour, overall positive

attitude of the benefits of ICTs to extension work may serve as a major influence to the success of the adoption and success of an innovation, (Udoto & Flowers, 2001).

Table 6 shows the distribution of the intention of extension workers to use the various ICTs. The table shows that 30% of the respondents expressed a strong intension to use mobile phones while 56% expressed very strong intentions to use mobile phones. This coupled with the penetration rates of mobile telephony in the country could be harnessed in reaching farmers with relevant and timely information in carrying out their activities. With regards to the use of the internet to search for information, 6.7% of respondents expressed very weak and weak intentions to use the internet, however 60% expressed (strong) and 13.3% (very strong) intensions to use the internet to search for information.

The use of SMS also had positive responses from respondents with 33.3% having a strong intention to use SMS and 46.7% with a very strong intension to use SMS. This is a very positive indication for MOFA in harnessing the potentials of mobile phones and SMS in delivering extension services. Intension to use internet café's had unfavourable responses with 26% (very weak) and 33.3% (weak) intensions of using internet café's. This may be a result of the fact that mobile phone users can now access the internet via their mobile phones.

Table 6: Intentions of Extension workers to use ICT

Types of ICTs	Responses *frequency (percentages)				
	Very weak	**Weak**	**Undecided**	**Strong**	**Very strong**
Mobile phone	--	--	4 (13.3%)	9 (30%)	17 (56.7%)
Use of Internet	2 (6.7%)	2 (6.7%)	4 (13.3%)	18 (60%)	4 (13.3%)
Email	1 (3.3%)	3 (10%)	3 (3%)	19 (63.3%)	4 (13.3%)
SMS	1 (3.3%)	1 (3.3%)	4 (13.3%)	10 (33.3%)	14 (46.7)
Use of Comm. Center (no internet)	17 (56.7%)	11 (36.7%)	2 (6.7%)	--	--
Internet café	8 (26.7%)	10 (33.3%)	6 (20%)	1 (5 (16.7%))	1 (3.3%)

Source: Field Survey, 2013

Table 7 also presents a high proportion of the respondents indicating the usefulness of the various ICTs. 33% and 50% of respondents respectively found mobile phones to be helpful and very helpful in their day to day activities. With only 23% of respondents being undecided about the usefulness of the internet, 56% of respondents found it to helpful. 50% of respondents indicated that SMS was helpful to them in communicating. Majority of the respondents (56%), however were undecided about the usefulness of the use of internet café's with only 3.3% indicating its usefulness. Since the attitude of extension workers adoption of innovations is further influenced

by their beliefs, perceived usefulness and perceived ease of use of innovations, this study confirms findings by (Davies, 1985).

Table 7: Usefulness of ICTs

Types of ICTs	**Responses**		***frequency (percentages)**		
	Very unhelpful	**Unhelpful**	**Undecided**	**Helpful**	**Very helpful**
Mobile phone	1 (3.3%)	1 (3.3%)	3 (10%)	10 (33.3%)	15 (50%)
Use of Internet	--	1 (3.3%)	7 (23.3%)	17 (56.7%)	5 (16.7%)
Email	--	1 (3.3%)	5 (16.7%)	17 (56.7%)	7 (23.3%)
SMS	--	2 (6.7%)	5 (16.7%)	15 (50%)	8 (26.7%)
Use of Comm. Center (no internet)	8 (26.7%)	2 (6.7%)	17 (56.7%)	3 (10%)	--
Internet café	4 (13.3%)	--	17 (56.7%)	8 (26.7%)	1 (3.3%)

Source: Field survey, 2013

Table 8 represents the distribution of the likelihood or otherwise of people who extension agents look up to influencing their use of the various ICTs. This seeks to find out the extension workers perception of what others around them believe they should do. This is so because social pressures make one's commitment seem irreversible, also the key nature of an innovation sometimes makes it impossible to turn back on (Sherifs, 1965).

Regarding mobile phone use, 40% (likely) and 33.3% (very likely) responses of respondents show that they are influenced by the views of their social referent with regard to the use of the following ICTs. Responses from personal interviews with the respondents weighed heavily on the

management information systems officer (MIS) who can be referred to as a subject matter specialist in this case; this was followed by the director of their respective directorates or districts. With a 50% likely and 30% very likely response, the respondents showed that they would be encouraged by their social referent to use the internet. While 40% and 46.7% of respondents were undecided about the use of community centres and internet café's respectively, 43.3% (likely) and 26.7% (very likely) responded that they would be encouraged to use SMS in communicating.

Table 8: Social encouragement

Types of ICTs	**Responses**		***frequency (percentages)**		
	Very unlikely	**Unlikely**	**Undecided**	**Likely**	**Very likely**
Mobile phone	--	--	8 (26.7%)	12 (40%)	10 (33.3%)
Use of Internet	--	1 (3.3%)	5 (16%)	15 (50%)	9 (30%)
Email	--	--	8 (26.7%)	16(53.3%)	6 (20%)
SMS	--	1 (3.3%)	8 (26.7%)	13(43.3%)	8 (26.7%)
Use of Comm.. Center (no internet)	7 (23.3%)	6 (20%)	12 (40%)	3 (10%)	2 (13.3%)
Internet café	4 (13.3%)	1 (3.3%)	14 (46.7%)	7 (23.3%)	4 (13.3%)

Source: Field Survey, 2013

Table 9 indicates major factors as expressed by respondents as hindering their use of the various ICTs. Though the cost of using e-mail was not relevant representing 10% of responses, poor network accounted for 52.8% of the responses, this was followed by power cuts (19.8%),

followed by loss of information and the possibility of e-mail being used by fraudsters representing 10% of respondents respectively.

Table 9: Factors hindering extension workers use of ICTs

Type of ICTs	Factors	Frequency	Percentage
Email	**1. loss of information**	**3**	**10.0**
	2. fraudsters	**3**	**10.0**
	3. cost / expensive to use	**1**	**3.3**
	4. poor network	**16**	**52.8**
	5. power cut	**6**	**19.8**
Mobile phone	**1. recharge units expensive**	**16**	**53.2%**
	2. poor network	**14**	**46.6%**
Internet	**1. cost too much**	**7**	**23.2%**
	2. poor network	**15**	**49.8%**
	3. can be used by fraudsters	**5**	**16.5%**
	4. slow at times	**3**	**10.5%**

Source: Field Survey, 2013

4.3 Effects of demographic factors on extension workers perception of access and use of ICTs

The demographic factors considered were age, sex, educational background and work experience of respondents as against access and use of ICTs.

4.3.1 Age and access to mobile phone

The table 10 below shows the relationship between respondents age and access to mobile phone. Clearly from the table below majority of respondents (22) aged between 25 – 45 have access to mobile phone as compared to the age category of 46 – 60. When subjected to the chi square test, the chi square (X^2 = 0.37, df = 1, p =0.543) at 5% confidence level shows that the relationship between age of respondents and access to mobile phone is not significant. It therefore means that access to mobile phone is not dependent on age of respondents.

Table: 10 Age and access to mobile phone.

Age	**Access to mobile phone (frequency**		**Total (frequency)**
	Yes	**No**	
25 – 45	**22**	**2**	**24**
46 – 60	**5**	**1**	**6**
Total	**27**	**3**	**30**

Source: Field Survey, 2013 X^2 = 0.37, df = 1, p =0.543

4.3.2 Age and access to internet

Table 11 shows the relationship between respondents' age and access to internet. From the table below majority of respondents (17) aged between 25 – 45 have access to internet with only (5) of respondents between the ages of 46 – 60 having access to internet. When subjected to the chi square test, the chi square (X^2 = 2.182, df = 1, p =0.139) at 5% confidence level shows that the relationship between age of respondents and access to internet is not significant. It therefore means that access to internet is not dependent on age of respondents.

Table: 11 Age and access to Internet

Age	Access to internet (frequency)		Total (frequency)
	Yes	No	
25 – 45	17	8	25
46 – 60	5	0	5
Total	22	8	30

Source: Field Survey, 2013 $X^2 = 2.182$, df = 1, p =0.139

4.3.3 Gender and access to mobile phone

Table 12 shows the relationship between respondents' gender and access to mobile phone. From table 12 majority of respondents (22) who are males have access to mobile phone as compared to (5) of respondents representing females who have access to mobile phones. When subjected to the chi square test, the chi square ($X^2 = 0.67$, df = 1, p =0.414) at 5% confidence level shows that the relationship between gender of respondents and access to mobile phone is not significant. It therefore means that access to mobile phone is not dependent on gender of respondents.

Table 12: Gender and access to mobile phone

Gender	Access to mobile phone (frequency)		Total (frequency)
	Yes	No	
Male	22	3	25
Female	5	0	5
Total	27	3	30

Source: Field Survey, 2013 $X^{2=}$ **0.67, df =1, p=0.414**

4.3.4 Gender and access to internet

Table13 shows the relationship between gender and access to internet. Clearly from table13 majority of respondents (18) with access to the internet who are males have access to the internet with only (4) being females with access to the internet. When subjected to the chi square test, the chi square (X^2 = 0.136, df = 1, p =0.712 at 5% confidence level shows that the relationship between age of respondents and access to mobile phone is not significant. It therefore means that access to internet was not dependent on the gender of respondents.

Table 13: Gender and access to internet

Gender	Access to internet (frequency)		Total (frequency)
	Yes	No	
Male	18	7	25
Female	4	1	5
Total	22	8	30

Source: Field Survey, 2013, $X^{2=}$ 0.136, df = 1, p=0.712

4.3.5 Education and access to mobile phone

Table14 shows the relationship between the educational background of respondents and their access to mobile phone. Clearly from the table 14 all the respondents had access to mobile phones. Majority of respondents (24) who have post secondary/college or Tertiary education had access to mobile phones, (2) with Secondary education had access to mobile phones while (1) respondent with Basic education had access to a mobile phone. The chi square analysis { X^2=0.37 , df = 1, p=0.543} at the 5% confidence level showed that there was no statistically significant relationship between the educational background of respondents and their access to

mobile phone. The test not being significant (p= 0.543) indicate that, access to mobile phones was not dependent on the educational background of respondents.

Table 14: Level of education and access to mobile phone

Level of education	**Access to mobile phone (frequency)**		**Total**
	Yes	**No**	
Basic	**3**	**0**	**3**
Tertiary	**24**	**3**	**27**
Total	**27**	**3**	**30**

Source: Field Survey, 2013 X^2=0.37 , df = 1, p=0.543

4.3.6 Education and access to internet

Table15 shows the relationship between the educational background of respondents and their access to internet. Clearly from the table below majority of respondents (23) who have post secondary/college or Tertiary education had access to internet, while (4) with Basic/ Secondary education had access to internet. The chi square analysis {X^2=0.67 , df = 1, p=0.414} at the 5% confidence level showed that there was no statistically significant relationship between the educational background of respondents and their access to mobile phone. The test not being significant (p= 0.414) indicate that, access to internet was not dependent on the educational background of respondents.

Table 15: Level of education and access to internet

Level of Education	Access to internet (frequency)		Total
	Yes	No	
Basic	4	1	5
Tertiary	23	2	25
Total	27	3	30

Source: Field survey, 2013, X^2=0.67,df = 1, p=0.414

4.3.7 Work experience and access to mobile phone

Table16 shows the relationship between respondents age and access to mobile phone. Clearly from the table below majority of respondents (14) who had 1 – 7 years of work experience have access to mobile phone as compared to (8) with 8 – 15 years of work experience, (5) representing respondents with more than 16 years of experience had access to mobile phone. When subjected to the chi square test, the chi square (X^2 = 0.494, df = 2, p =0.781) at 5% confidence level shows that the relationship between the work experience of respondents and access to mobile phone is not significant. It therefore means that access to mobile phone is not dependent on work experience of respondents.

Table 16: Work experience and access to mobile phone

WORK EXPERIENCE	ACCESS TO MOBILE PHONE		TOTAL
	YES	NO	
1 – 7	14	1	15
8- 15	8	1	9
16<	5	1	6
TOTAL	27	3	30

Source: Field Survey, 2013 X^2=0.494, df = 2, p=0.781

4.3.8 Work experience and access to internet

Table17 shows the relationship between respondents age and access to internet. Clearly from the table below majority of respondents (12) who had 1 – 7 years of work experience have access to mobile phone as compared to (5) with 8 – 15 years of work experience, (5) representing respondents with more than 16 years of experience had access to internet. When subjected to the chi square test, the chi square (X^2 = 2.102, df = 2, p =0.349) at 5% confidence level shows that the relationship between the work experience of respondents and access to internet is not significant. It therefore means that access to mobile phone is not dependent on work experience of respondents.

Table 17: Work experience and access to internet

WORK EXPERIENCE	ACCESS TO INTERNET		TOTAL
	YES	NO	
1 – 7	12	3	15
8- 15	5	4	9
16<	5	1	6
TOTAL	22	8	30

Source: Field Survey, 2013 X^2=2.102, df = 2, p=0.349

4.4 Extension workers intention to harness the potential of ICTs

This section discusses results with regards to extension workers intention to harness the potentials of the following ICTs. From table18, 23 respondents acknowledged that e-mail makes it possible to reach many people quickly, 8 respondents indicated that e-mail makes communication easier. Responses from respondents show they strongly agree that using e-mail enhances information to be received and sent quickly. Other reasons were that it makes it possible to keep in touch with family and friends.

53.3% of respondents indicated that mobile phone was easy and convenient to use while 23.2% said it makes communication easier. This may be due to the fact that majority of the respondents have had training regarding the use of the smart phones issued by MOFA for the take off of the E-extension programme being introduced and also because of the simple to use applications of the smart phones.

Majority of the respondents (93.4%) indicated that the internet offered a quick and easy way of accessing information. Notable responses given were that it made it possible to get information

that will help the respondents in carrying out their work and to get information that will help with gaining knowledge.

Table 18: Harnessing potential of ICTs by extension workers

Type of ICTs	Factors	Frequency	Percentage
Email	**1. can reach many people quickly** **2. makes communication easier**	**23** **8**	**50%** **26.6%**
Mobile phone	**1. convenient and easy to use** **2. quick way to communicate**	**16** **7**	**53.3%** **23.2%**
Internet	**1. quick and easy way to access info.**	**28**	**93.4%**

Source: Field Survey, 2013

4.5 ICTs Available to extension workers

Table 19 shows the various ICTs available to the respondents. All thirty extension workers selected for this study owned and had access to mobile phones and used it in their agricultural activities. The respondents indicated during interviews with them that they mainly used the phones in communicating with farmers, friends, family and their superiors. With regards to computers 80% of respondents respectively both owned and had access to computers with 6% not owning and having access to computers. Internet access recorded 73.3% of respondents while 26.7% did not have access to the internet. This number of respondents having access to mobile phones, computer and internet supports a FARA, 2006 document that: ICT revolution has also been a mobile revolution not leaving the internet and computer behind.

Table 19: Availability of ICTs

ICT Type	Yes (frequency/%)	No (frequency/%)
Mobile phone	**30 (100%)**	**0**
Computer	**24 (80%)**	**6 (20%)**
Internet	**13 (43.3%)**	**17 (56.7%)**

Source: Field survey.2013

4.6 Frequency of use of telecommunication services by extension workers

Table20 discusses the frequency and percentage usage of telecommunication services by extension agents. There was no respondent who did not use a mobile phone, 16.7% indicated they used the mobile phone at least up to four times a week with 63.7% using it more than two times a day. This implies that the mobile phone is and can be used as an effective means of communicating with farmers as can be show by strides being made in this direction by Esoko among others the world all over. Responses from the use of e-mail shows that 13.3% of respondents do not use this service, 23.3% use it at least twice a month while 30% use it one to four times a week. 23.3% of respondents use the service one to two times a day with only 10% use it more than two times a day. Only 3.3% of respondents do not use internet services, 33.3% and 20% respectively use the internet one to four times a week and over two times a day. While 6.7% of respondents do not use SMS, 30% of respondents use it more than two times a day and this can be accounted for by free SMS services by service providers there for attracting little or no charge. Respondents also indicated from interviews with them that it was a quick and convenient way of communicating with farmers, family and friends, also cost associated with SMS usage was regarded as not relevant. 56.7% of respondents indicated that they did not use a private phone at

the work place or home and this is because majority of the respondents are field staff and are often out of the office and also because of the unavailability of private phone at work or home.

Majority of the respondents (80%) do not use community centre – no internet and the reason given for this was that it is now possible to use the internet via ones mobile phone. Internet café usage had a response of 36.7% by respondents who said they used the service at least twice a month, however, 33.3% did not use it at all.

Table 20: Frequency/percentage distribution of respondent's use of telecom services

ICT type	Not used	2x a month	1-4x a week	1-2x a day	Over 2x a day
Mobile phone	--	1 (3.3%)	5 (16.7%)	5 (16.7%)	19 (63.3%)
E-mail	4 (13.3%)	7 (23.3%)	9 (30%)	7 (23.3%)	3 (10%)
Internet	1 (3.3%)	9 (30%)	10 (33.3%)	4 (13.3%)	6 (20%)
SMS	2 (6.7%)	1 (3.3%)	4 (13.3%)	14 (46.7%)	9 (30%)
Private phone	17 (56.7%)	4 (13.3%)	2 (6.7%)	2 (6.7%)	5 (16.7%)
Commu. centre	24 (80%)	4 (13.3%)	1 (3.3%)	--	1 (3.3%)
Internet café	10 (33.3%)	11 (36.7%)	6 (20%)	2 (6.7%)	1 (3.3%)

Source: Field survey, 2013

4.7 Training needs of extension workers

Successful application of ICTs for agricultural development however depends on its user's knowledge of the information driven technologies applications (Omotayo, 2005). Studies have shown that extension workers need professional development and in service training to strengthen their computer skills (Albright, 2000). It is for this reason that Rogers, (2003) states that

employees should have basic computer and internet skills to get the full benefit of e- extension and for it to be successful. Rogers (2003) further cites that individuals who have a level of higher education are more likely to adopt an innovation than others. Hence, educational levels of extension workers can be used as one of the predictors of e- readiness. Organizations that do not belief in the importance of self development and whose employees have negative attitudes towards self development and adoption of innovations would find it difficult to adopt innovations than others who have positive attitudes. ICTs in agriculture promote and distribute new and existing farming information and knowledge that facilitates agricultural and rural development as well as social and economic development, (Swanson and Rajalahti, 2010). A lack of computer skills could increase the perceived complexity of e- extension.

It is therefore not surprising that responses from my interviews with the respondents indicated a strong intension for capacity building to facilitate an effective and efficient execution of their duties. They also mentioned that in- service training by MOFA should be intensified and not limited to staffs in the head office and regional offices but should from time to time include those in the districts and remote areas of the country. This findings support that of Bharati et al; (2010) which stresses the important characteristics of an organization that influences technology adoption is the knowledge base of its employees. Similarly, Asenso-Okyere (2007) states that capacity development is necessary for the development of organizations. It is however important to note that MOFA is and has been consistently committed to the capacity building of its human resource and this is true considering the number of MOFA staffs who have successfully passed through and are pursuing various academic programmes in the three premier universities in Ghana, namely, University of Ghana, Legon, Kwame Nkrumah University of science and technology and the University of Cape Coast. Other organizations that have also assisted in

capacity development of MOFA staffs include the German International Assistance (GIZ), Canadian International Development Assistance (CIDA). Some NGOs also organize non – formal education classes for staffs of MOFA.

CHAPTER FIVE

SUMMARY, CONCLUSIONS AND RECOMMENDATIONS

5.0 Introduction

Summary, conclusions and recommendations as well as the implications of this study are based on the research findings 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.

5.1 Summary

This study was primarily initiated to assess extension workers attitude towards ICT s in carrying out their extension delivery services to farmers and the availability, access and use of the various ICTs. The objectives of this study were:

- Assess extension workers attitude about the use of ICTs.
- Assess factors that might hinder extension workers use of ICTs.
- To determine if demographic factors affect extension workers perception of access and use of ICTs.
- To determine extension workers intension to harness the potential of ICTs in carrying out their work.
- Identify the ICTs available to the extension workers.
- Ascertain the frequency of use of ICTs.
- Identify the training needs of extension workers.

Questionnaires (appendix 1) were used to collect data from 30 AEAs in two districts in the Greater Accra region of Ghana, namely the Ga East and Tema municipal. Apart from using questionnaires, telephone interviews in the form of follow up questions and face-to-face interviews were used to solicit clarification and detailed descriptive information relating to the objectives of the research.

From the results, it is evident that the AEAs have access to one or more ICTs personally and assessed and used them largely for personal interactions. The AEAs depended more on the use of mobile phones and its applications in communicating to farmers, family and friends.

Generally, AEAs choice of sourcing and communicating information depended largely on the availability, access and usefulness of their ICT choice of use.

5.2 Conclusion

The study found that AEAs are a crucial link between research and the farmers and that apart from access to the internet, use of the community centre with no internet connectivity and the internet café there was a high proportion of respondents with access and use of mobile phones in extension work. Respondents indicated that the availability, access and use of these ICTs depended on their usefulness and ease of use. However poor network connectivity, power cuts, loss of information and the possibility of fraudsters using these ICTs were some of the barriers mentioned by respondents as being factors affecting their use.

In assessing extension workers attitude about the use of ICTs, the study revealed that 30% and 56.7% of respondents expressed strong and very strong intentions respectively to use mobile

phones, while 60% and 13.3% expressed strong and very strong intention respectively to use the internet in carrying out extension work.

With regards to factors that might hinder extension workers use of ICTs, loss of information (10%),use of ICTs by fraudsters (10%), cost/expensive to use (3.3%), poor network (52.8%) and Power cuts (19.8%) were some of the striking response given as barriers to ICT use. The second hypothesis is thus rejected because even though the respondents gave the above reasons as barriers to change, it did not affect their actual usage of the ICTs.

In determining if demographic factors affect extension workers perception of access and use of ICTs the study found that there was no significant relationship between age, gender, work experience and educational background and mobile phone and internet use. This therefore confirms the third null hypothesis which states that demographic factors do not affect extension workers use of ICTs.

In determining extension workers intention to harness the potential of ICTs in carrying out their work, the study revealed that the extension workers indicated very positive responses, mobile (53.3%) being convenient and easy to use, (23.2%) quick way to communicate with people and with a 50% (very helpful) response reflecting its usefulness. The use of the internet also had a

(93.4%) quick and easy way to access information response and (50.7%) helpful and (23.3%) very helpful response respectively to indicate the usefulness of the internet in accessing information either for knowledge acquisition or accessing general information. This therefore

refutes the assertion that extension workers in the greater Accra region are not harnessing the potential of ICTs in extension work.

It suffices that ICTs are ideally suited to the task of enhanced interaction because they can expand communication, cooperation and ultimately innovation among the actors in the agricultural sector. However it is only when extension workers are aware of, have access to and can use modern ICTs that they can effectively discharge their communication function.

5.3 Recommendations

ICTs as an extension tool could enhance the flow of information in the application of agricultural extension services because these are being used as cost effective and practical tools to facilitate information delivery and knowledge sharing among farmers, extension workers and other stakeholders. The most timely, accessible, convenient and effective means through which relevant and content specific agricultural information can reach farmers is through ICTs specifically mobile phone technology and the internet.

Based on the findings of this research the following recommendations are made:

Mobile phone technology has proven that it can benefit farmer's, text messaging of agricultural information is a cost effective way of communicating with farmers, thereby making it possible for them to utilize the information available in carrying out improved agricultural practice to increase productivity, income and improved livelihoods. Ways should be found to widen existing mobile phone usage by extension workers to allow farmers access to relevant, content specific and timely information. It is therefore commendable that MoFA through the directorate of agricultural extension services had at the time this research was carried out had

trained 113 AEAs under its maiden e- extension programme being rolled out in the use of SMART phones in the carrying out of extension delivery services.

To enable extension workers access and benefit from the use of computers and for that matter the internet, extension workers need assistance in terms of acquisition of hardware as well as knowledge acquisition, skill training and capacity building in the area of computer use to take full advantage of the benefits that accrue from their use. Government may want to consider implementing and strengthening agricultural ICT curriculum in the formal and informal educational and training programmes.

The problem of the lack of local content in ICT development should be seriously looked into. Keyboards of computers should be developed and produced in the local language(s) preferably the major Ghanaian languages in order to improve access to indigenous and modern language. Content should be developed in innovative ways so that it could easily be understood by rural folks with low literacy rates. The importance of user acceptance ICTs in rural areas is very crucial to the success of ICT for agricultural development. Ensure that agricultural and rural development programmes are ICT compatible with end user needs and national policies on ICT for agricultural development. Policy makers and implementers should therefore involve rural dwellers in their policy planning and implementation processes. This would ensure that the traditions, culture, values and beliefs of rural folks are incorporated in the programmes to ensure acceptance and sustainability.

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APPENDIX 1: SURVEY QUESTIONNAIRE

(EXTENSION WORKER ATTITUDE TOWARD ICTs FOR EXTENSION WORK)

QUESTIONNAIRE

Entry number ☐

1. Survey Data:

1. Respondent ID# _____.
2. Telephone number _____ .
3. Name of district _____

2. Respondent's Data

4. Name of respondent: _____ .
5. Age of respondent
6. Gender

(tick appropriate box)

(*1*) Male ☐ **(*2*) Female** ☐

7. What is the highest level of education achieved?

(Tick only <u>one</u> box indicating the highest level of education mentioned)

No schooling / non-formal ***(1)***	☐
Primary school / JSS / Middle school ***(2)***	☐
Secondary school / SSS ***(3)***	☐
Post secondary e.g. college or university ***(4***	☐

8. Number of years working with MoFA? _____

9. Do you own and or have access to any of these ICTs

ICTs	Do you own any of the *ff.* **[1. YES]** **[2. NO]**	Do you have access to the *ff.* **[1. YES]** **[2. NO]**	Own and have Access to the *ff.* **[1. YES]** **[2. NO]**
Mobile phone			
Computer			
Internet			
Others specify			

10. Do you communicate with farmers through any of the ICTs below? [1. YES] [2. NO]

11. Which of the following information and communication services do you know about?

(tick as many boxes as appropriate)

Voice mail ***(1)*** ☐

Prepaid phone cards for mobile phone (2) ☐

Mobile phones ***(3)*** ☐

Internet ***(4)*** ☐

Short message service (SMS) ***(5)*** ☐

Personal computers ***(6)*** ☐

12. What are the most effective means of picking new information?

(tick as many boxes as appropriate)

Word of mouth ***(1)*** ☐

Traditional methods e.g. gongon, town crier ***(2)*** ☐

Internet ***(3)*** ☐

Mobile phone ***(4)*** ☐

TV ***(5)*** ☐

Radio (6) ☐

☐

3. Recent use of telecommunication services

Could you indicate?

a) The average **frequency** of use of the different services used in the last three months?

*(**Code a**: not used = **1**, up to twice a month = **2**, one to four times a week = **3**, one or two a day =**4**, over two a day = **5**)*

b) The average **duration** of the use of the different services used in the last three months?

*(code b: Not used = **1**, less than 3 min = **2**, 3 to 10 min = **3**, 10 to 30 min = **4**, more than 30 min = **5**)*

c) Can you indicate the proportion of calls/messages that are **received** as opposed to **sent** i.e. number received out of a total of 10 calls sent or received?

(Note the proportion as a ratio of 10)

d) Can you indicate the average **cost** each time you use the service to the nearest 1.00GHS?

*(**Code d**: n/a = **1**, <2.00 = **2**, 2.00 to 5.00 = **3**, 6.00 to 10.00 = **4**, **11.00 to 20.00 = 5,** >20.00 = **6**)*

(Ask questions from top to bottom on each column. Do not fill in shaded boxes)

	Different services	Frequency (code a)	Duration (code b)	Received : total (code c)	Cost (code d)
	A mobile phone				
	e-mail				
	Used the internet to search for information				
	Sent a or received a text message (SMS)				
	Used a private phone at home or work				
	Used a communication centre (no internet access)				
	Used an internet café				

4 Use of Mobile Phone

13. Mobile - what is the average duration of outgoing calls?

(tick only <u>one</u> box)

Not used *(1)*	***< 3 mins (2)***	***3 – 10 mins (3)***	***11 – 30 mins (4)***	***> 30 mins (5)***

14. Mobile - what is the average duration of incoming calls?

(tick only <u>one</u> box)

Not used *(1)*	***< 3 mins (2)***	***3 – 10 mins (3)***	***11 – 30 mins (4)***	***> 30 mins (5)***

15. Where are most of your outgoing calls made to?

(tick only <u>one</u> box)

family ***(1)***	***friends*** ***(2)***	***Farmers*** ***(3)***	***work*** ***(4)***

16. Where are most of your incoming calls received from?

(tick only <u>one</u> box)

Family ***(1)***	***friends*** ***(2)***	***Farmers*** ***(3)***	***work*** ***(4)***

17. What time of the day do you usually use the phone?

(tick as many boxes as appropriate)

6 am – 10 am ***(1)***	***10 am – 3 pm*** ***(2)***	***3 pm – 6 pm*** ***(3)***	***6 pm – 10 pm*** ***(4)***	***10 pm – 6 am*** ***(5)***

18. What types of phone calls do you make / receive most often?

(Ask as an open question and tick as many boxes as appropriate)

Family – financial matters	***(1)***	☐
Family – well being	***(2)***	☐
Friends	***(3)***	☐
Social functions e.g. funerals, festivals	***(4)***	☐
Religious affairs	***(5)***	☐
Business / work – eg. talking to farmers	***(6)***	☐
Calling for external assistance e.g. police, electricity	***(7)***	☐
Government enquiry	***(8)***	☐

4. Use of Email and Internet

19. What time of the day do you use the email / internet?

(tick as many boxes as appropriate)

6 am – 10 am (1)	***10 am – 3 pm (2)***	***3 pm – 6 pm (3)***	***6 pm – 10 pm (4)***	***10 pm – 6 am (5)***

20. How many emails do you send?

(tick only <u>one</u> box)

None (1)	***1 - 2 / month (2)***	***1 – 4 / week (3)***	***1 – 2 / day (4)***	***> 2 / day (5)***

21. What types of emails do you send / receive most often?

(Tick as many boxes as appropriate)

Family ***(1)*** ☐

Friends ***(2)*** ☐

Education related ***(3)*** ☐

Social / community related ***(4)*** ☐

Religious affairs ***(5)*** ☐

Business / work ***(6)*** ☐

Government enquiry ***(7)*** ☐

22. What types of web sites do you browse most often?

(Tick as many boxes as appropriate)

News – current affairs ***(1)*** ☐

News – sports and entertainment ***(2)*** ☐

Education related ***(3)*** ☐

Entertainment – music, Movies ***(4)*** ☐

Entertainment - adult ***(5)*** ☐

Social – e.g. finding pen pals, Facebook, Twitter, LinkedIn ***(6)*** ☐

Religious affairs ***(7)*** ☐

Work eg MoFA Website ***(8)*** ☐

Government information ***(9)*** ☐

23. Where do you regularly access email / internet?

(tick as many boxes as appropriate)

Internet café ***(1)*** ☐

Community centre ***(2)*** ☐

Home (own phone) ***(3)*** ☐

Private line e.g. friends /business ***(4)*** ☐

place of work ***(5)*** ☐

5. Use of SMS (Short message service)

24. What types of messages do you send / receive most often, using SMS?

(Tick as many boxes as appropriate)

Family	***(1)***	☐
Friends	***(2)***	☐
Social / community related	***(3)***	☐
Work - extension	***(4)***	☐
News	***(5)***	☐

25. Which of the following do you regularly use to access SMS?

(tick as many boxes as appropriate)

Internet	***(1)***	☐
Mobile phone	***(2)***	☐
Was App	***(3)***	☐

6. General

26. When you make a journey to access any of the telecommunications services, how much do you spend on travel? ***(tick only <u>one</u> box)***

Not relevant (1)	***<2.00 Ghc (2)***	***2.00 – 5.00 Ghc (3)***	***5.00 – 10.00 Ghc (4)***	***>10.00Ghc***

27. What means of communication did you use before you had access to telecommunications services?

(Write the main method used only)

_____

7. **Intention, Attitude and Subjective norm**

Could you indicate?

a) How strongly do you **intend** to use the different ICTs in the next three months?

(read the following scale for each service and fill in the code which represents the strength of their intent to use each service)

*(**Code c**: Very weak = 1, weak =2, undecided = 3, strong = 4, very strong = 5)*

b) How **helpful** will it be to you to use the different ICTs in the next three months?

(read the following scale for each service and fill in the code which represents how good or bad they feel their use of the service will be)

*(**Code d**: Very unhelpful = 1, unhelpful =2, undecided = 3, helpful = 4, very helpful = 5)*

c) How **likely** is it that the people **who you respect most/look up to** would encourage you to use the different ICTs in the next three months?

(read the following scale for each service and fill in the code which represents how likely or unlikely their social referent will be to encourage their use of each service)

*(**Code e**: Very unlikely = 1, unlikely =2, undecided = 3, likely = 4, very likely = 5)*

	Different services	**Intention (code c)**	**Helpfulness (code d)**	**Social encouragement (code e)**
	A mobile phone			
	e-mail			
	Use the internet to search for information			
	Send a or receive a text message (SMS)			
	Use a private phone at home or work			
	Use a communication centre (no internet)			
	Use an internet cafe			

What source of information would you respect most regarding the use of the **phone**?

(Write down the social referent mentioned without prompting the subject)

_____

What source of information would you respect most regarding the use of the **e-mail and internet**?

(Write down the social referent mentioned without prompting the subject)

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9. Outcome Beliefs / Expectations regarding the use of e-mail

(Read the following introduction and then each statement in turn ticking the response to each on the two scales which correspond to the following questions)

The questions below are what other Ghanaians are saying about the use of the **e-mail for correspondence**.

- How strongly do you agree or disagree with the following statements regarding using the **e-mail for correspondence**?

- How good or bad is the outcome of each statement to you?

Em1 Using the e-mail will make communication easier

Strongly disagree ***(-2)***	Disagree ***(-1)***	Don't know ***(0)***	Agree ***(+1)***	Strongly agree ***(+2)***
Very bad ***(-2)***	Bad ***(-1)***	No opinion ***(0)***	Good ***(+1)***	Very good ***(+2)***

Em2 Using the e-mail for correspondence will cost less

Strongly disagree ***(-2)***	Disagree ***(-1)***	Don't know ***(0)***	Agree ***(+1)***	Strongly agree ***(+2)***
Very bad ***(-2)***	Bad ***(-1)***	No opinion ***(0)***	Good ***(+1)***	Very good ***(+2)***

Em10 The e-mail system will loose some of the correspondence (mail)

Strongly disagree ***(-2)***	Disagree ***(-1)***	Don't know ***(0)***	Agree ***(+1)***	Strongly agree ***(+2)***
Very bad (-2)	Bad (-1)	No opinion (0)	Good (+1)	Very good (+2)

Em3 Using the e-mail will mean you can receive and send information very quickly

Strongly disagree ***(-2)***	Disagree ***(-1)***	Don't know ***(0)***	Agree ***(+1)***	Strongly agree ***(+2)***
Very bad ***(-2)***	Bad ***(-1)***	No opinion ***(0)***	Good ***(+1)***	Very good ***(+2)***

Em11 I will not know how to use email

Strongly disagree ***(-2)***	Disagree ***(-1)***	Don't know ***(0)***	Agree ***(+1)***	Strongly agree ***(+2)***
Very bad ***(-2)***	Bad ***(-1)***	No opinion ***(0)***	Good ***(+1)***	Very good ***(+2)***

Em4 The e-mail will mean I can keep in touch with my clients (farmers)

Strongly disagree ***(-2)***	Disagree ***(-1)***	Don't know ***(0)***	Agree ***(+1)***	Strongly agree ***(+2)***
Very bad ***(-2)***	Bad ***(-1)***	No opinion ***(0)***	Good ***(+1)***	Very good ***(+2)***

Em12 Will <u>loose work</u> due to cut-offs while using the e-mail (power cuts)

Strongly disagree ***(-2)***	Disagree ***(-1)***	Don't know ***(0)***	Agree ***(+1)***	Strongly agree ***(+2)***
Very bad ***(-2)***	Bad ***(-1)***	No opinion ***(0)***	Good ***(+1)***	Very good ***(+2)***

Em5 Will be able to use the e-mail to <u>help my schooling/education (Acquire information)</u>

Strongly disagree ***(-2)***	Disagree ***(-1)***	Don't know ***(0)***	Agree ***(+1)***	Strongly agree ***(+2)***
Very bad ***(-2)***	Bad ***(-1)***	No opinion ***(0)***	Good ***(+1)***	Very good ***(+2)***

Em13 <u>Correspondence will not be private</u> when using the e-mail

Strongly disagree ***(-2)***	Disagree ***(-1)***	Don't know ***(0)***	Agree ***(+1)***	Strongly agree ***(+2)***
Very bad ***(-2)***	Bad ***(-1)***	No opinion ***(0)***	Good ***(+1)***	Very good ***(+2)***

Em6 Will be able to <u>keep in touch with family</u> by using the e-mail

Strongly disagree ***(-2)***	Disagree ***(-1)***	Don't know ***(0)***	Agree ***(+1)***	Strongly agree ***(+2)***
Very bad ***(-2)***	Bad ***(-1)***	No opinion ***(0)***	Good ***(+1)***	Very good ***(+2)***

Em14 It will be <u>difficult to get access / connect to your mail</u> on the internet

Strongly disagree ***(-2)***	Disagree ***(-1)***	Don't know ***(0)***	Agree ***(+1)***	Strongly agree ***(+2)***
Very bad ***(-2)***	Bad ***(-1)***	No opinion ***(0)***	Good ***(+1)***	Very good ***(+2)***

Em7 Using the e-mail will mean I can <u>keep in touch with my friends</u>

Strongly disagree ***(-2)***	Disagree ***(-1)***	Don't know ***(0)***	Agree ***(+1)***	Strongly agree ***(+2)***
Very bad ***(-2)***	Bad ***(-1)***	No opinion ***(0)***	Good ***(+1)***	Very good ***(+2)***

Em8 Will be able to <u>have a record of correspondence</u> using e-mail

Strongly disagree ***(-2)***	Disagree ***(-1)***	Don't know ***(0)***	Agree ***(+1)***	Strongly agree ***(+2)***
Very bad ***(-2)***	Bad ***(-1)***	No opinion ***(0)***	Good ***(+1)***	Very good ***(+2)***

What do you see as your most important advantage or disadvantage of **using e-mail for correspondence?**

(Note only the first statement made only)

(Advantage)_____

(Disadvantage)_____

10. Outcome Beliefs / Expectations regarding the use of the internet

(Read the following introduction and then each statement in turn ticking the response to each on the two scales which correspond to the following questions)

The questions below are what other Ghanaians are saying about the use of the **internet for search for information**.

- How strongly do you **agree** or **disagree** with the following statements regarding using the **internet for search for information?**

- How **good** or **bad** is the outcome of each statement to you?

In1 By using the internet I will know what is happening in the rest of the world

Strongly disagree ***(-2)***	Disagree ***(-1)***	Don't know ***(0)***	Agree ***(+1)***	Strongly agree ***(+2)***
Very bad ***(-2)***	Bad ***(-1)***	No opinion ***(0)***	Good ***(+1)***	Very good ***(+2)***

In19 I will not know how to use the internet

Strongly disagree ***(-2)***	Disagree ***(-1)***	Don't know ***(0)***	Agree ***(+1)***	Strongly agree ***(+2)***
Very bad ***(-2)***	Bad ***(-1)***	No opinion ***(0)***	Good ***(+1)***	Very good ***(+2)***

In2 By using the internet I will be able to get information that will help my work

Strongly disagree ***(-2)***	Disagree ***(-1)***	Don't know ***(0)***	Agree ***(+1)***	Strongly agree ***(+2)***
Very bad ***(-2)***	Bad ***(-1)***	No opinion ***(0)***	Good ***(+1)***	Very good ***(+2)***

1n3 Will be able to find music to listen to by using the internet (Entertainment)

Strongly disagree ***(-2)***	Disagree ***(-1)***	Don't know ***(0)***	Agree ***(+1)***	Strongly agree ***(+2)***
Very bad ***(-2)***	Bad ***(-1)***	No opinion ***(0)***	Good ***(+1)***	Very good ***(+2)***

In11 The connection will often be lost when using the internet

Strongly disagree ***(-2)***	Disagree ***(-1)***	Don't know ***(0)***	Agree ***(+1)***	Strongly agree ***(+2)***
Very bad ***(-2)***	Bad ***(-1)***	No opinion ***(0)***	Good ***(+1)***	Very good ***(+2)***

1n4 People will use the internet for watching movies

Strongly disagree ***(-2)***	Disagree ***(-1)***	Don't know ***(0)***	Agree ***(+1)***	Strongly agree ***(+2)***
Very bad ***(-2)***	Bad ***(-1)***	No opinion ***(0)***	Good ***(+1)***	Very good ***(+2)***

In12 The cost is too high to be able to use the internet for browsing

Strongly disagree ***(-2)***	Disagree ***(-1)***	Don't know ***(0)***	Agree ***(+1)***	Strongly agree ***(+2)***
Very bad ***(-2)***	Bad ***(-1)***	No opinion ***(0)***	Good ***(+1)***	Very good ***(+2)***

1n5 Will be <u>able to find employment opportunities</u> using the internet

Strongly disagree ***(-2)***	Disagree ***(-1)***	Don't know ***(0)***	Agree ***(+1)***	Strongly agree ***(+2)***
Very bad ***(-2)***	Bad ***(-1)***	No opinion ***(0)***	Good ***(+1)***	Very good ***(+2)***

1n13 You can be <u>defrauded when using some web sites</u>

Strongly disagree ***(-2)***	Disagree ***(-1)***	Don't know ***(0)***	Agree ***(+1)***	Strongly agree ***(+2)***
Very bad ***(-2)***	Bad ***(-1)***	No opinion ***(0)***	Good ***(+1)***	Very good ***(+2)***

1n6 Will be <u>able to get information to help my education</u> on the internet

Strongly disagree ***(-2)***	Disagree ***(-1)***	Don't know ***(0)***	Agree ***(+1)***	Strongly agree ***(+2)***
Very bad ***(-2)***	Bad ***(-1)***	No opinion ***(0)***	Good ***(+1)***	Very good ***(+2)***

In14 The internet is too slow to be of interest

Strongly disagree ***(-2)***	Disagree ***(-1)***	Don't know ***(0)***	Agree ***(+1)***	Strongly agree ***(+2)***
Very bad ***(-2)***	Bad ***(-1)***	No opinion ***(0)***	Good ***(+1)***	Very good ***(+2)***

1n7 Will be able to network with my colleagues and subject matter specialists on the internet

Strongly disagree ***(-2)***	Disagree ***(-1)***	Don't know ***(0)***	Agree ***(+1)***	Strongly agree ***(+2)***
Very bad ***(-2)***	Bad ***(-1)***	No opinion ***(0)***	Good ***(+1)***	Very good ***(+2)***

1n8 Will be able to find new friends and/or potential spouse on the internet

Strongly disagree ***(-2)***	Disagree ***(-1)***	Don't know ***(0)***	Agree ***(+1)***	Strongly agree ***(+2)***
Very bad ***(-2)***	Bad ***(-1)***	No opinion ***(0)***	Good ***(+1)***	Very good ***(+2)***

What do you see as your most important advantage **(drivers)** or disadvantage **(barriers)** of using **the internet to search for information**?

(Note only the first statement made)

(Advantage)_____

(Disadvantage)_____

11. Outcome beliefs or expectation of using a mobile phone

(Read the following introduction and then each statement in turn ticking the response to each on the two scales which correspond to the following questions)

The questions below are what other Ghanaians are saying about the use of **mobile phone**.

- How strongly do you agree or disagree with the following statements regarding using **mobile phones**?

- How good or bad is the outcome of each statement to you?

M1 Able to make and receive calls anywhere with a mobile (e.g. when travelling)

Strongly disagree ***(-2)***	Disagree ***(-1)***	Don't know ***(0)***	Agree ***(+1)***	Strongly agree ***(+2)***
Very bad ***(-2)***	Bad ***(-1)***	No opinion ***(0)***	Good ***(+1)***	Very good ***(+2)***

M8 There will be insufficient coverage by mobile networks

Strongly disagree ***(-2)***	Disagree ***(-1)***	Don't know ***(0)***	Agree ***(+1)***	Strongly agree ***(+2)***
Very bad ***(-2)***	Bad ***(-1)***	No opinion ***(0)***	Good ***(+1)***	Very good ***(+2)***

M9 Will loose or misplace the mobile phone

Strongly disagree ***(-2)***	Disagree ***(-1)***	Don't know ***(0)***	Agree ***(+1)***	Strongly agree ***(+2)***
Very bad ***(-2)***	Bad ***(-1)***	No opinion ***(0)***	Good ***(+1)***	Very good ***(+2)***

M10 When using a mobile phone it will be <u>difficult to connect with other telephone systems</u>

Strongly disagree ***(-2)***	Disagree ***(-1)***	Don't know ***(0)***	Agree ***(+1)***	Strongly agree ***(+2)***
Very bad ***(-2)***	Bad ***(-1)***	No opinion ***(0)***	Good ***(+1)***	Very good ***(+2)***

M4 Will be able to <u>carry the mobile phone easily</u>

Strongly disagree ***(-2)***	Disagree ***(-1)***	Don't know ***(0)***	Agree ***(+1)***	Strongly agree ***(+2)***
Very bad ***(-2)***	Bad ***(-1)***	No opinion ***(0)***	Good ***(+1)***	Very good ***(+2)***

M1 The mobile phone will be <u>too expensive to use</u>

Strongly disagree ***(-2)***	Disagree ***(-1)***	Don't know ***(0)***	Agree ***(+1)***	Strongly agree ***(+2)***
Very bad ***(-2)***	Bad ***(-1)***	No opinion ***(0)***	Good ***(+1)***	Very good ***(+2)***

M5 You will be able to tell the source of the caller

Strongly disagree ***(-2)***	Disagree ***(-1)***	Don't know ***(0)***	Agree ***(+1)***	Strongly agree ***(+2)***
Very bad ***(-2)***	Bad ***(-1)***	No opinion ***(0)***	Good ***(+1)***	Very good ***(+2)***

M13 The mobile phone is likely to get damaged

Strongly disagree ***(-2)***	Disagree ***(-1)***	Don't know ***(0)***	Agree ***(+1)***	Strongly agree ***(+2)***
Very bad ***(-2)***	Bad ***(-1)***	No opinion ***(0)***	Good ***(+1)***	Very good ***(+2)***

M7 Using text messaging will reduce the cost of mobile phone communication

Strongly disagree ***(-2)***	Disagree ***(-1)***	Don't know ***(0)***	Agree ***(+1)***	Strongly agree ***(+2)***
Very bad ***(-2)***	Bad ***(-1)***	No opinion ***(0)***	Good ***(+1)***	Very good ***(+2)***

M3 With a mobile phone you can make calls privately, e.g. from your own home

Strongly disagree ***(-2)***	Disagree ***(-1)***	Don't know ***(0)***	Agree ***(+1)***	Strongly agree ***(+2)***
Very bad ***(-2)***	Bad ***(-1)***	No opinion ***(0)***	Good ***(+1)***	Very good ***(+2)***

What do you see as your most important advantage or disadvantage of using a **mobile phone**?

(Note only the first statement made)

(Advantage)_____

(Disadvantage)_____

Thank you for your help and time.