

**PERCEPTIONS OF TEACHERS, LEARNERS AND SCHOOL PRINCIPALS ON
THE INTEGRATION OF ICT IN TEACHING AND LEARNING OF SECONDARY
SCHOOL AGRICULTURE IN BUNGOMA COUNTY, KENYA**

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**A thesis submitted to Graduate School in partial fulfillment of the requirements for the
degree of Master of Science in Agricultural Education of Egerton University**

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DECLARATION AND RECOMMENDATION

Declaration

This research thesis is my original work and has not been submitted or published for any award of a degree or diploma in this or any other University.

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Recommendation

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DEDICATION

This thesis is dedicated to my loving mother Lenah Wasike, my wife Carolynne and my children Allan, Mitchell and Faith, whose love, patience and understanding during my study period enabled me to complete this thesis.

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ABSTRACT

Education is a basic right and an essential part of human rights as recognized in the Universal Declaration of Human Rights. For the right to education to be realized, the process of learning should reflect the needs and aspirations of society. Technology is one such avenue through which education objectives may be achieved. Whereas evidence shows an increase in investment in ICT in education in Kenya, perceptions of teachers, learners and school Principals on the integration of ICT in teaching and learning of secondary school agriculture is yet to be studied more so in Bungoma County. The purpose of this study was to establish the teachers' perception on use of ICT in the teaching of secondary agriculture in Bungoma County. The study was conducted to ascertain the teachers' perceived usefulness of ICT, ease of use and adoption of ICT and their preparedness to use the same as a pedagogical tool in secondary schools in Bungoma County. The study also gathered the perceptions of learners and school Principals on the use of ICT in teaching and learning of agriculture. A descriptive survey research design was employed. The target population of the study consisted of all Form three agriculture students, 498 agriculture teachers and 252 Principals of secondary schools in Bungoma County. Purposive sampling was used to select 65 Principals, 120 secondary school agriculture teachers and 780 Form Three agriculture students as respondents for the study. A questionnaire was used to collect information from the agriculture teachers and school Principals. An observation checklist was used to ascertain the state of ICT in the schools and a discussion guide was used for the focus group discussion with students of agriculture. To establish reliability of the instruments a pilot study was carried out using 30 secondary school agriculture teachers, 10 school Principals and 120 Form Three agriculture students selected through purposive sampling technique in Kakamega County. Validity of the instruments was established by the supervisors from the Department of Agricultural Education and Extension at Egerton University. Quantitative data were coded and analyzed using the Statistical Package for Social Sciences. Qualitative data was analyzed using document report analysis. The results were presented in frequencies, means and percentages. The study established that the perception of agriculture teachers, head teachers and students towards the use of ICT in teaching was positive. The study established that few teachers used ICT in teaching of agriculture as compared to other subjects. The study recommends formulation of policies that promote the integration of ICT in teaching of agriculture. It also recommends agriculture teachers to use ICT in teaching and learning.

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ACRONYMS AND ABBREVIATIONS

BoM	Board of Management
CD	Compact Disc
DVD	Digital Versatile Disc
EDU	Educational Development Unit
EFA	Education for All
GoK	Government of Kenya
GS	Graduate School
ICT	Information and Communication Technology
KESSP	Kenya Education Sector Support Programme
KICD	Kenya Institute of Curriculum Development
MOE	Ministry of Education
MoEST	Ministry of Education Science and Technology
PTA	Parents Teachers Association
SEMASE	Strengthening of Mathematics and Science Education
SPSS	Statistical Package for the Social Sciences
TAM	Technology Acceptance Model
TSC	Teachers Service Commission
UNCTAD	United Nations Conference on Trade and Development
UNESCO	United Nations Educational Scientific and Cultural Organization
UNCST	Uganda National Council of Science and Technology

CHAPTER ONE

INTRODUCTION

1.1 Background of the Study

Vocational agriculture was introduced in Kenya's secondary school curriculum initially at Chavakali High school in 1959 (Covington & Dobbins, 2004). Due to the premium the Kenya Government had on agriculture, it focused on developing a curriculum that would address the developmental needs of the country with agriculture as the main driving force. This resulted in the expansion of schools offering agriculture to six more schools; Rapogi, Kisii, Narok, Njoro, Kangaru and Bungoma High school (Konyango, 2010). However, vocational agriculture was taken as manual labor to take Africans back to the land creating a negative perception and attitude towards the subject by learners (Wanzala, 2013). The Ominde report of 1964 emphasized the teaching of agriculture in schools and this led to more schools taking up the subject (Konyango, Onyango & Kibett, 2010). The Report recommended agriculture to be taught among the science subjects. Currently, agriculture subject is in Group 4 under applied practical skills and technical and vocational subjects, where students choose one subject from among a variety of subjects in the category. These technical and vocational subjects include; agriculture, wood work, metal work, power mechanics, electricity, drawing and design, building and construction, business education, art and design and music (Okaka, 2001).

Teaching and learning of agriculture has become an essential tool for achieving food security in many developing countries including Kenya, and therefore, much effort has been put in to make it more accessible, affordable and of quality. Such efforts include among others the integration of Information and Communication Technology (ICT) in the teaching and learning of agriculture in secondary schools (World Bank, 2004). Some of the ICT used in teaching include live broadcast for radio and television and generic software applications such as audio cassettes, CDs, tapes, video cassettes, DVDs, satellite, the internet, and web-based content. Electronic devices such as the radio, television, computers, telephones, video tapes, audio tapes, and projectors are classified as ICT (Adomi, 2010).

In the education sector, ICT is regarded as an engine for growth and tool for empowerment with profound implications for education change and socio-economic development (Gesci, 2013). Its impact has been felt as one of the most immediate imperatives and as a major trend shaping education, every facet of the curriculum, instruction and student engagement (Kidd,

2010). Instructional media such as interactive radio, television, e-learning and video conferencing dramatically expand options for engaging in teaching and learning at all levels (Abdulrasool, 2015). It is generally agreed that the use of technology in the instructional process could promote innovative approaches to teaching and learning by going beyond the classroom teacher (Gesci, 2013; Mahmud, 2014). Therefore, the potential that ICT offer to improve accessibility and delivery of education in developing economies is enormous (Gasco, 2012).

In the knowledge age, developments in ICT do not only affect what needs to be learnt, but also how learning will take place in the future (Redecker, 2011). This means that with the ubiquity of technology, learning will be accessible anywhere, anytime, and there will be a shift from having institutions of learning to ‘classrooms without walls’. Johnson, Smith, Willis, Levine, and Haywood (2011) also predict massive technological transformations influencing education in the coming decade, where abundance of resources and relationships made easily accessible through the internet will affect teachers’ roles.

The role of ICT in education not only leads to the transformation of teachers’ functions to that of instructional managers but also changes the whole school environment by giving teachers new instruments for the analysis and continuous monitoring of the learning process (Gasco, 2012; Van, 2015; Adam, 2010). However, although ICT are a critical tool in teaching and learning, and a facilitator for major education and development reforms, it is not a sufficient condition as it calls for focusing on the changing roles of the teachers. Teachers are agents of change in the adoption and use of ICT in education (Adomi, 2010; Gesci, 2013). Therefore, their perceptions determine whether or not they will integrate ICT in teaching and learning. Communication research done in developed countries and some parts of Asia indicates that teachers’ perceptions and other factors affect the extent to which ICT may be used (Li & Ni, 2011; Jones, 2012).

A study by Almadhour (2010) on the integration of ICT in pedagogy by secondary school teachers in teaching in New Zealand, identified tools such as the internet, digital cameras, video, video cameras and video players as pedagogical tools. The study found that these tools were used in teaching but the most used tool was the internet. Cameras were used only to take photos and videos of researched activities. Another study by Afamasaga-Wright (2008) on

teacher perceptions of use of ICT in secondary school teaching in Samoa revealed similar findings, that the internet was mostly used by teachers to search for information for teaching.

In another study by Zhu (2010) on insights into innovative classroom practices with ICT in China, it was found that ICT was not a critical tool to transform teaching and learning. They are pedagogical tools that involve the use of software application to solve problems, to extend student capabilities, to create products or communicate and share their perspectives with each other (Johnson et al., 2011).

In Kenya, the use of ICT in education in general tops the Government's agenda. According to ICT in Education Session Paper of 2010, integration of ICT in education not only helps learners acquire the 21st century skills of critical thinking, collaboration and problem solving, but also improve the quality of curriculum delivery (Government of Kenya, 2011). While the initial plans to introduce ICT especially computers were aimed primarily at developing ICT skills, the focus over time has shifted to leveraging ICT to address issues of access aiming at improving teaching and learning (Government of Kenya, 2012b).

The integration of ICT in all sectors of the economy has been emphasized in Kenya under the country's Vision 2030 blueprint (Government of Kenya, 2010a). This commitment is re-emphasized in the education sector as stipulated in the National ICT Strategy for Education and Training, Sessional Paper No.14 of 2012, and the task force report on the realignment of the education sector to the 2010 Constitution (Government of Kenya, 2012a; 2012b). Consequently, a great deal of time and money is spent on the quest to provide appropriate ICT to teachers and students with expectation that they will use them effectively in teaching and learning. However, only a few of them fully exploit the opportunities offered by use of technology for teaching and learning, or as an alternative method for the delivery of the curriculum (Inan, 2014). The issue of agriculture teachers not effectively integrating ICT in teaching and learning then arose. A survey study carried out by Makhanu and Kamper (2012) to investigate the relationship between ICT access to secondary school heads and secondary school performance in Bungoma County of Kenya showed that school principal's access to ICT has a positive influence on secondary school performance. It also revealed that a relatively low percentage of principals (42 percent) had access to ICT in schools. This study is a useful source of reference especially on the distribution of ICT in secondary schools in Kenya. However, the study only concentrated on school principals and did not involve agriculture

teachers who happen to be the agents of implementing integration of ICT in teaching and learning in secondary schools. The availability and accessibility of ICT may not automatically translate into use.

1.2 Statement of the Problem

The integration of ICT in all sectors of the economy has been emphasized in Kenya under the country's Vision 2030 blueprint. Whereas evidence shows an increase in investment in ICT in education in the country, perceptions of teachers, learners and school principals on the integration of ICT in the teaching and learning of secondary agriculture remain unclear. This study was geared towards generating information on perceptions of teachers, learners and school principals on the integration of ICT in teaching and learning of secondary school agriculture, in Bungoma County, Kenya. Without such information it will continue to be difficult to enhance the use of ICT in teaching and learning of agriculture in the county and beyond.

1.3 Purpose of the Study

The purpose of this study was to establish the teachers', learners' and school principals' perceptions on the use of ICT in teaching and learning of secondary agriculture in Bungoma County.

1.4 Objectives of the Study

This study was guided by the following objectives:

- i. To document the status of ICT for teaching and learning of agriculture in secondary schools in Bungoma County.
- ii. To determine the extent of use of ICT by agriculture teachers in teaching and learning in secondary schools in Bungoma County.
- iii. To determine the perceptions of agriculture teachers on the use of ICT in teaching and learning of agriculture in secondary schools in Bungoma County.
- iv. To determine the perceptions of learners on the use of ICT in teaching and learning of agriculture in secondary schools in Bungoma County.
- v. To determine the school Principals' perceptions towards ICT use in teaching and learning of agriculture in secondary schools in Bungoma County.

1.5 Research Questions

The research questions below guided the study:

- i. What is the status of ICT for teaching and learning agriculture in secondary schools in Bungoma County?
- ii. To what extent do secondary school agriculture teachers use ICT as a pedagogical tool in Bungoma County?
- iii. What are the perceptions of agriculture teachers towards ICT use in teaching and learning of agriculture in secondary schools in Bungoma County?
- iv. What are the perceptions of learners towards ICT use in teaching and learning of agriculture in secondary schools in Bungoma County?
- v. What are the perceptions of school Principals towards ICT use in teaching and learning of agriculture in secondary schools in Bungoma County?

1.6 Significance of the Study

The findings of the study can inform the Ministry of Education and Teachers Service Commission on the hindrances to ICT integration in the teaching and learning of secondary agriculture. The information can enable the ministry of education and teachers service commission to identify mechanisms that will ensure successful ICT integration in secondary school agriculture. The research will also guide policy-makers, decision-makers and investors to make well-informed decisions about policies and investment in ICT as regards secondary education by understanding the perceptions of teachers, learners and school Principals on the use of ICT as a pedagogical tool in secondary agriculture. Additionally, the study will be beneficial in building a knowledge base of perceptions of teachers, learners and school Principals on the use of ICT in teaching and learning secondary agriculture. The knowledge may serve as a guide for overcoming challenges that teachers face while using ICT in teaching and learning of secondary agriculture. Furthermore, the study is intended not only to shed light on the teachers', learners and school Principals' perceptions towards ICT integration in teaching and learning but also to reveal the factors obstructing their positive attitudes towards the use of ICT. The knowledge from the study will enable parents and communities to consider investment in ICT as a priority for effective teaching and learning. Finally, the study will help future researchers to make references on this work with the aim of building more knowledge in the field of ICT in relation to teaching and learning of secondary agriculture.

1.7 Scope of the Study

This study was confined to Bungoma County, Kenya and focused on the agriculture teachers, learners and principals of secondary schools as they were the ones who are best suited to provide information on the extent to which ICT is utilized in the teaching and learning of

agriculture. The research examined the agriculture teachers' attitude and awareness of ICT and readiness to use and to train on use of ICT and perceived ease of use and usefulness of ICT as a pedagogical tool. The study also investigated the adequacy of ICTs tools in secondary schools and gathered the perceptions of learners and Principals on the use of ICT in teaching and learning of agriculture in the County.

1.8 Assumptions of the Study

This study was carried out under the following assumptions:

- i. Teachers in selected schools would be willing to participate in the study and that they will voluntarily give the correct information.
- ii. Agriculture teachers have ICT knowledge.

1.9 Limitations of the Study

The study had the following limitations:

- i. Not all secondary schools in the Country were covered. Any findings and generalizations of the study were therefore, to be confined to the County.
- ii. The sampled respondents included agriculture teachers who were 60 years old that were not well versed with new technology. In such cases, the researcher interpreted and assisted in filling of the questionnaire.

1.10 Definition of Terms

The following operational terms were used in this study.

Adequacy: The state of being sufficient for the purpose concerned i.e. both quantity and quality (Unwin, 2011). In this study it refers to whether the ICT acquired by secondary schools are sufficient for teaching secondary agriculture.

Attitude: Is an inward feeling expressed by the outward behavior of a person (Krishan, 2009). In this study it refers to the way teachers of agriculture think and feel about the use of ICT in teaching agriculture in secondary schools. It was measured through a likert scale question.

Awareness: It is knowing that something exists and is important (Serin, 2011). In this study it will refer to whether teachers of agriculture know that ICT can be used to enhance the teaching of agriculture in secondary schools.

Curriculum: A program of activities to be undertaken by the people of a nation, organization, and professional group derived from the goals of a nation (Mselle, 2012). In this study it will refer to the various activities undertaken in the teaching of agriculture in secondary schools.

Education: Involves teaching people various subjects, usually at school or college or being taught (Kavagi, 2014). In this study it will refer to teaching of agriculture in secondary schools.

ICT resources: A diverse set of technological tools used to communicate and create, disseminate, store and manage information (Laaria, 2013). In this study it refers to the technological facilities that agriculture teachers use in the teaching and learning.

Information and Communication Technologies: Consists of the hardware, software, network and media for the collection, storage, processing, transmission and presentation of information in form of voice, data, text and images (Adomi, 2010). In this study ICT will refer to the technologies such as computers, internet, radio, overhead projector, digital camera, DVD players, television sets, mobile phones, flash disc and e-mail that secondary school agriculture teachers use to access information, analyze and apply knowledge in teaching and learning process.

Perceived Ease of Use: The degree to which a person believes that using a particular system would be free of effort (Davis, 1989). In this study it refers to the teachers' believe that using ICT is free of effort. It was measured through a likert scale question.

Perceived Usefulness: The degree to which a person believes that using a particular system would enhance his or her job performance (Davis, 1989). In this study it refers to the degree to which Agriculture teachers believe that using ICT in teaching would enhance his or her job performance. It was measured through a likert scale question.

Perception: A process by which individuals organize and interpret their sensory impressions in order to give meaning to their environment, and it is influenced by perceiver's attitude which may be positive or negative interest, experience or situation (Tay, 2012). In this study it refers to agriculture teachers', learners' and school Principals' notion about integration of ICT in the teaching and learning of secondary agriculture.

CHAPTER TWO

LITERATURE REVIEW

2.1 Introduction

This chapter discusses the various subsections as derived from the research title through the use of literature review. It is organized into the following subtopics under the objectives of the study and focuses mainly on; agriculture teaching approaches in Kenya, ICT resources in Secondary Schools in Kenya, ICT utilization in teaching of agriculture in secondary schools, factors affecting teachers' perceptions on the use of ICT for teaching, benefits of using ICT in secondary schools, theoretical and conceptual framework.

2.2 Agriculture Teaching Approaches in Kenya

Teaching learning approaches are traditionally referred to as methods of teaching (Kisirikoi, Wachira & Malusu, 2008). Modern trends in teaching emphasize certain approaches which determine the strategy to be used. These approaches include; interaction approach, collaborative approach, transmission approach, experiential approach and facilitation approach. Interaction approach is where there is exchange of ideas between the teacher and the learner or among learners themselves as in group work.

Collaborative approach is where learners share ideas in groups or projects. Transmission approach, the teacher dominates the lesson by use of lecture. In experiential approach learners life experiences are explored and used as a basis for development of new knowledge and passing judgment. Learning is based on the learner's experiences in the community. Facilitation approach, the teacher provides the stimulus for the learner's interaction with new knowledge and also provides opportunities for the learners to learn. The teacher is merely a guide and director of learning (Wanzala, 2013).

From the above approaches the agriculture teacher determines the strategy to use depending on the content one is teaching. The most used strategies in teaching agriculture are lectures, demonstrations, discussion, educational visits, projects, question and answers, assignments and practical (Vandenbosch, 2011). Lecture as a method of teaching involves transmission of information from the teacher to the learner. The teacher reads out the notes to the learners as he explains to them. The method is mainly teacher –centered and the learner's activity is listening and taking notes. Demonstration is a practical way of explaining or describing a process or an activity. The teacher demonstrates an activity before engaging the class in the

same. The teacher may also use one of the learners to demonstrate the activity. Discussion is a form of interaction which involves learner's participation through talking or writing that encourages an open exchange of ideas. Educational visits provide learners with an opportunity to explore other environments and make school life more interesting. It provides the learners with exciting experiences that bring joy and satisfaction that would not have been experienced in the normal classroom interaction (Kisirikoi, Wachira & Malusu, 2008).

Project method involves manipulation of physical materials, planned and carried out to completion by the students and the teacher in a natural "real life" manner. The practical orientation and education value of projects make them suitable for implementing the practical aspects of secondary agriculture. Assignments are a common practice in most schools. This involves literature review and at times interview or field observations. During a study of literature students are assisted to learn how to extract facts from books and to prepare a brief written report on their findings (Vandenbosch, 2011). In Kenya, Ngesa (2006) indicated that teachers of agriculture use lecture, class discussion and group discussion methods. Demonstrations, practical, experiments, projects and problem –solving are moderately used. In this methods ICT is hardly incorporated thus the need to find out the perceptions of agriculture teachers, learners and head teachers towards the use of ICT as a pedagogical tool in Bungoma County.

2.3 ICT Resources in Secondary Schools in Kenya

ICT resources is an umbrella term that includes any communication device or application, encompassing: radio, television, cellular phones, computer, network hardware, software and satellite systems as well as the various services and applications associated with them, such as video conferencing and distance learning. The use of ICT in education dates back to 1924 when Sidney Presley tried out the teaching machine for revision and testing at Ohio University in the United States of America. The use of technology in education was generally slow until the coming of computers (Kavagi, 2014). Integrating technology into curricula with the sole aim of influencing positively the teaching and learning process has been evolving since 1980 when a number of countries in the world introduced computers in their education systems (Wakhaya, 2010).

This change was mainly as a result of hardware and software evolution, computer accessibility in educational settings and popular instructional technology trends. Technology integration

cover a wide area ranging from instruction on programming skills, self-directed drill, testing, instructional delivery, and Internet based accessibility to information and communication. It has been argued by certain scholars that the use of new technologies in the classroom is essential for providing opportunities for students to acquire knowledge and skills that will enable them to function in an information age (Hennessy, 2014). It is therefore evident, as Zhu (2010) argued that traditional educational environments do not seem to equip the learner with adequate skills to be productive in their places of work in today's society. She asserts that organizations which do not integrate the use of technology in schools cannot claim to prepare the learners for life in the modern technological age.

There is a wide range of ICT facilities in secondary schools that agriculture teachers should use in planning for a lesson and actual classroom instruction. They include: software, CD-ROMs, the Internet, DVD players, television and radio, image capture devices that include still and video cameras, video recorders among others (Wanzala, 2013). A teacher wishing to integrate ICT in the teaching of agriculture should start by thinking about the needs of agriculture curriculum rather than about technology. Indeed, ICT should be used in the service of the teacher and for individual lessons.

Planning for teaching entails preparation of schemes of work, lesson plans, identification and trying out of learning activities and teaching notes, among others. When planning for a lesson, agriculture teachers can use the internet available to identify and develop learning activities and search for up to date information on the concept or skill to be learned. Besides, they can use the computer to type schemes of work, lesson plans, class notes and assessments which saves on planning time as compared to using pen and paper. The most crucial part and yet which has been given less attention by agriculture teachers is ICT integration in classroom instructional process (Aguyo, 2010). It is against this background that this study intends to examine the levels of investment in ICT for use in teaching of secondary agriculture in Bungoma County.

In a study to explore factors that influence use of ICT in Sub-Saharan Africa, Hennesy (2014), it was noted that introducing ICT into schools is largely dependent upon the availability and accessibility of ICT. It was observed that schools were increasingly being equipped with computers for teaching, learning and connectivity improving students' enthusiasm about using computers for learning despite lack of ICT as a pedagogical tool.

2.4 ICT Utilization in Teaching of Agriculture in Secondary Schools

Andoh, (2012) defines implementation as processes and decisions made by individuals every time they consider adopting innovation. Khan, Hassan and Clement, (2012) describes implementation of ICT in schools as the decision made by school leaders and teachers to make use of technology as the best course of action available. Andoh, (2012) observes that the process of implementation of ICT starts with initial hearing about the technology to final adoption and using it. In practice, the usual teaching and curricula approaches still remain basically unchanged in many schools, while the technology is typically poorly adopted and underused in classroom (Dzidonu, 2010). It appears that the emphasis is on students ICT capabilities rather than application of ICT knowledge and skills to other subjects across the syllabus.

Keengwe, and Onchwari, (2011) notes that, despite rapid growth in ICT access by teachers and students both at home and school, and substantially improved school ICT infrastructure connection to internet, computer labs, availability of educational software, most teachers are not keen in adapting and using ICT during teaching and learning. Usman and Pascal (2014) observed that most of reforms and initiatives in using ICT in teaching in schools failed due to their top-down approach that did not take into account teachers' attitude and awareness of ICT as a pedagogical tool. Therefore, an investigation of agriculture teachers, school principals and learners ICT perception can provide insights into their preparedness in adopting and using technology in classroom.

A study in Singapore by Teo (2013), on the observations of ICT-mediated lessons identified several barriers to ICT-integration in the classroom. These barriers involve inadequate appointment of technical support staff, inadequate appointment and training of student ICT helpers, lack of sufficient time for teachers to prepare for ICT-mediated lessons, insufficient collaboration among teachers in preparing ICT-mediated lessons, lack of support provided by school Principals in addressing teachers' ICT concerns, and insufficient training and demonstrations or advice for teachers on how to incorporate ICT into classroom instruction. The study does not explain school Principals and agriculture teachers' perceptions towards the use of ICT as a pedagogical tool.

A study in Cyprus by Dirckinck-Holmfeld, Hodgson, Jones, de Laat, McConnell and Ryberg Dirckinck-Holmfeld (2010) shows that curriculum and school manuals do not include ICT integration; there is lack of supporting materials for each learning unit. Teachers, therefore,

need to spend excessive amounts of time to find, assess, revise and adjust learning materials, activities and technologies to fit to the needs of their students and the curriculum. Peeraer and Van Petegem (2011), assert that important barriers to use of ICT in teaching and learning are the teacher educators' computer skills and confidence in using ICT. However lack of exposure to lessons fully-designed with ICT, lack of opportunities to try ICT, the need to practice in a technology laboratory, lack of educational technology teachers, an exam-driven educational system and studying to learn only what is to be tested were some of the underlying reasons for the prospective teachers' negative perceptions of ICT use in the teaching process (Hismanoglu, 2012).

Across Africa, many countries have started investing considerable amount of money and designing new policies all aimed at making teachers adopt and use ICT in schools. However, there are many challenges some of which could be attributed to the teachers' perceptions in using ICTs (Zaman, 2011). For ICT to be effectively implemented in schools, teachers should be prepared to face challenges that come with its implementation.

In Kenya, the government recognizes the positive effect of ICT in making the country a middle level economy as is envisaged in Kenya vision 2030. Effort to implement ICT in schools was first initiated by publishing sessional paper No.1 of 2005 where ICT was given prominence. The idea was to equip public secondary schools with ICT infrastructure and integrate it in existing school curriculum in order to meet the challenges of information society (GOK, 2015). In 2006 the government disseminated National ICT policy on education with a section promoting acquisition of knowledge through e-learning, facilitating rural electrification and connecting schools to electricity grid, among other policies (GOK, 2014). Some of achievements so far include; connecting over 300 rural schools with electricity, equipping over 500 public secondary schools with computers, establishing a unit at Kenya Institute of Curriculum Development (K.I.C.D) to provide leadership in implementation of ICT in schools, launching of e-content for schools in March 2010 by K.I.C.D, partnering with several organizations and private sector in providing computers to schools, among others (Laaria, 2013). These efforts reflect the seriousness the government is attaching to application of ICT to schools. Now the focus is on the teachers using ICT in teaching and learning process.

There has been an encouraging emphasis on in-service development, supported by enlightened national ICT policy initiatives. Such programs focus on helping teachers to use technology as a pedagogical tool, and to transform their classrooms into interactive learning environments.

For example the Intel Corporation ‘Teach’ programme supported Kenya’s transition from traditional teaching methods through educating teachers in the integration of ICT into primary and secondary school education (Karsenti, 2009). It was done Using a ‘train the trainer’ model, the 25 selected participants from teacher training colleges, Centre for Mathematics, Science and Technology Education in Africa, Kenya Institute of Curriculum Development and Kenya Education Staff Institute, were working on the development of online material to then orient 250,000 teachers nationwide. Teachers who engage in appropriate professional development, however, learn how to manage their classrooms more effectively and to use the technology to create a more stimulating learning environment (Olakulehin, 2007).

In their study of secondary schools in Kenya, Kombo (2013) found that educational software, lack of internet access and e-mail were lacking in schools. They recommend staff training, mainstreaming of ICT across the curriculum and provision of adequate ICT equipment as ways of enhancing integration of ICT in curriculum delivery. It is apparent that use of ICT enables access to learning as they can solve many of the educational challenges faced by education systems in developing countries. When teachers use it as a teaching tool, it improves instructional delivery, hence making learning more effective. However, for this to happen, teachers must be ready to acquire the knowledge, skills and attitudes needed to use ICT.

Despite its importance and strategies developed by government to implement ICT in schools, research conducted in many schools in the country has established that most of them are not effectively using ICT to support teaching and learning (Manduku, Kosgey, & Sang, 2012). Laaria (2013), revealed that despite efforts made by various stakeholders and importance of the ICT in education sector, the 2006 National ICT policy on education has not been effectively implemented as was intended. It is with this background that an investigation on perception of agriculture teachers, head teachers and learners towards ICT in teaching in secondary schools in Bungoma County, Kenya was conceptualized.

2.5 Factors Affecting Teachers’ Perceptions on the Use of ICT for Teaching

Perception is a process by which individuals organize and interpret their sensory impressions in order to give meaning to their environment, and it is influenced by perceiver’s attitude which may be positive or negative interest, experience or situation (Tay, 2012). Teachers play an important role in the implementation of ICT in schools. As a result, their perceptions are major predictors of the utilization of technologies in instructional settings (Al-Zaidiyeen, Mei & Fook

2010). Positive attitudes often encourage less technologically capable teachers to learn the skills necessary for the implementation of technology based activities in the classroom.

Although the ICT have been in use for over 40 years, decision makers underestimate the costs of producing quality educational ICT programmes (Bates, 2011). This perception is reinforced by the belief that it is an expensive medium. Other studies carried out among teachers on use of ICT indicate that teachers who viewed it positively had high levels of use while those who viewed it negatively did not integrate it into their classroom teaching (Kuskaya & Kocak, 2015).

Teachers' perception of technology use is affected by their belief about the way the subject content should be taught and whether they are willing to change their teaching styles (Tina, 2010). Therefore, if teachers want to successfully use technologies in their classes, they need to possess a positive attitude towards the use of technology. Such an attitude is developed when teachers are sufficiently comfortable with technology, and are knowledgeable on its use. However, if teachers lack the technological proficiency needed to use new technologies in the classroom, their perception will be affected. Mundy (2012) and Alazam, (2014) confirm this argument and assert that lack of technological proficiency and competency leads to underutilization in the classroom.

In America, technologies like the computer have been in use in the educational system since the 1980s. However, as Cuban puts it in his book "*Oversold and underused: computers in the classroom*", agriculture teachers have been infrequent and limited users of this technology in the classroom (Cuban, 2001). Sinclair (2010) seems to concur with Cuba's assertion, that there is increased funding and provision of computers to schools to satisfy the needs of teachers and students and no meaningful strategies to institutionalize their use. The role of the teachers is therefore important. This is supported by another study by Cuban, Kirkpatrick and Peck (2012) who found that a teacher's belief structure about teaching and learning is one of the most important factor that inhibit his or her adoption of the technology integration pedagogy. However, Cuban (2001) did not find teacher resistance or technophobia, reasons often cited in studies on teachers' use of computers. This view is also supported by the study on Spanish teachers' beliefs and practices on computer use in the classroom (Cummings, 2010).

Diffusion of an innovation is an important factor regarding the adoption rate of an innovation and its compatibility with the values, beliefs and past experiences of individuals in the social system (Rogers, 2011). He explains that acceptance of a new technology in a society depends

on how well the proposed innovation fits the existing culture. Consequently, there must be a match between organizational culture and new technology in an organization. Tearle (2013) concurs with Rogers (2011) argument that within the school set up, the institutional culture is an important consideration as regards ICT integration. According to Tearle, the school culture consists of norms and values, traditions and cultural artifacts that are shared by members of the school community. These meanings and perceptions indirectly affect attitudes and behavior in the organization of schools (Devos, Bouckenooghe, Engels, Hotton & Aelterman, 2010). Hence, if a technology is not received well by teachers in a school, there could be a mismatch of values between the culture of the school and the technology. With this understanding, the rate of integration will most likely take longer than expected because most teachers will have to change their belief structure.

Li and Ni (2011) indicate that although teachers hold positive attitudes towards technology, there are other constraining factors such as the use of teacher instead of student-centered pedagogical practices, and lack of professional development for teachers that focuses on instructional design and technology integration. Ajelabi and Agbatogun (2010) strongly argue that electronic learning for instruction in secondary schools improves instruction. Another factor that determines a teacher's perception on the use of technologies is the social system within the society he or she lives in. According to Rogers (2011), there are change agents within the social systems. Change agents must, if possible, communicate to opinion leaders a convincing argument in favor of the innovation which must be compatible with the society's belief systems and norms.

Cuba, Kirkpatrick and Peck (2012) found out that teachers' belief structure about teaching and learning inhibited their adoption of technology integration pedagogy. The opinion leaders will then be able to use this argument, which will hopefully resonate with the masses, to support their own adoption decision. It is therefore important to find out the change agents in schools and see how they can assist in teacher's adoption of technology. Charalambos and Glass (2013) explain that schools have support systems and their interrelationship with the society as a whole form a complex environment. This interrelationship contributes to difficulties and complications when teachers are adopting innovations such as technology. It is this complexity that raises concern on the successful use of instructional methods that integrate ICT in secondary schools.

Komba, and Kira, (2013) explored school Principals' perceptions towards ICT in their study of effectiveness of teaching practice in improving student teachers' teaching skills in Tanzania. The overall picture which emerged from the study was a positive one, there was a great deal of interest and motivation to learn more about ICT and an acknowledgment that this was the direction things were likely to take in the future. Head teachers reported a wide range of positive benefits of ICT use which influenced their feelings towards ICT use in the teaching and learning. However, despite the reported positive perceptions and that the majority, 92% (n=329), were interested in developing their ICT skills and felt comfortable with ICT, there were many head teachers who felt overwhelmed by ICT and worried about the pace of developments, felt they could not cope with the jargon associated with computers, and generally worried about their own lack of skills and knowledge compared to that of their own students.

Moreover, some head teachers viewed their colleagues as technophobic and resistant to learning about computers because they perceived them to be difficult to use. The aforementioned findings are similar to those reported by Isaacs (2014) who found head teachers hesitation towards ICT was a result of their perception of ICT as an innovation that de-skills people, creates incompetence, has an inhuman influence in the classroom, and promotes students isolation. The study by Burton (2014) reported anxieties among head teachers as a result of their incompetent ICT skills, however, they indicated that increasing exposure to ICTs enhanced their positive perceptions and decreased their anxiety. Although teachers in Burton (2014) study reported some negative perceptions, the majority had positive perceptions towards ICT, especially for personal use. More than 60% of principals revealed that not only did they like working with ICT but they were also confident users. Moreover, almost all participating head teachers believed ICT to be useful for their work and to have an important role in teaching and learning. However the study by Isaacs (2014), Burton (2014), and Komba et al. (2013) did not investigate the perceptions of Principals on the use of ICT in teaching of secondary agriculture.

2.6 Benefits of Using ICT in Secondary Schools Teaching and Learning

ICT benefits schools in several ways: enhancing learning in classroom, improves management of school (for example, it helps in timetabling, record storage, secretarial work like, typing staff meeting minutes, examinations and letters), improves accountability, efficiency and effectiveness in school activities and use of Power Point presentations and internet (Peeraer & Petegem, 2011). Hennessey (2014) takes a cautionary view by stating that putting ICTs

infrastructure in school does not itself create stimulating new learning environment that are about shifting the culture of classroom teaching and the ethos of schools. By using ICT, schools can present high quality teaching and learning.

There are four different ways schools can offer quality education supported by ICT: real time conversation, learning by doing, directed instruction and delayed time conversation (Keengwe & Onchwari, 2011). Higgins, and Moseley, (2011) observed use of ICT could improve teaching, learning, performance and management, improves impact on school as a whole, and develop significant skills in the marginalized communities (hence helping in liberation and their transformation). Education For All (EFA) Global monitoring Report, (2012) observed that use of ICT could help in achieving 'education for all' goals. The report recommends that ICT should be harnessed to sustain EFA goals at affordable cost. The report went further to note that these technologies have great potential for effective learning, knowledge and development of more efficient school services.

ICT should be used to support school objectives like cooperation in school, problem solving, communication, developing skills, assessing and searching information which are essential in preparation of students for knowledge society (Hennessy, 2014). A study by Higgins, and Moseley, (2011) found that teachers who use ICT in classroom perceived it as useful for personal work and for teaching and were prepared to continue using it due to its usefulness. Some of usefulness of ICT by teachers this study found were: making teaching more interesting, easier, and more diverse, more fun for them and students, more enjoyable and motivating to students. Additional personal usefulness were found to be: allowing larger access to computer for personal use, improving presentation of materials in class, giving more prestige to teachers, giving more power to teachers in school, providing professional support through the internet and making management in school more efficient and effective.

Students report higher attendance, motivation and academic accomplishment as a result of ICT programs (Dzidonu, 2010). To address the challenge of high school drop-out rates experienced in sub-Saharan Africa, ICT can be used to make school curriculum more interesting. Studies have established that children enjoy learning using technology. This motivation may discourage students from dropping out of school. Rebecca and Marshall, (2012) described how using internet in school for street children in Colombia enticed a higher than usual number back to classroom.

ICT in school can be viewed as a cost effective especially in terms of manpower as one teacher can reach many learners through internet, interactive white board and video conference technologies (Aguyo, 2010). Parents are also spared the agony of buying many text books because many of them would be available online. Study and teaching materials are very sparse in many schools in developing countries; ICT can play a significant role in providing teachers and students with access to educational content and up to date resources. The use of ICT by students helps develop future workforce that can effectively participate in the increasingly networked world and the emerging knowledge economy.

Learners have strong perceptions of ICT integration in the learning process in schools because most learners prefer learning using ICT integration to learning without using ICT integration (Obura, 2012). The findings of this study agree with the findings of Wong (2006) who established that students see ICT integration as a method which assists them to utilize multiple ways of solving academic problems and justify their solutions. The findings of this study are in line with the findings of Dogan (2010) who noted that learners see computer integration as a way of acquiring skills that they will need to enter the global workforce and get better jobs upon graduation. They further noted that they see computer integration in learning as a means of improving their communication skills. However the above studies did not investigate the perceptions of agriculture teachers, learners and secondary school Principals on the integration of ICT in teaching and learning of agriculture in Bungoma County.

2.7 Theoretical Framework

This study was guided by two theories, namely; Globalization Theory (Held, McGrew, Goldblatt & Perraton, 1999), and technology acceptance model (TAM) (Davis, 1989). According to Globalization Theory, there is the stretch of social, political and economic activities across frontiers such that events, decisions and activities in one region of the world can have significance for individuals and communities in distant regions of the globe. It makes sense to say that globalization is a form of internationalization of some aspects of education such as sharing of teaching and learning resources and pedagogical techniques. Tools such as blogs, discussion forums and chat rooms are quite familiar to most teachers and may be used to offer great potential for online collaboration among them (Godwin-Jones, 2015). These ICT provide a channel through which teachers can enrich their global awareness, which, in turn, strengthens teachers' design of effective learning environments (Smith & Doyle, 2014).

To meet the challenges of globalization, it would be necessary to prepare agriculture teachers for a workplace where responsibilities are constantly changing. Therefore, education must help teachers to perform tasks for which they were not originally trained, to prepare for a non-linear career path, to improve their pedagogical skills and lay the basis of complex thinking linked to the harsh realities of practical life.

As for teaching through ICT as a pedagogical tool, this theory can enable teachers beyond traditional teaching because technology provides adaptable and flexible teaching and learning. Through ICT, teachers are able to find information more easily through internet, create information through word processing software and communicate through instant messaging and web based classroom. That is to say, the productivity of education can be significantly improved by upgrading the skills and knowledge of teachers to apply ICT skills in the classroom.

Technology acceptance model (TAM) has been identified as one of the most relevant and most cited models (Davis, 1989) in determining factors affecting technology acceptance and use through perceived ease of use, usefulness, attitude toward using and actual behavior. The critiques of this model argue that it does not consider social influence which determines whether an individual's intention to use a system with intention to use serving as a mediator of actual system use. Perceived usefulness is also being seen as being directly impacted by perceived ease of use of the technology. In this study, TAM is relevant in that if agriculture teachers perceive ICT to be useful and easy to use; influence their attitude positively which determines the actual use.

2.8 Conceptual Framework

The conceptual framework was developed from the reviewed related literature. Under this frame work, the dependent variable is the use of ICT in teaching agriculture and was measured by the perceived ease with which teachers are able to source information through internet, create information through word processing software and the ability of teachers to prepare power point slides for teaching agriculture. The independent variables are the perceptions of the teachers, learners and school Principals on the integration of ICT in teaching agriculture. Perception was measured by the attitude, awareness level, adequacy of ICT, eagerness to use and train on the use of ICT by agriculture teachers through a likert scale question. The

interaction between independent and dependent variables is further influenced by intervening variables. The intervening variables influence the effects of the independent variable on the dependent variables (Kothari, 2008). In this study intervening variables are age, gender and category of school which were controlled through random selection of the participants. The study was conceptualized as indicated in Figure 1.

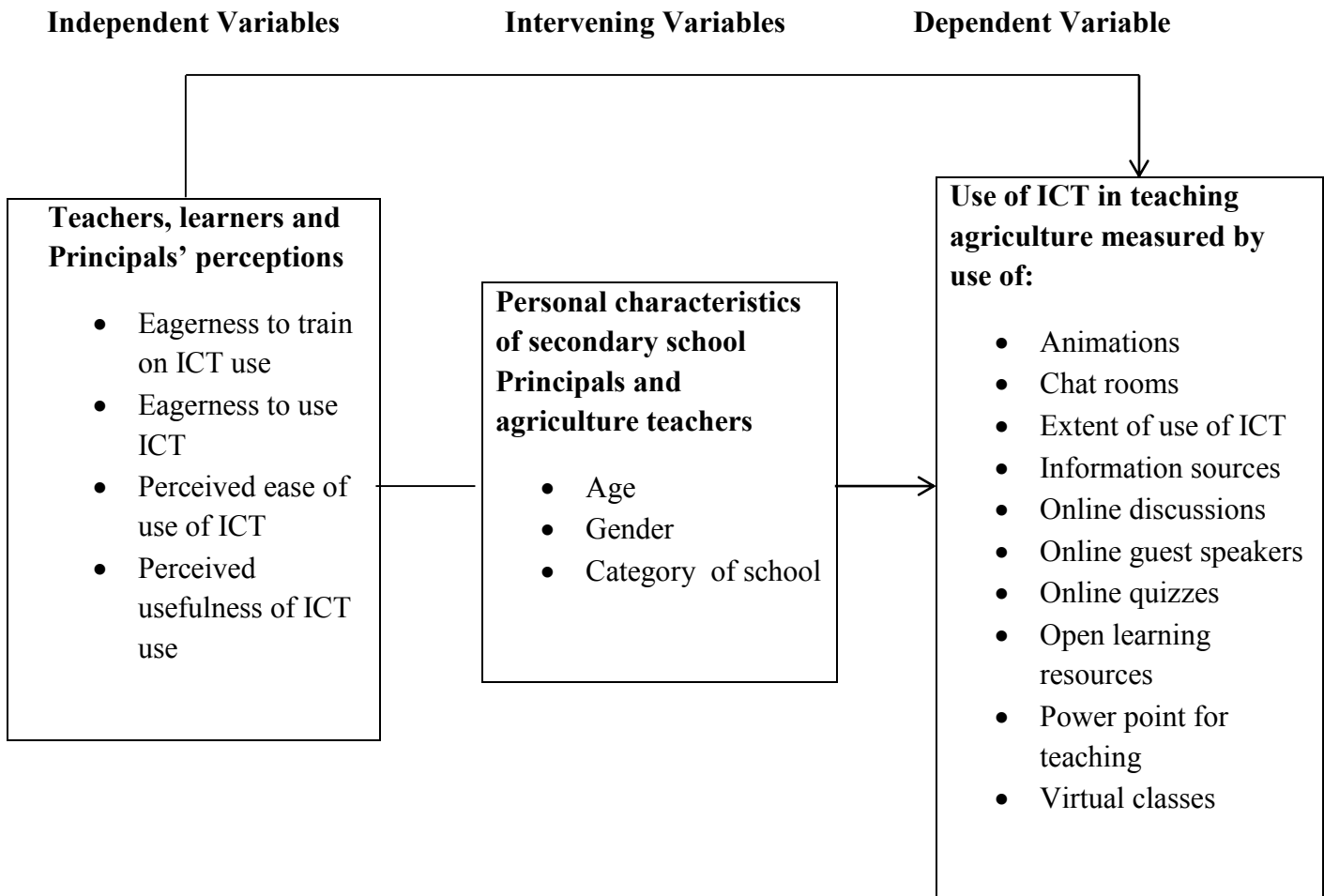


Figure 1: Conceptual framework showing interaction of variables

CHAPTER THREE

RESEARCH METHODOLOGY

3.1 Introduction

This Chapter deals with methodology that was used to carry out the study under the following subheadings; research design, study location, target population, sample size and sampling techniques, instrumentation, data collection procedure and data analysis techniques.

3.2 Research Design

In this study, a descriptive survey research design was used. This design is relatively faster and inexpensive. It provides self-reported facts about respondents, their inner feelings, attitudes, opinions and habits (Kothari, 2008). It takes a snapshot of a population at a certain time, allowing conclusions about phenomena across a wide population to be drawn. It is envisaged that this descriptive survey provides appropriate information on the perceptions of agriculture teachers, learners and school principals on the use of ICT as a teaching tool in secondary school agriculture.

3.3 Study Location

The study was carried out in Bungoma County, Kenya. It consists of nine sub-counties, namely; Bumula, Bungoma Central, Bungoma East, Bungoma North, Bungoma South, Bungoma West, Cheptais, Kimilili/Bungoma and Mt.Elgon. It borders Uganda to the North and North West, Counties of Kakamega to the South and South West, Busia to the West and Trans Nzoia to the East and North East. It has a population of 1,375,063 and an area of 2,069 km². Temperatures range from minimum of between 15 – 20 °C to a maximum of between 22–30 °C.

3.4 Target Population

The target population of the study consisted of 498 agriculture teachers, 252 Principals and all Form Three agriculture students in the County.

Table 1

Target population of agriculture teachers

Sub-county	Number of agriculture teachers
Bumula	55
Bungoma Central	58
Bungoma East	58
Bungoma North	57
Bungoma South	61
Bungoma West	56
Cheptais	48
Kimilili/Bungoma	59
Mt.Elgon	46
Total	498

Source: County Director TSC Office Bungoma (2016)

Table 2

Categories of secondary schools

School category	Frequency	Percent
National	1	1.5
Extra county	7	10.8
County	13	20.0
Sub county	44	67.7
Total	65	100.0

3.5 Sampling Procedure and Sample size

The sampling units for the study consisted of all secondary school agriculture teachers, school Principals and Form Three agriculture students in Bungoma south and Kimilili/Bungoma Sub-counties of Bungoma County. In this study purposive random sampling was used. Bungoma South and Kimilili/Bungoma Sub-counties were purposively selected since they were fairly representative and easily accessible. Fraenkel and Wallen (2000) recommend that for a descriptive study of this nature, it requires a minimum sample of 100 subjects. This sample was increased by 20% to 120 to compensate for sample mortality and respondents' inability to participate as recommended by Balian (1988) and to ensure a high level of statistical significance. The 120 agriculture teachers that took part in the study were selected through

census. All the Principals in the two Sub-counties took part in the study. In addition, 780 Form Three agriculture students were randomly selected from National, Extra-County, County and Sub-County schools, to participate in four focus group discussions. In total, 120 agriculture teachers, 65 Principals and 780 agriculture students were used as indicated in Table 3.

Table 3

Summary of the Sample population

Sampling units	Sample
Agriculture teachers	120
Principals	65
Agriculture students	780
Total	965

Source: County Director TSC Office Bungoma (2016)

3.6 Instrumentation

A researcher developed questionnaire, containing both open and close ended questions was used to collect both quantitative and qualitative data from agriculture teachers and Principals in secondary schools in Bungoma County. The questionnaire design in this study was based on the principles of questionnaire design outlined by Oppenheim, (2000). The questionnaire was chosen because it allows standardization, ease of use, and anonymity. In many surveys, honest answers depend on the extent to which the respondents feel the data remain confidential (Nayab, 2011). An observation check list was used to ascertain the state of ICT in secondary schools in the County. A discussion guide was used for the focus group discussion with learners. Data was collected based on the study objectives.

3.6.1 Validity

Validity is the accuracy, soundness or effectiveness with which an instrument measures what it intended to measure in the research objectives. A panel of five experts in instrument validation from the Department of Agricultural Education and Extension of Egerton University judged the appropriateness of the items in terms of content and recommended modifications that improved the validity of the instruments. The supervisors in the Department of Agricultural Education and Extension at Egerton University ensured that items in the questionnaire, observation checklist and discussion guide adequately measured the degree to which the data

collected represented concepts that cover all relevant issues under investigation (Mugenda, 2008).

3.6.2 Reliability

Reliability is defined as the degree to which a particular measuring procedure gives similar results over a number of repeated trials (Orodho, 2008). Oso and Onen (2011) also define reliability as the extent to which an interview schedule or any procedure produces the same results on repeated trials. The Cronbach's alpha reliability coefficient was used to measure the questionnaire's internal consistency. Ashcroft and Parker (2009) have indicated that reliability scores of less than 0.6 are generally problematic. The researcher therefore ensured that the questionnaire meets the threshold for acceptable alpha reliability coefficient of 0.70 or higher by pretesting it with thirty agriculture teachers and 10 school Principals from Kakamega County, having set the significance level *a priori* at 0.05. The study established Cronbach's reliability coefficient of 0.821 which was above the required threshold of 0.70. Pre-testing procedures were identical to those that were used during the actual data collection as recommended by Kothari (2008).

3.7 Data Collection Procedures

A letter of approval was obtained from the Board of Graduate Studies of Egerton University and was presented to the National Research Fund (NRF) to obtain a research permit. Once authority was obtained, arrangement was made to visit the County Director of Education, Bungoma County for further clearance. Once authority was obtained, arrangement was made to visit the sampled schools and administer the Questionnaires, Checklists and Group discussion guides to the respective respondents. A total of 120 teachers of agriculture and 65 school Principals were given the questionnaires. Each of the 65 schools was given a checklist of ICT facilities and finally 65 Focus Group discussions were conducted by the researcher in National, extra county, county and sub county schools in Bungoma County.

3.8 Data Analysis

The researcher collected both qualitative and quantitative data. The qualitative data collected was edited and cleaned up before coding. The edited, proof read and coded data was then analyzed. This study used qualitative and quantitative data analysis and synthesis techniques. Qualitative method was used to answer interpretive and explanatory questions of why, how and which way while quantitative methods was used to answer objective questions of when, where,

how many, at what time and to what extent. Qualitative data was evaluated, classified and categorized into appropriate themes based on the objectives and then coded. Analyses of qualitative data collected using document report analysis was an on-going process where emerging trends were categorized basing on research objectives. Quantitative data was coded and analyzed using Statistical Package for the Social Sciences (SPSS) Version 20. Frequency tables, charts and percentages were used to summarize and present the quantitative data.

Table 4**Summary of Data Analysis**

Research Questions	Independent Variable	Dependent Variable	Statistical Analysis
i) What is the status of ICT in secondary schools in Bungoma County?	Status of ICT	Use of ICT in teaching agriculture <ul style="list-style-type: none"> • Animations • Power point • Information sources • Open learning 	Frequencies Means Percentages
ii) To what extent do secondary school agriculture teachers use ICT as a pedagogical tool in Bungoma County?	Availability of ICT	Use of ICT in teaching agriculture <ul style="list-style-type: none"> • Animations • Power point for teaching • Information sources 	Frequencies Means Percentages
iii) What are the perceptions of agriculture teachers towards ICT use in teaching and learning of agriculture in secondary schools in Bungoma County?	Agriculture teachers perceptions	Use of ICT in teaching agriculture <ul style="list-style-type: none"> • Animations • Power point • Information sources • Open learning 	Frequencies Means Percentages
iv).What are the perceptions of learners towards ICT use in teaching and learning of agriculture in secondary schools in Bungoma County?	Learners perceptions	Use of ICT in teaching agriculture <ul style="list-style-type: none"> • Animations • Power point • Information sources • Open learning 	Frequencies Means Percentages
v) What are the perceptions of school Principals towards ICT use in teaching and learning of agriculture in secondary schools in Bungoma County?	Secondary school Principals perceptions	Use of ICT in teaching agriculture <ul style="list-style-type: none"> • Animations • Power point • Information sources • Open learning 	Frequencies Means Percentages

CHAPTER FOUR

RESULTS AND DISCUSSION

4.1 Introduction

This chapter presents results and discussions based on objectives and research questions of the study. It is divided into the following sections: (i) personal characteristics of the respondents, (ii) the status of ICT facilities for teaching and learning in secondary schools (iii) the extent of use of ICT in teaching and learning agriculture (iv) the perceptions of agriculture teachers on the use of ICT in teaching and learning of agriculture (v) the perceptions of learners on the use of ICT in teaching and learning of agriculture (vi) the Principals' perceptions towards ICT use in teaching and learning of agriculture.

4.2 Rate of Return

The researcher administered a total of 120 questionnaires to the sampled agriculture teachers and 65 school Principals in 65 public secondary schools in Bungoma south and Kimilili/Bungoma Sub counties. However, 98 respondents returned their questionnaires to the researcher. This gives 81.7 % of the rate of return. According to Creswell (2002), a return rate of 75% and above is deemed representative of a study since it reduces the level of sampling bias.

4.3 Personal Characteristics of Agriculture teachers

The background characteristics determined from agriculture teachers are shown in Figures 2. and 3 and Tables 5 and 6.

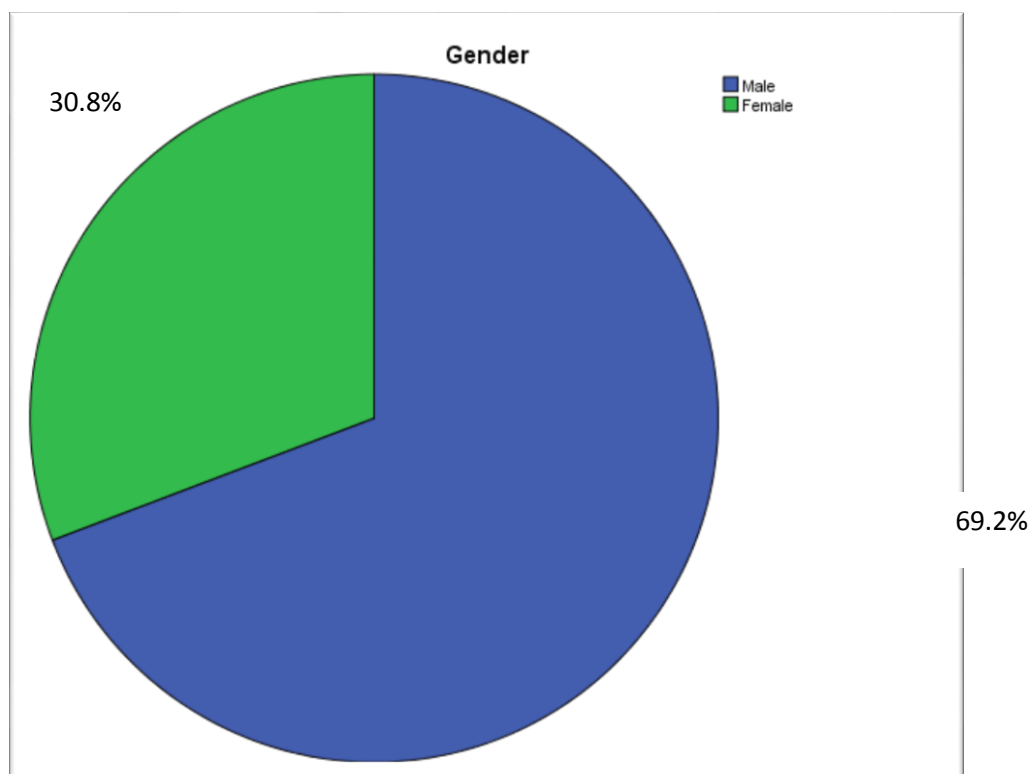


Figure 2: Genders of Agriculture Teachers

Figure 2 shows that majority of the agriculture teachers in the study were male, as compared to female. According to Labbo and Place, (2014), male teachers are positive about ICT in school while female teachers are neutral or negative. Studies have cited female teachers low levels of ICT use due to their inadequate skills, interest and technology accessibility. However, some studies disclose that gender variable is not a forecaster of adoption and use of ICT in schools (Hussein, 2013).

Table 5

Age of Agriculture Teachers

Age	Frequency	Percent
Below 29 years	9	7.7
30-39 years	51	43.6
40-49 years	45	38.5
50-60 years	12	10.2
Total	117	100.0

The results in Table 5 shows that most agriculture teachers were relatively mature in terms of age. This finding reveal that agriculture subject in secondary schools was taught by teachers were youth. There were few young energetic teachers of ages below 29 years who probably may have just graduated from college. Such teachers were in college at a time when ICT as a means of instruction had been introduced. Hence, majority of them had access to ICT and could use them in the teaching and learning of agriculture in secondary schools in Bungoma County.

Table 6

Academic qualification of agriculture teachers

Professional qualification	Frequency	Percent
PhD	0	0
Master's Degree	15	12.8
Bachelor's Degree	75	64.1
Diploma	27	23.1
Total	117	100.0

Concerning the agriculture teachers' academic qualifications, Table 6 shows that a majority of the respondents had a Bachelor's degree in Education, none had PhD degree and minority had a Master's degree in Education and a diploma in Education. This means that a good number of the agriculture teachers had passed through a system of education where ICT have been employed as a pedagogical tool and this could influence their perceptions towards the use of ICT in teaching and learning of agriculture in secondary schools. This could also affect the extent of use of ICT in teaching and learning of secondary agriculture. According to Binde (2010) communication channels used to spread word about an innovation determines its rate of adoption.

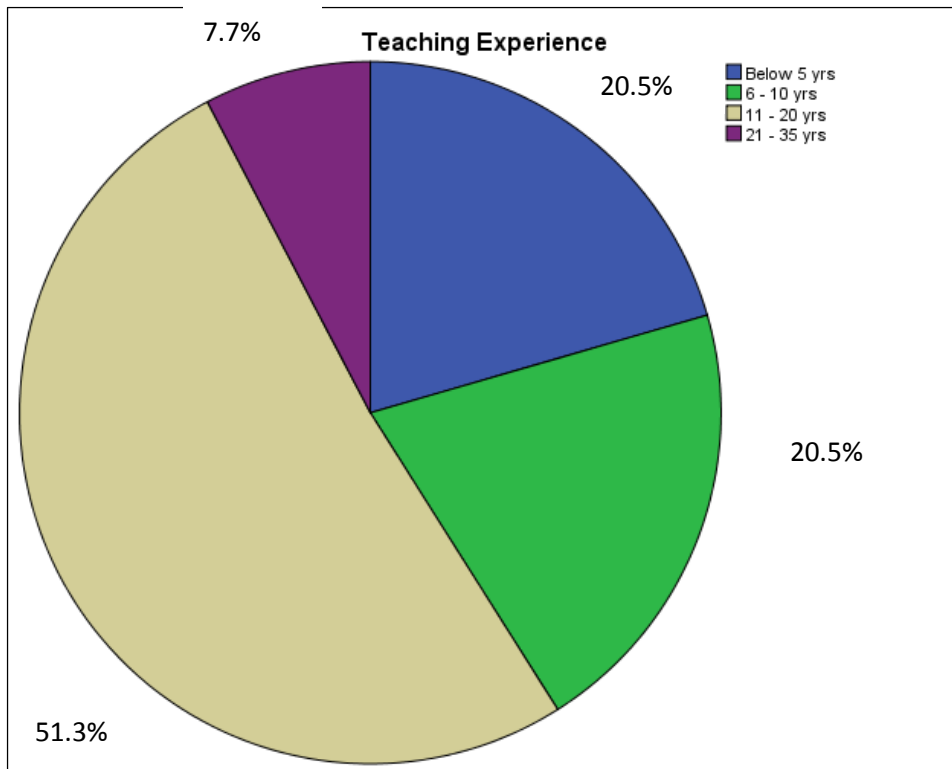


Figure 3: Teaching experience of agriculture teachers

Regarding teaching experience, majority of the agriculture teachers had taught in secondary schools for between 11 to 20 years while minority had taught for 21-35 years. This shows that a good number of the agriculture teachers had taught in secondary schools for a significant period of time therefore had experience that could have a direct positive influence on adoption and use of ICT in the teaching and learning of secondary agriculture in their respective schools.

4.4 Personal Characteristics of Principals

Personal characteristics determined from the Principals included: gender, age and academic qualification. Figure 4 below shows the gender of Principals.

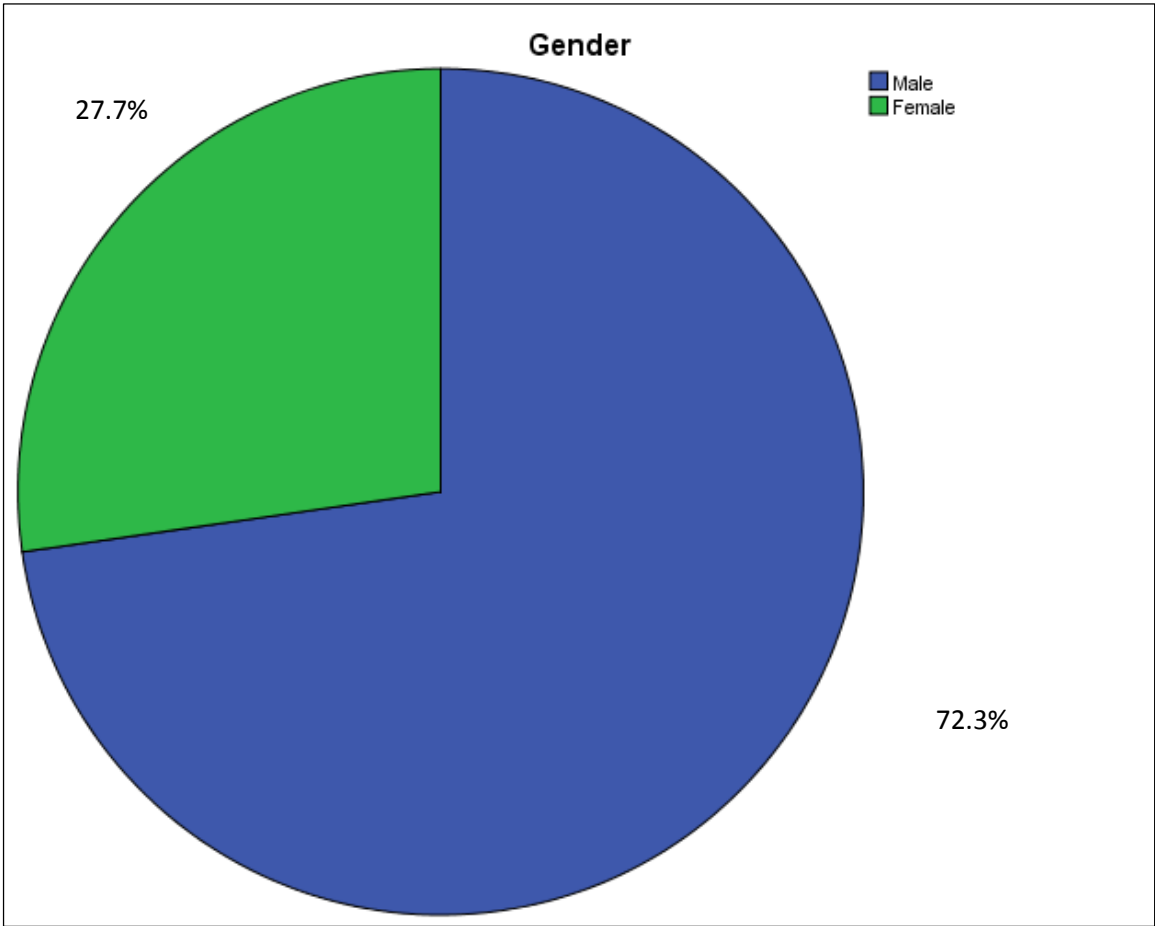


Figure 4: Personal characteristics of Principals

Figure 4 shows that majority of the Principals, were male as compared to female Principals. The findings could influence the perceptions of principals towards integration of ICT in the teaching and learning of secondary agriculture in Bungoma County. According to Awiri (2011) majority of the male Principals (62.4%) had adopted the use of ICT in teaching of science subjects in Nigeria as compared to female Principals (37.6%).

Table 7 below shows the age variation of Principals in secondary schools in Bungoma County.

Table 7**Age of school Principals**

Age	Frequency	Percent
Below 29 years	0	0
30-39 years	8	12.3
40-49 years	43	66.2
50-60 years	14	21.5
Total	65	100.0

Pertaining to age, minority were above 49 years, while majority were between 40 and 49 years old and finally none of the Principals was below 29 years old. The results show that those teachers who hold the position of Principal are advanced in age. The age of the Principals is likely to influence their perceptions towards the use of ICT in teaching and learning of agriculture in secondary schools. One of the Principals interviewed said that his predecessor, who had since retired, was not interested in implementation of ICT integration in teaching and learning in the school. He claimed that the young ones were do it and never made any initiative to introduce it. When the researcher visited his office, he found 10 desktops on the shelf supplied by Computer for schools programme funded by the Government of Kenya that were not in use.

The academic qualification determined from secondary school Principals is shown in Table 8.

Table 8**Academic qualification of school Principals**

Professional qualification	Frequency	Percent
PhD	2	3.1
Master's Degree	6	9.2
Bachelor's Degree	47	72.3
Diploma	10	15.4
Total	65	100.0

With regards to academic qualification, majority of the Principals had a Bachelor's degree in Education, few had a diploma in Education and Master's in Education while minority had a PhD degree. Findings about the school Principals' academic qualifications imply that most of them were well trained through a system of education where different communication channels about the integration of ICT in teaching and learning have been employed. This could influence one to acquire adequate ICT to be used in teaching and learning. This findings also imply that majority of them are able to give informed views pertaining to the use of ICT in teaching of agriculture in their respective schools.

4.5 Status of ICT Facilities for Teaching and Learning of Secondary School Agriculture in Bungoma County

This section presents data related to the objective number one of this study; to document the status of ICT facilities for teaching and learning in secondary schools in Bungoma County. This included finding out the availability and adequacy of ICT ,internet connectivity, radio, computer facilities, laptops, desktops, ipads/tablets, scanners, printers, still digital camera, video digital camera, DVD players, television set, newspapers/feature articles, pamphlets, magazines/feature articles, posters, bulletins, fact sheets, power sources and agriculture resource room.

To establish the availability of ICT in schools, the agriculture teachers were provided with a Check list of ICT and asked to indicate whether they were available or not. Furthermore, they were required to indicate if the available facilities were adequate or not adequate. The researcher then confirmed the availability of ICT in schools using the filled checklists. Table 9 gives a summary of the responses.

Table 9**Status of ICT in secondary schools in Bungoma County by agriculture teachers**

Item	Available & Adequate F (%)	Available & Inadequate F (%)	Not Available F (%)
Internet connectivity	12(18.5)	41(63.0)	12(18.5)
Radio	8(12.3)	14(21.5)	43(66.2)
Computer facilities	20(30.8)	41(63.0)	4(6.2)
Laptops	12(18.5)	45(69.2)	8(12.3)
Desktops	18(27.7)	40(61.5)	7(10.8)
Ipads/Tablets	2(3.1)	24(36.9)	39(60.0)
Scanners	12(18.5)	26(40.0)	27(41.5)
Printers	47(72.3)	16(24.6)	2(3.1)
Still digital camera	2(3.1)	26(40.0)	37(56.9)
Video digital camera	2(3.1)	13(20.0)	50(76.9)
DVD players	2(3.1)	41(63.1)	22(33.8)
Television set	39(60.0)	18(27.7)	8(12.3)
Newspapers/Feature articles	41(63.1)	20(30.8)	4(6.1)
Pamphlets	18(27.7)	39(60.0)	8(12.3)
Magazines	22(33.8)	31(47.7)	12(18.5)
Posters	33(50.8)	26(40.0)	6(9.2)
Bulletins	20(30.8)	31(47.7)	14(21.5)
Fact sheets	10(15.4)	33(50.8)	22(33.8)
Agriculture resource room	2(3.1)	6(9.2)	57(87.7)
Power sources	49(75.4)	12(18.5)	4(6.1)
LCD projectors	13(20.0)	19(29.2)	33(50.8)

N=65

Table 9 shows that most basic ICT such as desktop, newspapers/feature articles, bulletins, LCD projectors, power sources, computer facilities and printers were available in most secondary schools in Bungoma County. The availability could be due to the fact that the government of Kenya has prioritized investment in ICT in educational institutions as articulated by the MOE (2012) in the National Education Support Sector Programme. Concerning adequacy of the ICT in secondary schools, Table 9 further shows that minority of the agriculture teachers in secondary schools maintained that desktop computers were not adequate and that TVs were similarly not adequate. Another 12.3% of the agriculture teachers observed that radios were adequate while 3.1% indicated that DVD players were adequate. Arising from the findings it is apparent that adequacy of DVD players and radios are possibly due to the fact that the technology is becoming obsolete. At the same time, 24.6% indicated that printers were not

adequate. This implies that the basic ICT for teaching and learning of secondary agriculture were available.

A further 29.2 percent were of the opinion that LCD projectors were not adequate. Additionally, 69.2 percent, 40.0 percent, and 20.0 percent maintained that laptops, scanners, and video digital camera were not adequate respectively. The researcher also used an observation guide to verify responses elicited from the agriculture teachers. Following the observation it was confirmed that the ICT that were available in most secondary schools were desktop computers, laptops and printers. Through observation it was confirmed that in most secondary schools, the desktop computers, TVs, radios, DVD players, printers, LCD projectors, scanner, and video digital camera available were in reasonably good working condition but still not adequate as it had been indicated by agriculture teachers. In one sub-county school for instance, there was only one computer which was mainly used by the school secretary. Also observed was that in some schools especially national and extra-county computer technicians were available to assist teachers in handling technical issues.

It was further noted through observation that in the County, the distribution and availability of ICT largely depended on the category of the school and also the mode of acquisition. In seven sub county secondary schools, there was only one desktop computer available in each of them while eleven sub county schools had three desktop computers each. Twenty six others had over 20 desktop computers since they had acquired them from the government under the programme Computer for schools. Three extra county schools and one national school had over 40 desktop computers in the ICT room and every teacher a laptop for use in teaching and learning. These findings imply that the sub county secondary schools were very disadvantaged in terms of available ICT for teaching as compared to national and extra county schools.

The inadequacy of ICT facilities in secondary schools hinders its use in teaching of agriculture as revealed by Kiptalam and Rodrigues (2010) that a relatively low percentage (42%) of principals had access to ICT facilities in their schools. This explains the reason why many secondary schools have not fully embraced the use of ICT in the teaching of agriculture. Findings from this study revealed that poor perceptions were the main obstacles that impeded the integration of ICT in teaching and learning of agriculture. Computers that were already installed in schools were for the exclusive use of computer classes.

4.6 Extent of use of ICT in Teaching and Learning of Secondary School Agriculture in Bungoma County

This section presents data related to the objective number two of this study; to determine the extent of use of ICT in teaching of agriculture in secondary schools in Bungoma County. To determine the extent of ICT use in teaching, agriculture teachers were asked to indicate ways in which they used ICT in the teaching and learning of agriculture. Table 10 shows the agriculture teachers' responses.

Table 10
Extent of use of ICT in teaching and learning of secondary school agriculture

Use of ICT	YES (F)	Percent
Creation of audiovisuals	48	41
Downloading teaching materials from the internet	48	41
Developing the scheme of work and lesson plans	78	66.7
Use of e-mail to send teaching materials to colleagues	45	38.5
I search for open education resources on the computer	54	46.2
I use a computer to type set exams for my students	72	61.5
Use animations during teaching and learning	75	64.1
I have digitized my teaching content	27	23.1
Taking photographs of some livestock breeds and farm machinery	93	79.5
I project my lessons in class	33	28.2
Use of open education resourced materials	48	41.0
Interacting with other teachers on social media	78	66.7
Interacting with students on social media during holidays	9	7.7
Reception of students to use of ICTs in teaching	99	84.6
Have you developed the e-content in agriculture	18	15.4

N=117

Table 10 shows that the most commonly reported use of ICT for teaching included preparation of schemes of work and lesson plans 66.7percent, typesetting exams for students 61.5 percent, use of animations to illustrate abstract concepts during teaching 64.1 percent, taking photographs of some livestock breeds and farm machinery to use for teaching during field trips

79.5 percent and use of social media to interact professionally with other teachers of agriculture 66.7 percent. It is also indicated that 41.0 percent of the respondents used ICT in creating visual presentations and typing assignments for students and also downloading teaching materials in agriculture from the internet. Further 38.5 percent used an e-mail to ask and send teaching materials in agriculture to their colleagues, whereas 46.2 percent searched for open education resources on the computer. Only 7.7 percent used social media to interact with students of agriculture during holidays, 41.0 percent used open education resources to teach agriculture while 23.1 percent had digitized their teaching content. The other 28.2 percent projected their lessons in class and only 15.4 percent had developed the e-content in agriculture. Such level of ICT use does not enable agriculture teachers to radically change their pedagogical practices.

The results were in agreement with a survey by the Ministry of Higher Education, Science and Technology (GOK, 2014), which indicated that majority of teachers trained through in-service courses offered during school holidays and given short period they were exposed to the training, few developed the required ICT skills. Essentially, it is a matter of capturing students' attention.

4.7 Perceptions of Agriculture Teachers on the Use of ICT in Teaching and Learning

This section presents data related to the objective number three of this study which was stated as; to determine the perceptions of agriculture teachers on the use of ICT in teaching and learning of agriculture in secondary schools in Bungoma County. To ascertain the perceptions of agriculture teachers on the use of ICT in teaching in secondary schools, a five point scale was used. Teachers of agriculture were provided with statements and asked to choose the level of agreement by indicating that they: Strongly Disagree (SD) =1, Disagree(D)=2, Undecided(U)=3, Agree(A)=4 or Strongly Agree(SA)=5. The findings are summarized in Table 11

Table 11**Agriculture teachers' perceptions on use of ICT in teaching and learning**

Statement	SD	D	U	A	SA	TOTAL
I am keen to make use of a radio in teaching	65.2	32.7	2.1	-	-	100.0
Teaching is about books, pens, chalk and blackboard	23.8	19.6	0.7	51.4	4.5	100.0
Computers are a luxury for most of my students	51.9	30.3	-	11.2	6.6	100.0
Internet can help me learn many new things	-	5.8	13.8	48.6	31.8	100.0
Use of animations makes agriculture interesting	0.4	6.2	-	50.1	43.3	100.0
Use of ICT can improve teaching	-	7.6	2.4	54.4	35.6	100.0
I prefer the secretary to type for me lesson plans	1.5	17.1	8.7	46.6	26.1	100.0
Use of ICT requires Administrative support	0.5	3.6	0.9	29.3	65.7	100.0
Use of open resourced materials is learner centered	19.2	16.5	1.4	47.3	15.6	100.0
Am confident when using power point slides	21.3	26.4	10.9	30.1	11.3	100.0

N=117

The results in Table 11 indicate that over 50 percent were in the category of agree except for use of radio in the teaching and learning of secondary agriculture. Majority of the respondents over 80 percent were in the category of disagree about computers being a luxury to agriculture students. This implies that agriculture teachers in secondary schools have positive perception towards integration of ICT in teaching and learning. Majority of the respondents agreed that use of ICT can improve teaching of agriculture in secondary schools as compared to those that disagreed. Another minority of the respondents agreed that they prefer to get the school secretary to type for them lesson plans using a computer than do it themselves. Majority of the respondents strongly agreed that use of ICT in teaching requires high administrative support and time. Majority of the respondents agreed that use of open education resources in teaching of agriculture leads to greater student involvement in teaching and learning process and finally minority of the respondents agreed that they feel confident teaching their students using power point slides as compared to those who strongly disagreed and disagreed respectively. Minority of the respondents indicated that they have been trained in basic computer applications in teaching which they felt was not sufficient.

This finding revealed that few agriculture teachers use ICT as a pedagogical tool in secondary schools since more than 50 percent were in the category of disagree. From observation, the findings continue to reveal that the use of ICT as a pedagogical tool is the most challenging situation among agriculture teachers and it is given a very little attention. One female agriculture teacher said that her school had neither internet connectivity nor agriculture resource room that could facilitate the integration of ICT in teaching and learning of agriculture. Again, the study was interested in knowing how agriculture teachers use the ICT in their classroom presentations. The findings revealed that most of them thought that the use of ICT in teaching has something to do with the use of Power Point slides only. One agriculture teacher was quoted saying that the school had two projectors and that he was the only agriculture who used them in teaching and learning.

The above findings revealed that most of the agriculture teachers in secondary schools in Bungoma County have low familiarity on using ICT as a pedagogical tool. This is said to be as result of inadequate ICT in secondary schools and insufficient training in ICT use in teaching and learning from their teacher education colleges. The findings are in line with those by Kafyulilo (2010) and Mwalongo (2011) who found that the most commonly reported use of ICT for teaching among teachers in Tanzania included preparation for notes, teaching and learning resources and examinations. In the similar vein, Kambagha (2008) found that teachers in Dar es Salaam-Tanzania had positive perceptions towards the integration of ICT in teaching and learning but they do not use it in pedagogy due to lack of technical support and insufficient ICT training as a pedagogical tool.

From the findings by Laaria (2013) on implementation of ICT in schools, agriculture teachers receive insufficient training and the focus is mainly on basic ICT skills rather than pedagogical skills. This is consistent with the suggestion by (Cubukcuoglu, 2013) who stresses that the training among teachers should not only include basic technology skills but also provide training on improving pedagogical use of ICT. This kind of training will help agriculture teachers feel confident and competent while using ICT at the right time and opportunity.

In a research report by Pouratashi et al (2010), it was indicated that many teachers who are unskilled in ICT are not prepared to use them in the classroom or in front of students who might probably be more familiar than them. He further argued that lack of competence in the use of ICT accounts for the inconsistency between training and usage. The report further addresses

the issue with a view that most agriculture teachers, even if they have received training in the use of ICT, fail to integrate it into the teaching and learning process. In addition, Pouratashi (2010) indicates that lack of confidence is linked to other barriers affecting the use of ICT in education. Such barriers include: limited technical assistance, lack of competence and the quality of training received in ICT. A number of strategies can be put in place to assist teachers to do things that might not be possible within the traditional classroom by using ICT as pedagogical tool. The respondents emphasized the importance of training and retraining of agriculture teachers to update their ICT skills. Providing agriculture teachers with personal computers, internet access, and in-service courses will encourage the use of ICT in teaching. Proper guidance should be given to the adoption of ICT skills.

4.8 Perceptions of Learners on the Use of ICT in Teaching and Learning of Secondary School Agriculture in Bungoma County

This section presents data related to the objective number four of this study which aimed to determine the perceptions of learners on the use of ICT in teaching and learning of agriculture in secondary schools in Bungoma County. The findings are summarized in Tables 12 and 13.

Table 12

Learners use of ICT in teaching and learning of agriculture

Question	Answer	F	%
Use of ICT by teachers	YES	24	50.0
Availability of computer laboratory	YES	36	75.0
Having an e-mail address	YES	02	4.2
Whether an e-mail address is important	YES	41	85.4
Use mobile phone at home	YES	46	95.8
Use mobile phone to search agriculture information	YES	05	10.4
Are you on social media?	YES	37	77.1
Type of social media used	Facebook	37	77.1

N=780

The results in Table 12 indicate that 50 percent of the teachers used ICT in teaching and learning. It also shows that 75 percent of the schools in the County have computer laboratories. Of the 46 respondents who had access to mobile phones at home, 77.1 percent were on social media Face book and only 10.4 percent used it to search for relevant information in agriculture.

The results also show that minority of them have had e-mail address. Majority of the respondents agreed that an e-mail address is important for a student although none of them used it to send important information to either other students or their teachers. It is evident from the findings that the majority of the students have not had access to e-mail address at home. It is plausible to assert that use of ICT in the teaching and learning of agriculture is a problem for majority of the students in the area which needs a serious attention. The study sought to determine what the situation is in the study area.

Table 13

Use of ICT in teaching and learning of agriculture

Statement	Answer	F	%
Examples of ICT 66.7	computers,laptops,mobile phones, Radios, Video cameras,newspapers,magazines ,projectors	32	
ICT used in teaching 43.8	Laptops, Projectors	21	
Topics where ICT are used 35.4	Livestock production I, crop pests and diseases	17	
Benefits of ICTs 72.9	explains abstract concepts, correct spellings	35	
Subjects where ICT are used 79.2	Physics,chemistry,Biology,Geography,C.R.E History, English and Kiswahili	38	
Visiting cyber café at home	Rarely	04	8.3

N=780

The responses in Table 13 clearly depict that 66.7 percent of the respondents gave examples of ICT as computers, laptops, mobile phones, LCD projectors, television sets, radios, video cameras and magazines. This indicates that the respondents could have interacted with some of the ICT either at home or school. The results of the discussion show that the 43.8 percent of the students are aware of some of the ICT that could be used in the teaching and learning of agriculture in secondary schools. Another 35.4 percent of the responds reported that ICT are used in the teaching of the topics livestock production I and crop pests and diseases. Out of those who use ICT in teaching and learning of agriculture, only laptops and LCD projectors

are used as reported by some respondents. Evidently, the majority of the agriculture students are not regular users of ICT in learning and as such they are likely to be using ICT at internet cafes, school computer laboratories and other places where their chances of continuous use of are limited.

About other subjects that their teachers used ICT in teaching and learning, 79.2 percent of the respondents reported Physics, Chemistry, Biology, Geography, C.R.E, History, English and Kiswahili. The most common mentioned benefit of using ICT in teaching of agriculture was that it is used in explaining abstract concepts and that students could get correct spellings when projected on the wall. Only 8.3 percent of the respondents visit cyber café while at home. The foregoing shows that the majority of the students had a positive perception towards integration of ICT in the teaching and learning of agriculture. This is because the world is increasingly becoming an information society and heavily reliant on the use of ICT as a means of communication and business transactions (EL-Daou, 2015). The findings are inconsistent with Serin (2011) study which found that both boys and girls exhibited negative attitudes toward ICT in education.

4.9 Perceptions of School Principals on the Use of ICT in the Teaching and Learning of Agriculture in Secondary Schools

This section presents data related to the objective number five of this study; to determine the Principals’ perceptions towards ICT use in teaching and learning of agriculture in secondary schools in Bungoma County. The findings are summarized in Tables 14, 15, 16 and 17.

Table 14

Principal’s knowledge on ICT use in teaching and learning of agriculture

Statement	Response	f	%
Has a policy on ICT use in teaching	YES	7	10.8
Awareness of ICT by teachers	YES	49	75.3
Teachers trained in ICT use in teaching	YES	24	36.9
Teachers preparedness to use ICT in teaching	YES	9	13.8
Equal opportunities for teachers in ICT training	YES	37	56.9

N=65

Only 10.8 percent of the respondents indicated that their schools have a policy on the use of ICT for teachings as compared to those that were aware of the benefits of using ICT in teaching

and learning. The high awareness of the benefits of ICT is attributed to the mounting of SEMASSE in-service course for teachers of mathematics and science subjects. Another 36.9 percent of the respondents indicated that their teachers had undergone training on the use of ICT for teaching and learning. This is in line with the study of Buabeng-Andoh, and Totimeh, (2012) of participating teachers of gifted children which found out those teachers had positive attitude toward ICT which was significantly influenced by their training, Avwiri (2011) discovered perceived attitude towards computers as a significant predictor of level of computer use.

On the preparedness of agriculture teachers on the use of ICT in teaching, only 13.8 percent agreed that their agriculture teachers are prepared to use ICT in teaching and learning. Further 56.9 percent of the respondents indicated that all teachers are given an equal opportunity to train on the use of ICT for teaching.

Table 15

Support given to ICT use in teaching and learning by school Principals

Statement	f	Percentage
Purchase of data bundles	4	6.2
Training teachers on ICT use	9	13.8
Acquisition of ICTs material for teaching	43	66.2
Appraising teachers who integrate ICT in teaching	65	100.0

N=65

On the support given to ICT use in teaching and learning by school Principals only 6.2 percent of the respondents indicated that they always purchase data bundles for their teachers to prepare for ICT lessons. Further 13.8 percent of the respondents indicated that they trained teachers on the integration of ICT in teaching and learning. The also pointed out that their agriculture teachers require further training as they were not fully prepared to use ICT in teaching and learning. Another 66.2 percent of the respondents indicated that they had acquired ICT teaching materials for their teachers while 100% showed that they always appraise their teachers whenever they integrate ICT in teaching and learning. In one extra county school, the head teacher hired an ICT expert to teach the whole staff on how to use ICT in teaching and learning. The above findings reflect positive perception towards use of ICT for teaching and learning by

secondary school Principals. However this is contrary to the study on application of ICT in Nigerian secondary schools whose results indicate 70 respondents (40%) citing widespread ignorance and misconception about ICT among teachers and administrators (Nihuka & Voogt, 2011). Kihwele (2012) also in his review of literature found out resistance to change and negative attitude as a significant barrier toward integration of ICT in teaching and learning by secondary school teachers.

Table 16

Principals' perception on integration of ICT in teaching and learning

Statement	f	Percentage
Teachers not fully prepared	44	67.7
Lack of electricity in schools	35	53.8
Integration of ICT is time consuming	51	78.5
Lack of ICT technicians	30	46.2

N=65

On the challenges of integrating ICT in teaching and learning by Principals' majority indicated that their teachers were not fully prepared to integrate ICT in teaching and learning, their schools were not connected to electricity and that preparation of an ICT lesson requires more time than that which is not ICT integrated. Less than 50 percent of the respondents pointed out that their schools don't have ICT technicians.

.Table 17 below shows the views of Principals in Bungoma County about the strategies that can be employed to improve on integration of ICT in teaching and learning.

Table 17

Strategies to improve on integration of ICT in teaching and learning

Statement	f	Percentage
Having more workshops	53	81.5
Connecting all schools with power	55	84.6
Employment of ICT technicians	30	46.2

N=65

From Table 17, 81.5 percent of Principals felt that organizing for more workshops on the integration of ICT in teaching and learning could improve the use of ICT in pedagogy. Another

84.6percent were of the opinion that all schools should be connected with power while 46.2.9 percent suggested that there is need to employ ICT technicians in every school to improve the integration of ICT in teaching and learning. Further, Principals, just like the agriculture teachers, were in agreement that ICT were useful when used in teaching and learning. One of the Principals indicated that he taught Biology and Chemistry in addition to handling administrative duties. The Principal said that use of animations helped learners internalize the abstract concepts better in the course of teaching than when the ICT was not integrated.

The Principal gave an example that when teaching the evolution during a Form 4 Biology lesson, learners are able to grasp the idea even when the teacher is not clear. Another Principal indicated that when teaching how energy is lost from one energy level to another in Chemistry, students understand better when they can see and hear. In addition, teachers can use ICT to create content in abstract areas such as glaciation in Geography to help learners conceptualize difficult concepts. Another Principal confirmed that teachers were interested in using ICT, as they were then now requesting for some more equipment like LCD projectors, laptops and modems. Another Principal in an extra county school asserted that teachers are eager to use ICT because since schools opened, the head of science department in the school has been requesting the Principal to buy an LCD projector and a laptop to enable them prepare Power Point presentations. He also indicated that use of ICT can complement the classroom teacher and that students can play the CDs in the absence of the teacher and hold group discussions especially during preparation time and weekdays and end up having constructive learning.

However, although ICT offers several benefits in teaching and learning, some Principals felt that use of ICT in pedagogy could kill the reading culture and may be misused in spite of its advantages. Another Principal from a sub county school explained that one of the disadvantages of using ICT in teaching and learning is loss of classroom control by the agriculture teacher. She claimed that it creates loopholes for students because some come with their own flash discs and CDs. Some of the perceptions from the Principals' sampled concurred with the agriculture teachers' responses. In spite of the fact that majority of the Principals felt use of ICT was useful, it was noted that for it to be effective it required the agriculture teacher's supervision which must be enhanced: Sometimes ICT is misused because teachers leave students to interact with the materials without the teachers guidance some of which could not be within the syllabus. It distracts students if unsupervised since they may start watching their own content such as music, movies and even pornographic materials. One of the Principals felt

that the ICT in teaching and learning provides the agriculture teacher with more content and assists the students who are below average in performance. The Principal noted that agriculture teachers generally had positive perceptions on the use of ICT in teaching and learning as agriculture teachers find them better resource compared to textbooks.

The Principals generally agreed that use of ICT in teaching and learning of secondary agriculture was useful. However, these perceptions appear to contradict the low level of use of ICT in teaching agriculture in secondary schools in Bungoma County. While the majority of the Principals believed that the use of ICT were important, the low levels of use clearly indicate disinterest by some agriculture teachers. This contradiction could possibly be as a result of lack of training or other factors such as accessibility or availability of the ICT. Findings from some of the principals also pointed to reluctance among agriculture teachers to use ICT in the classroom due to lack of confidence and being overwhelmed by the complexity of ICT.

This perceptions of secondary school Principals on the use of ICT are similar to those of other studies conducted in Kenya that indicate that teachers were positively predisposed to the use of ICT in teaching and learning. For example, a study on teachers' perception of the contribution of ICT to pupils' performance in Christian religious education in 2010 found that teachers looked forward to the establishment of the classroom of the future and what was needed were institutional reforms at the school level which were critical to leverage ICT use in schools (Kosoko-Oyedeko & Tella, 2010). Miima et al (2013) also found that teachers of Kiswahili had positive attitude and were willing to integrate ICT in teaching while Makhanu (2012) concurs that secondary school Principals generally had positive attitude towards the adoption of e-learning in schools. The above findings reflect positive perception toward use of ICT by secondary school Principals.

CHAPTER FIVE

SUMMARY, CONCLUSIONS AND RECOMMENDATIONS

5.1 Introduction

This chapter provides a summary, conclusion and recommendations of the study that was carried out to determine the perceptions of teachers, learners and school Principals on the integration of ICT in teaching and learning of secondary school agriculture in Bungoma County, Kenya.

5.2 Summary of the Study

The main purpose of this study was to establish the teachers', learners' and school Principals' perception on the use of ICT in the teaching and learning of secondary agriculture in Bungoma County and propose ways which can be taken to improve the use of ICT in the area. The study was guided by the following objectives; to document the status of ICT for teaching Agriculture in secondary schools; to determine the extent of use of ICT by Agriculture teachers in teaching in secondary schools; to determine the perceptions of agriculture teachers on the use of ICT in teaching and learning of agriculture in secondary schools; to determine the perceptions of learners on the use of ICT in teaching and learning of agriculture in secondary schools and to determine the Principals' Perceptions towards ICT use in teaching and learning of agriculture in secondary schools in Bungoma County.

Related literature was reviewed on agriculture teaching approaches in Kenya, ICT resources available in secondary schools in Kenya, ICT utilization in teaching of agriculture in secondary schools, factors affecting teachers' perceptions on the use of ICT for teaching and benefits of using ICT in secondary schools. However the literature review did not reveal any study on the perceptions of teachers, learners and school Principals on the use of ICT as a teaching tool in secondary school agriculture in Bungoma County.

The study used a descriptive survey research design. Census and simple random sampling procedures were used to arrive at the sample of agriculture teachers, while purposive sampling was used to select the Principals and form three agriculture students. The sample consisted of 120 agriculture teachers and 65 Principals and 780 form three agriculture students. The data was analyzed using the SPSS version 20.0 and summarized using descriptive statistics such as frequencies, percentages and means and presented in tables. Qualitative data was evaluated, classified and categorized into appropriate themes based on the objectives and then coded.

Analyses of qualitative data collected using document report analysis was an on-going process where emerging trends were categorized basing on research objectives. Qualitative data was presented in narratives. The summary of the study findings are as follows:

The study findings disclosed that the key ICT resources available in schools were desktop computers, tablets, scanners, printers, television set, newspapers, pamphlets, feature articles, power sources and DVD players. The ICT however was inadequate, with only a few of the schools registering adequacy in desktop computers, internet connectivity, ipads/tablets, still digital camera, video digital camera and agriculture resource room.

Another finding was that the use of ICT in the teaching of agriculture was more often in the topics livestock production I and crop pests and diseases. It was disclosed that ICT were mainly used in preparation of schemes of work and lesson plans in most schools. Teachers of agriculture also perceived that using ICT reduced time wastage, enhanced their job performance and job satisfaction. However teachers were not well equipped with relevant ICT skills for use in the teaching and learning of secondary agriculture.

The study also established that majority of the agriculture teachers had a positive perception towards ICT utilization in teaching and learning. They emphasized the importance of in service courses for agriculture teachers to update their ICT skills. The importance of integrating ICT in teaching according to agriculture teachers were found to be reduced time spent on explaining abstract concepts, improved communication and improved quality of lesson delivery where students of hearing impairments were not disadvantaged.

The study established that the majority of the learners had a positive perception towards ICT in the teaching and learning of agriculture. It is very heartwarming that the majority of the respondents had favorable attitude towards use of ICT in learning of agriculture. It is evident from the findings that majority of the respondents agreed that having an e-mail address is important. Finally the study established that majority of the Principals believe use of ICT offers real advantage over traditional methods of instruction. Further, Principals, just like the agriculture teachers, were in agreement that ICT were useful when used in teaching and learning. However, most of them believed that teaching with ICT is not easy and that it required all teachers to train in their use in pedagogy.

5.3 Conclusions

The following conclusions were made based on the findings of the study which was guided by five research questions.

- i. There was adequacy of ICT resources like desktop computers, tablets, scanners, printers, television set, newspapers, pamphlets, feature articles, power sources and DVD players in most secondary schools in Bungoma County. However there was an acute inadequacy in internet connectivity, ipads/tablets, still digital camera, and video digital camera and agriculture resource rooms in these schools.
- ii. The use of ICT in the teaching and learning was more often in biology, chemistry and physics but in agriculture it was limited to the topics livestock production I and crop pests and diseases. However teachers were not well equipped with relevant ICT skills for use in the teaching of secondary agriculture.
- iii. Majority of the agriculture teachers had a positive perception towards ICT utilization in teaching. They emphasized the importance of in service courses for agriculture teachers to update their ICT skills.
- iv. Although ICT was found to be useful and appropriate in the teaching and learning, agriculture teachers were not adequately prepared to use them.

5.4 Recommendations

The following are the recommendations emanating from the study findings:

- i. Parents and communities to consider investing in ICT for effective teaching and learning of secondary agriculture
- ii. Teachers of agriculture should attend workshops on ICT integration in teaching and learning
- iii. . All secondary school Principals should have a school policy on the use of ICT in teaching and learning

5.4.1 Recommendations for further study

The following are the recommendations for further study emanating from the study findings:

- i. The effect of SMASE training programme on the use of ICT in teaching of agriculture in secondary schools in Bungoma County, Kenya.
- ii. Effects of ICT use in teaching and learning of agriculture on learners with hearing impairments.

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APPENDIX A: AGRICULTURE TEACHERS’ QUESTIONNAIRE

Introduction

I am Wasike A. Juma, a Master of Science in Agricultural Education student at Egerton University, Njoro Campus. As part of my studies, I am conducting a research study on

perceptions of teachers, learners and school Principals on the use of ICT as a teaching tool in secondary school agriculture in Bungoma County, Kenya. You have been selected to participate in the study. You are requested to sincerely respond to all the items in the questionnaire as truthfully as possible. Your contribution will be useful in not only this study but also in future teaching of secondary school agriculture. Your responses are highly valued and will be treated with at most confidentiality.

PART A: Personal Information

- 1. Gender: Male () Female ()
- 2. Age: Below 29yrs () 30-39yrs () 40-49yrs () 50-60yrs ()
- 3. For how long have you taught agriculture in a secondary school?
Between 5 yrs () 6-10 yrs () 11-20 yrs () 21-35 yrs ()
- 4. Professional Qualifications Diploma () Master’s Degree ()
Bachelor’s Degree () PhD ()

PART B: Teachers Perceptions towards the Use of ICTs as a Pedagogical Tool

The statements presented in the second column in the matrix below describe the various aspects of Teachers’ attitude towards the use of ICT as a pedagogical tool. Please rate each statement by ticking the appropriate box on the scale against it to the extent to which you agree or disagree on the likert scale below.

Strongly disagree (SD)=5,Disagree(D)=4,Uncertain(U)=3Agree(A)=2,Strongly agree(SA)=1.

	Item	SD	D	U	A	SA
1	I am keen to make use of a radio in teaching agriculture					
2	To me teaching is normally about books,pens,pencils,chalk and the blackboard					
3	Computers are a luxury for most of my students considering their poor social background					
4	I know that use of internet can help me to learn many new things in agriculture subject					
5	I believe that use of animations makes agriculture subject more interesting					
6	I believe that use of ICT can improve teaching of agriculture					

	Item	SD	D	U	A	SA
7	I prefer to get the school secretary to type for me lesson plans using a computer than do it myself					
8	The use of ICT in teaching requires high administrative support and time					
9	The use of open education resources in teaching leads to greater student involvement in the teaching and learning process					
10	I feel confident teaching my students using power point slides					

11. Are you trained in use of ICT? () YES () NO

12. If yes, which form of training?

.....

13. Do you consider that training adequate? YES () NO ()

PART C: The Extent of Use of ICT by agriculture Teachers for Teaching.

The statements presented below describe the various aspects to the extent which teachers use ICT as a pedagogical tool. Put a tick (✓) against the appropriate response.

1. I create visual presentations, graphics, charts, drawings and type assignments for students by using a computer YES () NO ()

2. I always download teaching materials in agriculture from the internet. YES () NO ()

3. I use computer in developing the scheme of work and lesson plans in agriculture
 YES () NO ()

4. I use e-mail to ask and send teaching materials in agriculture to my colleagues
 YES () NO ()

5. I search for open education resources on the computer YES () NO ()

6. I use a computer to type set exams for my students YES () NO ()

7. I use animations to illustrate abstract concepts during teaching YES () NO ()

8. I have digitized my teaching content YES () NO ()

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APPENDIX B: CHECK LIST OF ICT RESOURCES IN SECONDARY SCHOOLS

1. Name of School _____

2. Type of School

National () Extra-County () County () Sub-county ()

Item	Available and adequate	Available and inadequate	Not available
Internet connectivity			
Radio			
Computer facilities			
Laptops			
Desktops			
Ipads/Tablets			
Scanners			
Printers			
Still digital camera			
Video digital camera			
DVD players			
Television set			
Newspapers Feature articles			
Pamphlets			
Magazines Feature articles			
Posters			
Bulletins			
Fact sheets			
Power sources			
Agriculture resource room			

APPENDIX C: PRINCIPALS' QUESTIONNAIRE

Introduction

I am Wasike A. Juma, a Master of Science in Agricultural Education student at Egerton University, Njoro Campus. As part of my studies, I am conducting a research study on perceptions of teachers, learners and school Principals on the use of ICT as a teaching tool in

Type	Number	Adequacy

6. Does your school have a policy on the use of ICT for teaching? YES () NO ()

7. If yes, explain

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8. Comment on the preparedness of agriculture teachers on the use of ICT in teaching in your school.....

9. What support is given to the use of ICT in teaching in your school?

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10. Are the teachers aware of the benefits of using ICT in teaching? YES () NO ()

11. If yes, explain

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12. What are the challenges your school is facing in using ICT for teaching?

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13. What do you think can be done to improve the use of ICT in teaching in your school?

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14. Have your teachers undergone any training on ICT use in teaching? YES () NO ()

15. If yes, which types of training?

16. Are all the teachers given an opportunity to go for training or only some of them? Please explain your answer.

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.....

Thank you for your co-operation.

APPENDIX D: STUDENTS' FOCUS GROUP DISCUSSION GUIDE

The purpose of this focus group discussion is to gather information regarding the perception of students towards ICT use in teaching of agriculture in secondary schools in Bungoma County, Kenya. The information you provide will be kept confidential and will be solely used for research.

1. Do you know what ICT are? Give examples of ICT.

2. Do your agriculture teachers use ICT when teaching? Which ICT? Which topics?
3. What are the benefits of using ICT in teaching of agriculture?
4. In which other subjects do your teachers use ICT for teaching?
5. Do you have a computer library?
6. Do you ever visit it? How often? What do you do there? What kind of information do you get? Do you get to handle computers?
7. How many of you have email addresses? Do you use it for educational purposes?
8. Do you think having an e-mail address is important for a student?
9. Have you ever used ICT to do assignments in agriculture?
10. Do you use a mobile phone at home? If yes, do you use it to search for relevant information in agriculture?
11. Are you on social media? Which type of social media? Do you use it to search for agricultural information?
12. Name the topics in agriculture syllabus that your teacher uses an overhead projector in teaching?
13. How many times do visit a cyber café to search educational information from the internet while at home?

Thank you for your co-operation.

APPENDIX F: AUTHORITY FROM NACOSTI



NATIONAL COMMISSION FOR SCIENCE, TECHNOLOGY AND INNOVATION

Telephone: +254-20-2213471,
2241349, 3310571, 2219420
Fax: +254-20-318245, 318249
Email: dg@nacosti.go.ke
Website: www.nacosti.go.ke
When replying Please quote

9th Floor, Utalii House
Uhuru Highway
P. O. Box 30623-00100
NAIROBI-KENYA

Ref: No.

Date:

NACOSTI/P/16/73124/14317

19th October, 2016

Alex Juma Wasike
Egerton University
P.O. Box 536-20115
EGERTON.

RE: RESEARCH AUTHORIZATION

Following your application for authority to carry out research on "*Perceptions of teachers, learners and school heads on the use of ICTs as a teaching tool in secondary school agriculture in Bungoma County, Kenya,*" I am pleased to inform you that you have been authorized to undertake research in **Bungoma County** for the period ending **18th October, 2017**.

You are advised to report to the **County Commissioner and the County Director of Education, Bungoma County** before embarking on the research project.

On completion of the research, you are expected to submit **two hard copies and one soft copy in pdf** of the research report/thesis to our office.

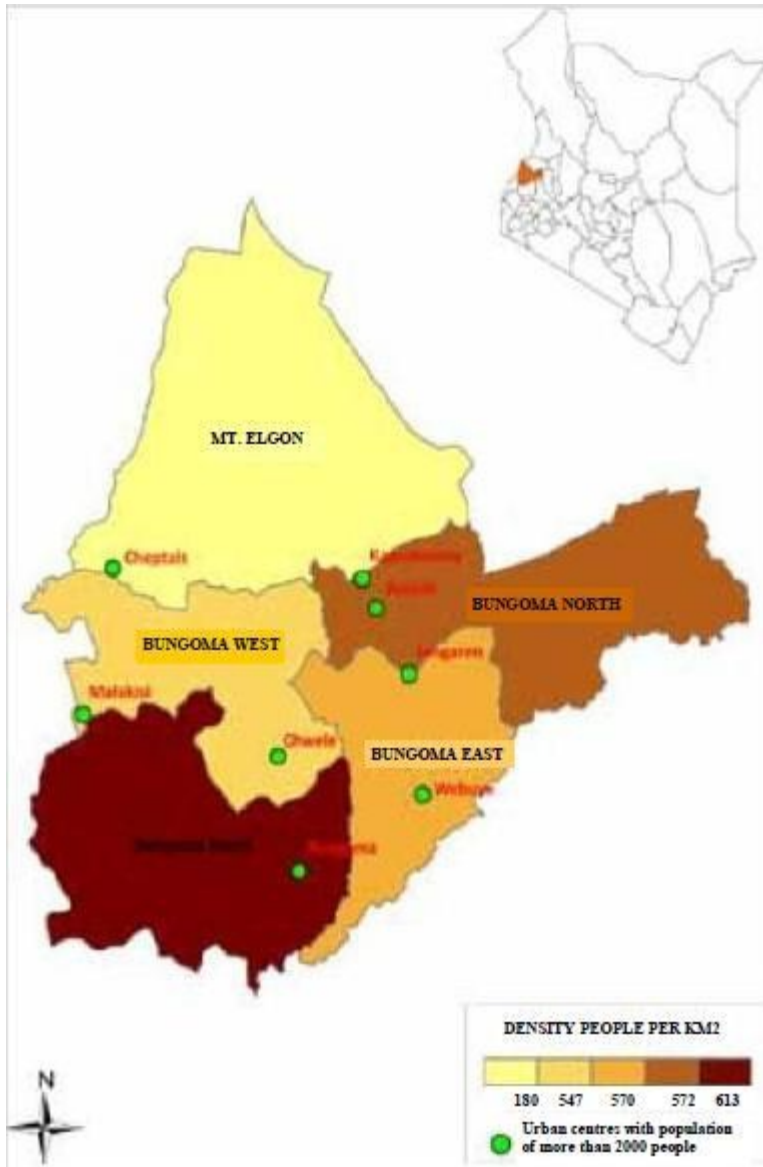
BONIFACE WANYAMA
FOR: DIRECTOR-GENERAL/CEO

Copy to:

The County Commissioner
Bungoma County.

The County Director of Education
Bungoma County.

APPENDIX G: MAP OF BUNGOMA COUNTY



**APPENDIX H: AUTHORITY FROM THE MINISTRY OF EDUCATION, SCIENCE
AND TECHNOLOGY**



REPUBLIC OF KENYA

MINISTRY OF EDUCATION, SCIENCE AND TECHNOLOGY
State Department of Education – Bungoma County

When Replying please quote
e-mail: bungomacde@gmail.com

Ref No: BCE/DE/19 VOL I/245

County Director of Education
P.O. Box 1620-50200
BUNGOMA
Dates: 7th December, 2016

**The Sub – County Directors of Education
BUNGOMA COUNTY**

**RE: AUTHORITY TO CARRY OUT RESEARCH – ALEX JUMA WASIKE REF. NO –
NACOSTI/P/16/73124/14317**

The bearer of this letter Alex Juma Wasike is a student of Egerton University. He has been authorized to carry out research on “ *Perceptions of teachers, learners and school Heads on the use of ICT as a teaching tool in secondary school agriculture in Bungoma County, Kenya.*” for a period ending 18th October, 2017.

Kindly accord him the necessary assistance.

A handwritten signature in black ink, appearing to read 'E. Olero'.

**ELIJAH ADIE OLERO
FOR: COUNTY DIRECTOR OF EDUCATION
BUNGOMA COUNTY**

APPENDIX I: AUTHORITY FROM COUNTY COMMISSIONER

REPUBLIC OF KENYA



THE PRESIDENCY
MINISTRY OF INTERIOR AND COORDINATION OF NATIONAL GOVERNMENT

Telephone: 055- 30326
FAX: 055-30326
E-mail: ccbungoma@yahoo.com
When replying please Quote

Office of the County Commissioner
P.O. Box 550 - 50200
BUNGOMA

7th December, 2016

REF: ADM.15/13/282

TO WHOM IT MAY CONCERN

RE: RESEARCH AUTHORIZATION

The bearer of this letter Mr Wasike Alex Juma is a student at Egerton University and has sought authority to carry out a research on, "**Perceptions of teachers, learners and school heads on the use of ICTs as a teaching tool in secondary school agriculture in Bungoma County, Kenya,**" for the period ending on 18th October, 2017.

Authority is hereby granted for the specific period and any assistance accorded to him in this pursuit would be highly appreciated

A handwritten signature in blue ink, appearing to read 'G.W. Khaemba', with a long horizontal line extending to the right.

G.W. Khaemba
For County Commissioner
BUNGOMA COUNTY

APPENDIX J: AUTHORITY FROM GRADUATE SCHOOL

EGERTON

Tel: Pilot: 254-51-2217620
254-51-2217877
254-51-2217631
Dir. line/Fax: 254-51-2217847
Cell Phone
Extension: 3606



UNIVERSITY

P.O. Box 536 - 20115
Egerton, Njoro, Kenya
Email: bpgs@egerton.ac.ke
www.egerton.ac.ke

OFFICE OF THE DIRECTOR GRADUATE SCHOOL

Ref.: EM11/3199/12

Date: 10th September, 2016

The Director General
National Commission for Science Technology and Innovation
P. O. Box 30623-00100,
NAIROBI.

Dear Sir,

**RE: REQUEST FOR RESEARCH PERMIT – ALEX WASIKE JUMA
REG. NO. EM11/3199/12**

This is to introduce and confirm to you that the above named student is in the Department of Agricultural Education, Faculty of Education & Community Studies, Egerton University.

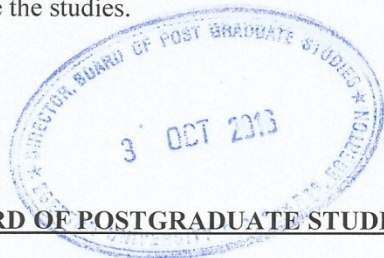
He is a bonafide registered Masters student in this University. His research topic is entitled “**Perceptions of Teachers, Learners and School Heads on the Use of ICTs as a Teaching Tool in Secondary School Agriculture in Bungoma County, Kenya.**”

He is at the stage of collecting field data. Please issue him with a research permit to enable him undertake the studies.

Yours faithfully,

Prof. Nzula Kitaka

DIRECTOR, BOARD OF POSTGRADUATE STUDIES



NK/vk

*“Transforming Lives Through Quality Education”
Egerton University is ISO 9001:2008 Certified*

APPENDIX K: A LETTER TO SCHOOL PRINCIPALS

WASIKE ALEX JUMA DEPT OF
AGRIC, EDUC & EXTENSION.
EGERTON UNIVERSITY
P.O BOX 536,
NJORO, KENYA.
1ST SEPTEMBER 2016

THE PRINCIPAL,

.....
.....
.....

Dear sir/madam

REF: RESEARCH ON PERCEPTIONS OF TEACHERS, LEARNERS AND SCHOOL PRINCIPALS ON THE USE OF ICT AS A TEEACHING TOOL IN SECONDARY SCHOOL AGRICULTURE.

I am in a process of carrying out a study on the perceptions of teachers, learners and school Principals on the use of ICT as a teaching tool in secondary school agriculture in Bungoma County. The needed information is to be gotten from the Principals, agriculture teachers and Form Three agriculture students. I plan to visit your school in the morning/afternoon of.....September 2016 for the research. I will require a discussion with twelve Form Three agriculture students for about 30 minutes. This research is a part of my Post Graduate Science Degree Program in Agricultural Education at Egerton University, Njoro campus. Any assistance provided to me will be highly appreciated. Thank you in advance.

Yours faithfully,

WASIKE ALEX JUMA.