RELATIONSHIP BETWEEN AGRICULTURE KNOWLEGDE AND FORM FOUR GRADUATES' FARMING ACTIVITIES AND ATTITUDES TOWARDS FARMING IN NYANDARUA WEST SUB COUNTY, KENYA

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DECLARATION AND RECOMMENDATION

Declaration

This research project is my original work and to the best of my knowledge, has not been presented in this university for award of any diploma or degree.

Signature…… Date……..

Charles Mwangi Njenga

EM11/2339/09

Recommendation

This Research Project Report has been submitted with my approval as a University supervisor.

Signature…… Date……..

Dr. Maurice O. Udoto

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DEDICATION

I would like to dedicate this work to my wife Pauline and sons Francis, Anthony and Celestine, whose support, both personal, financial, was a constant source of strength, and made this report possible. Special dedication goes to the almighty God, who gave me the physical and mental strength to undertake and accomplish this project in the prescribed period.

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ABSTRACT

Agriculture contributes the highest in the country's economy. Despite agriculture being taught in secondary schools, many secondary school graduates seem not to participate in farming activities in Nyandarua West Sub-County. Although it is not clear whether farmers who have studied agriculture in secondary school are making use of the knowledge gained and whether they find it helpful in their careers, there has never been any comprehensive study to investigate the relationship between secondary school agriculture knowledge and Form Four graduates' farming activities in Nyandarua West Sub-County. The purpose of this study was to fill this gap. The target population was farmers in Nyandarua West Sub-County who sat for Kenya Certificate of Secondary Education (K.C.S.E) in the period between year 2000 and 2007. Ex-post-facto research design was used in this study. Snow ball sampling procedure was used so as to establish a sample size of 100 respondents collected from five administrative divisions. A Questionnaire and observation schedules were used in data collection. The researcher discussing the items in the instrument with two experts from the Department of Agricultural Education and Extension and colleagues determined the content validity of the instrument. Statistical Package for Social Sciences (SPSS) was used to analyze data using descriptive statistics (means and percentages) and inferential statistics (t-test and chi-square) to test the hypothesis at 0.05 significance level. The study results indicates that agricultural knowledge had a positive relationship with adoption of diversification and use of technology in farming. The study also found significant relationship between secondary school agriculture knowledge on students' attitude towards agriculture. The study concludes secondary school agriculture knowledge positively affect attitude of the students towards farming and contributes to adoption of technologies and diversification. The study recommends for policies to be strengthened to promote acquisition of agriculture knowledge in order to improve participation in farming. The researcher recommends that schools and educators should enhance their efforts aimed at encouraging the students taking secondary school agriculture subject to interact with superior modern technologies in agriculture since it promotes increased production. Agricultural educators should encourage many students in secondary school to study agriculture subject up to Form Four level since it enables the graduates to adopt a profitable diversification portfolio in their farming.

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LIST OF ABBREVIATONSAND ACRONYMS

DEO	Sub-County Education Office
KCSE	Kenya Certificate of Secondary Education
KYF	Kenya Youth Foundation
KIE	Kenya Institute of Education
KNEC	Kenya National Examination Council
MOA	Ministry of Agriculture
MOE	Ministry of Education
SPSS	Statistical Package for Social Sciences
SFE	Students in Free Enterprise-Kenya
8-4-4	8 Years Primary; 4 Years secondary; 4 Years University

CHAPTER ONE
INTRODUCTION

1.1 Background of the Study

Agriculture has an immense impact to humanity in terms of global food supplies, hunger alleviation, economic development and provision of employment (Nova, 1996). Therefore, agriculture can be considered as a pillar for human survival and hence the importance of agriculture being taught at all levels of education. In the U.S.A, formal programs in agricultural education are conducted at secondary schools, community colleges and universities. As a vocational educational program, agricultural education focuses on three major components - formal classroom instruction, career experience programmes and leadership development. These components are delivered through a competency based curriculum in the context of agriculture in the USA (Lloyd and Osborne, 1988). Beyond the secondary agriculture program, community colleges and universities provide excellent opportunities for students to specialize and gain skills and knowledge in agriculture (Williams and Dollisso, 1998).

In sub-Saharan Africa, the agricultural sector is still the dominant provider of employment, and it remains crucial for economic growth. Moreover in most parts of Africa food security is still a critical issue and therefore food production will continue to be a major focus of agricultural education and training institutions (Vandenbosch, 2006). In some countries in sub-Saharan Africa, agriculture has been introduced in general school curricula at secondary education levels as a compulsory or as an optional subject. Development of the agricultural sector in many African countries hinges on the development of the smallholder systems that have sustained African agriculture to date, but continue to face challenges of low productivity.. Poverty in Africa has been found to be predominantly a rural phenomenon. About 75% of the world's poor are believed to work and live in rural areas, and it is estimated that, by the year 2020, 60% of the poor will still be rural (Olwande and Mathenge, 2010).

In Kenya agriculture is offered at all levels of the formal education system. The primary level has 8 years of compulsory universal education system and agriculture is integrated in the science subject. The secondary schools level lasts for four years and agriculture is offered as an optional subject. There are 3 categories of tertiary education levels, that is, certificate, diploma, and degree, and agriculture is offered in the three levels (Kironchi & Mwangombe, 2007). The teaching of agriculture in Kenya is expected to promote the acquisition of skills for

self–reliance in farming (Mwiria, 2002). It is viewed as particularly critical for the development of Kenya as agriculture is the main economic activity in most parts of the country. The overall objective of the course is the development of basic agricultural skills relevant to Kenya and the learners' home environment. The subject is meant to have a large practical component to enable learners acquire useful agricultural practice skills. According to Omiti *et al.* (2009), agriculture supports the livelihoods of about 80% of the rural population in Kenya (about 85% of them being small-scale farmers). Most of these people are engaged in agricultural activities, which in turn contribute to the production of food, raw materials for industries, employment, and market for industrial goods, foreign exchange, and capital for national development, and helps to correct the balance of trade deficit (Government of Kenya, 2009). Only 22% of land in Kenya is arable though another 40% has potential for irrigated agriculture. The agricultural sector employs 70% of the national labor force through forward and backward industrial linkages, thus providing food and incomes to individuals and households (Omiti *et al.,* 2009). Agriculture was included in the secondary school curriculum with an objective of equipping the students with practical skills that may help them to engage in agriculture after their studies. This was informed by the fact that Kenyan economy is dependent on Agriculture and a majority of the workforce is absorbed by agriculture either directly or indirectly.

The youth comprises of individuals aged 35 years and below and are more vulnerable to unemployment, (Students in Free Enterprise-Kenya, 2004). Arnon (1989) observed that small-scale farmers have great potential in increasing agricultural production in the Least Developed Countries, (LCDs), Kenya included. There is a rapid growth of population and steady expansion of the education system leading to unemployment of secondary school Form Four graduates who do not get access to further education. It was expected that empowering the community with agricultural knowledge would help alleviate the problem of unemployment in the rural areas. This led to the need for initiating agriculture in secondary schools in Kenya (Ministry of Education, 1964).

The role of education in employment creation is thus critical. The education system of a country plays a major role in the development of humans and natural resources as well as creating attitudes which inspire and dispose people towards inevitable changes. Education can therefore be described as a process of transmitting cognitive, practical and affective skills from one generation to another. It provides participatory skills in people which in turn enhance

economic, political and social development (Mwangi, 1998). The 8-4-4 system of education was introduced in Kenya in 1985 with the main objective being that of transmitting skills that would help the youth to attain self-reliance after school. Perception is the cognitive process by which an individual gives meaning to the environment (Wardsworth, 1996). The way individuals select and organize their perception depends on the characteristics of the objects, persons, or events being perceived. Attitude is a persistent tendency to feel and behave in a particular way towards some object about which people have both feelings and beliefs (Hattie, 1992). In a school setting, attitude can come from many sources including the peers, physical environment and past predispositions. The new system emphasized teaching more technical and vocational skills in secondary schools in order to serve those who would not continue with further formal education (Kathuri, 1990). Agriculture was identified as one of the key subjects useful in transmitting farming skills to the secondary school Form Four graduates. It was therefore expected that if teaching of agriculture in secondary schools was effectively done through proper syllabus coverage and participation in agriculture practical activities, students would be well equipped with agriculture knowledge. This would have led to secondary school Form Four leavers involving themselves in farming activities after school. Although other factors like access to land, climatic conditions, capital availability amongst others may have influenced them negatively; their attitudes towards farming was still expected to be positive.

Nyandarua West Sub-County relies entirely on farming activities. In crop production, maize remains the staple food of the Sub-County hence a major farming activity while beans, potatoes and vegetables production are also other common farming activities. Wheat is a major cash crop but common with farmers who own relatively large parcels of land and hence may not be very common to Form Four graduates. In livestock production, dairy forms the major source of income to the farmers in the Sub-County. Dairy plays a major role in both milk and beef production because of bull calves and old culled cows. In many parts of the Sub-County, free grazing system in the unimproved pastures is practiced. Other farmers practice semi-zero grazing system in their farms. In poultry production, most of the farmers rear indigenous birds under free range system although few farmers rear exotic birds under deep litter system. Bee keeping is practiced by few farmers although the Sub-County has a high potential for honey production. Sheep and goat production is one of the most ignored industry by farmers hence management is very poor. This study therefore focused on the relationship between secondary

school agriculture knowledge and the farming activities engaged after school by Form Four graduates.

1.2 Statement of the Problem

The secondary school agriculture curriculum is designed to develop students who are well equipped with practical skills that can help them venture into various agricultural enterprises after completing their education. People who have gone through this curriculum sat the KCSE examination but did not continue with education are expected to apply the practical skills learned during their education in order to earn a living and even create employment to other people. However, it is not clear whether the graduates apply the knowledge acquired and transform it into practical ventures. Despite the importance of farming in Nyandarua west Sub County, there is no clear documentation on whether these graduates use the knowledge acquired to engage in farming activities and the extent to which they practice agricultural diversification. It is also not clear the kind of technologies they use in their farming activities and the impact of the knowledge acquired on their attitudes towards agriculture. This study was aimed at filling these gaps.

1.3 Purpose of the Study

The purpose of this study was to generate information that can be used to make secondary school agricultural curriculum relevant to farming and related activities in Nyandarua West Sub County, Kenya

1.4 Objectives of the Study

i. To determine the relation between curriculum coverage and agricultural diversification by form four graduates in Nyandarua West Sub County
ii. To evaluate the relation between curriculum coverage and technology adoption in farming by form four graduates in Nyandarua West Sub County.
iii. To establish the relation between curriculum coverage and attitude of graduates towards agriculture in Nyandarua West Sub County.

1.5 Hypotheses

i. There is no significant relationship between secondary school agriculture curriculum coverage and practicing agricultural diversification by form four graduates in Nyandarua West Sub County.
ii. There is no significant relationship between secondary school agriculture curriculum coverage and technology use in farming by form four graduates in Nyandarua West Sub County.
iii. There is no significant relationship between secondary school agriculture curriculum coverage and attitude of graduates towards agriculture in Nyandarua West Sub County.

1.6 Significance of the Study

The findings of the study may be useful to teachers, extension officers, policy makers, curriculum developers, researchers, parents and communities in the understanding of the relationship between secondary school agriculture knowledge and Form Four graduates' farming activities. The findings of the study may be used in improving the agriculture curriculum in secondary schools by acting as a guide to curriculum developers and also helping the teachers to identify and develop new methods of delivery. It will also be used in improving extension services provided to the farmers since it shows areas that knowledge gap exists. This will help the extension agents to identify the key areas of intervention. The study findings may also help policy makers in planning the strategies for bringing about development in the Sub-County and develop policies that will enhance curriculum improvement. By improving the agricultural knowledge reaching the farmers, production will increase and consequently improving the country's economic development.

1.7 Scope of the Study

The study targeted farmers who studied agriculture in secondary school between the years 2000 and 2007 and were leaving in villages surrounding day secondary schools that do agriculture as an examinable subject. The components of the syllabus coverage in secondary school that were of interest in this study were livestock and crop production practices. The livestock production practices targeted in this study included dairy production, sheep rearing and poultry keeping while crop production practices included potatoes, maize and wheat production.

1.8 Assumptions of the Study

The study made the following assumptions:-

i. Farmers had been exposed to the same agriculture knowledge at secondary school.
ii. Farmers who had agricultural knowledge from secondary schools had been willing to implement the knowledge.
iii. Farmers who had agricultural knowledge from secondary schools had enough resources to implement the knowledge.

1.9 Limitation of the Study

Some of the issues that were studied were viewed as personal and some respondents refused to answer them as expected. However, the researcher took necessary caution in the framing of such questions in order to obtain true and unbiased responses. This was also accompanied by measures to ensure that the purpose of the research was well explained and assured confidentiality of respondents about the information provided.

1.10 Definitions of Terms

The following were operational definitions of terms as used in this study:-

Adequacy of Secondary School Agriculture Knowledge: This refers to the ability of the secondary agriculture knowledge gained by the Form Four graduates to enhance crop and livestock productivity, adoption of improved agricultural technologies, diversification of agricultural activities and contribute to a positive change in attitude towards farming.

Agricultural activities: Refers to crop production and livestock rearing either individually or collectively

Agricultural diversification: Refers to carrying out both crop production and livestock rearing. In this study graduates who had both crops and livestock were considered to have diversified.

Agricultural Extension Services: This refers to the agricultural information given to farmers by extension agents. In this study it was determined by the number of times the Form Four graduates were visited by the agents in their farms per given time frame.

Agricultural technologies: Refers to modern ways or methods and equipment used in farming. In this study fertilizer use, use of pesticides, artificial insemination among others were considered as technologies.

Capital availability: It is the freedom of ability to acquire and use money or capital assets for farming activities. In this study it was determined by access to bank loans, self-savings, grants from non-governmental organizations, local authorities, produce sales etc.

Farming activity: This means a single agricultural undertaking carried out on a farm. Such undertakings include dairy, beef, poultry, bee, pyrethrum, maize, beans and vegetables production.

Farming as a business: Refers to carrying out agriculture with an objective of generating income

Form Four graduates: In this study this referred to farmers who had gone through the four years of secondary school agriculture subject curriculum and sat for K.C.S.E. in the years

between and including 2000 and 2007, hailed and were actively involved in farming in Nyandarua West Sub-County, Nyandarua County, Kenya.

Land availability: Refers to the freedom to acquire and use land. In this study it was determined by the acreage of farm land at disposal to the Form Four graduates involved in the research as well as the method of acquisition.

Secondary School Agriculture Knowledge: This refers to the education related to farming. In this study, it was determined by the grades Form Four graduates obtained at K.C.S.E. and their success in farming.

CHAPTER TWO
LITERATURE REVIEW

2.1 Introduction

This chapter considered the following areas:-Introduction, Historical background, Agriculture and National Development, Secondary School Agricultural Education Curriculum, Objectives of Secondary School Agriculture, Practical Skills in Agriculture, Diversification of Farming Activities, Technologies used in Farming Activities, Theoretical Framework and Conceptual Framework.

2.2 Agriculture Education in the World

Agriculture is offered as a subject in many countries in the world with an aim of equipping the students with knowledge in crop production, livestock management, soil and water conservation and various other aspects of agriculture (Schultz *et al*., 2008). In China during the past decade, agriculture schools have started to take actions systems and to strengthen their vocational programs (Ministry of Education, 1998). Agriculture is the traditional foundation of Chinese society and China is facing a great challenge in restructuring its system to meet the needs of the market economy. In the United States, the purpose of agricultural education in high schools is to provide students with the personal academic and career experiences essential for success in the fields of science, business and technology (Schultz, 2008). High school agricultural education programme consists of three components namely classroom/ laboratory instruction, supervised agricultural experience (SAE) and future farmers in America (FFA). This is aimed at providing students with foundation knowledge in agricultural practices, preparing them for careers and give them the opportunity to experience ownership of their own agricultural enterprises or work in the industry.

In sub-Saharan Africa, the agricultural sector is still the dominant provider of employment, and it remains crucial for economic growth. Moreover in most parts of Africa food security is still a critical issue and therefore food production will continue to be a major focus of agricultural education and training institutions (Vandenbosch, 2006). In some countries in sub-Saharan Africa, agriculture has been introduced in general school curricula at secondary education levels as a compulsory or as an optional subject. The rationale for offering agriculture to secondary school students counter the apparent negative attitude to farming by many secondary school students, whose occupational choices are often limited, and thus exposing them to the

knowledge and skills that they would require in agricultural production, should they choose to become farmers (Abalu, 2001). The World Bank (2004) underscores the fact that in Mozambique, agricultural education intends to provide students with knowledge and skills for increasing agricultural production and productivity. It is also expected to provide students with the skills they need to obtain employment and earn a sustainable livelihood.

2.3 Agricultural Education in Kenya

In Kenya during the period between 1965 and 1976, the United States Agency for International development, (USAID) played a prominent role in supporting the introduction of agriculture in secondary schools by financing the building of workshops, equipping of schools and the training of agriculture teachers at Egerton University. However due to the strict conditions that secondary schools had to fulfill before they could be allowed to teach agriculture, only about 1,000 students were taking the subject at the level by 1966 (Weir, 1967). This trend continued so and in 1980, only about 100 schools out of 1,760 were offering agriculture as an examinable subject. The introduction of the 8-4-4 education system in 1985 brought a new dimension to the education system. This meant introduction of new curriculum that emphasized the need to make learners self-reliant by the time they left school, by offering them broad based practice oriented curriculum (Republic of Kenya, 1981). Agriculture as a practical subject was therefore made compulsory in all primary schools and the first two years of secondary school education.

Agriculture is the backbone of Kenya's economy. It is the livelihood of over 80% of the total population. It serves as the source of food, raw materials for industries, source of employment, provides foreign exchange, provides market for industrial goods, source of capital for national development and helps to correct the balance of trade deficit (Cheruiyot, 1992). Arnnon (1989) observes that small-scale farmers have great potential in increasing agricultural production in the Least Developed Countries (LDCs), Kenya included. Chitere and Doorne (1985) have also noted that 85% of the Kenyan people live in the rural areas, most of them in small holding areas where farm units are only approximately two hectares. Despite enormous efforts to industrialize, Kenya still remains an agricultural nation with the majority of its people (75%) living in the rural areas and depending on agriculture, either directly or indirectly for their income.

Kenya’s economic growth pattern follows that of agriculture. According to Sheffield, 1972, a stagnant agricultural development leads to a stagnant market which in turn inhibits the growth

of the rest of the economy. Most of the people living in rural areas derive their livelihood from farming (Bessey, 1972). Agriculture sector is a key player in the country's GPD and of the export earnings and there exists an empirical evidence of strong connection between agricultural growth and GPD (GoK, 2009). Rationally utilized knowledge, skills and attitudes greatly contribute to social and economic development (KNBS, 2010). According to the Ministry of Education (2007), teaching of agriculture in secondary schools should aim at ensuring that the learner is exposed to and taught the basic principles that are important of agricultural production in the country and exposing and involving learners in various practical and projects that will help them develop the necessary skills and abilities required in agricultural production.

The 8-4-4 system of education contains a heavier practical component at all levels than was the case. Primary education is now intended to equip primary school students with skills that will enable them to contribute towards the developrnent of rural society and its environment. Since the majorities of primary school graduates do not proceed to secondary schools and live and work in rural areas, primary schooling is accorded more importance as an entity in itself. To this end, agriculture has been re-introduced as a compulsory, examinable subject (Abagi, 1990).

The rapidly growing population and steady expansion of the education system has resulted in the unemployment of those who complete school and cannot find access to further education. Students who cannot get into high paying jobs can engage themselves in agriculture, hence, the need for initiating agriculture in secondary schools in Kenya (RoK, 1964).

A pilot agricultural education program was initiated by Robert Maxwell in 1960 at Chavakali secondary school in Western Kenya. The program aimed at making rural secondary education in Kenya more practical and more responsive to developmental needs of the country. It also targeted to develop the school demonstration area and generate enthusiasm and willingness to work among the students. Again, it also focused on relating agricultural courses to the entire school program, development of the region and the country and finally to the life and future of the students.

The course name at that time was vocational agriculture since the subject molded students with a lot of technical knowledge. The aim of this course was to produce graduates who were skilled for employment in agriculture (Struck, 1945; Kathuri, 1990). At first, the pilot project encountered a lot of resistance since agriculture was seen as occupation for the uneducated (Kathuri, 1990). This occupation was also viewed as a dirty job (Stabler, 1969). In the wake of slow development of colonial education, Agriculture subject was officially established in the school's curricula (Sheffield, Morris and Hermans, 1976). Numerous national development plans (Kenya 1960, 1970, 1974, 1979) made recommendations for the expansion of agriculture education by having more secondary schools teaching agriculture as a subject. Provision of agriculture education and training through schools, colleges and extension education including youth clubs was observed as one of the ways in which agriculture expansion and development could have been purposefully accelerated (Mosher, 1971).

2.3.1 Agriculture in Nyandarua County

According to the Nyandarua CIDP (2013), the main crops grown are potatoes, wheat, maize and vegetables. The county has a large proportion of its farming area dedicated to food crops, which include potatoes, cabbages, peas, carrots among others. These crops are not exclusively meant for subsistence as they also account for significant income for most of the households. Cut flowers and horticulture are the main cash crops grown in the county. Revitalization of the pyrethrum growing industry is also underway and will play an important role in improving the economic status of the county. The Large farms are located evenly all over the county and majority of them are used for horticultural and dairy farming. Smaller farms are found in areas originally designated as settlement areas during the colonial period. The farmers in these areas mostly practice mixed farming. Land sizes in both the low and high potential zones are experiencing subdivision into smaller parcels and low productivity due to overuse of the land. Fish farming is also an upcoming economic activity in the county with 1,200 fishponds with a total area of 360,000 m^2. The main fish species reared are tilapia, catfish, trout and common carp. Most of the fish produced is for local consumption.

Nyandarua County produces the highest amount of milk due to its higher population of dairy cows as compared to the other regions in Central Kenya (MoLFD, 2007). However, dairy production potential for Nyandarua County is the least exploited (Romney *et al.*, 2004). There is therefore a need to improve the efficiency of dairy production and marketing for equitable

distribution of income and hence poverty alleviation among households especially in the rural areas in line with the Kenya Vision 2030 (GOK, 2007).

2.4 Secondary School Agricultural Education

According to the Ministry of Education (2003), teaching of agriculture in secondary schools should aim at ensuring that the learner is exposed to and taught the basic ideologies that are important in agricultural production in the country. It should also expose and involving learners in various practical and projects that will help them develop the necessary skills and abilities required in agricultural production. By the end of the agriculture courses, the student should be able to develop an interest and awareness of opportunity that exist in the agriculture sector, create an understanding of agriculture and its importance at the household and national level, and demonstrate that farming is a profitable and dignified occupation and develop and improve the knowledge and skills of basic agricultural practices.

Other objectives are to provide a background for further studies in agriculture, develop self-reliance, resourcefulness, problem solving abilities and an occupational outlook on agriculture, promote good agriculture activities to enhance environmental conservation and good health, and take an active part in rural development by integrating agricultural activities in the curriculum (Republic of Kenya, 2012).

2.4.1 Objectives of teaching agriculture in secondary schools

Agriculture is a useful subject in the secondary school curriculum. One of the objectives of teaching the subject in secondary schools is for students to develop an understanding of agriculture and its importance to the family and the nation. A second objective is to promote interest in agriculture as an industry and create awareness of opportunities existing in agriculture and related fields (KIE, 2006). These objectives have both the educational and social economic dimensions.

The educational objectives of teaching agriculture as a subject in secondary school in Kenya are spelt out in the syllabus as follows; promote an interest in agriculture as an industry and create awareness of opportunities existing in agriculture and related sectors, enhance skills needed in carrying out agricultural practices, provide background for further studies in agriculture, develop self-reliance, resourcefulness and problem solving abilities in agriculture, enable schools to take an active part in national development through agricultural activities and

promote agricultural activities which enhance environmental conservation (Ministry of Education, 1998).

Achievement of these objectives can assist the country towards realization of Vision 2030 (Republic of Kenya, 2007). They can also assist the country towards realization of Millennium Development Goals (MDGs). The first MDG is to eradicate extreme poverty and hunger (UN, 2002). Hunger and poverty can partly be eradicated by increasing food production. Sufficient quality food to a nation is viewed as dependent on a large number of individuals being adequately educated in agriculture (Talbert *et al*., 2007). School agriculture is viewed as a major component to this education. Secondary school agriculture broadens the farmer's capacity, makes them more effective, self-reliant, resourceful and capable of solving farming problems (Saina *et al*., 2012). It will also contribute towards achievement of sustainable development goals (SDGs) 1 and 2 which emphasizes on reduction of poverty and hunger.

2.4.2 Integration of agriculture in the school curriculum

Agriculture became officially established in schools curriculum at several phases in the slow development of colonial education (Sheffield, Moris & Hermans, 1976). With the introduction of the 8-4-4 system of education in Kenya in 1985, all the schools started offering agriculture. This meant introduction of a new curriculum that emphasized the need to make learners self-reliant by the time they left school, by offering them broad –based and practice oriented curriculum (Republic of Kenya, 1984; Ngugi *et al*., 2002). The subject is taught so that the youth can appreciate the role agriculture plays in the economy of the country.

In primary school curriculum, agriculture is integrated into the science curriculum thus compulsory while in secondary schools, it is a separate subject in the school curriculum which is compulsory in the first two years of secondary school education (KIE, 2006). Kathuri (1990) did a study to investigate how the Kenya agricultural education curriculum was being implemented in schools, factors influencing the implementation process and how the implementation affected student's achievement in agricultural education. Kathuri's findings were that school location, school category, teacher qualification and availability of teaching resources were significant factors related to students' achievements. It was also observed that teachers used more theoretical than practical-oriented teaching methods. Consequently, curriculum implementation did not match the syllabus in both content coverage and development of practical skills in agriculture. Teaching of agriculture give emphasis to, the

learners, after completing their secondary school education, to develop self-reliance, resourcefulness, problem-solving abilities and may engage themselves in agricultural enterprises which may not necessarily require a lot of capital to start, but assist in improving the economy of this country (Kipkemei *et al.*, 2015).

2.5 Secondary school Agriculture knowledge and Form four graduates Farming activities

Apparently, farmers with secondary school agriculture knowledge diversify more in crop productivity as compared to farmers without this knowledge. This could be as a result of the knowledge they gained in school on the need to diversify as a security against total harvest failure in a case of only one crop being grown. This indicates that secondary school agricultural knowledge not only broadens farmers' capacity but also makes them more effective, self-reliant, resourceful and capable of solving farming problems (Kipkemei *et al.*, 2015).

2.5.1 Agricultural Diversification

Agricultural diversification is defined broadly as the increased variety of agricultural commodities produced (David & Otsuba, 1993). The livelihood of many farmers critically depends on incomes from diverse sources including the production of commercial crops and livestock products. Agricultural diversification represents a powerful counteractive force against population pressure that otherwise results in growing poverty and inequality in many developing countries. Diversification in crops and livestock is not likely to be successful unless it is based on major technological advancement in farm production. Significant progress cannot be expected unless it is supported by technological innovations.

These innovations require a higher level of education among the farmers for better adoption of new technologies of production (David & Otsuka, 1993). One of the general objectives of including agriculture in the 8-4-4 secondary school curriculum (KIE, 1992), is to ensure that schools take an active part in rural development by integrating agricultural activities in the curriculum. This would be through provision of technical knowledge, reinforcing interest in and awareness of opportunities existing in agriculture among the secondary school graduates (RoK, 1976).

2.5.2 Agricultural Technology

Despite the agricultural technologies that have been generated through research in Africa, the impact of such technologies is yet to be felt in most households owing to inefficiency in communicating and sharing agricultural knowledge. The situation in Africa is aggravated by slow adoption of modern information and communication technologies and the shortage of information and communication management professionals. Besides the slow adoption of technologies, interest in agriculture among students at education institutions has been on the decline. Agriculture as a subject is devalued in primary and secondary schools. The situation is made worse since agriculture is given undesirable connotations e.g. agricultural activities are sometimes used as punishment. In some instances, agriculture is merged with other subjects, agricultural curriculum is poorly designed and most often students do not have access to learning aids that can enable them learn about new technologies in agriculture (Mwangi, 1998; World Bank, 1988).

2.6 Secondary School Agriculture knowledge and Attitude towards Farming

Attitude towards farming is influenced by both internal and external factors. Among the internal factors influencing perception towards agriculture are the characteristics of the perceiver which includes, the self-concept, needs and motives, past experience, attitude and values, and personality. External factors, influencing perceptions are found in people's physical environment (Purkey, 1998).

Self-concept being person's own perception of him- or herself (Strein, 1995), helps an individual to understand oneself and regulate ones behavior. It significantly influences people's attitudes, values, beliefs and emotions (Rao, 1990). It also relates to ones level of aspirations and guides an individual in deciding what to do in future (Hamachek, 1978). During their stay at schools, agriculture students develop perceptions about their physical environment, teachers and learning environment.

2.7 Theoretical Framework

This study will be guided by the Sustainable Livelihood Theory by (Carney, 1990). According to Carney the sustainable livelihoods framework is a tool that can define the scope and provide the analytical basis for livelihoods analysis by identifying the main factors affecting livelihoods and the relationships between them. These factors include poor access to finances, natural resources, human/social resources and the livelihood opportunities and the way they interact at micro, intermediate and macro levels. A key feature in this study was the provision to learners' core skills necessary in farming activities which they may use should they enter into farming activities that require agriculture knowledge in future. In this, study livelihoods related to participation in farming activities where Carney's factors for livelihoods related to the selected factors under investigation. The study adopted the theory to investigate the interaction between the graduates' involvement in agricultural activities and the contributions towards sustainable livelihoods.

2.8 Conceptual Framework

The study on relationship between secondary school agriculture knowledge and Form Four graduates' farming activities in Nyandarua West Sub-County, involved the use of a conceptual framework which related independent variable "Secondary school agriculture knowledge" and its relationship with a common dependent variable "Participation in farming activities". This independent variable was indicated by studying agriculture in secondary school, level of agriculture study, participation in agriculture practical activities in secondary school, adequate coverage of agriculture enterprises/topics studied in secondary school, and attendance of field trips in secondary school. The dependent variable was indicated by the amount of yield obtained, income from farm products, number of farming activities, types of farming activities, number of technologies in use, use of credit facilities, access to agricultural extension services and attendance of refresher courses. The study also considered that there existed variables, which were not under the control of the researcher. In order to control the influence of intervening variables, the researcher had made sure that the sampled respondents were homogenous with respect to these variables. Such variables included capital availability, market for farm products, socio-economic status, profitability and attitude towards farming. To minimize the influence of intervening variables, the study targeted farmers who had sat for K.C.S.E. within the period between years 2000 and 2007 and were actively involved in farming activities.

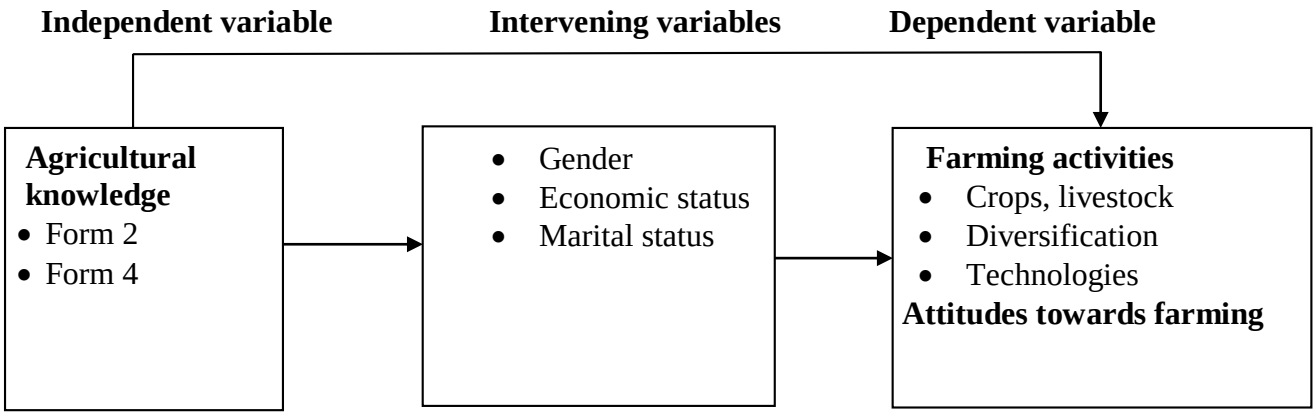

Figure 1. Relationship between secondary school agriculture knowledge and participation in farming activities

CHAPTER THREE
RESEARCH METHODOLOGY

3.1 Introduction

The Chapter explored the Introduction, Research Design, Study location, Target Population, Sampling Procedure and Sample Size, Instrumentation, Data Collection Procedures and Data analysis.

3.2 Research Design

The study used a descriptive survey in *ex-post facto* approach. In this type of research, changes in the independent variables had already taken place, and the researcher studied them in retrospect for their effects on an observed dependent variable (Ary, Jacob and Razavieh, 1979). The researcher has no control over the variables; he could only report what has happened or what was happening. This implies that there were no manipulations of the variables investigated. Descriptive *ex post facto* research design is recommended in educational studies because many causes and effects relationship that are studied in does not allow manipulation.

3.3 Location of the Study

This study was carried out in Nyandarua West Sub-County, Nyandarua County in Kenya. The Sub-County is one of the seven sub-counties in Nyandarua County. It boarders Nyandarua North Sub-County to the North East and East, Laikipia Sub-County to the North, Milangine Sub-County to the West and Nyandarua Central to the South. The Sub-County covers an area of approximately 381.9 sq. Km. According to the National Census (2008), the Sub-County consists about 133,148 persons from 15,980 households. It has a population density of 142 persons per sq. Km. This Sub-County was curved off from the larger Nyandarua Sub-County and has five divisions namely; Boiman, Gathanji, Gatimu, OlJoro-orok and Weru divisions. This Sub-County was chosen due to its larger population of farmers engaged with variety of agricultural and socio-economic activities.

3.4 Target Population

The target population of the study consisted of 7893 Form fourgraduates in Nyandarua West Sub-County who had sat for K.C.S.E and were involved in farming activities (DEO, Nyandarua West Sub-County). They must also have sat for K.C.S.E. in the period between year 2000 and 2007 and were presently actively involved in farming activities. The reason for exclusion of former students who had done K.C.S.E. after year 2007 was because such graduates may not

have had adequate time for them to have significant progress on their farming activities. The Sub-County has a population of about 133,148 people. This target group should have been farmers who might have been heads of their households and might have been relying on farming for their livelihood.

3.5 Sampling Procedure and Sample Size

The study systematically identified a few Form Four graduates from each of the five divisions selected for inclusion in the study. In this case initial subjects with the desired characteristics were identified using purposive sampling technique where the researcher used cases that had the required information with respect to the objectives of the study. A snowball sampling method was then used. A total of 100 sampled O-Level Farmers was eventually achieved from the entire Sub-County. These Form Four graduates were evenly distributed from the Sub-County to give every division an equal chance of representation in the study (Mugenda & Mugenda, 1999).

Table 1: Sample Distribution

SAMPLE NO.	DIVISION	POPULATION	TOTAL RESPONDENTS (Per Division)
1	Oljoro-orok	1915	24
2	Weru	1613	20
3	Gatimu	1389	18
4	Gathanji	1274	16
5	Boiman	1702	22
TOTALS		**7893**	**100**

Source: DEO, Nyandarua West Sub-County.

3.6 Instrumentation

A combination of two types of instruments was used to collect data, namely research questionnaires and an observation schedule. The questionnaires were semi-structured in form of questions for the Form Four graduates to tick the appropriate answer or fill in the blank spaces. The farmers ‘questionnaires were used to solicit information on the following: secondary school agriculture knowledge, level of technology used in farming activities, diversification of enterprises and attitude towards farming. The questionnaire contained likert type items with a scale of 1 to 5.In this study the observation schedule was used in order to capture in-depth information on agricultural activities undertaken as well as extents of

diversification among farmers. While using this method, the researcher was a non-participant observer and had minimal interaction with the subjects in order to obtain as complete a record as possible of the level of technology used by farmers in the study area (Gall *et al.*, 2003). The Observation schedule helped in producing supporting ways of collecting data (Mutai, 2000). To control the effects of history and maturation, the data was collected at one point at a time. To moderate the effects of education, the study only used subjects who had studied and done agriculture in secondary school.

3.6.1 Validity

Validity is concerned with establishing whether the questionnaires content is measuring what it is supposed to measure (Orodho, 2005). Content validity refers to the content and format of the instruments. Therefore, it is the extent to which the contents of the instrument measures what it is supposed to measure based upon judgments of several subject specialist (Koul, 1993, Fraenkel & Wallen). Face Validity involve only a casual, subjective inspection of an instrument to judge whether it covers the content that the text purports to measure (Howell *et al.,* 2005; Bhattacherjee, 2012). Two experts in the Department of Agricultural Education and Extension, Egerton University assessed the degree of validity of content of questionnaires and their views were used to revise the instrument to enhance validity. The researcher made the necessary changes on the document.

3.6.2 Reliability

Pilot testing was done in Rurii Sub-location, Rurii Location, OlKalou Division in Nyandarua Central Sub-County. This was to ensure reliability of the items and their relevance to the study. To ascertain the reliability of the instruments for this study, 20 respondents were involved in the pilot study. The internal consistency technique was employed where the Cronbach's coefficient Alpha was then computed. According to Fraenkel and Wallen (1990), a reliability coefficient of 0.7 was an acceptable value for research purposes. Thus, the instrument was deemed reliable for use if a reliability coefficient of 0.7 and over was obtained. Unlike other estimates of reliability, Guilford and Fruchter (1978) observed that internal consistency requires only one testing, therefore easy to be used.

3.7 Data Collection Procedures

The researcher obtained an approval letter from Graduate School to conduct the study. To be able to carry out research in Nyandarua West Sub-County, Nyandarua County and be able to probe documents in various offices, the researcher further obtained research permit from the National Council of Science and Technology (NCST) in the Ministry of Education Science and Technology (MoEST).

Primary data was collected from the Form Four graduates using questionnaires consisting of closed and open ended questions. The identified Form Four graduates were visited on their farms within their Wards and at their most convenient time. Face-to-face interview with the identified graduates was done at that time. The questionnaires were then given to them to complete. Documents that include records, books, periodicals and other academic work from schools, MOA and MoEST offices within the Sub-County were used to compile necessary secondary data. The heads of the relevant offices were requested to allow the researcher to access the relevant documents. In all the above cases, confidentiality was always assured.

3.8 Data Analysis

Data from questionnaires and scheduled interviews was coded and analyzed using Statistical Package for the Social Sciences (SPSS) computer software. The data was then analyzed using qualitative and quantitative methods and presented by the use of tables, frequencies and percentages, statistical measures of relationships between the independent and dependent variables. The results were used to draw conclusions and in making recommendations.

Pearson's correlation coefficient and regression analysis were used to determine the relationship between secondary school agriculture knowledge and the level of technologies on farming activities. To determine the relationship between secondary school agriculture knowledge and diversification of farming activities, Chi-square analysis was used. A measure of farmers' level of diversification was computed using Entropy diversity index and compared against secondary school agricultural knowledge. To determine the adequacy of secondary school agriculture knowledge on farming activities was analyzed using chi-square and t-test. Likewise, determining the relationship between secondary school agriculture knowledge and attitude towards farming activities was analyzed using chi-square.

CHAPTER FOUR
RESULTS AND DISCUSSIONS

4.1 Introduction

This study examined the relationship between secondary school agriculture knowledge and form four graduates' farming activities in Nyandarua West Sub-County, Kenya. The chapter presents the results and discussions of the study. It contains the demographic characteristics of the respondents and the relationship between agriculture knowledge and, diversification of farming activities. The chapter also examines the relationship between agricultural knowledge and adoption of technologies and attitudes of form four graduates towards agriculture. Each of the results is discussed in relation to those of similar studies done in the past.

4.2 Descriptive Statistics

4.2.1 Characteristics of Respondents

The characteristics of the 100 form four graduates who participated in this study were examined with regard to gender, age, marital status and size of land owned. The characteristics are presented in Table 2.

Table 2: Characteristics of the Form Four Graduates

Scale (n = 100)	Characteristic	Frequency	Percentage
Gender	Male	73	73.0
	Female	27	27.0
Age	25 years and below	22	22.0
	26 - 35 years	40	40.0
	36 - 45 years	29	29.0
	46 - 55 years	5	5.0
	56 years and above	4	4.0
Marital status	Married	63	63.0
	Single	34	34.0
	Others*	3	3.0
Size of farm	2.5 acres and below	70	70.0
	2.6 - 5.0	21	21.0
	5.1 - 7.5	4	4.0
	7.6 and above	5	5.0

**Widows/widowers/divorced*

Table 2 reveals that nearly three quarters (73%) of the respondents were male while slightly more than a quarter (27%) were female. The results indicate that majority of form four graduates who engage in farming in the Nyandarua West Sub County are males. **N**early two thirds (62%) of respondents were aged 35 years and below. This is an indication that the form four graduates who engage in farming in the sub county are relatively young. Majority (63%) of the respondents were married. The sizes of the farms of nearly all (91%) of those who participated in the study were 5 acres and below.

4.2.2 Farmers who engaged in both crop and livestock farming

Farmers may decide to engage in one or more enterprises on their farms. This decision depends on several factors among them; availability of financial resources, land, labor and even knowledge of the farmer. Farmers who have more knowledge supported by availability of resources are more likely to diversify their farming operations. Table 9 indicates the different activities that farmers are engaged in.

Table 3: Agricultural Activities that the farmers are engaged in

Activity	N	Percentage	
		Yes	No
Crop farming	100	85.0	15.0
Diary production	81	60.5	39.5
Beef production	81	2.5	97.5
Poultry production	81	38.3	61.7
Bee keeping	81	4.9	95.1

Majority of the farmers were engaged in crop farming and dairy farming at 85% and 60.5% respectively. Poultry production was third with 38.3% of the farmers practicing while bee keeping and beef production were the least practiced at 4.9% and 2.5% respectively. Crop and dairy farming are the most common activities performed by many farmers because they directly address the issue of food security in the household. They are also the most common enterprises that almost all farmers like to engage in as a source of income. Poultry and bee keeping are viewed to be more technical and labor intensive and are presumed to be difficult enterprises especially for small scale farmers.

4.2.3 Crops grown by the Farmers

Farmers grow different crops depending on their preference, market availability, availability of resources and skills to manage the crop. Farmers choose those crops they can manage comfortably and derive maximum yields leading to better returns. Table 10 indicates the crops grown by the farmers in the study area.

Table 4: Crops grown by the Farmers

Crop	N	Percentage	
		Yes	No
/Maize	81	49.4	50.6
Potatoes	79	39.2	60.8
Beans	81	24.7	75.3
Vegetables	81	34.6	65.4
Pyrethrum	81	4.9	95.1

Most farmers in the area were growing maize, potatoes and vegetables at 49.4%, 39.2% and 34.6% respectively. Beans was planted by 24.7% of the respondents while only 4.9% planted pyrethrum. This can be attributed to the importance of maize beans and vegetables as food crops hence most farmers would want to enhance the households' food security status. Pyrethrum is the least planted crop because of the instability that has been witnessed in the industry for a long period of time. The prices went very low hence the farmers have no incentive of planting it.

4.2.4 Animals kept by the Farmers

Farmers have a choice between several species of livestock that they can keep depending on their needs and financial ability. Some are kept for income generation, others for prestige while others are kept for labour purposes. They may also be viewed as an investment that can be easily turned into cash. Table 11 shows the types of animals that are kept by farmers in the study area.

Table 5: Animals kept by the Farmers

Animals	Percentage	
	Yes	No
Dairy cattle	76.0	24.0
Poultry	72.0	28.0
Pigs	8.0	92.0
Sheep	19.0	81.0
Beef cattle	42.0	58.0
Bees	17.0	83.0
Goat	7.0	93.0

Dairy cattle and poultry were the animals kept by majority of farmers at 76% and 72% respectively. Beef cattle were kept by 42% while sheep and bees followed by sheep and bees at 19% and 17% respectively. Pigs and goats were the least kept at 8% and 7% respectively. Dairy cattle and poultry are common because their products (Milk, eggs and chicken) are consumed by many people and are readily marketable. This products especially milk contributes towards the major diets in almost every household. Poultry have been traditionally kept by many people as a source of food and also income because of their ease of disposal. Beef and mutton are also fairly consumed hence sheep and beef are also kept. The market for honey has been developing in the recent past because of the perception of it being medicinal and the prices are high. This has made many people to start bee keeping. However, pork is not universally accepted by many because of religious beliefs and many people also associate it with unhygienic conditions hence the market is not highly developed. This makes it less popular making it unattractive to rear by farmers. Goats are delicate animals and majorly browsers which survive in hot and dry areas. Cold conditions may make it difficult to survive thus many farmers avoid keeping them.

4.3 Agricultural Knowledge and Diversification of Farming Activities

Knowledge in agriculture is presumed to enhance an individual's ability to try different activities in order to spread the potential risk. Diversification is a strategy that safeguards against potential risks through en-cooperating several activities so as to cushion against the associated risks. Farmers try to diversify by introducing different enterprises which may not be affected by the same risks at the same time

Table 6: Agricultural Knowledge and Diversification

Knowledge in agriculture	Frequency	Percentage
Form 2	14	17.1
Form 4	68	82.9

Table 6 indicates results on the relationship between agricultural knowledge and diversification. The results show that 82.9% of those who were practicing diversification had form four education. On the other hand only 17.1% had form two education. This shows that those farmers who had form four knowledge had embraced diversification. This can be attributed to the more knowledge that a form four graduate attains as compared to form 2 leavers. A form four leaver also understands the importance of diversification and hence is more likely to use it.

4.3.1 Application of secondary school Agriculture Knowledge in Farming Activities

Knowledge gained in secondary school can be very important if put into practice especially in agriculture. It is expected that people who acquire knowledge from their secondary should apply the knowledge in their practical activities.

Table 7: Application of Agriculture Knowledge in Farming Activities

Extent of application	Frequency	Percentage
Little	5	14.3
Moderate	4	11.4
Much	17	48.6
Very much	9	25.7

Majority (74.3%) of the respondents had applied the knowledge they acquired in high school to a large extent. Some had applied moderately (11.4%) while 14.3% had applied to a very little extend. This indicates that majority of the respondents are aware of the importance of this knowledge to their farming activity. This can also be associated with the benefits that arise from the application of the knowledge. If the knowledge was not yielding then most farmers could not use it but the greater use is associated with the benefits attached to application of the knowledge acquired.

4.3.2 Contribution of Agriculture Knowledge towards Success in Farming

Knowledge acquired through secondary education should contribute positively towards agricultural production if it is to be deemed relevant. Agriculture being a practical subject should have a positive impact on the skills gained by the students and its applicability in real life situations. More people will be encouraged to apply the skills only if it results into a positive contribution in productivity. Table 8 presents results on farmers' perception on the contribution of secondary school agriculture knowledge towards success in farming.

Table 8: Agriculture Knowledge towards Success in Farming

Contribution	Frequency	Percent
Very little	2	2.5
Little	7	8.6
Moderate	14	17.3
Much	34	42.0
Very much	24	29.6

Majority of the respondents (71%) acknowledged the contribution of secondary school agriculture towards their success in farming. Further 17.3% noted that the knowledge had contributed moderately to their success while only 11.1% felt that the contribution was little or too little. This indicates that secondary school agriculture knowledge contributes significantly towards agricultural production. A majority acknowledging the contribution of the knowledge attained in secondary school to their agricultural success may be attributed to the successful applicability of what they learned in school to real life situations. If a farmer tries something learned in school and get positive results then it means the knowledge gained was important and relevant. Waithira (2013) found out that that majority of the student population had practiced Agriculture at home proving that learning agriculture was important.

4.3.3 Diversification

Farmers diversify in order to spread the risks involved in agriculture. In Kenya most agricultural activities are depended on natural weather and therefore very susceptible to extreme weather events. However not all enterprises can be affected in the same magnitude. Some enterprises may survive effects of some extreme events which encourages farmers to diversify so as to avoid total losses. Table 9 shows the percentages of farmers who were engaged in both crop and livestock production.

Table 9: Farmers Engagement in Crop and Livestock Production

Response	Frequency	Percentage
Yes	59	72.8
No	22	27.2

Most farmers 72.8% were engaged in both crop and livestock production while 27.2% were engaged in only one among the two. Many farmers know the risks that are associated with agricultural production hence are willing to engage in both the activities to diversify the risks. Students perceive knowledge acquired as the one capable of promoting their career opportunities. This is in line with Muchiri *et al*. (2013) who noted that students seemed to appreciate the fact that secondary school agriculture ensured that schools take an active part in rural development.

4.3.4 Hypothesis testing

The relationship between agriculture knowledge and diversification of farming activities was determined using the Chi-Square test for independence. The test was deemed appropriate because the agriculture knowledge and diversification of farming activities were measured at ordinal and nominal scales. The results of the test are in Table 10

Table 10*:* Agriculture Knowledge and Diversification of Farming Activities

Scale	Chi-Square value	df	p-value
Continuity Correction	1.056	1	.304
N of Valid Cases	82		

The results in Table 10 reveals that the relation between agriculture knowledge and diversification of farming activities is not statistically significant at .05 level, $X^2(1, N = 82)= 1.056$, $p \leq 0.05$. This implies that knowledge in agriculture has no relationship with diversification in farming activities. The results support the null hypothesis that there is no relationship between knowledge in agriculture and diversification in farming activities. The hypothesis was thus accepted.

Diversification is influenced by many other factors other than agricultural knowledge. It can be concluded that farmers without secondary school agriculture knowledge performed better in diversification of farming activities as compared to the farmers with this knowledge.

The most probable reason for this could be that farmers with secondary school agriculture knowledge tended to specialize more on a particular type of farming activity for higher productivity. Experience of the farmer especially with past extreme events influence how the farmer will deal with future events. Agro ecological zones also play a role in what the farmer can be able to do or not. A farmer may be willing to diversify but if the agro ecological zone does not favor the anticipated enterprise then the farmer may be forced to abandon the idea. Financial ability is also another factor. Diversification needs financial resources to be implemented, a farmer may be willing to diversify but lacks the required finances to initiate the enterprise. This is in line with the findings of Davis *et al*. (2012), who noted that the impact of agricultural income for households whose head had secondary education was generally weak or negative. However, the findings are in contrast to the findings of Kipkemei *et al*. (2015) who stated that it is evident that farmers with secondary school agriculture knowledge diversify more in crop productivity as compared to farmers without this knowledge.

4.4 Agricultural Knowledge and Adoption of Technologies in Farming.

Objective two of the study examined the relationship between agricultural knowledge and adoption of technologies by form four graduates in their farming activities**.**

Several technologies are available to the farmers in crop and animal production depending on the type of crops and animals in question and the region. Most farmers implement those technologies that will end up increasing productivity

4.4.1 Crop production

Table 11: Technologies used in Maize and Beans Production

Technology	**Maize**		**Beans**	
	Frequency	**Percentage**	**Frequency**	**Percentage**
Mechanization(during land preparation, weeding, harvesting, irrigation)	53	53.0	46	46.0
Pesticide and herbicide	50	50.0	43	43.0
Improved seed varieties	38	38.0	41	41.0
Disease control (Chemicals)	43	43.0	43	43.0

Slightly more than half of the farmers (53%) had mechanized their activities in maize production as compared to 46% who had mechanized operations in beans production. Maize is the main crop in Kenya and intensive investments have been made in technologies to enhance

its production. On the other hand there are some activities that have not been mechanized in beans production. Pesticide use was also higher in maize at 50% as compared to beans where 43% of the farmers used pesticides in beans production. Maize tends to be attacked by more pests during growth and even after harvest hence the need for increased use of pesticides. However on the use of improved seeds many farmers had adopted improved beans seeds (41%) as compared to maize at 38%. Many farmers trust the seeds that they have tasted and proved and because most of the times maize is grown on a large scale, most farmers fear risking by introducing new varieties. On the other hand beans is mostly planted on a small scale and farmers may be willing to experiment because of the low risk associated. In terms of disease control, 43% of the farmers controlled diseases in both maize and beans. However in beans both technologies were practiced by less than half of the farmers while in maize improved seeds and disease control were practiced by less than half of the farmers. This may be due to the little importance attached to beans by most farmers and also there may be few incidences of diseases in the area for both crops. Sharma *et al*. (2010) noted that agriculture is economically lucrative for farmers hence permitting them to secure the use of effective expertise and technology.

4.4.2 Technologies used in Livestock Production

Different technologies are used in livestock production to improve production, reduce production costs or manage the health of the animals. Farmers use the various technologies depending on their financial ability. The technologies include mechanization of operations, use of acaricides, disease control, and artificial insemination among others. Table 12 indicates the technologies use by farmers in livestock production.

Table 12: Technologies used in Livestock Production

Technology	Frequency	Percentage
Mechanization (prepare feeds, milking etc.)	25	25.0
Acaricides	43	43.0
Disease control (e.g. antibiotics)	53	53.0
Artificial insemination	40	40.0
Feeds (forage, silage, mineral licks, concentrates etc.)	52	52.0

Most farmers majored on feeds and disease control technologies in production at 53% and 53% respectively. Use of acaricides and artificial insemination practices were also popular among farmers at 43% and 40% respectively. Mechanization was adopted by only 25% of the respondents. Feeds and disease control are very essential practices that contribute directly and almost immediately to the level of production. Most farmers ensure proper feeding of their livestock in order to improve production, disease control is also essential because an unhealthy animal cannot produce optimally. Accaricides also control pests which may lead to diseases and use of accaricides is one of the basic practices in livestock production. Artificial insemination has become popular among farmers as a way of improving the genetic makeup of animals so as to improve production and resistance to diseases and environmental conditions. Mechanization on the other hand involves higher financial investment and only those farmers who are capable will invest in them. This therefore sidelines those farmers who have low financial capabilities and majority of the small scale farmers are constrained in terms of finances.

Adoption of technologies

Data on adoption of technologies was generated using a set of 9 items in the graduates' questionnaire. The respondents indicated the frequency of use of crop and livestock production technologies. The responses were scored as follows; Never = 0, Rarely = 1, Sometimes = 2, Often = 3. The scores were averaged and transformed into the adoption of technologies index.

Table 13: Frequency of use of technologies

Technology	N	Mean	SD
Crop Production			
Mechanization in crop production (during land preparation, weeding, harvesting, irrigation)	87	1.52	0.78
Pesticide and herbicide	93	1.30	0.69
Improved seed varieties	93	1.68	0.80
Disease control (Chemicals)	94	1.31	0.73
Animal Production			
Mechanization in livestock production(prepare feeds, milk etc)	94	1.06	0.75
Accaricides	96	1.50	0.71
Drugs for controling diseases (eg antibiotics)	93	1.22	0.66
Artificial insemination	86	2.36	0.78
Feeds (forage, silage, mineral licks, concentrates etc)	92	1.95	0.95
Adoption index	100	1.41	0.37

Technologies which had been adopted by farmers include mechanization in crop production, improved seed varieties, use of accaricides, artificial insemination, feeds. Artificial insemination was the most popular followed by feeds. This strategies have direct impact on production of the animal. Pesticides, disease control, mechanization in livestock production and drugs for controlling disease were the least adopted strategies. This are technologies conditional to the infestation of diseases or pests while mechanization in livestock is very capital intensive hence many farmers are constrained to invest in them. This is due to the low incomes that most farmers get from their production.

4.4.3 Categorizing the form four graduates – adopters and none adopters

Form four graduates were categorized either as adopters or non-adopters depending with the rate of technology use. Categorization was done by converting the indices of each respondent using the scale: Adopters (1.51 to 3.00) and Non adopters (0.00 to 1.50.

Table 14: Category of Form Four Graduates

Category	Frequency	Percentage
Non Adopter of technology	62	62.6
Adopter of technology	37	37.4

Majority of form four graduates 62.26% had not adopted technologies in their practices while only 37.4% had adopted. This may be due to the kind of knowledge that is given in high school whereby it may not directly advocate for technology use but only give the learners general agricultural knowledge. Adoption is also a function of financial availability regardless of the knowledge that an individual may have. This is in line with Feder *et al.*, 2004 who noted that even if graduates gain knowledge that could improve performance, the change is rather small and cannot be detected in the econometric study. This was attributed to systemic challenges associated with technology adoption including finances.

Hypothesis test

The hypothesis that there is no relationship between agriculture knowledge and technology adoption was tested for acceptance or rejection. The results are indicated in Table 15.

Table 15: Agriculture Knowledge and Adoption of technology

Scale	Chi-Square value	df	p-value
Continuity Correction	.336	1	.562
N of Valid Cases	82		

The results of the chi-square test in Table 15 reveal that the relationship between agriculture knowledge and adoption of technology was not statistically significant, χ^2 (1, N = 82) = .336, $p \leq 0.05$. This implies that agricultural knowledge has no relationship with farmer adoption of technology. The results support the second hypothesis which states that the relationship between agriculture knowledge and adoption of technology is not significant. It was thus accepted.

Adoption of technology is a function of several factors that interact together to make an individual decide whether or not to adopt. Having agriculture knowledge alone may not be enough to influence an individual's decision to adopt. Most farmers work with experience and will try out any technology after seeing it work or succeed somewhere else. Past experiences, weather conditions and availability of funds also play an important role in ensuring that farmers adopt new technology. Feder *et al.* (2004) noted that the knowledge gained in training is complex, as learners do not master a specific set of contents rather, they master a process of learning that can be applied continuously.

4.5 Agricultural Knowledge and Form Four graduates Attitudes towards Farming

The third objective of the study examined the relationship between agricultural knowledge and form four graduates' attitudes towards farming. The attitudes of the graduates was measured using data generated by their questionnaire. The association between the two constructs was determined using this measure and farmers knowledge in agriculture determined in section 4.3.

Data on the attitudes of the form four graduates toward farming was gathered using their questionnaire. A set of 8 close-ended Likert type items based on the extent to which the respondents agreed with them was used to measure attitudes. The responses of the graduates to the items are summarized in Table 16.

Table 16: The Responses of the Form Four Graduates to the Items

Statements	N	Responses				
		SA	A	N	D	SD
Farming is the backbone of the Kenyan economy	94	66.0	28.7	2.1	1.1	2.1
Farming is a well-paying job.	94	16.0	48.9	22.3	6.4	6.4
Farming is a very tiring activity	92	9.8	25.0	13.0	19.6	32.6
One can get rich through farming	92	26.1	39.1	23.9	5.4	5.4
Farming is a very dirty job	92	6.5	7.6	6.5	19.6	59.8
There too many risks associated with farming	93	6.5	18.3	21.5	18.3	35.5
Farming is very involving	92	31.5	48.9	12.0	3.3	4.3
Farming is the key to success of the citizens of Kenya	91	56.0	15.4	17.6	5.5	5.5

Legend: Strongly Disagree (SD), Disagree (D), N = Neutral (N), Agree (A), Strongly Agree (SA)

Majority of the form four graduates strongly agreed that farming is the backbone of the Kenyan economy and is the key to success of the citizens of Kenya at 66% and 56% respectively. Further 48.9% agreed that farming is a well-paying job and 39.1% felt that one can get rich through farming, 59.8% disagreed that farming is a dirty job, 32.6% disagreed that agriculture is a tiring activity and 35.5% felt that agriculture does not have many risks. However 48.9% felt that agriculture is very involving, Agriculture is the livelihood of many people in developing countries Kenya being included hence the high approval by many of the respondents. However for it to be profitable one has to commit time and financial resources this explains why some felt that it is very involving. Agriculture has an important role compared to other economic sector, in terms of assuring required food for growing population in the world (Wairimu, 2013).

The attitudes of the form four graduates was measured using 8 items 4 of which were positive and 4 were negative. The attitudes were considered positive when the graduates agreed with majority of the positive items and disagreed with majority of the negative ones. The attitude of a respondent was deemed neutral when majority of the responses were neutral or when agreed tied with disagreed. The attitudes were considered negative when they disagreed with majority

of the positive items and agreed with majority of the negative ones. The attitudes of the graduates are summarized in Table 17.

Table 17: Attitudes of the form Four graduates towards Farming

Attitude	Frequency	Percentage
Positive	65	69.9
Neutral	13	14.0
Negative	15	16.1

Majority of form four graduates had a positive attitude towards agriculture at 69.9% while 16.1% had a negative attitude and 14% were neutral. A farmer who has gained form four education is able to have facts about agriculture and hence change the perception about agriculture from the mythical beliefs to an informed understanding about agriculture. Many people portrayed agriculture as a poor man's way of life and a means by which one cannot get out of poverty.

Hypothesis test

The hypothesis that there is no relationship between agricultural knowledge and attitudes towards farming was tested. Table 17 presents the chi square results of the relationship between agriculture knowledge and attitudes towards farming.

Table 18: Relationship between Agriculture Knowledge and Attitudes towards Farming

Scale	Value	Df	*p*-value
Pearson Chi-Square	4.74	2	.043*
N	79		

*Significant at 0.05

Table 18 shows that the relation between agriculture knowledge and attitudes towards farming was statistically significant, X^2 (2, N = 79) = 4.740, $p \leq 0.05$. This means that those with agriculture knowledge tend to have positive attitudes towards farming. The results are not in harmony with the third hypothesis which states that the relationship between agriculture knowledge and attitudes towards farming is not statistically significant. The hypothesis was rejected on the basis of the results.

Individuals tend to change their attitudes as they gain more knowledge about agriculture. Agriculture knowledge opens up an individual's mind to different ways that can make agriculture more profitable. Culturally agriculture is seen as a dirty job and preserved for the jobless people but through knowledge an individual learns that agriculture is a job in itself and can be practiced professionally like any other business. Knight (2003) noted that Education may lessen the inherent riskiness of agricultural activities by reducing uncertainty, as literacy and numeracy enhance the ability to receive, decode and understand information. Education also has non-cognitive effects on attitudes and habits which may enhance a farmers' willingness to take on risk.

CHAPTER FIVE
SUMMARY, CONCLUSIONS AND RECOMMENDATIONS

5.1 Introduction

This section presents the conclusions that are drawn from the study and recommends policy measures that can be taken in order to address the arising issues. Agriculture being the backbone of the Kenyan economy needs close attention if the country is to achieve its goals.

5.2 Summary

Agriculture contributes the highest in the country's economy. Despite agriculture being taught in secondary schools, many secondary school graduates seem not to participate in farming activities in Nyandarua West Sub-County. Although it is not clear whether farmers who have studied agriculture in secondary school are making use of the knowledge gained and whether they find it helpful in their careers, there has never been any comprehensive study to investigate the relationship between secondary school agriculture knowledge and Form Four graduates' farming activities in Nyandarua West Sub-County.

The purpose of this study was to fill this gap. The target population was farmers in Nyandarua West Sub-County who sat for Kenya Certificate of Secondary Education (K.C.S.E) in the period between year 2000 and 2007. Ex-post-facto research design was used in this study. Snow ball sampling procedure was used so as to establish a sample size of 100 respondents collected from five administrative divisions. A Questionnaire and observation schedules were used in data collection. Statistical Package for Social Sciences (SPSS) was used to analyze data using descriptive statistics and inferential statistics to test the hypothesis at 0.05 significance level.

The results indicate that agricultural knowledge had a positive relationship with adoption of diversification and use of technology in farming. The results also show a significant relationship between secondary school agriculture knowledge on students' attitude towards agriculture. The findings lead to the conclusion that secondary school agriculture knowledge positively affect attitude of the students towards farming and contributes to adoption of technologies and diversification. It is therefore recommended that policy guidelines related implementation of the agriculture curriculum in secondary schools be strengthened to

promote acquisition of practical agriculture knowledge in order to improve participation in farming activities.

5.3 Conclusions

i. Secondary school knowledge is very important in helping farmers realize the different risks that they may encounter in their agricultural activities. It also gives them the available options that they may use in order to counter the risks. Farmers with form four education had embraced diversification farming and most of them applied the knowledge they acquired in secondary school in their farming activities. However, there was no significant relationship between agricultural knowledge diversification, which may be due to the other factors that come in to play when one wants to implement diversification.

ii. Knowledge in agriculture is very important in exposing the learners to different technologies that are available in agriculture. It gives the learner an insight of new avenues that can be exploited in order to improve agricultural productivity. Form four graduates had adopted different technologies in their farming activities especially mechanization and disease control though the relationship between agricultural knowledge and technology use was not significant

iii. Agriculture knowledge had a positive relationship with the attitudes of the students towards farming. Individuals tend to change their attitudes as they gain more knowledge about agriculture. Agriculture knowledge opens up an individual's mind to different ways that can make agriculture more profitable. Culturally agriculture is seen as a dirty job and preserved for the jobless people but through knowledge, an individual learns that agriculture is a job in itself and can be practiced professionally like any other business.

5.4 Recommendations

i. MoE should ensure that the knowledge gained is put into practice for it to be meaningful; this involves resources and even further training. Policy should aim at ensuring that education is accompanied with empowerment of the farmers in all aspects to encourage diversification.

ii. Agriculture departments in secondary schools should implement a whole round approach towards encouraging adoption of technology should be used in order to ensure that the knowledge acquired is practiced. This should involve demonstrations and trainings to the farmers on the importance of those technologies.

iii. MoE should review policy guidelines on agriculture in secondary schools to make agriculture as a core subject in the curriculum to ensure more people gain agricultural knowledge, which enhances a positive attitude towards farming.

5.5 Suggestions for further Research

i. This Study was done in Nyandarua County. The researcher therefore recommends that other studies be done to assess the impact of agriculture knowledge on farming activies in other counties.

ii. The researcher also recommends that further research should focus on the content of the curriculum to make it more practical in the farming context.

REFERENCES

Agricultural Education (2nd Ed.). Danville, U.S.A: *Professional Educators Publishers and Policy Studies.*3: 338-345.

Arnnon, I. (1989). Agricultural Research and Technology Transfer. London, U.K.:Elsevier Science Publishers Ltd.

Arnon, I. (1989). *Agricultural Research and Technology Transfer*, Elisiever Science Publishers Ltd, London, U.K.

Ary, D. Jacobs, L. C. & Razavieh, A. (1979). *Introduction to Research in Education* (2nd Ed.) New York: Hort, Rinehart and Winston.

Bhattacherjee, A. (2012). Social Science Research: Principles, Methods, and Practices. *Open Access Textbooks.* Book 3. Retrieved on 13th July, 2014 from http://scholarcommons.usf.edu/oa_textbooks/3

Carney D., Drinker, M., Rusinow, T., Neefjes, K., Wanmali, S. & Singh, N. (1999) *Livelihood Approaches Compared*, DFIDI, London.

Cheruiyot, D. (1992). KCSE Revision Agriculture. Nairobi: Kenya Literature Bureau.

Chitere, P. A., & Van Doorne, J. H. (1985).Extension Education and Farmers Performance in Improved Crop Farming in Kakamega District. Agricultural Administration, 18(2).

David, N. & Otsuka, J. (1993). Agricultural Diversification for Growth and Equity in Agricultural Technology. Wallington: Oxford U.K

David, N. & Otsuka, J. (1993). Agricultural Diversification for Growth and Equity in Agricultural Technology, Wallington; Oxford U.K. December 24, 2007, from http://www.un.org/millenumgoals/goals.html.

Fabusoro, E., Omotayo, A. M., Apantaku, S. O. & Okuneye, P. A. (2010). Forms and Determinants of Rural Livelihoods Diversification in Ogun State, Nigeria. *Journal of Sustainable Agriculture.***34** (*4*) Pp 417-438.

Fraenkel, J. R. & Wallen, N. E. (1990). *How to Design and Evaluate Research in Education. Education.* McGraw- Hill: New York

GoK. (2009). Government of Kenya. Food security in Kenya. Ministry of Agriculture Report, Government printer, Nairobi.

Guilford, J.P. & Fruchter, B. (1978). *Fundamental Statistics in Psychology and Education.* McGraw- Hill Inc. USA

Hattie, J. (1992). *Self-concept*. Hillsdale, Lawrence Erlbaum Associates Inc, New Jersey. Inc.

Kathuri, N. & Pals, A. (1993). *Introduction to Education Research.* Njoro, Kenya. Education Media Centre, Egerton University.

Kathuri, N. J. (1980). *Principles and Practices of Agriculture: Its importance and Evaluation in Kenya Secondary Schools.* M.A. Thesis (Dissertation)

Kathuri, N. J. (1981). *The Status of Agriculture as a Subject in our Schools' Curriculum. Curriculum Development in Agriculture and its' Relevance to Schools, Colleges and universities in Kenya*. Njoro, Kenya: Proceedings of the third conference of the Kenya Agriculture Teachers Association.

Kathuri, N. J. (1986). *Prospects and Problems in Secondary Schools Agricultural Education Programme in Kenya*. Kenyatta University, Kenya: Bureau of Educational Research.

Kathuri, N. J. (1990). *A Study of the New Agricultural Education in the Secondary Schools in Kenya.* A PhD Thesis, University of Illinois at Urbana-Champaign, U.S.A.

Kenya Institute of Education. (2006). Secondary Education, Agriculture Teachers

Kenya Institute of Education. (1985). *Secondary School Agriculture Syllabus for Kenya Certificate of Secondary School Education-Nairobi*. Kenya Institute of Education.

Kenya Institute of Education. (1992). *Secondary School Agriculture Syllabus for Kenya Certificate of Secondary School Education-Nairobi*. Kenya Institute of Education.

Kenya Institute of Education. (2002). *Secondary School Agriculture Syllabus for Kenya Certificate of Secondary School Education-Nairobi*. Kenya Institute of Education.

Kipkemei, E., Mose J., Chepchumba, C., Kosgei, D., Chepng'eno, W. & Boit, R. (2010). Contribution of secondary school agricultural knowledge on farmers' crop and livestock diversification activities in Uasin-Gishu County, Kenya. *International Journal of Innovative Agriculture & Biology Research*.3:18-26.

Kironchi, G. & Mwang"ombe, A. W. (2007). Technology-Mediated open &Distance education [Tech-Mode] in Agricultural education & training in Kenya. Opportunities & Challenges. Country case study commissioned by the common wealth of learning.

KNBS. (2010). *The 2009 Kenya Population and Housing Census: "Counting our people for implementation of vision 2030."* Population distribution by administrative units. Vol. 1 Government Printer, Nairobi.

Lloyd, P. J. and Osborne, E. W. (2008). Handbook on Agricultural Education in Public Schools**.** Dunville, UL: International Printers

Maxwell, R. H. (1970). Relationship between Social Differentiation to Academic Success in Secondary Schools and Occupational Patterns in Kenya: *Chavakali Case.* Cornell University, Unpublished PhD Thesis

Maxwell, R. H. (1968). Relationship between Former Students' Secondary School Agriculture Knowledge and their Present Occupations in Kenya*: Chavakali Case.* Cornell University, Unpublished M.A. Thesis

Ministry of Agriculture. (2003). *Economic Recovery Strategy for Wealth and Employment Creation.* Nairobi. Government Printer

Ministry of Agriculture. (2005). Poverty Reduction Strategy Paper. Nairobi. Government Printer

Ministry of Agriculture. (2006). Kenya Rural Development Strategy. Nairobi. Government Printer

Ministry of Agriculture. (2006). *Strategy Plan (2006-2010).* Nairobi. Government Printer

Ministry of Agriculture and Ministry of Livestock and Fisheries Development. (2004). Strategy for Revitalizing Agriculture, *(2004-2014).*

Ministry of Agriculture. (1968). Agricultural Extension Training Manual for Extension Training Program. Nairobi. Government Printer

Ministry of Education (1964). Kenya Education Commission Report, part 1, Nairobi. Government Printer

Ministry of Education. (1976). Report of the National Committee on Education Objectives and Policies. The Government Printer, Nairobi.

Ministry of Education. (1984). The 8.4.4 System of Education. Government printer 1984.

Mosher, A. T. (1971). Agricultural Development: Behavioural Change in Agriculture. Cornell University Press.

Mugenda, O. M. & Mugenda G. D. (1999). Research Methods: Quantitative and Qualitative Approach, Nairobi: Acts press.

Mutai, B. (2000). How to write Quality Research Proposal: A Complete and Simplified Recipe. NewDelhi: Thelley publications.

Mwangi, J. W. (1998). Contributions of Education and Research to National Development with Special Reference to Kenya. *Egerton Journal of Humanities, Social Sciences and Education.*

Mwangi, J. G. (1998). Contributions of Education and Research to National Development with Special Reference to Kenya. Egerton Journal of Humanities, Social Sciences and Education.

Mwiria, K. (2002). Vocationalisation of Secondary Education; Kenya Case Study, Kimkam Development Africa Limited.

Nova, T. (1996). An Agri-Tourism Strategy, for Nova Scotia. Scotia Department of Agriculture and Marketing.

Odera, J. (1996). The Effects of Selected Factors on the Performance of Students in Agriculture in Secondary Schools of Nakuru County. Egerton University, Unpublished MSc Thesis

Onyango, C. A. (1975). The Establishment of Secondary School Agriculture and its Contribution to Rural Development in Kenya. University of Reading, Unpublished Ph.D Thesis

Purkey, W. (1988). An Overview of Self-Concept theory for Counselors. ERIC clearing house on Counseling and Personal Services, Ann Arbor, Mich. (An ERIC/CAPS Digest: ED304630)

Rao, S. N. (1990). Educational Psychology. Wiley Eastern Limited. New Delhi.

Republic of Kenya. (1976). Report of the National Committee on Education Objectives and Policies (Gachathi, Peter, J.). Nairobi: Government Printers.

Republic of Kenya. (2007). The Kenya Vision 2030. Nairobi: Government Printer.

Republic of Kenya. (2007). Kenya Vision 2030 Brochure. Nairobi: Government printers.

Schultz, L. H., Wieckert, D. A., Howard, W. T. & Dickson, D. P. (2008). A century of excellence in education and Discovery. Wikipedia Free Encyclopedia of Agriculture Education, eb 2008.

Sheffield, J. R., Moris, J. R., Hermans, J. (1976). Agriculture in Africa Secondary Schools, Case Studies of Botswana, Kenya and Tanzania. The African, American Institute, New York.

Stabler, E. (1969). Education Since Uhuru: The Schools of Kenya. Connecticut Wesleyan University Press.

Strein, W. (1995). Assessment of Self-concept. Greensboro,NC: ERIC clearing House on Counseling and Student Services. [ED389962]

Struck, F.T. (1945). Vocational Education for a Changing World. New York: John Willey and Sons Inc.

United Nations (UN). (2002). Millennium Development Goals (MDGs).

Vandenbosch, T. (2006). Post –Primary Education &Training in sub-Saharan Africa; principal Research work commissioned by the World Bank on Agricultural Education and Training in Sub-Saharan Africa. Nairobi: World Agro forestry Centre (ICRAF).

Wardsworth, B. J. (1996). Piagets theory of Cognition and Affective Development. World Bank. Washington.

Weir, J. R. (1967). Report of the Agricultural Education Commission. Nairobi; Kenya Government Printers.

Williams, D. L. & Dollisso, A. D. D. (1998). Rationale for research on sustainable agriculture in the high school agricultural education curriculum. Journal of Agricultural Education, 39(3), pp.51-56. doi: 10.5032/jae.1998.03051

World Bank. (1988). Education Sector Policy paper, Washington D.C., U.S.A, cited by World Bank. Education in Sub-Saharan Africa: Policies for Adjustment, Revitalization and Expansion. Washington D.C.: World Bank.

Zwanembegy, A. (2004). The Agricultural History of Kenya. Nairobi: East African Publishing House.

APPENDIX A

FORM FOUR GRADUATES QUESTIONNAIRE

Dear Farmer,

I am a student at Egerton University pursuing a Master of Science Degree in Agricultural Education. I am carrying out a research entitled *"Relationship between Secondary School Agriculture Knowledge and Form Four graduates' Farming Activities in Nyandarua West Sub-County, Nyandarua County, Kenya".* I am kindly requesting you to assist in conducting the study by filling this questionnaire. Please note that information given will be treated with utmost confidentiality and will only be used for the purpose of this study.

Instructions:-

Please tick [√] the preferred answer or fill write down the answer in the provided spaces [……]

SECTION A:-

Personal information

1. Gender Male [ ] Female [ ]
2. Age in Years ……
3. Marital Status: (*tick as appropriate*) Married ( ) Single ( ) Divorced ( ) Widow/er ( )
4. What is the size of your farm, in acres? ----------

Section B: Agriculture Knowledge (Secondary school agriculture curriculum coverage)

5. To what level did you study secondary school agriculture? Form 2 [ ] Form 4 [ ]
6. How frequently do you apply in your farming activities knowledge and skills acquire through secondary school agriculture? Never [ ] Rarely [ ] Occasionally [ ] Often [ ] Very often [ ]
7. To what extent does knowledge in agriculture acquired when in secondary school contribute towards your success in farming? Very little [ ] Little [ ]Moderate [ ] Large [ ] Very large [ ]

Section C: Farming activities and Diversity

10. Which of the below farming activities do you engage in? (Tick [ ])

a) Diary production ( )

b) Beef production ( )

c) Poultry production ( )

d) Bee keeping ( )

e) Pyrethrum production ( )

f) Crops production ( )

g) Vegetable Production ( )

h) Others (specify)……

11. List the different crops grown in the order of priority ……

a. ……

b. ……

c. ……

d. ……

e. ……

12. List the different types of livestock kept in the order of priority ……

a. ……

b. ……

c. ……

d. ……

e. ……

13. What off-farm activities do you engage in?

a) Teaching ( )

b) Business ( )

c) Employed ( )

d) Others (specify)…….. ( )

Section D: Technology

Which of the technologies listed below have you adopted in the following farming activities

1. Maize production
   a) Mechanization
   b) Pesticide and herbicide
   c) Improved seed varieties
   d) Disease control (Chemicals)
   e) Others (Specify) ……..…..….

2. Beans production
   i. Pesticide and herbicide
   ii. Irrigation
   iii. Improved seed varieties
   iv. Disease control
   v. Others (Specify ……

Indicate how frequently you use the technologies listed in the table below in your farm when engaging in diary production. Use the given scale

Scale: Never (NE), Rarely (RA), Sometimes (ST), Often (OF)

Technology	**Frequency of use**			
	OF	**ST**	**RA**	**NE**
Mechanization (prepare feeds, milk etc)				
Accaricides				
Disease control (eg antibiotics				
Artificial insemination				
Feeds (forage, silage, mineral licks, concentrates etc)				
Others (Specify)				

Section E: Attitude towards Farming

The items in the table below are on attitudes towards farming. Indicate your agreement with each using the given scale.

Scale: Strongly Disagree (SD), Disagree (D), N = Neutral (N), Agree (A), Strongly Agree (SA)

Statements	**Responses**				
	SD	**D**	**N**	**A**	**SA**
Farming is the backbone of the Kenyan economy					
Farming is a well-paying job.					
Farming is a very tiring activity					
One can get rich through farming					
Farming is a very dirty job					
There too many risks associated with farming					
Farming is very involving					
Farming is the key to success of the citizens of Kenya					

In your view briefly comment on the contribution of agriculture knowledge and skills you learned at school to the real life situation in farming?

_____

_____

_____

_____

THANKS FOR YOUR CO-OPERATION!!!

APPENDIX B

OBSERVATION SCHEDULE

Ser. Number……

Farm location …….

1. Approximate size of the land ……...

2. Crops farming activities observed.

   i) ……

   ii) ……

   iii) ……

   iv) ……

   v) ……

   vi) ……

3. Livestock farming activities observed.

   i) ……

   ii) ……

   iii) ……

   iv) ……

   v) ……

3. Technologies adopted

   a. ..……..

   b. ……

   c. …….

   d. …….

APPENDIX C

RESEARCH PERMIT

PAGE 2

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

Nyandarua West Location
Central District
Province

on the topic: Influence of secondary school agriculture knowledge on O-Level farmers' farmin activities in Nyandarua West District, Nyandarua County, Kenya.

for a period ending: 31st December, 2013.

PAGE 3

Research Permit No. *NCST/RCD/10/013/17*
Date of issue *24th April, 2013*
Fee received *KSH. 1,000*

Applicant's Signature

Secretary
National Council for
Science &Technology

CONDITIONS

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

REPUBLIC OF KENYA

RESEARCH CLEARANCE PERMIT

GPK6055t3mt10/2011

(CONDITIONS—see back page)

APPENDIX D

AUTHORIZATION LETTER

REPUBLIC OF KENYA

NATIONAL COUNCIL FOR SCIENCE AND TECHNOLOGY

Telephone: 254-020-2213471, 2241349, 254-020-2673550
Mobile: 0713 788 787 , 0735 404 245
Fax: 254-020-2213215
When replying please quote
secretary@ncst.go.ke

P.O. Box 30623-00100
NAIROBI-KENYA
Website: www.ncst.go.ke

Our Ref: **NCST/RCD/10/013/17**

Date: **24th April, 2013**

Charles Mwangi Njenga
Egerton University
P.O.Box 536
Egerton.

RE: RESEARCH AUTHORIZATION

Following your application dated *16th April, 2013* for authority to carry out research on "***Influence of secondary school agriculture knowledge on O-Level farmers' farming activities in Nyandarua West District, Nyandarua County, Kenya,***" I am pleased to inform you that you have been authorized to undertake research in **Nyandarua West District** for a period ending **31st December, *2013*.**

You are advised to report to **the District Commissioner, the District Education Officer and the District Agricultural Officer, Nyandarua West District** 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.

DR M.K. RUGUTT, PhD, HSC.
DEPUTY COUNCIL SECRETARY

Copy to:

The District Commissioner
The District Education Officer
The District Agricultural Officer
Nyandarua West District.

"The National Council for Science and Technology is Committed to the Promotion of Science and Technology for National Development".

APPENDIX E

MAP OF NYANDARUA WEST SUB-COUNTY