THE RELATIONSHIP BETWEEN SELECTED FACTORS AND THE USE OF INFORMATION AND COMMUNICATION TECHNOLOGIES (ICTs) IN CLASSROOM INSTRUCTION BY SECONDARY SCHOOL AGRICULTURE TEACHERS IN NYAMIRA COUNTY, KENYA

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DECLARATION AND RECOMMENDATION

Declaration

I hereby declare that this thesis is my original work and has not been submitted to this or any other university for the award of a degree or diploma.

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Recommendation

This thesis has been submitted for examination with our approval as university supervisors.

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DEDICATION

I dedicate this work to my teachers who taught me at all academic levels, my late father Nelson, my mother Jeriah, my husband Duke and my children Elvis, Angela and Omaerera.

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ABSTRACT

Research studies in the past decade have shown that ICTs are effective means for widening educational opportunities. However, their use in classroom instruction by most teachers in Kenya is limited. Some of the factors influencing teachers' use of ICTs in teaching have been extensively studied but scanty information exists on their influence on secondary school agriculture teachers' use of ICTs in classroom instruction. The purpose of this study was; to determine the relationship between selected factors and the use of ICTs in classroom instruction by secondary school agriculture teachers in Nyamira County. The study investigated the relationship between the following ICT factors and the use of ICTs in classroom instruction by secondary school agriculture teachers: availability of ICT resources, availability of e-content, teachers' attitudes towards ICTs, teachers' ICT competency, and school administrative support on ICTs. Descriptive survey design was adopted. The target population comprised 215 secondary school agriculture teachers from the five sub-counties of Nyamira County. Proportionate to size, stratified random sampling was used to obtain a sample size of 100 respondents. A semi-structured questionnaire developed by the researcher was used for data collection. The instrument was evaluated by supervisors, lecturers and peers in the Department of Agricultural Education and Extension of Egerton University for its content and face validity. It was then piloted in south Gucha sub-county for its reliability. The instrument reliability was estimated using Cronbach's alpha coefficient of reliability and 0.77 alpha coefficient was obtained. Descriptive and inferential statistics (Pearson's Product Moment Correlation) were used for data analysis. Statistical Package for Social Sciences (SPSS) was used as an aid in data analysis and all tests were computed at $\alpha=0.05$. The study established that although most of the schools had basic ICT resources, these resources were barely adequate and inaccessible to teachers. Significant relationships existed between the following independent variables and ICT use: availability of ICT resources ($r=0.204$, $p<0.05$); availability of e-content and ($r=0.46$, $p<0.05$); teachers' attitudes towards ICTs ($r=0.28$, $p<0.05$); teachers' ICT competence ($r=0.52$; $p<0.05$), and administrative support ($r=0.405$; $p<0.05$). These factors were therefore found to influence agriculture teachers' use of ICTs. The study recommends that the Ministry of Education, school administrators and other educational stakeholders should provide ICT resources to schools, provide training opportunities and support to teachers for effective use of ICTs in classroom instruction.

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LIST OF ABBREVIATIONS AND ACRONYMS

ACE	Adult and Continuing Education
AT	Activity Theory
BECTA	British Educational Communications and Technology Agency
CFSK	Computers for School Kenya
GIS	Geographic Information System
GOK	Government of Kenya
EMIS	Education Management Information System
ICT	Information and Communication Technology
KESSP	Kenya Education Sector Support Programme
MOE	Ministry of Education
NEPAD	New Partnership for Africa's Development
PPMC	Pearson's Product Moment Correlation
PPTCs	Primary Teacher Training Colleges
TAM	Technology Acceptance Model
TI	Traditional Instruction
TRA	Theory of Reasoned Action
UNESCO	United Nations Educational Scientific and Cultural Organization
US	United States

CHAPTER ONE
INTRODUCTION

1.1 Background of the Study

The rapid growth in Information Communication Technologies (ICTs) has brought remarkable changes in the twenty-first century, and also affected the demands of modern societies (Amenyedzi, Lartey & Dzomeku, 2011; Buabeng-Andoh, 2012; Cubukcuoglu, 2013). ICTs are increasingly seen as an integral part of modern education systems (United Nations Educational, Scientific and Cultural Organization (UNESCO), 2011). According to Osodo, Chisikwa and Ongati (2010), ICTs transforms the teaching and learning process from a dull teacher-dominated activity to an exciting learner-centred process which nurtures confidence, initiative and mental skills. Kubiatko (2010) noted that, ICTs if used appropriately can support students' collaboration, stimulate higher cognitive skills and deepen teaching and learning process. Integrating ICTs in teaching and learning secondary school agriculture is therefore required in improving the quality of instruction.

ICTs provide the opportunity to gather, store, retrieve, process, analyze, and transmit information (Tezci, 2010). It is not a single technology, but combination of hardware, software, multimedia, and delivery systems (Avwiri, 2011). Today, ICTs in education encompasses a great range of rapidly evolving technologies such as desktop, notebook, and handheld computers, digital cameras, local area networking, Bluetooth, the Internet, the World Wide Web and DVDs; and applications such as word processors, spreadsheets, tutorials, simulations, email, digital libraries, computer-mediated conferencing and video conferencing (Mishra, Sharma & Tripathi, 2010). For many people, books and journals are no longer the first or primary source of information or learning. We now regularly rely on images, video, animations and sound to acquire information and to learn (Kosoko- Oyedeko & Tella, 2010). Increased and improved access to the Internet has accelerated this phenomenon.

A research study by Avwiri (2011) has shown that ICTs, if well-utilized in the classroom, have the potential to enhance the learning process in the following ways: (i) motivate and engage students in learning. It has been shown that students are motivated when learning activities are

authentic, challenging, multi-disciplinary and multi-sensorial; (ii) Bring abstract concepts to life, especially when concepts go against immediate intuition and common knowledge; (iii) Foster inquiry and exploration; (iv) Allow students to use the information acquired to solve problems, formulate new problems, and explain the world around them; (v) Provide access to world-wide and local information sources, and (vi) Provide a means to communicate, share research, and join projects across geographical borders.

A study by Lau and Sim (2008) in Malaysia observed that up to 75% of teachers agreed that ICT integration would make them more effective in teaching. Introducing technology into teaching and learning makes learning more student centred, encourage cooperative learning and stimulate increased teacher/student interaction (Agbulu & Ademu, 2010). The use of ICTs in education can enhance the quality of teaching and learning as well as the research productivity of teachers and students (Kashorda, Waema, Omosa & Kyalo, 2007). This is why many African countries have initiated various projects in schools so as to integrate ICT use in teaching and learning (Hennessy, Harrison & Wamatoke, 2010).

Kenya's Ministry of Education through the Kenya Institute of Education (KIE) for instance has developed e-learning materials in several subjects including agriculture which are packaged in DVDs (Ratemo, 2011). Despite these concerted efforts, a survey by Kiptalam and Rodrigues (2010) reflects a very low and slow pace of ICT integration. Similar findings were echoed in a study that targeted public and private secondary schools in Thika district in Kenya which revealed that ICT adoption in both public and private secondary schools was very slow as characterized by user complexity, perception, inadequate IT literacy, and lack of psychological and technical readiness (Nchunge, Sakwa & Mwangi, 2012).

One of the factors that determine educational development and innovation is teachers since they are the ones expected to use ICT investments for educational development (Tezci, 2010). A technology adds educational value when teachers use it in learning-teaching process. Hence, knowledge of ICTs and skills to use ICTs in teaching and learning has gained enormous importance for today's teachers. Teachers are expected to know how to successfully integrate

ICTs into their subject areas to make teaching and learning more meaningful (Nchunge *et al*., 2012).

Successive integration of ICTs in school system depends on a number of influencing factors, which may be external/ school level or internal/ teacher level (Ertmer,1999). According to Ertmer, external factors include availability and accessibility of ICT resources, presence of technical support, institutional/ administrative support and ICT training. Internal factors include teachers' attitudes towards technology, confidence, competence, beliefs and anxiety towards ICTs. Selected factors in this study include: availability of ICT resources, availability of e-content, teachers attitudes towards ICTs, teachers' ICT competence and administrative support. These factors were selected on the basis that there was limited literature on their influence on ICT use by secondary school agriculture teachers in Nyamira County.

1.2 Statement of the Problem

Teaching and learning of agriculture in Kenya's secondary schools, faces many challenges because the resources and facilities which used to be available for teaching and learning agriculture are either inadequate or not available. This has made it difficult for learners to acquire the necessary agricultural skills. Meanwhile, schools are increasingly acquiring ICTs like computers and other computer peripherals which can be used as alternative means for the acquisition of these agricultural skills through use of videos, simulations, animations and internet search. There is also mass of information related to emerging technologies in agriculture available in the internet which if used by agriculture teachers can enrich their instructional contents. The use of ICTs has the potential to expand the teaching and learning resource base but its use by agriculture teachers in classroom instruction has remained low in Kenyan schools. Information on the relationship between factors such as availability of ICT resources, availability of e-content, attitudes of agriculture teachers towards ICTs, ICT competence of agriculture teachers, and school administrative support and the use of ICTs in classroom instruction by secondary school agriculture teachers in Nyamira County is limited or inadequate, hence the need for this study.

1.3 Purpose of the Study

The purpose of the study was to determine the relationship between selected factors and the use of ICTs in classroom instruction by secondary school agriculture teachers in Nyamira County, Kenya.

1.4 Objectives of the Study

The objectives of the study were to determine:

i. The state of ICT use in classroom instruction by secondary school agriculture teachers in Nyamira County;

ii. The relationship between availability of ICT resources and the use of ICTs in classroom instruction by secondary school agriculture teachers in Nyamira County;

iii. The relationship between availability of e- content and the use of ICTs in classroom instruction by secondary school agriculture teachers in Nyamira County;

iv. The relationship between teachers' attitudes towards ICTs and the use of ICTs in classroom instruction by secondary school agriculture teachers in Nyamira County;

v. The relationship between teachers' competence in ICT and the use of ICTs in classroom instruction by secondary school agriculture teachers in Nyamira County and

vi. The relationship between school administrative support and the use of ICTs in classroom instruction by secondary school agriculture teachers in Nyamira County.

1.5 Research Question

The following research question was derived from objective one: What is the state of ICT use in classroom instruction by secondary school agriculture teachers in Nyamira County?

1.6 Hypotheses of the Study

The following null hypotheses derived from objectives (ii) to (vi) guided the study:

Ho_1 There is no statistically significant relationship between availability of ICT resources and the use of ICTs in classroom instruction by secondary school agriculture teachers in Nyamira County;

Ho_2There is no statistically significant relationship between availability of e-content and the use of ICTs in classroom instruction by secondary school agriculture teachers in Nyamira County;

Ho_3 There is no statistically significant relationship between teachers' attitudes towards ICT and the use of ICTs in classroom instruction by secondary school agriculture teachers in Nyamira County;

Ho_4 There is no statistically significant relationship between teachers' competence in ICT and the use of ICTs in classroom instruction by secondary school agriculture teachers in Nyamira County;

Ho_5 There is no statistically significant relationship between school administrative support on ICTs and the use of ICTs in classroom instruction by secondary school agriculture teachers in Nyamira County.

1.7 Significance of the Study

The findings of this study intend to inform all the educational stakeholders on the relationships between the following factors and the use of ICTs in classroom instruction by agriculture teachers: availability of ICT resources in schools, teachers' attitudes towards ICTs, ICT competence of teachers and school administrative support on ICT. By understanding the influence of these factors, problems surrounding ICT integration in teaching and learning may be overcome by the stakeholders adopting strategies that might address them. As a result of this study, agriculture teachers may be influenced towards the use of ICTs in improving acquisition of agricultural skills, content delivery and active participation of learners in class. The findings of this study will also encourage other potential scholars and researchers with an interest to study other related aspects in this field of ICT integration in classroom instruction.

1.8 The Scope of the Study

The study was carried out in Nyamira County of Kenya and the target population was 215 secondary school agriculture teachers. The focus of the study was to determine the relationship between selected factors and the use of ICTs in classroom instruction by secondary school agriculture teachers.

1.9 Limitations of the Study

The schools in Nyamira County are far apart and this posed a challenge of reaching majority of the respondents. This made the researcher to use more money as travel expenses to reach all respondents in their respective schools. Some of the agriculture teachers were reluctant to accept as respondents when they were first contacted. The researchers had to persuade them by making repeated phone calls and explaining to them the significance of the study.

1.9 Assumptions of the Study

The study was conducted under the assumption that the respondents gave their honest opinions while responding to the study questions.

1.10 Definitions of Terms

Attitudes towards ICT Usage: Refers to a person's general evaluation or feeling towards ICTs and specific computer and internet related activities (Smith, Caputi & Rawstone, 2000). In this context, it means one's positive or negative judgement about various ICT related statements.

E-content: Everything from e-books and online content to blog comments as well as how it can be used educationally (Ash, 2011). In this context, e-content means the digital content developed for and used by teachers and students in order to improve instructional delivery.

Information Communication Technologies (ICTs): - Are broadly defined as diverse set of technological tools and resources used to communicate, and to create, disseminate, store and manage information (Blurton, 2002). In this study ICT refers to the computer and internet connections used to handle and communicate information for learning purposes.

ICT availability: In this context, it refers to the ability of a user to access ICT resources in a specified location, and correct amount and format.

ICT Competence: is the ability to handle a wide range of computer applications for various purposes (Van Braak *et al.*, 2004). In this context, ICT competence means the ability to use various ICT applications in classroom instruction.

ICT Integration in Education: Refers to the use of technology in communication, data processing and data storage to impact the knowledge to learners (Tinio, 2004). In this context, it means incorporating ICTs to aid teaching.

ICT Resources: In this context, ICT resources mean computers and their peripherals such as LCD projectors, interactive whiteboards, digital cameras, digital video recording equipment, printers and internet access.

ICT Software: Is a general term for organized collections of computer data and instructions (Nutt, 2007). In this context ICT software includes: Microsoft word, Microsoft excel, Microsoft access, Microsoft Power Point, internet, e-mails, CD-ROMs based on agriculture content, digital video editing, online demonstrations, and simulation programmes.

Learner-centered learning environment: - is a learning environment that pays attention to knowledge, skills, attitudes, and beliefs that learners bring with them to the learning process where its impetus is derived from a paradigm of learning called constructivism. In the context, it means students personal engagement to the learning task using ICT hardware and software.

CHAPTER TWO
LITERATURE REVIEW

2.1 Introduction

This review of literature is organized into the following sections: Use of ICTs globally, State of ICT use in education in Kenya; Use of ICTs in teaching and learning of agriculture; Challenges to the use of ICT in teaching; Factors influencing teachers' use of ICT in teaching; Theoretical Framework and Conceptual Framework.

2.2 Use of ICTs Globally

The growth of ICTs has been exponential around the world, though not evenly distributed between countries. Developed countries have heavy investment in ICTs which many researchers feel that it has been a contributing factor to the development (Spence and Smith, 2009). Kozma 2005 notes that knowledge creation, technological innovativeness, organizational networking, and knowledge sharing can support both sustained economic growth and social development. Developing countries, majority from Africa are lagging behind in the information revolution (UNESCO, 2011). Not surprisingly, the quest for connectivity has been problematic and will require fundamental shifts in the regulatory environment, as well as renewed attention to public-private partnerships and social services. Africa is also facing uneven access to and skills in ICTs which results to digital divide with the developed countries hence posing challenges in striking a balance between technology and the need for local development.

Despite the growing demand for ICTs in education, global statistics concerning basic information about ICT policies in education are lacking. UIS and UNESCO have recently begun some regional initiatives intended to provide at least a comparative worldwide perspective of access to computers and the Internet in schools, while the World Bank's System Assessment and Benchmarking for Education Results (SABER) initiative and the Inter-American Development Bank are currently focusing on a compilation of detailed information about technology policies in education, mostly from a qualitative perspective. Unfortunately, neither of these initiatives has yet produced a comprehensive global assessment (UNESCO, 2014).

2.3 State of ICT Use in Kenyan Education

The history of ICTs and education goes back to Kenya's early post-independence years (1963). At that time the use of radio broadcasts was seen as the best way of harmonizing education standards across the country for all students and teachers. Though this has continued to be used to date, other ICTs like the television were not widely adopted for the same purpose in Kenya. The convergence of information and telecommunication technologies has resulted in the computer being a powerful ICT tool through which all the advantages of the radio and the television are combined (National ICT Policy, 2006).

The initial aim of introducing ICTs in education was primarily at developing ICT skills, the focus has over time shifted to leverage ICTs to address issues of quality and to improve teaching and learning especially at secondary and post secondary levels. However, the use of ICTs at various levels of education is still low (Farrel, 2007). This can be attributed to inadequate ICT equipment, lack of content, lack of guidance on how best to leverage the existing infrastructure, lack of curriculum support for the use of ICTs and lack of maintenance and technical support structures to keep the existing infrastructure operational (Kenya ICT Situation Analysis in Education, 2009).

An examination of the National ICT Policy (2006) and The National ICT Strategy for Education and Training revealed that they recognize the role of ICTs in education and development, ICT as a universal tool in education and training, and its integration to improve access, learning and administration are emphasized. The Sessional Paper No. 1 of 2005, Kenya Education Sector Support Programme (KESSP) and Vision 2030 documents underscore the importance of ICTs in education in laying a firm base for skills development and innovation for enabling the country to attain a competitive edge. These policies seek to establish policy frameworks; install digital equipment, connectivity and network infrastructure; and integrate ICTs in education and training. KESSP focuses on challenges facing the education sector and gives solutions on how to overcome them. ICTs in Education Options Paper, discusses the ways in which ICTs can support and improve delivery of quality education to Kenyans (National ICT Policy, 2006).

The Kenya ICT situational analysis confirms that there is evident interest and concerted effort on the part of the government, the Ministry of education and training, and development partners to use ICTs in teaching and learning processes (Kenya ICT Situation Analysis in Education, 2009). For instance, the Kenyan government established a Computer Supply Programme during the period of first Medium Term Plan 2008 to 2012. The programme targeted 20,229 public primary schools, 4,000 public secondary schools, 20 primary teacher training colleges (PTTCs), 2 diploma colleges, 10 Model e-learning centres for Adult and Continuing Education (ACE) and the 7 public universities. During the period 2009 to 2011, a total of 230 teachers and 30 ICT champions were trained to support the coordination and harmonization of ICT in education issues particularly integration of ICT in teaching and learning. The one Laptop per child project is one of the key flagship programmes highlighted in the second medium term plan 2013 to 2017. The aim is to integrate ICTs into curriculum at all levels (preparing teacher and learner), procure ICT infrastructure and develop institutional and policy framework for ICTs. The Ministry of Education (MOE) in conjunction with the Kenya Institute of Education (KIE) are progressively developing digital content for all subjects in secondary schools' use. (Education for all National Review Report: Kenya, 2015).

2.3 Use of ICTs in Teaching and Learning of Agriculture

In Kenya, the social and economic objectives of teaching Agriculture as a subject in general secondary schools are set out in the syllabus: to promote interest in agriculture as an industry and create awareness of opportunities existing in agriculture and related sectors; to demonstrate that farming is a dignified and profitable occupation; to enhance skills needed in carrying out agricultural practices; to develop self-reliance, resourcefulness and problem solving abilities in agriculture; to develop occupational outlook in agriculture; to enable schools to take an active part in national development through agricultural activities; and to promote agricultural activities which enhance environmental conservation (Republic of Kenya Ministry of Education, 2002). The objectives are multi-dimensional in nature, so for their achievement multiple methods should be used in an integrated fashion. At present ICTs may be important as it provides variety

in the presentation of content which helps learners in concentration, better understanding, and long retention of information which is not possible otherwise.

Where ICT has become a regular part of the classroom experience, there is evidence of positive impact on learning and student performance. The visual nature of some technologies, particularly animations, simulations and moving imagery, engage learners and enhance conceptual understanding (Eskrootchi & Oskrochi, 2010). The use of simulation software offers opportunities to investigate problem or difficult areas which are impossible to create in classrooms – or are often too dangerous. Simulations and animations allow students to see events that would otherwise be invisible because they happened too quickly, too slowly or were not readily observable. Students can also access authentic data on the internet and use its facilities to collaborate with professional scientists.

2.4 Challenges to the Use of ICT in Teaching

Although the Government of Kenya (GOK) is committed to implementing ICTs in education, the process is hindered by a number of barriers. The barriers are categorized as external/ first-order or internal /second order (British Educational Communications and Technology Agency (BECTA), 2004; Ertmer, 1999; Keengwe, Onchwari & Wachira, 2008). According to BECTA (2004), first order barriers include lack of equipment, unreliability of equipment, lack of technical support and other resource-related issues. Second-order barriers include both school level factors, such as organizational culture and teacher level factors, such as beliefs about teaching and technology and openness to change.

Literature concerning the barriers to ICT use in schools suggests that teachers resist change especially when asked to use new technologies in their teaching (Mumtaz, 2000). Ertmer (2005) noted three types of barriers that are caused by teachers' beliefs and attitudes concerning ICT implementation. The first is the lack of access to technologies or training, the second concerns 'beliefs' about what is considered effective professional practice in teaching, and the third contends that teacher must find sufficient purpose and reason to be motivated to use a particular tool in his or her teaching. However, the idea that teachers resist change as a result of their personal beliefs is questioned by researchers who suggest that the reported attitude of teachers

towards ICT tells us more about what equipment the teacher has access to, what training they have had, and what sort of community they are part of, than it does about the willingness of the teacher to use ICT (Hayden & Barton, 2007). BECTA (2004) suggests that barriers interrelate and in some cases cause each other. Some of the challenges are discussed below under the selected factors influencing teachers' use of ICTs.

2.5 Factors Influencing Teachers' Use of ICT

Teachers are at the centre of curriculum change and they control the teaching and learning process (Agbulu & Ademu, 2010). Therefore, they have the responsibility to prepare young people for the knowledge society in which the competency to use ICTs, to acquire and process information is crucial. However, it is documented in the literature that Kenyan schools have not made effective use of technology (Hennessy *et al.,* 2010; Kiptalam & Rodrigues, 2010). Ertmer (1999) defines two types of factors influencing teachers' use of ICTs: external (school level) factors and internal (teacher level) factors.

2.5.1 External Factors

External factors include: availability of ICT resources, availability and relevance of digital content, technical support on ICT, school administrative support on ICT, level and quality of ICT training as discussed below.

Availability and accessibility of ICT Resources

Effective adoption and integration of ICT into teaching in schools depends mainly on the availability and accessibility of ICT resources such as hardware, software and network infrastructure (Hennessey *et al*., 2010). According to Osodo *et al.* (2010), using up-to-date hardware and software resources is a key feature to diffusion of technology. Infrastructure is more than a question of availability, but also about access. If teachers cannot access ICT resources, then they will not use them. Therefore, access to computers, updated software and hardware are key elements to successful adoption and integration of technology. A study by Yildirim (2007) found that access to technological resources is one of the effective ways to teachers' pedagogical use of ICT in teaching. Agbulu and Ademu (2010) noted that the poor

choices of hardware and software and lack of consideration of what is suitable for classroom teaching are problems facing many teachers.

In an attempt to investigate availability and utilization of the Internet in Kenyan secondary schools, Kiptalam and Rodrigues (2010) found that there was high use of internet and its integration in teaching and learning with its use more among students and teachers as means of communication and for information searching. They also found out that, teachers and students from urban-based schools had a higher internet access rates at home and in schools compared with their counterparts in rural-based schools. This difference was attributed to non-networked computers in rural-based schools.

In another study to explore factors that influence classroom use of ICT in Sub-Saharan Africa, Hennessy *et al*. (2010) noted that introducing technology into schools is largely dependent upon the availability and accessibility of ICT resources. It was observed that schools are increasingly being equipped with computers for teaching, learning and administrative purposes; connectivity is improving and students enthusiastic about using computers for learning.

Availability and Relevance of Digital Content

Kenya has realized the importance of embracing technology in learning and has made tremendous steps towards integrating it in education (Kimotho, 2011). The use of computer in curriculum delivery in particular, promises better methods of delivery and expanding the teaching and learning resource base. One of the avenues the government of Kenya has used to adopt new technologies in education is through the Curriculum centre, The Kenya Institute of Education (KIE). KIE has already developed e-learning materials in chemistry, mathematics, English, physics, Kiswahili, agriculture, computer studies, business studies, history and government, biology, geography and home science (Ratemo, 2011). The developed e-materials are delivered online and are also packaged in DVDs for offline delivery (Kimotho, 2011). Apart from KIE, e-materials have also been developed by various private authors and are already being used by some teachers. These e-materials use animated graphics to explain content developed using the KIE syllabus (Muiruri, 2013).

The e-content usually involves interactivity between the learner and their teacher or peers. The use of both audio and visual senses in acquisition of knowledge as learners visualize computer graphics and images displayed with animation in videos makes illustrations look real in actual life situation and also enhances retention. These resource materials may be used to support, illustrate, explain or revise specific topics and to provide extra support for individual learners. The content supports educators by proposing a variety of teaching methodologies and by giving explanations in areas that have previously proved to be difficult for learners and educators (Ratemo. 2011).

Although e-content are available in the Kenyan market, little had been found to ascertain their availability in schools, their relevance in supporting classroom instruction and whether their presence in schools influences agriculture teachers to use them in instructional delivery. Therefore this study provided the knowledge gap existing in this area.

Technical Support

Along with ICT training, one needs a technology related support mechanism to gradually induce the integration. Teachers need support in use and integration of technology into the curriculum and teaching methods. Osodo *et al*. (2010) noted that teachers are afraid of using computers when they are not sure of where to turn for help when something goes wrong. Agbulu and Ademu (2010) reported that the breakdown of a computer causes interruptions and if there is lack of technical assistance, then it is likely that the regular repairs of the computer will not be carried out resulting in teachers not using computers in teaching. The effect is that teachers will be discouraged from using computers because of fear of equipment failure since no one would give them technical support in case there is technical problem. Similarly, Yilmaz (2011) in assessing the technology integration processes in the Turkish education system reported that in providing schools with hardware and internet connections, it is also crucial to provide the schools with technical support with regard to repair and maintenance for the continued use of ICT in schools. Tella *et al.* (2007) examined Nigerian secondary school teachers' uses of ICTs and its implications for further development of ICT use in schools through a census of 700 teachers. The results showed that for teachers a lack of technical support in the schools and

teachers' lack of expertise in using ICT were the prominent factors hindering teachers' readiness and confidence of using ICT during lessons.

Even though, lack of technical support discourages teachers from adopting and integrating technology in classrooms, a study by Korte & Husing (2007) revealed that schools in Britain and the Netherlands have appreciated the significance of technical support to help teachers to integrate technology into their teaching. They argued that ICT support in schools influence teachers to apply ICT in classrooms without wasting time troubleshooting hardware and software problems.

School Administrative Support on the Use of ICT

Though infrastructure support is imperative, school administrative support is a stronger predictor of teachers' use of ICTs in teaching and learning process (Makanda, 2015). According to Makhanu and Kamper (2012), the success of ICT use in schools is determined by proactive school leaders who give timely support to the integration of ICT into school operations, because these leaders have the responsibility to encourage teachers, students and other school personnel to appreciate technology use. Then, if leaders are cognizant of the benefits to be gained from using technology in the teaching, learning process, technology use in school is more likely.

The leadership style exhibited by school principals could help or hinder ICT infusion in schools. Afshari *et al*. (2012) conducted a study on transformational leadership roles of principals in implementing ICTs in Iranian schools. The study revealed a relationship between the school principals' level of computer competence and transformational leadership practices. Based on their results, they concluded that school principals who use computer frequently in their administrative and instructional tasks and have a higher levels of skill and knowledge in ICT use will exhibit more transformational leadership behaviours in their schools. These leaders also will act as strong role models for the effective use of technology in support of teaching and learning.

Institutions exemplified by executive involvement and decision-making, strengthened by ICT plan, effectively adopt ICT integration curriculum. To promote ICT integration in schools,

school leaders should adopt strategies that make ICT a part of the daily routine or tasks of the teachers. These strategies may include using e-mail as the mode of communication among staff, accessing the Intranet to download forms and using a word-processor to complete lesson plans for submission (Bangkok, 2004).

A study by Makanda (2015) revealed that, 36% of the school principals in Bungoma County indicated that there schools did not have any policy on ICT use in teaching. The findings further revealed that only 27% of the school principals had taken some initiative to have their teachers trained on how to integrate ICTs in teaching. In Nyamira County, little was known about the support accorded by school principals to their teachers especially agriculture teachers hence the importance of this study.

Level and Quality of ICT Training

Professional development of teachers sits at the heart of any successful technology and education program. Several studies have revealed that whether beginner or experienced, ICT related training programs develop teachers' competences in computer use (Bauer & Kenton, 2005), influence teachers' attitudes towards computers (Hew and Brush, 2007; Keengwe *et al*., 2008) as well as assisting teachers reorganize the task of technology and how new technology tools are significant in student learning (Amenyedzi *et al.,* 2011). Baylor and Ritchie (2002) carried out a quantitative study that looked at the factors facilitating teacher skill, teacher morale, and perceived student learning in technology-using classrooms. They found that professional development has a significant influence on how well ICT is embraced in the classroom.

According to Schaffer and Richardson (2004), when technology is introduced into teacher education programs, the emphasis is often on teaching about technology instead of teaching with technology. This is supported by Baylor and Ritchie (2002) who added that teachers' training programmes often focus more on basic literacy skills and less on the integrated use of ICT in teaching. Amenyedzi *et al*. (2011) claim that teachers' technology skills are strong determinants of ICT integration, but are not conditions for effective use of technology in the classroom. He argues that training programs that concentrate on ICT pedagogical training instead of technical issues and effective technical support, help teachers apply technologies in teaching and learning.

Hence, teachers are more likely to integrate ICT in teaching, when professional training in the use of ICT provides them time to practice with the technology and to learn, share and collaborate with colleagues.

A study by Kiptalam and Rodrigues (2010) found out that majority of teachers in Kenyan schools both from urban and rural, did not receive any prior ICT training during their formative years at the teacher training colleges or universities before joining the teaching profession. About 55% of the teachers stated that they did not receive any ICT training at all. Nevertheless, 51% of the teachers had taken the self-initiative to undergo ICT training while in the teaching profession. This result agrees with the finding of Lau and Sim (2008) where most of the teachers considered themselves as having limited knowledge of ICTs; and indicated other channels to provide them with more effective ICT training. In Kenya, few teachers may have received ICT training during their teacher training programmes. Some teachers may have taken their personal initiative to learn the use of ICT. However, little is known about the influence of training on ICT use in classroom instruction especially in a specific field of specialization. Therefore this study intended to find out the influence of agriculture teachers' ICT training on their use of ICTs in classroom instruction in Nyamira County.

2.5.2 Internal Factors

Internal factors include: Teachers characteristics, ICT competence of the teachers and teachers' attitudes towards ICT as discussed below.

Teachers' Characteristics

Teachers' characteristics (e.g. individual's educational level, age, gender, educational experience, experience with the computer for educational purposes and financial position) can influence the adoption of an innovation (Schiller, 2003). The report by the US National Center for Education Statistics (2000) indicated that teachers with fewer years of experience were more likely to use computers in their classes than teachers with more years of experience. More specifically, teachers with three years or less teaching experience reported using computers 48% of the time; teachers with 4-9 years, 45% of the time; those with 10-19 years, 47% of the time,

while teachers with 20 years or more reportedly used computers only 33% of the time. This may be due, in part, to the fact that new teachers have been exposed to computers during their training and therefore, have more experience using this tool. Then, one of the factors that determine the extent to which teachers use computers in their classes may be the number of years they have been teaching.

Furthermore, there are other personal characteristics that may influence how teachers use computer applications in their classrooms. The teacher's own learning style is certainly one such factor. For example, if a teacher is a creative thinker who likes the idea of constructing knowledge, is a life-long learner, a social learner, and a decision maker, he may be more likely to use computers in more integrative and transformational ways that are useful and valuable to students instead of ways that promote and support traditional classroom practices (Bielaczyc & Collins, 1999; Carvin, 1999).

ICT Competence of the Teachers

Computer competence is defined as being able to handle a wide range of computer applications for various purposes (Van Braak *et al*., 2004). In order to achieve high levels of teacher competence in ICTs, there is a need to provide training, and perhaps unsurprisingly, there is a great deal of literature evidence to suggest that effective training is crucial if teachers are to implement ICTs effectively in their teaching (Buebeng-Andoh, 2012; Tasir, Abour, Halim, & Harum, 2012). If training is inadequate or inappropriate, then teachers will not be sufficiently prepared, and perhaps not sufficiently confident, to make full use of technology in classroom (BECTA, 2004).

According to Buebeng-Andoh (2012), the success of educational innovations depends largely on the skills and knowledge of teachers. Also, he found that teachers' lack of knowledge and skills was the second most inhibiting factor to the use of computers in schools. Similarly, in the United States, Knezek and Christensen (2000) hypothesized that high levels of attitude, skill and knowledge (proficiency), and tools (level of access) would produce higher levels of technology integration that will reflect on student achievements positively. Their model postulated that educators with higher levels of skill, knowledge, and tools would exhibit higher levels of

technology integration in the classroom. Moreover, a study conducted by Tasir *et al*. (2012) in Malaysia concluded that teachers' ICT training programmes provide them with sufficient knowledge about ICTs which in its role satisfies them and make them more encouraged and motivated. This implies that teachers' ICT competence is the greatest predictor of their use of ICTs in the classroom instruction.

The UNESCO ICT competency standards for teachers (UNESCO, 2008) describe three approaches: technological literacy; knowledge deepening; knowledge creation. These approaches are seen as part of a development continuum and each approach has different implications for education reform and improvement; each has different implications for changes in the components of the education system: pedagogy, teacher practice and professional development, curriculum and assessment, and school organisation and administration. ICT plays a different, but complementary role in each of these approaches, with new technologies requiring new teacher roles, new pedagogies, and new approaches to teacher education. The successful use of ICT in the classroom depends on the ability of teachers to structure their learning environments in some non-traditional ways, merging technology with new pedagogies, to develop active classrooms that encourage cooperative interaction, collaborative learning, and group work.

The competence of teachers in using ICTs in classroom instruction has been found to be dependent on continuous training and exposure to ICT. A study by Tasir *et al*. (2012) revealed that Malaysian teachers have a high level of ICT competency. This means that these teachers are able to use most ICT tools for classroom instruction. However, another study by Agbulu and Ademu (2010) in Nigerian schools, found out that teachers were not knowledgeable in the use of ICTs for teaching and therefore the level of utilization of ICTs in secondary schools was very low. Limited literature had been found on ICT competence in Kenya and in Nyamira County specifically. This study therefore aimed at filling this gap.

Teachers' Attitudes towards ICTs

The attitude of the teacher has been found to play an important role in technology use in the teaching-learning process (Khan, Hasan & Clement, 2012). How people perceive and react to the

technologies is far more important than technical obstacles in influencing ICT implementation and use (Osodo *et al*., 2010). If teachers' attitudes are positive toward the use of educational technology then they can easily provide useful insight about the adoption and integration of ICT in the teaching and learning processes.

Demirci (2009) conducted a study on teachers' attitudes towards the use of Geographic Information systems (GIS) in Turkey. The study used questionnaire to collect data from 79 geography teachers teaching in 55 different high schools. The study revealed that though barriers such as lack of hardware and software existed, teachers positive attitudes towards GIS was an important determinant to the successful integration of GIS into geography lessons. A study by Osodo *et al*. (2010) on attitudes of students and teachers towards use of computer technology in Geography education in Kenya, revealed that 82% of teachers had a positive attitude towards computer use and would therefore recommend and support its integration in Geography curriculum. In a similar study, Naser, Leong and Fong (2010) revealed that attitude levels towards the use of ICT had a direct relationship with the use of ICT.

Teachers' computer experience relates positively to their computer attitudes. The more experience teachers have with computers, the more likely that they will show positive attitudes towards computers (Khan *et al*., 2012). Positive computer attitudes are expected to foster computer integration in the classroom. Positive attitudes often encourage less technologically capable teachers to learn the skills necessary for the implementation of technology-based activities in the classroom. Osodo *et al*. (2010) found out that participants with negative computer attitudes were less skilled in computer use and were therefore less likely to accept and adapt to technology than those with positive attitudes. They concluded that, changing individuals' negative attitudes is essential for increasing their ICT skills. Therefore, if teachers want to successfully use technology in their classes, they need to posses positive attitude towards ICT use (Naser *et al*., 2010). Such attitude is developed when teachers are sufficiently comfortable with technology and are knowledgeable about its use (Afshari *et al*., 2009). These findings elaborated above have only to be proved and researched in the adoption of ICT in Kenya and more so in Nyamira County.

2.6 Theoretical Framework

This study was based on both Activity Theory (AT) and Technology Acceptance Model (TAM). AT is a general framework for studying different forms of human activity. Within this general context, Engestrom (1987) proposed a model (Figure 1) that conceptualizes all purposeful human activity as the interaction of the elements: subject, object, tools, community, rules, and division of labour. In this model of an activity system, the *subject* refers to the individual or group whose point of view is taken in the analysis of the activity. The *object* (or objective) is the target of the activity within the system. *Tools* refer to internal or external mediating artefacts which help to achieve the *outcomes* of the activity. The *community* is comprised of one or more people who share the objective with the subject. *Rules* refer to the explicit and implicit regulations, norms and conventions that constrain actions and interactions within the activity system. The *division of labour* discusses how tasks are divided horizontally between community members. It also refers to any vertical division of power and status.

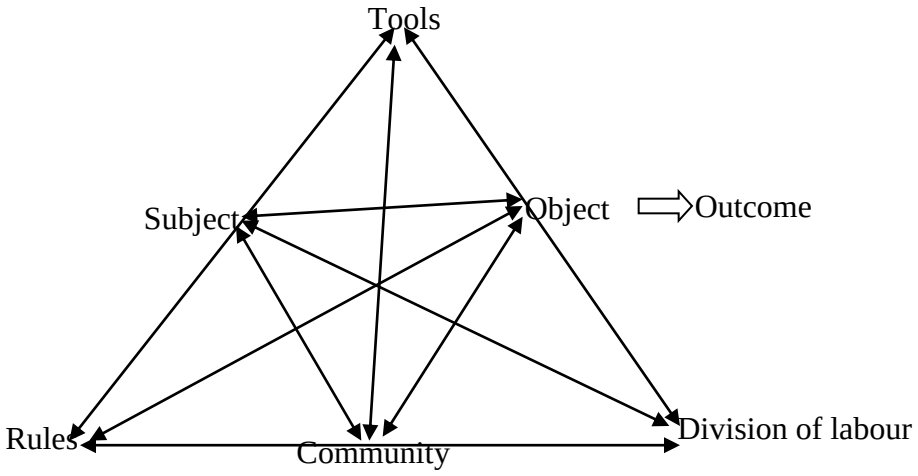

Figure 1: The Structure of an Activity System

Using this model to analyse ICT integration in the teaching-learning process, The subject may represent the teachers, their teaching experience, their personal, administrative and instructional use of ICTs, and their knowledge and skills related to ICT; Object may represent the goals of

using ICT in teaching-learning process; Tools will include ICT resources; Rules represent school ICT policy; Community in this study is represented by: agriculture teachers, school principals, learners and ICT experts; Division of labour is seen to be the roles and responsibilities of agriculture teachers, cooperation among teachers and the support of administration. Outcome is the reflection of the use of ICTs in teaching-learning process (Demiraslan, 2005).

AT uses the term *contradiction* to indicate a misfit within elements, between them, between different activities, or between different developmental phases of a single activity (Sujan, Rizzo & Pasquini, 2002). According to Engestrom (1987), these contradictions can be problematic but if handled constructively, they can invoke development through expansive learning. Introduction of ICT into the education system is likely to bring about contradictions, which may hinder the effective integration of ICTs. These contradictions can be addressed by reassessing and redefining each component of the activity systems (Lim& Hung, 2003). This study seeks to find out what the contradictions may be and their influence on the outcomes. Activity theory is adopted for this study because it provides a useful lens to study the interactions that take place amongst the various participants, and serves as a good framework to map the interaction of the factors that play an integral part in ICT use in classroom instruction.

The TAM developed by Davis, Bagozzi and Warshaw (1989), is an information system theory that models how users come to accept and use technology. The model (Figure 2) links the perceived usefulness and ease of use with attitude towards using ICT and actual use (system use). TAM is one of the most influential extensions the theory of reasoned action (TRA) developed by Ajzen and Fishbein (1980). Both TRA and TAM have strong behavioural elements. They assume that when someone forms an intention to act, that they will be free to act without limitation. In the real world there will be many constraints, such as limited ability, time constraints, environmental or organisational limits, or unconscious habits which will limit the freedom to act (Bagozzi *et al*., 1992). Bagozzi *et al*. noted that because new technologies such as personal computers are complex and an element of uncertainty exists in the minds of decision makers with respect to the successful adoption of them, people form attitudes and intentions toward trying to learn to use the new technology prior to initiating efforts directed at using. Attitudes towards usage and intentions to use may be ill-formed or lacking in conviction or else

may occur only after preliminary strivings to learn to use the technology evolve. Thus, actual usage may not be a direct or immediate consequence of such attitudes and intentions. As pertains to this study, TAM applies in that the agriculture teachers are the users of ICT. Their perceptions of usefulness and ease of use are to be investigated as factors that influence them in classroom instruction using ICT.

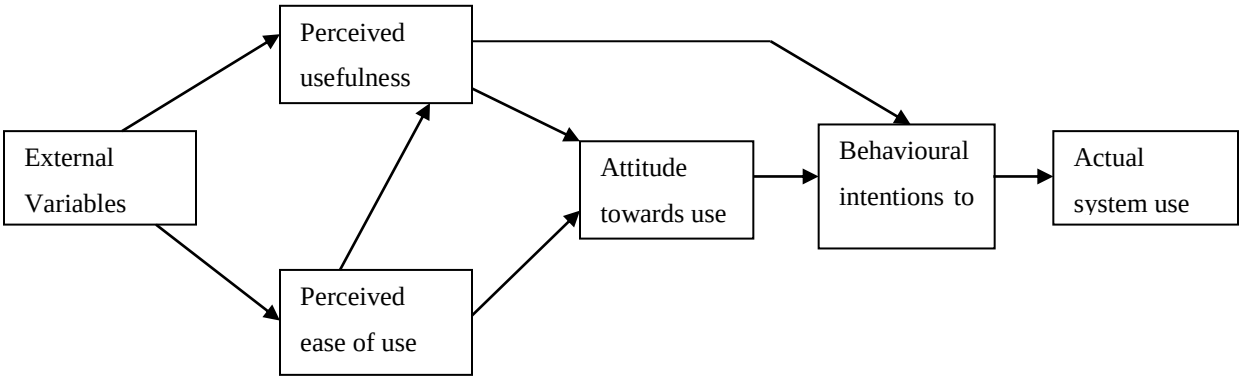

Figure 2: Technology Acceptance Model

2.6 Conceptual Framework

In this study, the independent variables were the selected factors on ICTs. They included: availability of ICT resources which was measured as the availability, accessibility and adequacy of ICT resources on a nominal scale; availability of e-content which was measures as the availability, adequacy and relevancy of e-content on a nominal scale; teachers' attitudes towards ICTs which was measured by statements reflecting perceived benefits and perceived problems to the use of ICTs on an interval scale; teachers' ICT competence which was measured by teachers' level of competence in using various ICT applications on an interval scale; and administrative support on ICTs which was measured as the number of times school administration supported teachers to undertake ICT training on an interval scale, and organization of ICT basic courses for teachers by school administration and teachers' satisfaction with the support of school principals on ICT use measured on a nominal scale. The dependent variable was the use ICTs in classroom instruction, which was measured as frequency of use of ICTs to carry out classroom tasks. Frequency of use of ICTs could either be: daily, two or more times a week, once a week, once a

term or never used at all. The independent variables were expected to influence agriculture teachers' use of ICTs in classroom instruction. The moderator variables were age, gender and teaching experience. These moderator variables were controlled through random sampling which ensured that teachers of all ages, gender and experience had an equal chance of being included in the sample. Figure 3 present the Conceptual Framework of the study.

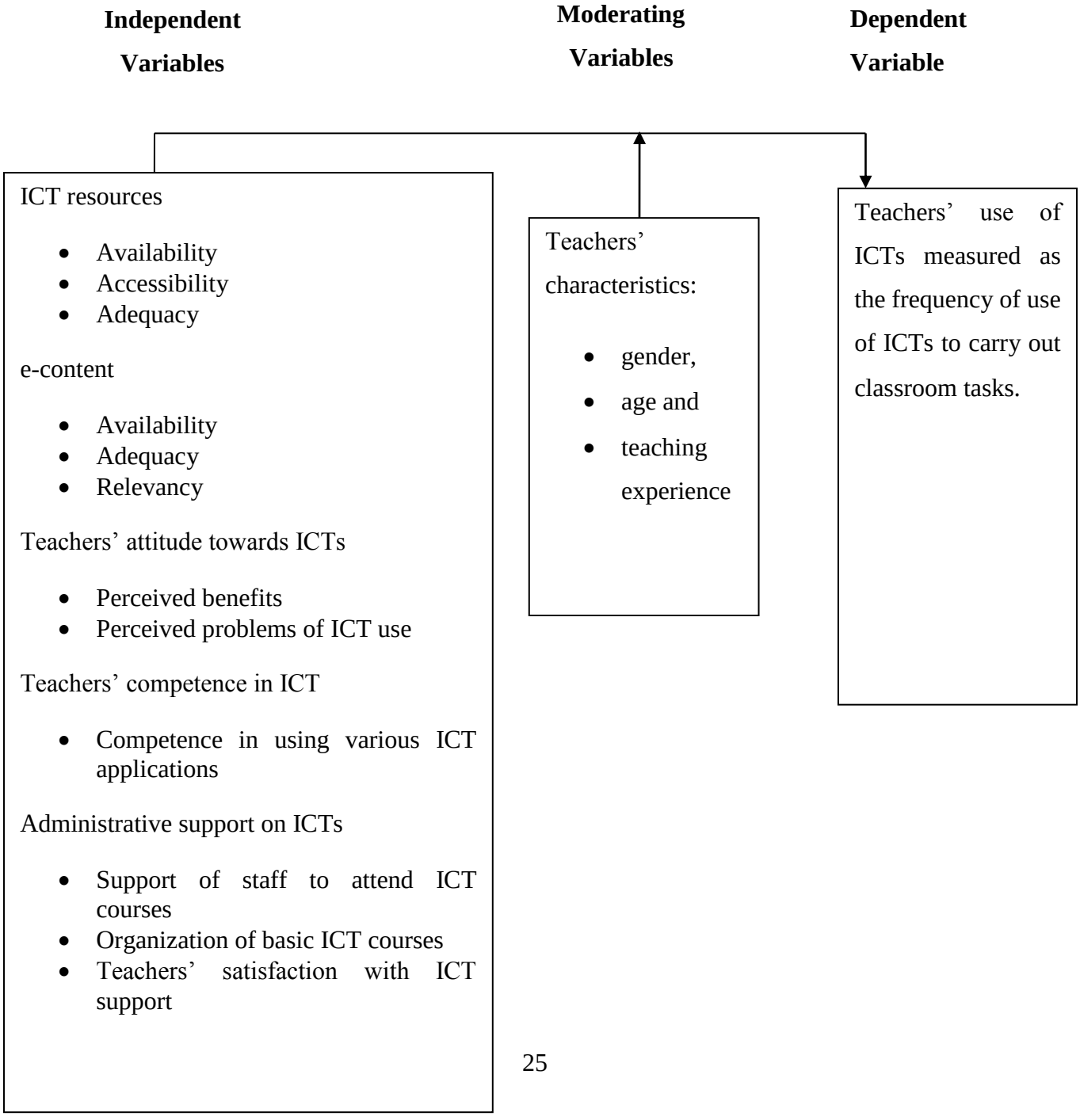

Figure 3: Conceptual framework used to investigate the relationship between selected factors and the use of ICTs in classroom instruction by secondary school agriculture teachers

CHAPTER THREE
RESEARCH METHODOLOGY

3.1 Introduction

This chapter provides a description of how the research was conducted. It consists of the research design, study location, target population, sampling procedures, sample size, instrumentation, data collection and data analysis.

3.2 Research Design

The study adopted a descriptive survey design. Gay (1983) defines descriptive research as a process of collecting data in order to test hypotheses or to answer questions concerning the current status of the subjects of the study. It was a survey as it was a self-report study which required the collection of quantifiable information from the sample (Mugenda & Mugenda, (2003). This design was deemed appropriate for the study because it enabled the description of the factors influencing the use of ICTs in classroom instruction by agriculture teachers and also enabled the researcher to reach as many respondents as possible within a short time.

3.3 Location of the Study

The study was carried out in Nyamira County of Kenya. The County is located in the former Nyanza Province, bordering the following Counties; Bomet to the East, Narok to the South, Kisii to the West, Homabay to the North and Kericho to the North East. The County covers an area of 900 km^2, having five sub-counties: Nyamira South, Nyamira North, Manga, Borabu and Masaba. According to the Ministry of Education, Nyamira County, the County has 168 secondary schools with 215 agriculture teachers.

3.4 Target Population

This study targeted all agriculture teachers from all secondary schools in Nyamira County. There were a total of 215 agriculture teachers distributed in the various sub-counties of Nyamira County (Nyamira County Education Office, 2013). The 215 teachers thus constituted the population of the study.

3.5 Sampling Procedure and Sample Size

Proportionate stratified random sampling technique was used to select a sample of agriculture teachers from Nyamira County as the respondents of the study. A list of all agriculture teachers with there contact numbers was obtained from the County education office to form the target population. Then, the teachers were proportionately stratified according to sub-counties to have a fair representation from each sub-county. From each stratum (sub-county), the desired sample size of 13 to 25 was randomly selected to attain a sample size of 100 agriculture teachers (Table 1). This sample was adequate as Kathuri and Pals (1993) recommend 100 subjects as ideal for a survey research in social sciences. To proportionately select the representative sample, the following formula was used:

$n_h=N_h/N \times n$

Where,

n_h= the sample size from stratum h

N_h= population size for stratum h

N= total population size

n= total sample size

Table 1

Proportionate sample size and Number of Agriculture Teachers in Nyamira County

Sub-county	Population	Sample
Nyamira North	50	23
Nyamira South	47	22
Manga	29	13
Borabu	36	17
Masaba	53	25
Total	215	100

Source: Nyamira County Education Office

3.6 Instrumentation

To successfully achieve the aims and objectives of this study, a semi-structured questionnaire, developed by the researcher, was used to collect the data required. The questionnaire (APPENDIX A) consisted of nine sections. Section A focused teachers' age, gender, teaching experience, professional qualification, and ICT experience. Section B investigated availability of ICT resources for teaching; C the use of ICTs to conduct classroom tasks; sections D, E, F and G investigated availability of e-content, ICT competence of agriculture teachers, teachers' attitudes towards ICT use, and administrative support on ICT use by agriculture teachers respectively while section H focused on challenges affecting ICT use by agriculture teachers.

3.6.1 Validity

Validity is the degree to which results obtained from analysis of data actually represents the phenomenon under study (Mugenda & Mugenda, 2003). The development of the research instrument was done by examining the research objectives and hypotheses. The researcher discussed the instrument with her colleagues, lecturers and supervisors in the department of Agricultural Education and Extension of Egerton University. These people ascertained whether the items in the questionnaire captured the intended information in accordance with the objectives and hypotheses of the study. Their suggestions were used to improve on the face and content validity of the instrument. Further suggestions made during defences were also used to modify the instrument.

3.6.2 Reliability

Reliability refers to the degree to which a research instrument yields consistent results or data after repeat trials (Mugenda & Mugenda, 2003). A pilot study was conducted before the actual administration of the questionnaire to establish its reliability. A total of 30 agriculture teachers were used from secondary schools in Gucha sub-county. The Sub-County was considered relevant for this study because of its proximity to Nyamira County and for the purpose of obtaining an independent group of respondents who were not supposed to take part in the main study. Cronbach's alpha reliability coefficient of each item of the questionnaire was computed after the pilot study. According to Moore and Benbasat, (1991), the reliability levels are

acceptable values for Cronbach's alpha when equal to 0.7 or greater. For the instrument used in this study, a Cronbach's alpha reliability coefficient of 0.77 was obtained and this was above the threshold of acceptable reliability.

3.7 Data Collection

The researcher obtained an introductory letter from the Graduate School of Egerton University. This facilitated the acquisition of a research permit from the National Council for Science and Technology before proceeding to gather data for the study. On the ground authorization and support were sought from the County Education Office of Nyamira County where a list of all agriculture teachers in their respective Sub-Counties with their phone numbers was obtained. Respondents for the study were contacted early by phone calls to inform them the purpose of the study and the day the researcher was expected to present questionnaires to them. Questionnaires were delivered by the researcher to all respondents contacted earlier in their respective schools. On arrival, the researcher sought permission from the school administrations before handing the questionnaires to the respondents. The researcher was available throughout the filling of the questionnaires to explain issues unclear to the respondents and to collect the completed questionnaires.

3.8 Data Analysis

The Statistical Package for Social Sciences (SPSS) version 17 for windows software was used to analyse data. All the completed questionnaires were reviewed and data obtained from them entered into SPSS. Descriptive and inferential statistics were used for data analysis. Descriptive statistics were used in all the objectives to summarize the mass of properties using frequencies, percentages and means. Objectives (ii), (iii), (iv) (v) and (iv) which were converted to hypotheses Ho_1, Ho_2, Ho_3 Ho_4 and Ho_5 respectively were analyzed using inferential statistics (Pearson's Product Moment Correlation). Pearson's Product Moment Correlation was preferred because it shows whether there exists a linear relationship between each dependent variable and the dependent variable in this study (Explorable.com, 2009). All the hypotheses were tested at α=0.05 significance level. Table 2 gives a summary of how the null hypotheses were tested.

Table 2

Summary of Data Analysis

Hypotheses	**Independent Variables**	**Dependent Variables**	**Statistical tests**
Ho_1 There is no statistically significant relationship between availability of ICT resources and the use of ICTs in classroom instruction by secondary school agriculture teachers in Nyamira County.	Availability of ICT resources	Use of ICTs in classroom instruction	Pearson's Product Moment Correlation
Ho_2: There is no statistically significant relationship between availability of e-content and the use of ICTs in classroom instruction by secondary school agriculture teachers in Nyamira County.	Availability of e-content	Use of ICTs in classroom instruction	Pearson's Product Moment Correlation
Ho_3: There is no statistically significant relationship between teachers' attitudes towards ICTs and the use of ICTs in classroom instruction by secondary school agriculture teachers in Nyamira County.	Teachers' Attitudes toward ICTs	Use of ICTs in classroom instruction	Pearson's Product Moment Correlation
Ho_4: There is no statistically significant relationship between teachers' ICT competence and the use of ICTs in classroom instruction by secondary school agriculture teachers in Nyamira County.	Teachers' ICT competence	Frequency of use of ICTs in classroom instruction	Pearson's Product Moment Correlation

Ho_5: There is no statistically significant relationship between school administrative support on ICTs and the use of ICTs in classroom instruction by secondary school agriculture teachers in Nyamira County.	School administrative support on ICTs	Use of ICTs in classroom instruction	Pearson's product Moment Correlation

CHAPTER FOUR
RESULTS AND DISCUSSION

4.1 Introduction

In this chapter, results and discussions on the relationship between selected factors and the use of ICTs in classroom instruction by secondary school agriculture teachers in Nyamira County are presented. Data was analyzed using Statistical Package for Social Sciences (SPSS version 17) software based on the variables and objectives of the study. Descriptive statistics of frequencies, percentages and means as well as inferential statistics (Pearson's Product Moment Correlation) were used. The findings are presented in the form of charts, percentage scores and frequency distribution tables.

The chapter is divided into nine sections: (i) characteristics of the respondents (ii) state of ICT use in classroom instruction, (iii) availability of ICT resources, (iv) availability of E-content, (v) teachers' attitudes towards ICTs, (vi) teachers ICT competence, (vii) administrative support, (viii) Use of ICTs to conduct classroom tasks, and (ix) hypotheses testing. The sections represent specific variables which are analyzed and computed to generate the best possible results for fulfillment of the objectives and testing the subsequent research hypotheses.

4.2 Characteristics of the Respondents

This section summarizes some of the common characteristics of the respondents. Respondents described themselves using some common variables put forward to them such as age, gender and experience in teaching agriculture. These characteristics were used as the foundation of discussing and testing the research variables.

4.2.1 Gender

Table 3 presents the gender distribution of the respondents in this study.

Table 3

Gender of Respondent

n=100

Gender	Frequency	Percent
Male	70	70.0
Female	30	30.0
Total	**100**	**100.0**

The respondents were, 70% male and 30% female. The male teachers in the County are more than the female teachers.

4.2.2 Age

Teachers' age shows the level of experience of the teacher in the County (see Figure 4).

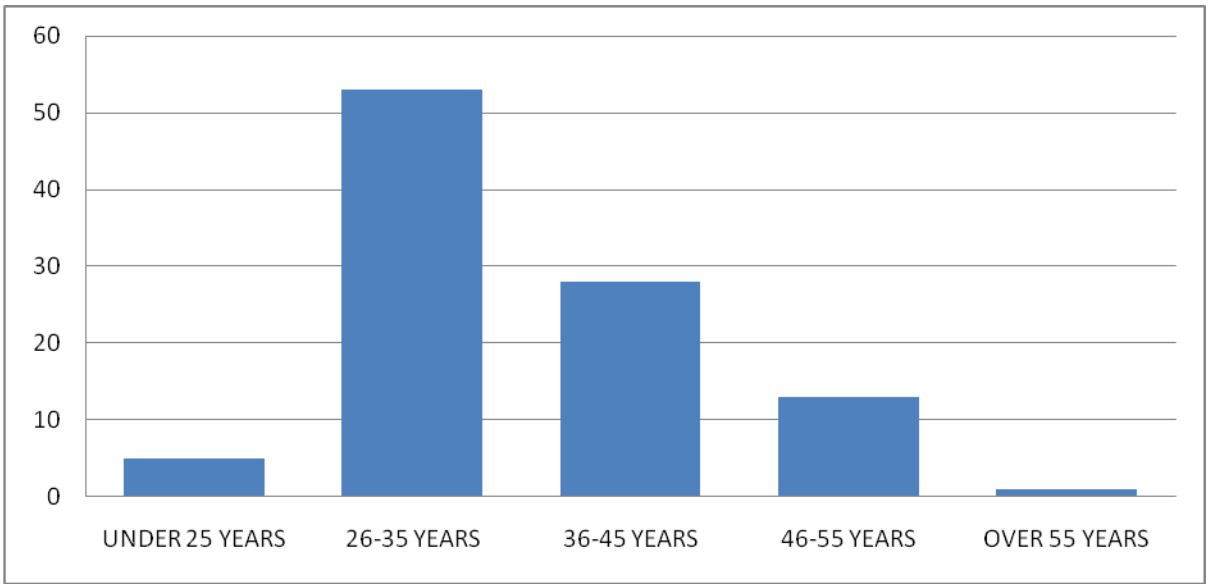

Figure 4: Age Distribution of Respondents

The Figure 4 shows that the majority of the respondents fell into the age bracket of 26-35 years often referred to as the youth in Kenya's development policies and planning structures. The lowest numbers of respondents were those above 55 years. This could be attributed to the retirement age which is currently standing at 60 years.

4.2.3 Experience in Teaching Agriculture

The teachers' teaching experience was considered in a range of five years. Table 4 gives the number of years the respondents had taught agriculture in secondary schools.

Table 4

Years in Teaching Agriculture

n=100

Categories (years)	Frequency	Percent
1-5	47	47.0
6-10	26	26.0
11-15	18	18.0
16-20	9	9.0
Total	**100**	**100.0**

The results showed that 47% had taught agriculture to secondary school students for a period ranging between 1 and 5 years. The teachers who had taught for a period of 6 to 10 years were 26%, while 18% had taught for 11 to 15 years and 9% had taught for 16 to 20 years.

4.2.4 Computer Experience

The agriculture teachers' computer experience was determined by asking them to state the number of years they had been using computers as presented in Table 5.

Table 5

Teachers' Computer Experience

n=100

Computer Experience (Years)	Frequency	Percentage
None	10	10.0
Less than 1	23	23.0
1-3	33	33.0
4-6	20	20.0
7-10	8	8.0
Over 10	6	6.0
Total	**100**	**100.0**

The results revealed that 33% had between 1-3 years experience in using computers while only 6% had experience of over 10 years. Bonnet *et al.* (2006) stated that few agriculture teachers had prolonged experience in the use of computers especially in the rural areas, because few schools had invested in computer and ICT training for teachers. Most of those with experience have invested in training themselves as part of their own personal skills improvement.

Although experience in the use of computers is paramount in the application of ICT to improve on the teaching method and curriculum, investment in computer training is still low in developing countries especially in rural counties. It is only recently, that external agents and non-governmental organizations started training teachers in the use of computers, (Bonnet *et al.,* 2006).

4.3 State of ICT Use in Classroom Instruction by Secondary school Agriculture Teachers

The study investigated availability of ICT resources such as desk tops, laptops, photocopiers among others and also the level of access and adequacy of these resources for classroom instruction.

4.3.1 Availability of ICT resources

Respondents indicated whether the ICT resources stated in the data collection tool were available in their schools and could therefore be used for purposes of teaching agriculture. The results of the data gathered are presented in the Table 6.

Table 6

Availability of ICT Resources in Secondary Schools of Nyamira County

n=100

	Availability of the ICT resources	
ICT resource	**Frequency**	**Percentage**
Desktop	99	99
Laptop	58	58
Printers	86	86
LCD projectors	59	59
Internet access	57	57
Digital camera	20	20
Scanners	24	24
Interactive white board	19	19
I-Pad	6	6
Photocopier	3	3

As can be seen from Table 6, majority of the respondents (99%) had desktop computers in there schools with only 1 % indicating that they had no desktop computers. Availability of desktop computers can be attributed to the fact that they are cheaper and are often used in computer labs where students are taught the use and management of the computers. Krumsvik (2005) indicates that whereas other resources may be scarce, the desk top computer is almost always available to teachers. In addition, some schools invest in laptops for teaching and administration particularly in private schools where such machinery can be afforded (Bonnet *et al* 2006). The data shows

that laptops are not as common as desktops. Other ICT resources such as photocopiers were only available to 3% of the respondents. Investment in other ICT resources seems to be much lower.

4.3.2 Access to ICT Resources

Although the resources could be available for teachers, access could be limited due to a number of factors, both procedural and environmental. The study also sought to determine if indeed the resources available to the teachers came with proper and easy access as presented in table 7.

Table 7

Access to ICT Resources

n=100

	Accessibility to ICT	
ICT resources	**Frequency**	**Percentage**
Desktop	82	82
Laptop	36	36
Printers	56	56
LCD projectors	36	36
Internet access	36	36
Digital camera	8	8
Scanners	15	15
Interactive white board	12	12
I-Pad	3	3
Photocopier	2	2

Table 7, shows the data gathered on accessibility to ICT resources. Majority of the respondents (82%) had proper and easy access to the desk top computers. However, for each ICT resource available, the percentage of respondents who had access was slightly lower than those who had indicated availability.

Access to ICT resource access can be limited by the procedure of access. If teachers are to seek permission and follow certain procedures to gain access to ICT resources, then the resource becomes less accessible (Higgins, 2010). Wang (2011) noted that access could also be limited by poor training of teachers. If teachers are not adequately trained in the use of ICT, their ability to access them will be limited. Where teachers are required to part with some economic resources, such as pay for ICT resources, access becomes even lower (Wang, 2011). The above factors could easily factor in to make access to ICT resources, earlier indicated to be available, less accessible for teaching agriculture.

4.3.3 Adequacy of ICT resources

This study made the assumption that ICT resources could be available but not adequate causing their not being utilized in classroom teaching. As such in order to complete the first objective properly, the researcher sought data on the adequacy of the resources that were available in the schools. The results were then summarized in Table 8.

Table 8

Adequacy of ICT Resources

n=100

	Adequate	
ICT resource	**Frequency**	**Percent**
Desktop	51	51
Laptop	14	14
Printers	32	32
LCD projectors	22	22
Internet access	25	25
Digital camera	7	7
Scanners	8	8
Interactive white board	3	3
	39	

I-Pad	0	0
Photocopier	3	3

The results presented in Table 8 show that although majority of the respondents had access to resources such as the desk top computer, the percentage of those who felt the resources were adequate was only slightly more than half. In the case of laptops, the percentage went even lower with only 14% feeling that the laptops available were adequate.

For teachers to make use of the available ICT resources in teaching, the resources must be adequate. In many schools, the resources are either outdated or few forcing teachers to share. In such cases the resources cannot be deemed to be adequate and as such use of ICT resources becomes inefficient and poor. Investment in proper and adequate ICT resources is difficult for schools with limited resources, especially for those public schools found in rural areas. Text books, desks and other resources are scarce, and therefore ICT resources take a back bench and are often ignored. Such resources may be available, but in many cases they are barely enough for all teachers (Higgins, 2010).

4.3.4 Mean Availability of ICT Resources

An index for availability of ICT resources comprising the questionnaire items of availability, adequacy and accessibility for listed ICT resources (desktops, laptops, printers, LCD projectors, internet access, digital cameras, scanners, interactive white boards, I-pads and photocopiers) was adopted. For these items, a score of one (1) was adopted for a "Yes" response and zero (0) for a "No" response. Response scores for the three items that constituted the index for availability of ICT resources were cumulated to obtain total scores for availability of each of the ICT resources. The findings were then analyzed descriptively using means and standard deviations as shown in Table 9.

Table 9

Means of Availability of ICT Resources

ICT Resource	n	Mean	Std. Deviation
Desktop Computers	100	2.3400	.75505
Printer	100	1.7400	1.01125
Internet Access	100	1.1800	1.17534
LCD Projectors	100	1.1700	1.16389
Laptops	100	1.0800	1.08879
Scanners	100	.4700	.91514
Digital Camera	100	.3500	.78335
Interactive Whiteboard	100	.3400	.75505
Photocopier	100	.1194	.56468
I-pad	100	.1100	.49021

The findings in table 9 indicate that desktop computers had the highest mean availability (2.34) with a standard deviation of 0.76 followed by the printer with a mean availability of 1.74 (standard deviation of 1.01). The I-pad had the lowest mean availability of 0.11 with a standard deviation of 0.49. As discussed in the previous sections, the higher mean in relation to the availability of the desktop computers may be attributed to multiple uses of this type of ICT resource in the school for both administrative and teaching and learning purposes which makes it imperative for most schools to stock them. The ICT resources with lower means less than unit (1) reveal that such resources were almost completely unavailable in the schools in the study location, attributable to the fact that most of them may be costly to the schools yet the schools have lower budgetary considerations for investments in ICTs. Generally, the lower means across all the ICT resources may be explained by the fact that although some schools may have the ICT resources, the same may not be adequate and easily accessible to teachers for use in classroom instruction. Hennessey *et al.* (2005) indicated that in underdeveloped countries the use of ICT resources is minimal, with less than 10% of the schools in rural areas of the third world, having any form of ICT resource available for teaching purposes. Lund and Nielsen (2008), however, state that external agents and third world governments have increased investment in ICT

resources. Therefore more and more schools are making ICT resources available to their teaching staff. In addition, to making resources, there has been an increase in knowledge and training in the use of ICT resources such as computers, scanners and digital cameras.

4.4 Availability of E-content

The availability, adequacy and relevance of e-content was determined in this study by asking the respondents to state whether the e-materials were available in their respective schools, were adequate and relevant in teaching agriculture. The responses of the teachers were as presented in Table 10.

Table 10

Frequency Distribution of the Availability, Adequacy and Relevance of E-content in Schools

n=100

Statements	Teachers responding positively to the statement	
	Frequency	**Percent**
Are e-materials available for teaching agriculture	67	67
Are the e-materials available adequate for teaching	32	32
Are e-materials relevant for teaching agriculture	58	58

n=100

Availability of e-content in schools was found to be high based on the 67% of teachers who reported availability of the same. This means that majority of the schools had e-materials in their respective libraries. The availability of e-content in many schools could be attributed to the fact that the Kenya Institute of Education (KIE) are currently developing them for curriculum instruction. The private sector could also be selling these materials to schools in form of CDs. The adequacy of these materials in the teaching of agriculture was found to be low as only 32% of the teachers felt that the materials were adequate. The available e-material was found to be relevant for teaching agriculture to secondary students as indicated by 58% of the respondents.

4.5 Agriculture Teachers' Attitude towards ICTs

The attitude of teachers towards ICTs was determined by asking the respondents to respond to attitudinal statements listed on a 5-point Likert scale ranging from strongly agreed to strongly disagree. Eleven (11) and four (4) of the statements depicted positive and negative attitudes respectively. The teacher's responses to the statements in percentages are given in Table 11.

Table 11

Agriculture Teachers' Attitudes towards ICTs

n=100

	Responses (% of teachers)				
Attitudinal Statements	**SA**	**A**	**U**	**D**	**SD**
1. I believe that ICTs contributes to students learning and provides fast and easy access to information	62	31	2	3	2
2. I believe that ICTs help to create an effective teaching/ learning environment	52	43	2	1	2
3. Use of ICTs helps students understand concepts better.	49	39	6	4	2
4. The use of ICTs saves effort.	39	40	6	10	5
5. ICTs allow students to express their thinking in different ways more effectively	42	41	6	8	3
6. I feel comfortable with ICTs use in classroom instruction	30	46	8	13	3
7. The maintenance of ICT equipment in my school is satisfactory	10	29	8	31	22
8. The use of ICTs in teaching scares me.	7	6	3	44	40
9. It is not easy for students to use ICTs.	9	15	5	37	34
10. I get frustrated when using ICTs in classroom	11	25	11	34	19
11. I would like evidence of educational value of ICT before using	16	32	5	34	13

it					
12. ICTs will motivate students to learn more	49	42	4	2	3
13. ICTs will improve the way students learn in my agriculture classes.	44	43	8	4	1
14. Use of ICTs in teaching/ learning agriculture will increase students' enrolment in agriculture	42	38	7	12	1
15. Use of ICTs will improve students' performance in agriculture	52	38	7	1	2

The findings in Table 11 revealed that among the positive statements, over 80% of the respondents responded positively by at least "agreeing" except for the statement "The maintenance of ICT equipment in my school is satisfactory" with which at most 39% of the respondents at least "agreed". Equally, for the negative statements, over 70% of the respondents at least "Disagreed" with two of the statements while 53% and 47% respectively at least "disagreed" with the statement "I get frustrated when using ICTs in classroom" and "I would like evidence of educational value of ICT before using it".

Further analysis on teachers' attitudes towards ICT sought to determine the means of teachers' responses to the attitudinal statements. The means computed by adopting a scoring strategy where, for the positive statements, a scale of 1-5 (strongly disagree to strongly agree) was adopted and for the negative statements (statements 8-11 in Table11), the scoring strategy was reversed to 5-1 (strongly disagree to strongly agree). The means and standard deviations of the scores were as presented in Table 12.

Table 12

Means of Agriculture Teachers' Attitudinal Responses towards ICTs

Attitudinal Statement	N	Mean	Std. Dev
1. I believe that ICTs contributes to students learning and provides fast and easy access to information	100	4.48	.847
2. I believe that ICTs help to create an effective teaching/ learning environment	100	4.42	.768
3. Use of ICTs helps students understand concepts better.	100	4.29	.902
4. The use of ICTs saves effort.	100	3.98	1.146
5. ICTs allow students to express their thinking in different ways more effectively	100	4.11	1.034
6. I feel comfortable with ICTs use in classroom instruction	100	3.87	1.079
7. The maintenance of ICT equipment in my school is satisfactory	100	2.74	1.353
8. The use of ICTs in teaching scares me.	100	4.04	1.145
9. It is not easy for students to use ICTs.	100	3.72	1.319
10. I get frustrated when using ICTs in classroom	100	3.25	1.321
11. I would like evidence of educational value of ICT before using it	100	2.96	1.355
12. ICTs will motivate students to learn more	100	4.32	.886
13. ICTs will improve the way students learn in my agriculture classes.	100	4.25	.845
14. Use of ICTs in teaching/ learning agriculture will increase students' enrolment in agriculture	100	4.08	1.032
15. Use of ICTs will improve students' performance in agriculture	100	4.37	.825

The means in Table 12 show that the means ranged from 4.48 (highest) to 2.74 (lowest). The highest mean was related to "I believe that ICTs contributes to students learning and provides fast and easy access to information", meaning that most teachers strongly agreed with this statement while the lowest mean was associated with "The maintenance of ICT equipment in my school is satisfactory" indicating that teachers were largely skeptical about how the ICT resources were maintained in their respective schools. Notably, the positive attitudinal statements

had relatively higher means compared to the negative attitudinal statements implying that teachers generally showed positive attitudes towards ICT. The findings of this study are in agreement with the results of Makanda's (2015) study in Bungoma County which noted that physics teachers had favorable attitudes towards ICT use. Teachers' attitudes were also found to be positive in another study by Tezci (2010). Positive attitudes towards ICT among Agriculture teachers provide the critical sociological capital towards adoption of ICTs in classroom instruction.

4.6 Agriculture Teachers' ICT Competence

Teachers' ICT competence was one of the factors upon which the study made the assumption would influence application and use of ICT in teaching agriculture. The respondents were asked to rate their level of competence in computer applications listed on a 5-point scale (1=cannot use, 2= low, 3= moderate, 4= high, 5= very high). The percentage distributions of the teachers' responses were as shown in Table 13.

Table 13

Level of Agriculture Teacher's ICT Competence

n=100

	Level of ICT competence (% of Teachers)					
ICT resources	**1**	**2**	**3**	**4**	**5**	**Total**
Word processing	7	9	40	26	18	**100**
Spreadsheet	10	26	37	14	13	**100**
Presentation	18	29	24	17	12	**100**
Database	20	34	27	11	9	**100**
Search engine	12	15	25	17	31	**100**
Communication	8	13	22	23	34	**100**

The results in Table 13 show teachers' responses across were almost evenly distributed across the 5 competence levels. With respect to word processing, 40% felt that they had "Moderate" competence while a significant 26% felt that their competence was "high". Similarly, 37% of the teachers reported "moderate" and another 26% reporting "low" competence in spreadsheets applications. On the other hand, 29% and 34% reported "low" competence in the application of presentation and databases respectively. On a positive front, 31% and 34% of the teachers felt that their competence in search engine and communication respectively was very high.

Adopting the scoring strategy assigned to the competence levels, the means for the teachers' level of competence in the various ICT applications were as shown in Table 14.

Table 14

Means of Agriculture Teachers' Level of Competence in ICT Applications

ICT Applications	N	Mean	Std. Deviation
Word processing (e.g. Ms word)	100	3.39	1.100
Spreadsheet (e.g. Ms Excel)	100	2.94	1.153
Presentation (e.g. Ms PowerPoint)	100	2.76	1.272
Database (e.g. Ms Access)	100	2.57	1.183
Search engines (e.g. Internet/www)	100	3.40	1.378
Communication (e.g. E-mail)	100	3.62	1.293

The results revealed that the means ranged from 3.62 (highest) to 2.57 (lowest). The highest means was related to teachers' competence in communication applications such as e-mail while the lowest means was related to their competence in databases. The results seem similar to those of Tezci's (2010) study with Turkish teachers which revealed that internet was frequently used followed by communication, then word processing and educational CDs, though rarely used. The high mean score of competence in communication followed by that of search engines may be attributed to frequent use of e-mail for communication given that due to the growth in communication technology, e-mail is fast replacing most of other formal communication methods thus frequently used by not only teachers but equally by learners. Search engines are frequently used to search information on the internet thus enhancing teachers' competence in the

same. In addition, the relatively high mean on word processing may also be attributed to frequent use of this Microsoft Office application as the main interface for typesetting printed works.

Generally, the means indicate that teachers' level of competence ranged from low to moderate, with very slim prospects of moving to high competence in applications such as communication. The findings of this study also agree with those of Agbulu and Ademu (2010) in Nigeria which revealed that agriculture teachers did not have deep knowledge in the use of ICTs in teaching. This led to low level utilization of ICTs in teaching-learning process. The findings are however contrary to those in a study by Tasir *et al*., (2012) which indicated that Malaysian teachers have a high level of ICT competency and confidence to use ICTs. Komis (2008) stated that, a majority of the teachers felt that application of the word processor was much easier, and more useful to their lesson planning and teaching, than other ICT software resources. In the same way, search engines were a source of information that could be useful in teaching, quizzing and even planning lessons, therefore many of the teachers applied themselves to improve their skills in this two areas. Schibeci *et al*. (2008) stated that, in moving towards complete ICT integration in the teaching process, teachers often use the word processors and search engines much more than other data bases. They therefore develop more confidence and skill in manoeuvring these applications than others.

4.7 School Administrative Support on ICTs

Teachers get encouraged to successfully use ICTs in classroom instruction when given support by the school administration. Four variables were used to gauge the support the school administration accorded the agriculture teachers in the use of ICTs. The variables included: (i) discussion on ICT, (ii) supporting training and allowing teachers to use ICT appliances in teaching, (iii) basic courses in ICT organized for staff and (iv) satisfaction with principal's support of ICT.

4.7.1 Agriculture Teachers' Discussion on Importance of ICTs with School Administration

The teachers were asked to state the frequency with which their school administrators discussed with them the importance of ICT use in classroom instruction, either in a staff meeting or any other forum. The results were then tabulated in Table 15.

Table 15

Agriculture Teachers' Discussion on Importance of ICTs with School Administration

n=100

Responses	Frequency	Percentage
Never	23	23.0
Almost Never	6	6.0
Sometimes	42	42.0
Often	22	22.0
Very Often	7	7.0
Total	**100**	**100.0**

The results show that only 7% of the respondents discussed ICT with their respective school administrations very often. Cumulatively, 29% almost never or never discussed ICT with the school administrators. Sipila (2012) stated that 28% of the school administration failed to discuss the importance of ICT with their teachers. Many felt that this was not important in transforming and integrating ICT into teaching. This is despite the information that many of the teachers felt that discussions led to appropriate investment in the right and best ICT applications for use in the schools, and also gave the teachers confidence in applying the ICT in teaching and lesson preparation.

4.7.2 School Administrative Support to Agriculture Teachers to Attend ICT Courses

The administrative support accorded to staff to attend courses related to ICTs was gauged by asking the respondents to state the number of times the administration supported them to undertake ICT training within the year. The results are given in Table 16.

Table 16

School Administrative Support to Agriculture Teachers to Attend ICT Courses

n=100

Number of times supported	Frequency	Percentage
Once A Year	42	42.0
Twice A Year	10	10.0
Thrice A Year	5	5.0
Not At All	43	43.0
Total	**100**	**100.0**

The highest percentage of the respondents (43%) indicated that they never attended ICT training/ courses that were supported by the school administration. In fact a very low percentage (5%) attended courses at least thrice a year. This is in agreement with Makanda (2015) who conducted research with physics teachers in Bungoma County and concluded that majority of the school administration gave minimal support in facilitating teachers to acquire more skills in use of ICTs. Very few principals felt that investing in ICT courses was as important as other matters in building the school portfolio.

4.7.3 Organization of ICT Basic Courses for Agriculture Teachers

The teachers were asked to state if their Principals had organised ICT basic courses for them. The responses are summarised in Table 17.

Table 17

School Principals' Organization of ICT Basic Courses at School for Agriculture Teachers

n=100

	Frequency	Percentage
Yes	34	34.0
No	66	66.0

Total	**100**	**100.0**

The findings show that 66% of the teachers reported that their respective schools' principals had never organized basic ICT training at the school level. Such basic courses would be important in ensuring that teachers can make use of the ICT applications available in the schools. However as Schiller (2003) pointed out, school administrators are normally operating at a deficit budget, and often ICT training for the teachers takes a back seat when it comes to the school budget, with other requirements of the schools taking precedence.

4.7.4 Teachers' Satisfaction with School Principals' Support to ICT Use

The teachers were asked to indicate whether they thought support by their respective school Principals on use of ICTs was satisfactory. The frequency distribution of their responses is given in Table 18.

Table 18

Agriculture Teachers' Satisfaction with School Principals' Support on ICT Use

n=100

Satisfaction	Frequency	Percentage
No	65	65.0
Yes	35	35.0
Total	**100**	**100.0**

The findings indicate that 65% of the respondents felt that the principals' support to ICT use were not satisfactory. This means that their decisions and running of the school did not necessarily support the use of ICTs for classroom instruction. The findings of this study were in agreement with those of Makanda's (2015) study. Schiller (2003) again states that principals in schools do not clearly understand the need for and the benefits that would accrue, from investing in proper ICT and supporting ICT for classroom instruction.

4.8 Frequency of Use of ICT Resources by Agriculture Teachers to Conduct Classroom Tasks

Although ICT resources may be available to teachers in the schools, this does not necessarily translate to frequent application and use of the resources in classroom instruction. There are cases where such resources are available but are not made use of. To determine the level of use of the ICT resources in classroom instruction, respondents were asked to rate the frequency with which they applied ICT resources to conduct various classroom tasks. The teachers were asked to rate the frequency of use based on a 5-point scale. Teachers' responses were analyzed quantitatively using frequencies and percentages.

Table 19

Frequency of Teachers' Use of ICT Resources to Conduct Classroom Tasks

n=100

Tasks	**Frequency**					**Total**
	Never used at all	*Less than 5 times a term*	*Once a week*	*Two or more times a week*	*Daily*	
1. Creating quizzes	33%	32%	16%	14%	5%	**100**
2. Creating power point presentations	58%	20%	12%	6%	4%	**100**
3. Downloading video clips/ animations	45%	25%	17%	10%	3%	**100**
4. Sending/ receiving e-mails	47%	19%	15%	11%	8%	**100**
5. Receiving subject association on-line resources	48%	22%	8%	9%	13%	**100**
6. Maintaining subject records	27%	23%	12%	21%	17%	**100**

7.	Preparing content for class	33%	17%	16%	18%	16%	**100**
8.	Preparing worksheets/handouts	47%	11%	15%	13%	14%	**100**

The percentages in Table 19 show that the largest percentage of teachers who used ICTs to perform various classroom tasks on a daily basis did so in preparing worksheets/handouts (17%), maintaining subject records (16%), preparing content for class (14%) and receiving subject association on-line resources (13%). The findings also show that more than half of the teachers (58%) never used ICTs in creating power point presentations which is the main interface for classroom curriculum delivery. By and large, most teachers either had never used the ICTs to conduct the classroom tasks covered by this study or used them less frequently as can be read from percentages in the columns with the response categories of "Never used at all" and used "Less than 5 times a term"

Further analysis involved determining the means of teachers' use of ICTs to conduct the various classroom tasks shown in Table 19. In order to determine the means, a scoring strategy was adopted for teachers' responses as follows: never used at all = 0, less than 5 times a week =1, once a week =2, two or more times a week =3 and daily =4. The scores for the use of ICTs in conducting the different tasks were added together to obtain a composite score for the use of ICT in classroom instruction. The means for teachers' frequency of use of ICT resources to conduct classroom tasks were as shown in Table 20.

Table 20

Means of Agriculture Teachers' Frequency of Use of ICT Resources to Conduct Classroom Tasks

Tasks	**n**	**Mean**	**Std. Deviation**
1. Maintaining subject records	100	1.78	1.474
2. Preparing content for class	100	1.67	1.491
3. Preparing worksheets/handouts	100	1.37	1.516

4.	Creating quizzes	100	1.26	1.203
5.	Receiving subject association on-line resources	100	1.17	1.443
6.	Sending/ receiving e-mails	100	1.15	1.335
7.	Downloading video clips/ animations	100	1.01	1.141
8.	Creating power point presentations	100	.78	1.124

Considering the means of frequency of teachers' use of ICTs in performing the tasks, the figures in Table 20 show that the highest mean of 1.78 was in relation to maintaining subject records which still fell below the "Once a week" frequency of use. On the other hand, using the ICTs to create power point presentations had the lowest mean of frequency of use with a mean value of 0.78 that equally fell below the "less than 5 times a week" frequency of use, indicating that it was almost never used in performing classroom tasks yet it is the single most import aspect of ICT integration in classroom instruction. Zakopaulous (2005) stated that whereas ICT resources are available for the use of teaching, and indeed come with many advantages and benefits that could make teaching much easier and less challenging; many factors come into play when applying the resources and thereby making use of them. Many schools do not experience the benefits of ICT resources because teachers are hindered by several factors from making use of them.

4.9 Test of Hypotheses

Test of hypotheses were carried out to determine whether there was any relationship between the independent variables (availability of ICT resources, availability of e-content, agriculture teachers' attitudes towards ICTs, ICT competence of agriculture teachers and school administrative support on ICTs) and the dependent variable (use of ICTs in classroom instruction). The hypotheses of the study were derived from objectives (ii), (iii), (iv), (v) and (vi) respectively.

4.9.1 Hypothesis One (Ho_1): There is no Statistically Significant Relationship between Availability of ICT Resources and the Use of ICTs in Classroom Instruction by Secondary School Agriculture Teachers in Nyamira County

To test this hypothesis, first, the individual scores for availability of the basic ICT resources (desktop computers, laptops, LCD projectors and whiteboards etc) were added together to obtain a composite score for the same. The composite scores for availability of ICT resources and that of teachers' frequency of use of ICT resources to conduct classroom tasks were then used to conduct the Pearson's Product Moment Correlation analysis (PPMC) to determine the nature and magnitude of association between the two variables. The findings were as shown in Table 21.

Table 21

Relationship between Availability of ICT Resources and the Use of ICTs in Classroom Instruction by Secondary School Agriculture Teachers

n=100

		Teachers' Use of ICTs in Classroom Instruction	**Availability of ICT Resources**
Teachers' Use of ICTs in Classroom Instruction	Pearson Correlation	1	.204*
	Sig. (2-tailed)		.045
	N	97	97
Availability of ICT Resources	Pearson Correlation	.204*	1
	Sig. (2-tailed)	.045	
	N	97	100

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

The PPMC analysis revealed that there was a significant, positive relationship between availability of ICT resources and secondary school agriculture teachers' use of ICT resources in classroom instruction ($r=0.204$, $p<0.05$). Based on this result, the null hypothesis (Ho_1) which stated: *there is no statistically significant relationship between availability of ICT resources and the use of ICTs in classroom instruction by secondary school agriculture teachers,* was rejected. Agriculture teachers in secondary schools where ICT resources were available, adequate and more accessible to teachers were more likely to use the ICT resources in classroom instruction than those in schools where such facilities were less available, inadequate and less accessible.

These findings concurred with the results of a study by Wanga (2014) who reported that availability of ICT infrastructure similar to those reported in this study significantly influenced teachers' integration of ICT in curriculum implementation in secondary schools in Gilgil Sub-County ($r=0.68$, $p<0.05$). Similarly, a study by Makanda (2015) in Bungoma County revealed a positive correlation between physics teachers' access to ICT tools and use of ICTs in classroom instruction ($r=0.39$, $p<0.05$). Lund *et al.* (2008) in his study concluded that the relationship between availability of ICTs and the use of ICTs for teaching is one that is highly significant. Schools that do not invest in ICT cannot make use and take advantage of ICT resources for teaching, administration and other purposes. To have the advantages of ICT in teaching, then the resources must be made available to the teachers, and the environment made conducive for purposes of applying and making use of the resources.

4.9.2 Hypothesis Two (Ho_2): There is no Statistically Significant Relationship between Availability of E-content and the Use of ICTs in Classroom Instruction by Secondary School Agriculture Teachers in Nyamira County

To test this hypothesis, an index for availability of e-content constituting e-material availability, adequacy and relevance was adopted. A scoring strategy of 1 point for "Yes" and zero (0) for "No" was adopted for the teachers responses to the questions on availability, adequacy and relevance of the e-materials. Individual scores in these three dimensions of e-content were cumulated to obtain a composite score for availability of e-content. This total score alongside the composite score for teachers' frequency of use of ICT resources to conduct classroom tasks were then used to compute the Pearson's Product Moment Correlation to determine the nature and magnitude of the relationship between the two variables. The findings were as shown in Table 22.

Table 22

The Relationship between Availability of E-content and the Use of ICTs in Classroom Instruction by Secondary School Agriculture Teachers

n=100

		Teachers' Use of ICTs	Availability of e-content
Teachers' Use of ICTs in Classroom Instruction	Pearson Correlation	1	.455**
	Sig. (2-tailed)		.000
	N	97	97
Availability of e-content	Pearson Correlation	.455**	1
	Sig. (2-tailed)	.000	
	N	97	100

***. Correlation is significant at the 0.01 level (2-tailed).*

The PPMC analysis revealed that there was a significant, positive relationship between availability of e-content and secondary school agriculture teachers' use of ICT resources in classroom instruction ($r=0.46$, $p<0.05$). The relationship was of moderate strength, indicating that in school where e-content were not only available but also adequate and relevant for teaching of agriculture, teachers utilized ICTs in classroom instruction. Based on this result, the null hypothesis (Ho_2) that stated: *There is no statistically significant relationship between availability of e-content and the use of ICTs in classroom instruction by secondary school agriculture teachers,* was rejected. Condice and Munro (2007) concluded that ease of accessibility, relevance and significance affected the use of e-content more than its availability. This was also found to be true by Harris (2002). The use of e-materials in CD and from internet has made work easier for the teachers as they can share experiences, access classroom materials and also communicate the same to their students (Zakopoulous, 2005). Teaching and shaping young minds has become much easier with the use of e-content (Knobloch and Washington, 2003).

4.9.3 Hypothesis Three (Ho_3): There is no Statistically Significant Relationship between Teachers' Attitudes towards ICTs and the Use of ICTs in Classroom Instruction by Secondary School Agriculture Teachers in Nyamira County

To test this hypothesis and hence determine the relationship between teachers' attitudes towards ICTs and their use of ICTs in classroom instruction, the individual scores for the 15 attitudinal statements were cumulated to obtain a composite score for teachers' attitudes and used to compute the Pearson's Product Moment Correlation coefficient using the composite score for teachers' use of ICTs in performing classroom tasks as the dependent variable. The results were as shown in Table 23.

Table 23

Relationship between Agriculture Teachers' Attitude towards ICTs and the Use of ICTs in Classroom Instruction

n=100

		Teachers' Use of ICTs in Classroom Instruction	Teachers' Attitude Towards ICT
Teachers' Use of ICTs in Classroom Instruction	Pearson Correlation	1	.281**
	Sig. (2-tailed)		.005
	N	97	97
Teachers' Attitude Towards ICT	Pearson Correlation	.281**	1
	Sig. (2-tailed)	.005	
	N	97	100

***. Correlation is significant at the 0.01 level (2-tailed).*

The correlation analysis results in Table 23 revealed that there was a significant, positive correlation between teachers' attitudes towards ICT and secondary school Agriculture teachers' use of ICT resources in classroom instruction ($r=0.28$, $p<0.05$). The positive but weak correlation indicated that Agriculture teachers' use of ICT resources in classroom instruction was weakly related with their positive attitudes towards ICTs. Based on this result, the null hypothesis that stated that: *There is no statistically significant relationship between teachers' attitude towards ICTs and the use of ICTs in classroom instruction by secondary school agriculture teachers in Nyamira County,* was rejected.

The above findings validate the most recent findings of Makanda's (2015) study in Bungoma County that reported similar results. Khan *et al*. (2012) and Osodo *et al.* (2010) had also earlier reported that teachers' attitudes and motivation influence their adoption of ICT. Bennet *et al.* (2006) found that negative attitude of teachers in the practical subjects often led to low commitment and use of ICT to teach and instruction. Schibeci *et al.* (2008) argues that in order for teachers to move from gaining basic ICT skills for personal use, to conducting ICT focused lessons and integrating ICT in the teaching and instruction, positive attitudes should be

developed towards ICT. However, Sipila (2012) tends to disagree with the results presented above. He states that although teachers may have negative attitudes towards ICT, circumstances surrounding them and the progress of technology forces the teachers to apply ICT in teaching and instruction. In retrospect therefore their attitudes have little impact on the use and implementation of ICT in teaching.

4.9.4 Hypothesis Four (Ho_4): There is no Statistically Significant Relationship between Teachers' ICT Competence and the Use of ICTs in Classroom Instruction by Secondary School Agriculture Teachers in Nyamira County

.The teacher's scores for the level of competence in the various ICT applications were added together to obtain a composite score for teachers' ICT competence. This composite score and that of teachers' frequency of use of ICT resources to conduct classroom tasks were used to compute the Pearson's Product Moment Correlation to determine the nature and magnitude of the relationship between the two variables. The results were as shown in Table 24.

Table 24

Relationship between Agriculture Teachers' ICT Competence and their Use of ICTs in Classroom Instruction

n=100

		Teachers' Use of ICTs in Classroom Instruction	Teachers' Competence in ICT applications
Teachers' Use of ICTs in Classroom Instruction	Pearson Correlation	1	.521**
	Sig. (2-tailed)		.000
	N	97	97
Teachers' Competence in ICT applications	Pearson Correlation	.521**	1
	Sig. (2-tailed)	.000	
	N	97	100

**. *Correlation is significant at the 0.01 level (2-tailed).*

The correlation analysis revealed that there was a significant, positive correlation between Secondary school Agriculture teachers' ICT competence and their use of ICTs in classroom instruction ($r=0.52$; $p<0.05$). The correlation was of moderate strength, indicating that Agriculture teachers' use of ICTs in classroom instruction was related with their levels of competence in the use of ICT applications. Therefore, based on this result, the null hypothesis which stated that: *There is no statistically significant relationship between teachers' ICT competence and the use of ICTs in classroom instruction by secondary school agriculture teachers,* was rejected. Higgins (2010) indicated that as teachers received training and help in accessing knowledge and proper application of ICT, the more committed and interested they become to employ ICT in their teaching activities. This is also true for cases of teachers engaged in teaching practical curriculum subjects (Knobloch *et al.,* 2003). Proper training and increased competence in handling ICT increases the level of use significantly.

4.9.5 Hypothesis Five (Ho_5): There is no Statistically Significant Relationship between School Administrative Support on ICTs and the Use of ICTs in Classroom Instruction by Secondary School Agriculture Teachers in Nyamira County

An index for school administrative support constituted using the variables discussed in sub-sections 4.8.1 to 4.8.4. The following scoring strategy was adopted for the four variables: Discussion on importance of ICTs (Never=0; Almost never=1; Sometimes=2; Often=3 and Very often=4); Support of staff to attend ICT courses (Not at all = 0; Once a year = 1; Twice a year = 2 and Thrice a year = 3); Organization of ICT basic course for teachers and teachers' satisfaction with principals' support to ICT (Yes=1; No=0). The individual teachers' response scores in these variables were cumulated to obtain a composite score for school administrative support and used to compute the Pearson's Product Moment Correlation coefficient using the composite score for teachers' use of ICTs in performing classroom tasks as the dependent variable. The findings were as shown in Table 25

Table 25

Relationship between School Administrative Support in ICTs and Use of ICTs on Classroom Instruction by Agriculture Teachers

n=100

		Teachers' Use of ICTs in Classroom Instruction	School Administrative Support
Teachers' Use of ICTs in Classroom Instruction	Pearson Correlation	1	.405**
	Sig. (2-tailed)		.000
	N	97	97
School Administrative Support	Pearson Correlation	.405**	1
	Sig. (2-tailed)	.000	
	N	97	100

***. Correlation is significant at the 0.01 level (2-tailed).*

The PPMC analysis revealed that there was a significant, positive correlation between school administrative support and teachers' use of ICTs in classroom instruction ($r=0.405$; $p<0.05$). The correlation was of moderate strength, indicating that in schools where there existed stronger administrative support towards ICT, agriculture teachers were more likely to use ICTs in classroom instruction. Based on this result, the null hypothesis which stated that *school administrative support in ICTs has no statistically significant influence on secondary school agriculture teachers' use of ICTs in classroom instruction* was rejected. Schiller (2003) indicated that the support for ICT by administration led to more confidence in ICT resources. Teachers were more willing to use ICT in teaching and classroom instruction when they received proper support for the same from the administration. Komis (2008), when school administrations are willing to show the benefits of ICT in classroom instructions, teachers under them are more willing to make use of the ICT.

CHAPTER FIVE
SUMMARY, CONCLUSIONS AND RECOMMENDATIONS

5.1 Introduction

This chapter outlines a brief summary of the main research findings of the study, gives conclusions drawn from the key findings and makes recommendations based on the conclusions reached by the study.

5.2 Summary of the Study

The study sought to determine the relationship between selected factors and the use of ICTs in classroom instruction by secondary school agriculture teachers in Nyamira County. The selected factors in this study were: availability of ICT resources, availability of e-content, agriculture teachers' attitudes towards ICTs, ICT competence of agriculture teachers and school administrative support on ICTs.

Descriptive survey research design was used in this study. The study was conducted in Nyamira County, Kenya. A population of 215 secondary school agriculture teachers formed the target population out of which 100 teachers were selected by proportionate stratified random sampling as the respondents of the study. A semi-structured questionnaire developed by the researcher was used for data collection. Descriptive and inferential statistics (Pearson's Product Moment Correlation) were used for data analysis.

The respondents were 70% male and 30% female. Majority of the respondents fell into the age bracket of 26 to 35 years while the least were those over 55 years of age. It was noted that 46% had teaching experience of 1-5 years, 26% had teaching experience of 6-10 years while 18% and 9% had taught agriculture for 11-15 years and 16- 20 years respectively. With regard to computer experience, 10% had no computer experience, 23% had less than one year computer experience, 20% between 4 to 6 years, 8% between 7 to 10 years and 6% with over 10 years computer experience.

The study established that although most of the schools had basic ICT resources especially desk top computers, printers, LCD projectors, laptops and internet access, most of the resources were

barely adequate and largely inaccessible to teachers. Only desktop computers were adequate and accessible by at most half of the respondents. A significant, positive but weak relationship ($r=0.204$, $p<0.05$) was found between availability of ICT resources and agriculture teachers' use of ICT resources in classroom instruction.

The study revealed that majority of the schools had e-content/materials in form of CDs and DVD ROMs. However, these materials were grossly inadequate despite more than half of the teachers confirming that the available materials were relevant for the teaching of agriculture. A significant, positive relationship of moderate strength ($r=0.46$, $p<0.05$) was established between availability of e-content and agriculture teachers' use of ICT resources in classroom instruction. With respect to Agriculture teachers' attitudes towards ICTs, the study revealed that generally, teachers exhibited positive attitudes towards ICTs which provided the critical sociological capital towards adoption of ICTs in classroom instruction. As a result, a significant, positive but weak relationship ($r=0.28$, $p<0.05$) was established between teachers' attitudes towards ICTs and their use of ICT resources in classroom instruction.

The study further established that teachers' level of competence in ICT applications ranged from low to moderate, with very slim prospects of moving to high competence in applications such as communication. There was a significant, positive correlation of moderate strength between Agriculture teachers' ICT competence and their use of ICTs in classroom instruction ($r=0.52$; $p<0.05$), indicating that Agriculture teachers' use of ICTs in classroom instruction was associated with their high levels of competence in the use of ICT applications. In addition, the study established that there was weak administrative support to teachers in relation to ICT integration in curriculum implementation in secondary schools in the study location, leading to massive teacher dissatisfaction with the level of administrative support over the same. Nevertheless, a significant, positive correlation existed between school administrative support and teachers' use of ICTs in classroom instruction ($r=0.405$; $p<0.05$) indicating that where teachers received stronger administrative support in relation to ICT adoption, the teachers were more likely to use of ICTs in classroom instruction.

Based on the foregoing findings that basically revealed that there existed significant relationships between the independent variables: availability of ICT resources; availability of E-content; Agriculture teachers' attitudes towards ICTs; Agriculture teachers' ICT competence; school administrative support and Agriculture teachers' use of ICTs in classroom instruction (dependent variable), all the five null hypotheses of the study were rejected.

5.3 Conclusion

Based on the results of this study, the following conclusions were reached:

i. In most schools in Nyamira County, most ICT resources are not available except for the desktop computers which are used for multiple purposes. In schools where the ICT resources are available, they are grossly inadequate and largely inaccessible to teachers making their application in classroom instruction by Agriculture teachers difficult.

ii. There is a significant relationship between availability of ICT resources and their use in classroom instruction by secondary school agriculture teachers. Where such resources are available, adequate and accessible, teachers are more likely to utilize them in classroom instruction of Agriculture.

iii. There is a significant relationship between availability of e-content and their use in classroom instruction by secondary school agriculture teachers. In schools where such resources are available, adequate and appropriate for teaching of agriculture subject content, agriculture teachers are more likely to use ICTs in classroom instruction.

iv. Agriculture teachers have positive attitudes towards ICTs. Positive attitudes towards ICTs positively influence utilization of ICTs in classroom instruction.

v. There is a significant relationship between secondary school agriculture teachers' ICT competence and their use of ICTs in classroom instruction. When agriculture teachers are competent in manipulating the ICT applications, they become more confident in the use of ICTs and make more use of the same in classroom instruction.

vi. School administrative support in ICTs has a significant influence on secondary school agriculture teachers' use of ICTs in classroom instruction. Support from the school administration is important in encouraging the use of ICTs for purposes of classroom instruction. When school administration actively supports teachers' use of ICTs, teachers are more likely to have the requisite competence and motivation to use ICTs in classroom instruction.

5.4 Recommendations

i. The government through the Ministry of Education should make budgetary provisions and indeed allocate financial resources to schools for the procurement of ICT resources to support the realization of the School ICT Policy (2006).

ii. School administrators should make ICT resources available to agriculture teachers for use in class, and should ensure that the resources are adequate and easily accessible to teachers in order for the application and benefits of such resources to be meaningful to teachers' utilization of ICTs in classroom instruction.

iii. School managements and other education stakeholders should make e-content available to teachers and should provide training opportunities for teachers to capacity build them on acquiring and developing e-content from already existing internet sources.

iv. Since the Ministry of Education is responsible in ensuring the realization of the objectives of the School ICT Policy, it should invest in enhancing positive teacher attitudes towards ICT so as to take care of teachers' perceived difficulties in using ICTs in classroom instruction while opening their minds to the benefits of ICTs not only to learners but also in making teaching and curriculum delivery easier and more effective in line with the global changes in teaching methodologies.

v. School administrators should provide internal training to enhance teachers' competence in the use of ICTs and to increase their experience in the use of ICT. This is important because exposure to various ICT applications consistently increases agriculture teachers' competency and confidence in using ICTs

vi. The school administration should encourage teachers to use ICTs, invest in regular training of staff and give agriculture teachers the support they need for the effective use of ICTs in classroom instruction.

5.5 Suggestions for Further Studies

During the study, the following gaps were realised which need further research:

1. Influence of ICT use in improving performance in secondary agricultural education.
2. The effect of implementation of ICT teaching methodologies in Kenyan primary school curriculum.

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APPENDIX A:

SURVEY QUESTIONNAIRE

I am a student at Egerton University, taking a course in Masters of Science in Agricultural Education. I'm conducting a study whose title is; Selected Factors Influencing Secondary School Agriculture Teachers' Use of Information and Communication Technologies (ICTs) in Classroom Instruction, in Nyamira County. I would like to inform you that you have been selected to be part of my respondents in this study. Your responses are integral to this study and would be highly appreciated. Thank you.

Instruction: Answer all questions appropriately, i.e. tick and or fill where necessary.

SECTION A: DEMOGRAPHIC INFORMATION

1. Gender.

   Female ☐ Male ☐

2. Age.

   Under 25 years ☐ 26-35 years ☐

   36-45 years ☐ 46-55 years ☐

   Over 55 years ☐

3. How long have you been teaching agriculture in secondary school?

   Less than 1 year ☐ 1-5 years ☐ 6-10 years ☐

   11-15 years ☐ 16-20 years ☐ over 20 years. ☐

4. Your computer experience.

   None ☐ Less than 1 year ☐ 1-3 years ☐

   4-6 years ☐ 7-10 years ☐ Over 10 years ☐

SECTION B: AVAILABILITY OF ICT RESOURCES FOR TEACHING

5 a) Which of the following ICT resources are available in your school? For the ones that are available, indicate whether they are adequate and easily accessible for the teaching and learning of agriculture.(tick all that apply)

	Availability	Adequacy	Accessibility
Desktop computer(s)			
Laptop(s)			
Printer(s)			
LCD Projector(s)			
Internet access			
Digital camera(s)			
Scanner(s)			
Interactive whiteboards			

b) Others (specify)

SECTION C: LEVEL OF ICT USE

Frequency of Use of ICTs to Conduct Classroom Tasks

6. a) How often do you use ICTs for the following tasks in your teaching? (Tick one of the five choices in each case)

Tasks Using ICT	Never used at all	Less than 5 times a term	Once a week	Two or more times a week	Daily
Creating quizzes					
Creating power point presentations					
Downloading video clips/					

animations					
Sending/ receiving e-mails					
Receiving subject association on-line resources					
Maintaining subject records					
Preparing content for class					
Preparing worksheets/handouts					

b) Others (specify)

SECTION D: AVAILABILITY OF E-CONTENT

7. Do you have any e-material(s) in your school packaged in CD-ROMs or DVDs in agriculture?

   Yes ☐ No ☐

(If your answer is "yes" in 9 above, please answer questions 10, 11, 12, and 13)

8. What is the source(s) of the e-materials you have in your school?

9.Are the e-materials adequate for teaching of agriculture?

Yes ☐ No ☐

10. Do you find the e-materials relevant for the teaching of agriculture?

Yes ☐ No ☐

11. How often do you use the e-materials in classroom instruction?

Once a term ☐

Once a week ☐

Two or more times a week ☐

Daily ☐

SECTION E: LEVEL OF ICT COMPETENCE

12. Please indicate your competency level in the following computer applications by ticking one of the choices given in each case. (1=cannot use, 2= low, 3= moderate, 4= high, 5= very high)

ICT competency	**1**	**2**	**3**	**4**	**5**
Word processing (e.g. Ms word)					
Spreadsheet (e.g. Ms Excel)					
Presentation (e.g. Ms PowerPoint)					
Database (e.g. Ms Access)					
Search engines (e.g. Internet/www)					
Communication (e.g. E-mail)					

13. Have you ever participated in professional development courses related to the use of ICTs in teaching and learning?

    Yes ☐ No ☐

14. If "Yes" in question 16 above, to what extent do you now use ICTs in classroom instruction after the training?

    Never used at all ☐ Once a term ☐

    Once a month ☐ Once a week ☐

    Daily ☐

15. If "No" in question 16 above, which reason(s) hinders you from using ICTs in classroom instruction after the training?

SECTION F: ATTITUDES TOWARDS ICT

16. Please indicate your level of agreement with the following statements in the table below by ticking one of the choices given in each case. (SA= strongly agree, A= agree, U= Undecided, D= disagree, SD= strongly disagree)

	SA	A	U	D	SD
1) 1. I believe that ICTs contributes to students learning and provides fast and easy access to information					
2) I believe that ICTs help to create an effective teaching/ learning environment					
3) Use of ICTs helps students understand concepts better.					
4) The use of ICTs saves effort.					
5) ICTs allow students to express their thinking in different ways more effectively					
6) I feel comfortable with ICTs use in classroom instruction					
7) The maintenance of ICT equipment in my school is satisfactory					
8) The use of ICTs in teaching scares me.					
9) It is not easy for students to use ICTs.					
10) I would like evidence of educational value of ICT before using it					
11) If something goes wrong I will not know how to fix it.					
12) ICTs will motivate students to learn more					
13) ICTs will improve the way students learn in my agriculture classes.					

14) Use of ICTs in teaching/ learning agriculture will increase students' enrolment in agriculture					
15) Use of ICTs will improve students' performance in agriculture					

SECTION G: SCHOOL ADMINISTRATIVE SUPPORT

17. How often does your school administrators discuss with you on the importance of ICTs use in classroom instruction in a staff meeting or any other forum?

    Never ☐ Almost never ☐ Sometimes ☐

    Often ☐ Very often ☐

18. How often does your school support you to attend any ICT developmental courses/ workshops?

    Once a year ☐

    Twice a year ☐

    Thrice a year ☐

    Not at all ☐

19. Has your school principal ever organized a basic ICT introduction course in the school for teaching staff?

    Yes ☐

    No ☐

20. Do you think the support from your school principal towards use of ICTs is satisfactory?

    Yes ☐

    No ☐

21. What do you think the school principal should do to improve your ICT use in classroom instruction?

SECTION H: CHALLENGES TO ICT USE

22. Please indicate the extent to which you believe the following are obstacles to ICTs use in your classroom teaching of agriculture by ticking one of the choices in each case. (1= a large obstacle, 2= a moderate obstacle, 3= a small obstacle, 4= not an obstacle at all).

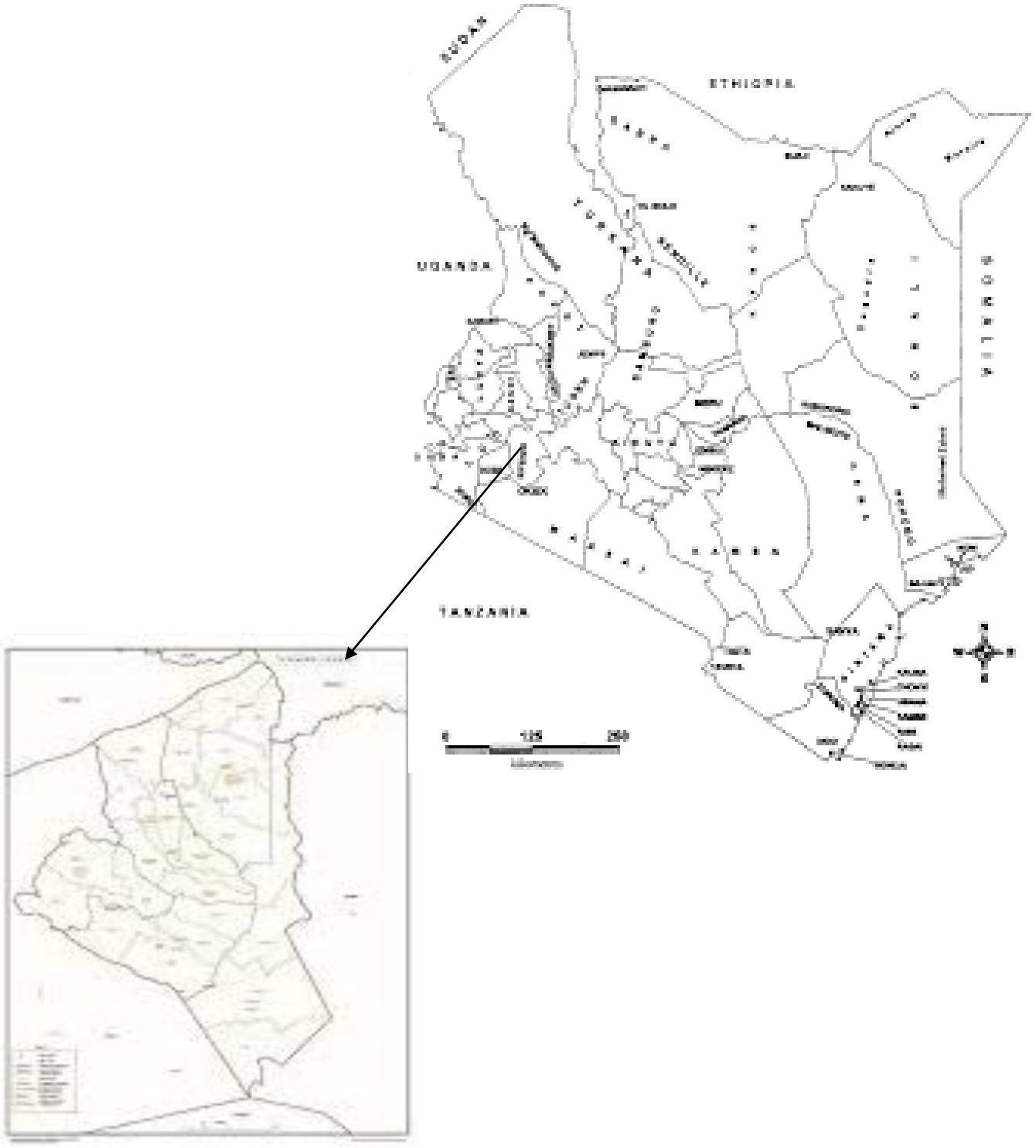
	1	2	3	4
Limited time to learn how to use ICTs				
Limited knowledge on how to make full use of ICTs in teaching				
Limited time to prepare ICT resources in my subject area				
Lack of access to ICT resources for teaching				
Lack of technical support in ICTs				
Lack of school policy on ICTs				
Lack of school administrative support				
Lack of incentives to use ICTs				

END

THANK YOU FOR YOUR SINCERE COOPERATION

APPENDIX B

MAP OF THE STUDY AREA



APPENDIX C

RESEARCH PERMIT

PAGE 2

THIS IS TO CERTIFY THAT:
Prof./Dr./Mr./Mrs./Miss/Institution
Jackline Kerubo Arabu
of (Address) Egerton University
P.O. Box 536, Egerton.
has been permitted to conduct research in

Location
Nyamira District
County

On the topic: Influence of selected factors on Secondary school agriculture teachers' use of Information Communication Technologies (ICTs) In classroom instruction in Nyamira County, Kenya

for a period ending: 31st December, 2013.

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Research Permit No. *NACOSTI/RCD/14/013/1674*
Date of issue *8th October, 2013*
Fee received *KSH. 1000*

Applicant's Signature

For: Secretary
National Commission for Science
Technology & Innovation

CONDITIONS

1. You must report to the County Commissioner and the County Education Officer of the area before embarking on your research. Failure to do that may lead to the cancellation of your permit
2. Government Officers will not be interviewed without prior appointment.
3. No questionnaire will be used unless it has been approved.
4. Excavation, filming and collection of biological specimens are subject to further permission from the relevant Government Ministries.
5. You are required to submit at least two(2) hard copies and one(1) soft copy of your final report.
6. The Government of Kenya reserves the right to modify the conditions of this permit including its cancellation without notice

REPUBLIC OF KENYA

National Commission for Science, Technology and Innovation

RESEARCH CLEARANCE PERMIT

Serial No. A 00387

CONDITIONS: see back page