INFLUENCE OF SCHOOL FACTORS ON THE IMPLEMENTATION OF SECONDARY SCHOOL AGRICULTURE CURRICULUM IN ARID AND SEMI-ARID LANDS OF KENYA: CASE OF BARINGO, MAKUENI AND NAROK COUNTIES

Miriam Nthenya Kyule

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DECLARATION AND RECOMMENDATION

Declaration

This is my original work and has not been previously submitted or published for the award of a degree or diploma in this or any other university.

Signed _____ Date _____

Miriam Nthenya Kyule

Reg. No. ED11/0472/14

Recommendation

This Thesis has been submitted for examination with our approval as University supervisors.

Signed _____ Date _____

Dr. Jacob J. J. Ochieng' Konyango

Department of Agricultural Education and Extension,

Machakos University

Signed _____ Date _____

Dr. Agnes O. Nkurumwa

Department of Agricultural Education and Extension,

Egerton University

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DEDICATION

To my husband Simon, our children Faith and Blessing, my dad Kyule, all fathers who value the education of their children and my late mother Susan.

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ABSTRACT

Introduction and implementation of secondary school agriculture curriculum in Kenya was an endeavor in meeting the developmental needs of the surrounding communities and the country at large. In the case of Arid and Semi Arid Lands (ASALs), there is need for human resource that can improve agricultural productivity of the area. Implementation of agriculture curriculum has not sufficiently integrated agricultural activities in the curriculum within the school in preparation of competent human resources. This inadequacy which is partly attributed to weak curriculum implementation strategies has resulted in under exploitation of ASALs agriculturally. This study sought to determine the influence of student, teacher, teaching resources and funding related factors on implementation of agriculture curriculum in ASAL secondary schools. The study used descriptive survey research design. The target population was 6,883 comprising agriculture teachers, agriculture students and school heads from Baringo, Makueni and Narok counties. Multi-stage sampling was used to select a sample of 88 agriculture teachers, 271 Form Three agriculture students, 29 secondary school heads and five experts in the Department of Agricultural Education and Extension. Four questionnaires and a content analysis check list were used to collect data from the four groups of respondents. A pilot study was carried out in Laikipia West Sub-county to determine the instruments' reliability. Cronbach's alpha of 0.76 and 0.79 were obtained for the agriculture teachers and students' questionnaires respectively. Reliability of the principals' questionnaire was determined qualitatively by discussing the items with the supervisors. Data were analyzed using both descriptive and inferential statistics aided by the Statistical Package for Social Sciences (SPSS) version 20. The inferential statistics used were Simple and Multiple Linear Regressions. Null hypotheses were tested at $\alpha = 0.05$ level of significance. The study findings showed that learner related factors, teaching resources and funding positively influenced agriculture curriculum implementation in ASAL schools. The study concludes that student related factors namely learning resource availability, adequacy and frequency of use have a significant influence on agriculture curriculum implementation in ASAL secondary schools. The study recommends that the Government through the Ministry of Education, teachers of agriculture and all other stakeholders need to ensure improvement in the provision of agriculture learning resources in ASAL schools. Agriculture teacher training need to be innovative and practical oriented to enable them to translate and implement the agriculture curriculum in ASAL schools practically.

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LIST OF ABBREVIATIONS AND ACRONYMS

ACTN	African Conservation Tillage Network
ALP	Adaptive Learning Programme
ASALs	Arid and Semi Arid Lands
ASARECA	Association for Strengthening Agricultural Research in Eastern and Central Africa
BoM	Board of Management
CEEPA	Center for Environment Economics and Policy in Africa
DLA	Dry Land Agriculture
EAC	East African Community
EAEC	East African Examinations Council
FAO	Food and Agriculture Organization
FSE	Free Secondary Education
FSK	Forest Society of Kenya
GDP	Gross Domestic Product
GoK	Government of Kenya
IDA	International Development Agency
IFAD	International Fund for Agricultural Development
IIRR	International Institute of Rural Reconstruction
ILRI	International Livestock Research Institute
INCIP	Indigenous Chicken Improvement Programme
IPCC	Intergovernmental Panel on Climate Change
KALRO	Kenya Agricultural and Livestock Research Organisation
KCSE	Kenya Certificate of Secondary Education
KEVEVAPI	Kenya Veterinary Vaccines Production Institute
KICD	Kenya Institute of Curriculum Development
KIE	Kenya Institute of Education
KIPPRA	Kenya Institute for Public Policy Research and Analysis
KLB	Kenya Literature Bureau
KNEC	Kenya National Examinations Council
MTP	Medium Term Plan
NCEOP	National Committee on Educational Objectives and Policies
PTA	Parents' Teachers' Association

RoK	Republic of Kenya
SDGs	Sustainable Development Goals
USAID	United States Agency for International Development

CHAPTER ONE

INTRODUCTION

1.1 Background of the Study

Agricultural education is considered paramount in promoting social and economic development globally (Lawal & Wahab, 2011). Among the major purposes of agricultural education in Africa is to prepare people for work, promote rural development and reinforce academic pursuits by preparing students for higher education. This was, and still remains the driving philosophy for the introduction and implementation of secondary school agriculture curriculum in Kenya. The government of Kenya acknowledges that education based on regular curriculum review and reforms is fundamental in preparation of human resource in all economic sectors (Ministry of Planning and National Development, 2007b). The agriculture sector remains essential in economic development of both developed and developing nations Kenya included (Meijerink & Roza, 2010). For this reason therefore, a need arises for regular curriculum reform in responding to societal changes. The introduction of secondary school agriculture curriculum in Kenya schools in 1959 was based on this need as (Konyango, 2014; Moore, 1979) who both point out the need for making secondary school agriculture curriculum more responsive to the rural developmental needs and in this respect preparation of human resource who can exploit ASALs agriculturally. Agriculture curriculum reforms have been done over the years and hence the current secondary school agriculture syllabus has agricultural content on practices and techniques which may serve to promote both conventional agriculture and Dry Land Agriculture (DLA).

Practices that serve to promote DLA in the agriculture syllabus include those aimed at maximizing soil water retention and minimizing soil disturbance, reducing water runoff, irrigation, use of green houses, rearing drought resistant livestock as well as practices involved in growing drought resistant crops (Kenya Institute of Education [KIE], 2002). Effective implementation of these practices in the curriculum at the school level should enable students to acquire agricultural skills which promote DLA which are paramount if agricultural production in ASALs is to be maximized. Proper curriculum implementation requires the combined efforts of teachers and other stakeholders in education. Enhancement of agricultural production in ASALs through DLA is expected to boost Kenya in attainment of the Sustainable Development Goal Two (SDG) on ending hunger, achieving food security

and improved nutrition and promoting sustainable agriculture (Ministry of Planning and National Development, 2007a; United Nations [UN], 2015).

The justification of curriculum reform was based on the premise that majority of African countries' Gross Domestic Product [GDP] relies heavily on agriculture and it employs 65 percent of Africa's labour force (Chauvin, Mulangu & Porto, 2012). In Sub-Sahara Africa, agriculture accounts for over 30 percent of GDP (Farauta & Amuche, 2013). Agriculture sector in Kenya contributes directly about 26 percent of the Gross Domestic Product [GDP] and about 19 percent of the formal wage employment (Kenya Institute for Public Policy Research and Analysis [KIPPRA], 2013; Lewa & Ndungu, 2012; Ministry of Devolution and Planning, 2013). Over 70 percent of the livestock population in the country is in the Arid and Semi-Arid Lands (ASALs). These livestock are of low quality compromising their productivity. This could be enhanced through linking school agriculture curriculum with the community to equip the future farmers with relevant skill and knowledge for improved agricultural production.

Despite ASALs' vulnerability to drought, wide spread poverty and under exploitation, they have potential for contributing to economic development of the country through improved agricultural production (United Nations Development Programme [UNDP], 2012b). The livestock sector contributes about 12 percent of Kenya's Gross Domestic Product [GDP], 43 percent to the agricultural GDP and employs 50 percent of agricultural labour force (Association for Strengthening Agricultural Research in Eastern and Central Africa [ASARECA], 2012; International Livestock Research Institute [ILRI], 2012; Kenya Veterinary Vaccines Production Institute [KEVEVAPI], 2011). Kenya's ASALs have the potential to produce drought resistant crops like sorghum, pearl millet, maize and legumes including beans, cowpea, green gram and pigeon pea but are under utilised (Ministry of State for Development of Northern Kenya and other Arid Lands, 2011). According to the Ministry of Planning and National Development (2007b), agriculture is a major contributor to national food security and is expected to play a critical economic role as Kenya works towards attaining Vision 2030.

Agricultural production can be enhanced by maximum utilization of Arid and Semi-Arid Lands which occupy 41 percent of the earth's land surface and are home to 35 percent of the world's population (Kimani, Esilaba, Njeru, Miriti, Lekasi & Koala, 2015). Effective implementation of agriculture curriculum in schools would equip learners with the relevant

knowledge and skills in DLA, which would enhance utilization of ASALs for agricultural productivity. Two-thirds of African land mass is ASAL, 40 percent of sub-Sahara Africa is also ASAL and home to more than 206 million people while in Eastern Africa, such land covers close to 81 percent of the total land mass (Mowo, Dobie, Hadgu & Kalinganire, 2010). In Kenya, nearly 10 million people live in the ASALs which constitute about 84 percent of the country's land and experience recurrent drought and famine (UN, 2011). However, most of the farming is done in the high and medium potential areas which only accounts for less than 17 percent of Kenya's land while the rest of the land is classified as Arid and Semi Arid Lands [ASALs] which are considered less productive (Ministry of State for Development of Northern Kenya and other Arid Lands, 2011). It is important to note that only 62 percent of the land in medium and high potential areas is under agriculture and it continues to face a very stiff competition from urbanization and new homesteads (Ministry of Planning and National Development, 2007b). This has been attributed to the rapid population growth in these areas. Although Kenyan ASALs have great potential for agricultural production, they remain largely under exploited (Ministry of State for Development of Northern Kenya and other Arid Lands, 2011). Rainfall patterns are unpredictable subjecting ASAL areas to moisture stress hence improved agricultural production can only be attained through knowledge and skills that promote Dry Land Agriculture (DLA). Such knowledge and skills finds its way in to the secondary school agriculture curriculum through regular curriculum reforms to make it relevant to needs of the society.

Exploitation of the potential in agriculture requires secondary school agriculture teachers to translate the curriculum in and about agriculture to serve all populations including the ASALs by putting emphasis on crops and livestock in these areas (Idris, Rajuddin, Latib, Udin, Saud & Buntat, 2012). Agriculture curriculum implementation should also produce experienced persons able to apply agriculture knowledge and skills in all ecological conditions in the country other conditions remaining favourable. Curriculum implementation is a composite of the learner, teacher, teaching learning resources, teaching methodologies, anticipated experiences and outcomes (Okogu, 2011). Equipping secondary school agriculture students in ASALs with DLA farming skills is likely to be a milestone in addressing agricultural productivity since the fundamental purpose of agricultural education is to ensure better agriculture that makes rural life as nearly perfect as possible (Saina, Kathuri, Rono, Kipsat & Sulo, 2012). In some developed countries such as the United States of America, agricultural institutions have taken charge of providing leadership and human resource development

among the learners of agriculture at secondary school level and Kenya can borrow from them (Kanyi, Vandenbosch, Ngesa & Kibett, 2011).

The bedrock of technological advancement in agriculture lies in the implementation of agriculture curriculum which would ensure that learners acquire the desired knowledge, skills and techniques as stipulated by the agriculture syllabus learning objectives (Ugochukwu, 2012). Implementation of Kenya's secondary school agriculture curriculum should steer agricultural development in the entire country including the ASALs. Among the specific objectives in the 8-4-4 secondary school agriculture syllabus is: to reinforce interest and awareness of opportunities existing in agriculture, to demonstrate that farming is a dignified and profitable occupation and to expand the knowledge of the basic principles and practices in agriculture. It is also to develop self-reliance, resourcefulness, problem solving abilities and occupational outlook in agriculture as well as ensuring that schools take an active part in rural development by integrating agricultural activities in the curriculum (Kenya Institute of Education, 2002). To attain these objectives there is need for agriculture curriculum to be as practical as possible. It should enable a secondary school agriculture student in the ASAL who has gone through the agriculture curriculum to be more self reliant, resourceful and better in farming than those who never chose agriculture in school.

Agriculture teachers who are grounded in the technical components of the subject and have a potential for teaching agriculture in a practical manner are crucial in implementation of the curriculum in ASALs if the above objectives are to be achieved. In Kenya, as early as 1990, the implementation of agriculture curriculum strategies had deviated from participatory and problem solving approaches to the teacher centered styles grounded on theoretical and rote learning (Eisemon, 1990). This was facilitated by the pressure to excel in examinations and the nature of assessment which focused more on theory than practical aspects (Kenya National Examination Council (KNEC), 2002). This view according to Farauta and Amuche (2013) observed that most agriculture teachers were teaching the knowledge required by learners to pass examinations rather than teach for acquisition of agricultural skills for both employment purposes as well as agricultural production. This situation compromises on the quality of DLA practical skills that learners acquire at secondary school level.

According to Njeru and Orodho (2003) and Puyate (2012), secondary school agriculture curriculum implementation is influenced by several factors among them teaching learning

resources such as agriculture textbooks, library, workshop, farm tools and equipment and a functional school farm. Others are learner related factors, teacher related factors, teaching methods used, school related factors and curriculum reform related factors. Student age, parental influence, career choice, gender, study times, class attendance, academic achievement, socioeconomic status and self-esteem are among student related factors that influence curriculum implementation in secondary schools (Levon & Blannie, 2004; Ogweno, Kathuri & Obara, 2014). The teacher related factors that may influence curriculum implementation are training level or teacher quality, competence, experience, teaching load, job satisfaction, monetary and non-monetary motivation and class attendance (Okogu 2011). Indoshi, Wagah and Agak (2010) indicated that teacher's attitude also influences the way they implement the curriculum. The teaching method used by a teacher is likely to influence curriculum implementation. Among the teaching methods used include; demonstration, project, lecture, tutorial and seminars, fieldwork, inquiry method, discussion and computer based method (Ali & Muhammad, 2012; Okogu, 2011).

Curriculum reform related factors have seen agriculture subject at primary school level being integrated with the science curriculum, while in secondary schools it is an elective subject (Kenya Institute of Education, 2002; Muchiri, Odilla & Kathuri, 2013). This has over time lowered the emphasis given to the subject in preparation of agriculture human resource. In addition, the time allocated for the agriculture subject per week was reduced limiting the time available to effectively implement a practical agriculture curriculum. With the government subsidy on secondary school fees, the class sizes have tremendously swollen and large class sizes have been found to influence curriculum implementation (Otaala, Maani & Bakaira, 2013). These curriculum reform related factors deny the subject the attention it deserves in a country whose economy is agriculture driven. To produce a reliable human resource that can propel Kenya's economic mainstay to its full potential, effective implementation of agriculture curriculum at secondary school level where most learners study the subject is critical. A study done in Uasin Gishu found out that a positive correlation existed between farmers with secondary school agriculture education and agricultural production which has been associated with their ability to apply the knowledge and skills learnt (Saina et al., 2012). Hence implementing agricultural content on practices and techniques that promote DLA would equip learners with skills they can replicate in ASALs to improve agricultural production.

Acquisition of agricultural skills has been found to depend on how the teacher presents the learning experiences to the learners and this demands that the teacher chooses an appropriate teaching method (Okorie, 2009). The teaching methods opined to be the best for acquisition of agricultural skills are guided discovery and learning by doing (Olaitan & Uwadiae, 2003) which have not been embraced by most secondary school agriculture teachers in Kenya. Agriculture being a technical subject whose focus is to equip learners with agricultural skills is best taught through active learner involvement by doing (Olatoye & Adekayo, 2010). For this reason, during the piloting of the first secondary school agriculture curriculum in Kenya at Chavakali High School in 1959, students were exposed to a school farm and a home garden where they could practice the skills acquired in school (Konyango, 2014). This was the best way to link school agriculture with the rural community.

The pilot project and the subsequent immediate secondary schools to teach agriculture in Kenya were adequately funded by United States Agency for International Development (USAID), World Bank and the Kenya Government. Thus provision of funds for an effective agriculture curriculum implementation is paramount. Agricultural skill acquisition is also dependent on how the agriculture teacher mobilizes and utilizes resources necessary for teaching (Alaja, 2008). The philosophy of 8-4-4 system of education on technical subjects like agriculture was to prepare school graduates who are self reliant, able to solve societal problems and participate in rural development. To achieve this philosophy, implementation of agriculture subject was to aim at equipping agriculture students with skills, knowledge and attitude they would utilize after school even in the ASALs. However, the ASALs have continued being under agriculturally exploited besides agriculture being implemented in secondary schools. Implementation of agriculture curriculum at secondary school level is crucial since it is at the initial level where agriculture is taught independently as a subject. Thus there is need to assess and document the relevance of the curriculum to the ASALs as well as the influence of the factors affecting implementation of secondary school agriculture curriculum in ASALs. This study focused on school factors among the many factors influencing agriculture curriculum implementation. The school being the institution where curriculum implementation takes place, school factors have a direct influence on the teaching learning process in agriculture in ASAL secondary schools. The school factors studied included student related factors, teacher related factors, teaching resource related factors and funding.

1.2 Statement of the Problem

The secondary school agriculture curriculum in Kenya aims at equipping learners with knowledge, skills and attitudes that they can replicate in real life situations regardless of the ecological conditions. One of the expected outcomes of teaching agriculture in secondary schools is that it would make a positive contribution to agricultural development in surrounding communities, through integration of relevant agricultural activities in the curriculum. Implementation of agriculture curriculum is also meant to demonstrate the opportunities that exist in agriculture as well as creating an interest in agriculture as an occupation among the rural youth. However, implementation of the agriculture curriculum in the ASAL schools has fallen short of these expectations. This could be due to curriculum implementation not being able to adequately integrate the agricultural activities in the curriculum on the school farm which would in turn influence agricultural activities in the surrounding communities. This may be one of the possible reason which has resulted in under exploitation of the agricultural potential of the ASALs, one of which is the way in which the curriculum is implemented. There are a number of factors that are likely to influence implementation of the secondary school agriculture curriculum in ASALs, including school related factors. There are few studies if any, which have looked at the influence of these factors on agriculture curriculum implementation in ASAL schools. This study therefore, sought to fill this gap by determining the influence of school factors, namely; student related, teacher related, teaching resource related and funding factors on implementation of secondary school agriculture curriculum in Baringo, Makueni and Narok counties.

1.3 Purpose of the Study

This study sought to determine the influence of school factors on implementation of secondary school agriculture curriculum in arid and semi-arid lands of Kenya.

1.4 Objectives of the Study

The objectives of the study were to determine:

i. The influence of student related factors on implementation of secondary school agriculture curriculum in selected arid and semi arid counties of Kenya.
ii. The influence of teacher related factors on implementation of secondary school agriculture curriculum in selected arid and semi arid counties of Kenya.
iii. The influence of teaching resources on implementation of secondary school agriculture curriculum in selected arid and semi arid counties of Kenya.

iv. The influence of funding on implementation of secondary school agriculture curriculum in selected arid and semi arid counties of Kenya.
v. The extent to which secondary school agriculture curriculum in Kenya covers content on Dry Land Agriculture.

1.5 Hypotheses and Research Question

The following are the hypotheses and research question of the study:

1.5.1 Hypotheses

The following null hypotheses guided the study:

$H0_1$ There is no statistically significant influence of student related factors on implementation of secondary school agriculture curriculum in selected arid and semi arid counties of Kenya.

$H0_2$ There is no statistically significant influence of teacher related factors on implementation of secondary school agriculture curriculum in selected arid and semi arid counties of Kenya.

$H0_3$ There is no statistically significant influence of teaching resources on implementation of secondary school agriculture curriculum in selected arid and semi arid counties of Kenya.

$H0_4$ There is no statistically significant influence of funding on implementation of secondary school agriculture curriculum in selected arid and semi arid counties of Kenya.

1.5.2 Research Question

The following research question guided the study:

To what extent does the secondary school agriculture curriculum in Kenya cover content relevant to Dry Land Agriculture?

1.6 Significance of the Study

This study was important because it was focusing on agriculture curriculum implementation in secondary schools which is important in preparing human resource for sustaining the agriculture sector which is the highest GDP earner in the country. The information obtained from this study should be useful to secondary school agriculture teachers since it highlighted areas related to teacher factors that need improvement for better implementation of agriculture curriculum. It is also likely to be informative to learners and their teachers on learner related factors that need to be addressed to improve on agriculture knowledge and

skill acquisition. The findings of this study are of use to the Ministry of Education and curriculum reviewers in identifying areas of deficit on content coverage related to ASAL areas. Additionally, it may inform them to rethink of the relevance of agriculture teaching and learning resources even as they emphasize on competence based curriculum. The information is also likely to be useful to policy makers in guiding them towards policy formulation for improved agriculture curriculum implementation to meet societal needs.

1.7 Scope of the Study

This study was restricted to the implementation of the Kenya secondary school agriculture curriculum focusing on ASAL areas with regard to the influence of school factors namely; teacher related factors, teaching resource related factors, funding and student related factors on implementation of agriculture curriculum in ASAL secondary schools. Teacher related factors included agriculture teacher's technical knowhow on the subject, ability to interpret the syllabus objectives to the local environment and teaching methods used. The teaching methods included discussion, lecture, practicals, demonstration, project, field visits, use of resource persons and computer based instruction. Among the teaching resources used in teaching DLA practices were the school farm, relevant agriculture text books, agriculture rooms, workshops, farm stores, livestock production structures, charts, models, videos, farm tools and equipment and irrigation equipment. Funding focused on financial support offered towards implementation of agriculture curriculum by the school administration specifically the school principals. The student related factors included agriculture students' attitude towards the subject, subject preference and choice and adequacy of learning resources.

1.8 Assumptions of the Study

The study assumed that:

a). All agriculture teachers were technically and professionally qualified.

b). Schools had resources for proper implementation of the agriculture curriculum.

c). By the time of data collection the form three students were covering form three syllabus.

d). The curriculum is adequate for ASALs.

1.9 Limitations of the Study

The study limitations were:

a). Inability to access records on fund allocation by the school to the Agriculture subject this was overcome by getting the information from the individual teachers.

b). A few teachers in the remote areas of Narok and Baringo were skeptical of participating in the study for fear that the information they disclosed would reach the school administration hence were assured of anonymity and confidentiality.

1.10 Definition of Terms

This section provides the operational meaning of the terms and phrases used in this study.

Agriculture: Agriculture is the art and science of crop and livestock production (Kenya Institute of Education, 2011). In this study, Agriculture referred to the subject offered in secondary schools and is meant to equip learners with knowledge, skills and attitude in crop and livestock production.

Arid and semi arid lands: The Ministry of State for Development of Northern Kenya and other Arid Lands (2011) defines ASALs as all the dry lands where annual precipitation is less than 600 mm and singles out 23 counties out of 47 in the country to be ASALs. This study adopted this definition and focused on Baringo, Makueni and Narok counties.

Curriculum: Refers to the body of knowledge, experiences, skills, values and attitudes transmitted to learners (Kelly, 1999). This study adopted as stated the definition of curriculum in relation to agricultural content that serves to promote DLA in secondary school agriculture syllabus.

Curriculum implementation: Cheng (1994) defined implementation as the translation of curriculum objectives into teaching learning process through which learners should acquire planned agricultural experiences, knowledge, skills, ideas and attitudes. In this study, implementation referred to the level of acquisition of knowledge and skill among agriculture students in ASAL secondary schools on practices that promote DLA as well as the type of projects they carried out within the school farm.

Dry land agriculture: DLA is a farming approach that advocates for increasing agricultural yields in ASALs through adoption of farming systems and cultural practices aimed at minimizing soil disturbance, maintaining permanent soil cover and diversifying crops grown (Milder, Majanen & Scherr, 2011; Mwenzwa, 2011; Towery & Werblow, 2010). In this study, DLA referred to all agricultural practices in the secondary school agriculture curriculum which serve to improve agricultural production in ASALs. They included practices aimed at soil and water conservation practices, minimum soil disturbance, DLA crop and livestock production practices.

Funding: Refers to the sum of money saved or made available for a particular purpose (Cambridge advanced learners dictionary, 2010). In this study, funding referred to the level of financial support that school administrations offered towards agriculture curriculum implementation in their schools. This is support towards agriculture related excursions and professional development of agriculture teachers.

Influence: Refers to the power to have an effect on people or things (Cambridge advanced learners dictionary, 2010). In this study influence referred to the power that the selected factors have effect on agriculture curriculum implementation.

Other stakeholders: Other than the school administration, teachers and students there are other stakeholders who play a role in curriculum implementation and these included; parents, Ministry of Education, quality assurance, curriculum developers, school surrounding communities, policy makers and employers.

School category: Referred to the grouping of schools as given by the Ministry of Education. A school can either be national, county, sub-county or a private school.

School factors: Refers to the school's socio-economic environment, human and material resources that influence curriculum implementation (Daryl, 1994). According to this study, school factors referred to the student related, teacher related, teaching resource related and funding factors.

Student related factors: Refer to student's individual and background related factors (Hedjazi & Omidi, 2008). In this study student related factors referred to their subject choice, career aspirations and learning resources availability, adequacy and frequency of use.

Teacher related factors: According to Ali and Muhammad (2012) a teacher cannot offer to a student what he/herself doesn't possess in his/her personal attributes which in turn influences how the teachers delivers the content in a classroom setting. In this study, teacher related factors referred to a teacher's technical knowhow on the subject, ability to interpret the syllabus objectives to the local environment and teaching methods used.

Vocational subject: Olaitan (2007) and Osam (2013) defined vocational as technical subjects deliberately designed for the development of skills and knowledge that are useful to both the individual and the society. In this study vocational subject referred to equipping learners with the right agricultural skills, attitude and knowledge on practical agriculture for employment and self reliance in ASALs.

CHAPTER TWO
LITERATURE REVIEW

2.1 Introduction

The review of literature was carried out under the following sub-titles; importance of agriculture to Kenya's economy, agricultural production in Kenyan ASALs and linking secondary school agriculture curriculum to DLA practices. Other subheadings include; secondary school agriculture curriculum and implementation of secondary school agriculture curriculum. The chapter concludes with the theoretical and conceptual framework.

2.2 Importance of Agriculture to Kenya's Economy

The agriculture curriculum implementation in schools cannot be ignored since the agriculture sector dominates the world's economy. It accounts for most of the African countries' gross domestic product up to 40 percent, 17 percent of exports and 60–80 percent of employment (Farauta & Amuche, 2013). Yet Africa is the only continent where hunger and poverty are projected to worsen in the 2020s with the number of malnourished children projected to increase correspondingly (FAO, 2013). To alleviate hunger and poverty, a well trained human resource in the agriculture sector is vital. Agriculture therefore remains important for sustainable development and poverty reduction in the continent. In Kenya, agriculture is critical to national food security and it is expected to play an economic role the country envisages its transformation into a rapidly industrializing, middle-income nation by the year 2030 (Lewa & Ndungu, 2012). However, to achieve the expected transformation in the agriculture sector, the education sector needs to play its role by preparing human resource who are competent through proper implementation of the agriculture curriculum in schools.

In Kenya's effort to develop and transform agriculture sector, the Government came up with the Strategy for Revitalizing Agriculture 2004-2014 (Ministry of Agriculture, 2005) and the first Medium Term Plan (MTP) for implementation of Vision 2030. The key policy goals included: raising agricultural productivity through increased resource allocations, exploiting irrigation potential, commercializing agriculture, reviewing comprehensively the legal and policy framework for agriculture and improving the governance in key agriculture institutions, especially cooperatives and farmer organizations. However, the agriculture production has not kept pace with the population growth rate and the country has become a net importer of its two major staple foods, maize and wheat (Saina et al., 2012). Therefore there is urgent need for agriculture expansion and development in order to reverse the current

trend in agricultural productivity in the country. Though the policy goal on exploitation of irrigation potential is of great importance to the ASALs as a Dry Land Agriculture (DLA) practice but little has been achieved and ASALs continue being agriculturally underutilized. Haphazard implementation of the agriculture curriculum in schools may have contributed to the incompetency of our human resource in improving agricultural productivity in ASAL areas. Such in competencies include inability to apply DLA knowledge and skills to utilize ASALs for food production. This has then culminated to over reliance on foreign human resource in implementing Kenya's agricultural projects like the Galana irrigation project. Hence, since the foreign investors do not share in Kenya's vision and are income driven, such projects never achieve their ultimate goal and the ASALs remain agriculturally under developed. Empowering the youth in high schools with knowledge and skills that promote practical agriculture would make them informed of the ways of enhancing agricultural productivity in ASALs. According to Kipkemei, Kipsat, Sulo, Korir and Inyanje (2012) a positive relationship exists between education and agricultural productivity. Given the importance of the agriculture sector to the economy, agricultural education cannot be ignored for it prepares the human resource that runs the sector. Emphasis on agriculture curriculum implementation for human resource who are adequately trained and equipped with relevant skills to keep agriculture at the top as the highest Gross Domestic product earner is paramount.

2.3 Linking the Curriculum to Dry Land Agriculture Practices

Globally, agricultural education has recorded massive successes in defeating food shortages amidst wide environmental catastrophes (David & Lavinia, 2003; Maguire, 2000). These successes are due to the joint efforts of scientists, agriculture teachers and extension workers who are charged with the task of disseminating new ideas to the farmers. There has been and continues to be pressure to adjust and to improve so as to meet the demand of the rising population. A multi-disciplinary agriculture curriculum has a place to play in achieving this global aspiration.

According to McCarthy, Lipper and Branca (2011), dryland agriculture incorporates a wide range of agricultural practices aimed at minimizing soil disturbance, soil bareness, maximizing soil moisture retention and increasing soil fertility. However, for good results DLA has to be carried out as a holistic and multi-disciplinary agriculture. DLA practices include, zero tillage which ensures that there is minimal soil disturbance. Zero tillage has a

significant impact on soil, water and air quality, which leads to dramatic reductions in soil erosion. Studies have shown that zero tillage can reduce soil erosion by 90 to 95 percent or more compared to conventional tillage practices and continuous zero tillage can make the soil more resistant to erosion over time (Towery & Werblow, 2010). The same study established that conventionally cultivated areas lose on average 1.5 to 6 times more soil than no-tillage. In zero tillage type all cultivation is replaced with herbicides so that soil disturbance occurs only at sowing time when the planting implement engages the soil.

Mulching is another DLA practice. It plays a vital role in promoting the uptake and recycling of plant nutrients, creates a conducive environment for increase of beneficial soil microorganisms, improving soil structure reducing the force of rain drops hence minimise soil erosion and increasing soils' capacity to hold water and nutrients (Nyende, Nyakuni, Opio & Odogola, 2007). In addition it regulates soil temperature and slows down the speed of runoff water giving it more time to percolate in the soil as well as reducing evaporation rate hence it's made available to the crops for a longer time (Marongwe et al., 2011).

Different cropping patterns also serve to improve soil and water conservation (Matata, Ajayi, Oduol & Agumya, 2010). Cover cropping and alley cropping provide a continuous cover between main crops reducing soil erosion, building soil organic matter and improving the water balance, leading to higher and more stable yields in the ASALs. Cover crops ensure that the soil is not left bare after harvest, lowers soil surface temperature and suppress weed growth. Crop rotation, use of sunken beds and ridge furrow are also DLA approaches aimed at soil water retention (FAO, 2013). Improved fallows which refer to the deliberate planting of fast growing species, usually legumes that quickly utilize available moisture, produce easily decomposable biomass and replenish soil fertility can also be adopted (McCarthy et al., 2011). According to USAID (2014), cereal transplanting has also been found to improve cereal production in ASALs by 85 percent when transplanting is properly timed. In addition, DLA requires timely planting to be observed so that these crops maximally benefit from the available rainfall (CARE International and Adaptive Learning programme [ALP], 2010). Thus if agriculture teachers interpreted the agriculture curriculum correctly, ASALs would only ask for logistic support in embracing DLA practices.

In-field and in-situ water harvesting techniques have also been used to improve crop yields in ASALs. There is need to extend such techniques to schools to exploit teachers' skills in implementing the curriculum. In-situ water harvesting involves the use of methods that

increase the amount of water stored in the soil profile by trapping the rain where it falls and it involves little movement of rainwater as surface runoff (Ministry of Agriculture India, 2013). This has been possible through structures that reduce runoff in farms and hold water long enough to allow it to infiltrate. Such structures include the: terraces, vegetated strips and farm ponds. Harvested runoff can sustain crop production during the dry spells and this will reduce crop failures and ultimately lead to improved household food production. Improved in-field and in-situ water harvesting can increase the time required for crop moisture stress to set in and thus can result in improved crop yields boosting food security. Structures like green houses have also been found to promote DLA in ASAL areas (African Conservation Tillage Network [ACTN], 2008).

In extensive dry land agriculture, livestock are an integral part of the production system. According to ILRI (2012), Kenyan ASALs support most of the livestock kept in the country. However, these animals die in masses whenever drought strikes ASAL areas. A lot of research is being done by research and higher learning institutions to come up with hardy livestock that are high yielding and can withstand the harsh environment in ASALs (KEVEVAPI, 2011). The livestock kept in ASALS include: cattle, sheep, goats, chicken, donkeys, camels, rabbits and bees. Use of multi-purpose fodder crops has been found to supplement livestock feeding during drought period in ASALs (Care International and ALP, 2010). Agricultural practices serving dry land agriculture that can be of use in improving agricultural production status in Kenyan ASALs have been covered in secondary school agriculture curriculum. However, the extent of coverage has not been determined. In addition, the researcher has not come across any study on how these DLA practices in the curriculum are implemented in ASALs. Determining the extent to which the secondary school agriculture curriculum covers content on DLA practices is thus paramount.

2.4 Agricultural Production in Kenyan ASALs

The implementation of the agriculture curriculum in schools should focus on the preparation of competent human resource to participate in agricultural production. This is because agricultural production geared towards food production is paramount since food is central to the well being of a country's population (Bosoni, 2013). The estimated number of hungry people in the world rose from 800 million to One billion between 2007 and 2008 and an additional 44 million have fallen into extreme poverty due to the rise in food prices since June 2010 (Beddington et al., 2012). A study by Mba, Guimaraes and Ghosh (2012), found

out that global population growth rate was outstripping food production and hence over 70 percent food production should be attained by the year 2050 to satisfy the expected demands for food for over 9 billion people. According to Bogdanski (2012) one third of the global population increase will occur in African developing countries, Kenya being one of them. In these countries, agriculture continues to be the economic mainstay (Meybeck & Gitz, 2013). To satisfy this food demand therefore, school agriculture has to play its role of equipping agricultural human resource with skills and knowledge they can use to exploit the agricultural potential in ASAL areas.

Most communities in arid lands in Kenya are predominantly pastoralists and the Vision 2030 development strategy for Northern Kenya and other dry areas acknowledges the need for diversification through crop production (Ministry of State for Development of Northern Kenya and other Arid Lands, 2011). There are 9.2 million hectares in ASAL which have the potential for crop production (Ministry of Planning and National Development, 2007b) but are underutilized yet they can be put under DLA. Thus enhancing knowledge and skills on agricultural practices that promote DLA in secondary school curriculum would address the yields per unit area to support the rising food demand in the country. It would also be of great importance in realization of Vision 2030 of Kenya becoming a middle level economy earner. This knowledge and skills need to be inculcated among the youth as early as secondary school level through agriculture curriculum implementation. In Kenya therefore, agriculture must be transformed to feed the country's rising population and provide a basis for economic growth, food security and poverty reduction. This calls for the Kenyan education sector to do its part through preparing the human resource with the right agricultural skills and techniques to promote agricultural production especially in the ASALs since they occupy a large land mass of the country.

According to UNDP (2012a), food was identified as a human right in the 1948 Universal Declaration of Human Rights. Food is therefore necessary for life and so is food security a prerequisite for human development. Food insecurity has debilitated the society by increasing mortality, disease and disability (Bryan, Ringler, Okoba, Koo, Herrero & Silvestri, 2013; FAO, 2010). Yambi (2009) found out that food insecurity led to poor education and bad health since hungry learners have weak immune systems making them prone to communicable diseases. This leads to frequent absenteeism from school, they learn less and drop out of school early. The number of Kenyans requiring food assistance rose from 650,000

in 2007 to almost 3.8 million in 2009/2010 (RoK, 2013). Studies by Eastern African Communities [EAC] (2011) and Kristjanson et al. (2012) found out that the elimination of hunger and ensuring sustainable food security was the first step to hunger and poverty eradication. However, decreasing rainfall in Kenyan ASALs implies worsening food productivity hence food shortage (Nyamadzawo, Wuta, Nyamangara & Gumbo, 2013). Schools with school farms can help bridge this deficit by engaging in agricultural enterprises to support food supply to both the school as well as the neighbouring community. The implementation of practical agriculture curriculum in schools would also transform school farms into model farms from which the community can learn. Erratic rainfall is projected to severely compromise food production in Kenya by the year 2020 (Milder et al., 2011). While rain fed agriculture in high and medium potential areas gave an assurance of agricultural productivity, Songok, Kipkorir and Mugalavai (2013) found out that continued decrease in rainfall in ASALs had adverse impacts on agricultural production across the drylands. Increasing agricultural production in ASALs through adopting agricultural practices aimed at promoting dryland agriculture is thus fundamental. Higher productivity would build up food security, boost income and raise the living standards of the ASAL people. Secondary school agriculture can be of help in addressing food security issues by equipping learners in secondary schools with the appropriate agricultural skills that promote DLA.

Relating school agriculture to life in the immediate community is essential in the promotion of agricultural production in ASALs. This would be achieved through proper funding and participatory implementation of the agriculture curriculum in ASALs. The two fundamental objectives of Kenya secondary school agriculture are to develop basic principles of agricultural production relevant to Kenya in general and specifically to the learner's own environment as well as to involve learners in practicals which aim at assisting them to acquire useful agricultural skills (KIE, 2002). The agriculture curriculum thus acknowledges that Kenya is not a uniform agro-ecological zone hence faces varying agricultural needs and challenges. According to the United States Agency International Development [USAID], (2014), because of the low precipitation in ASALs, special farming techniques, well adapted crops and livestock are needed to ensure successful, stable and sustainable agriculture. Emphasis has then shifted to dryland agriculture to offer solution to the erratic rainfall patterns, which have become frequent over the years leading to decline in crop production or complete crop failure in some areas (Marongwe, Kwazira, Jenrich, Thierfelder, Kassam & Friedrich, 2011; Ministry of Agriculture India, 2013). This farming approach advocates for

increase in agricultural production in ASALs by minimizing soil disturbance, maintaining permanent soil cover, diversifying crops grown as well as growing adaptable crop varieties (Milder et al., 2011). Apart from water constraints, the soils are degraded due to continuous loss of top fertile soil through erosion caused by conventional tillage. DLA has been found to have the potential to boost crop yields, while securing the sustainability of soil, crops and water resources as well as declining labour requirement (Regional Land Management Authority [RELMA], 2007; International Institute of Rural Reconstruction [IIRR] and ACTN (2008). This then calls for secondary schools to establish some of the DLA structures like irrigation water reservoirs to enhance practical agriculture curriculum implementation in ASALs.

There are a few success stories that have been noted in some ASAL counties. For example, during the pilot phase of this study, the researcher came across a school in the ASAL County of Laikipia which has invested in an irrigation water reservoir. Construction of the water reservoir has changed the environment which appears all green as opposed to the expectation in an ASAL area. The school through the agriculture teacher and agriculture students manage a farm that had different varieties of vegetables at different growth stages as well as tomato fruit plants. From this irrigated farm, agriculture students were able to supply vegetables to the school throughout the term. Being a boarding school with a student population of around 800 students, the same farm was able to supply fruits to the school twice a week.

The yield from this farm saves the school a lot of money that would be spent in buying vegetables and fruits for feeding the students. The school has a livestock section that complements so well with the farm since any vegetable waste is fed to the animal and the manure from the animals is applied on the farm. Besides the farm being able to feed the school, students' involvement in the entire production process in the farm equips them with the DLA skills and knowledge they can replicate after school to make ASALs agriculturally productive. This school stands out in demonstrating the underexploited potential of ASALs. Plate1 shows the progress made by the school in embracing DLA.

a.Water reservoir and spinach section

b. Flourishing tomato plant fruits

c. Kales section and the agriculture teacher in charge

d. Cabbage section and the students on the far end preparing land for transplanting

Plate 1: Dry land agricultural activities in a school in the ASAL Laikipia County

Source: Photograph by researcher in a school in Laikipia County on 20th May 2015

The Kenya Government acknowledges the potential that agriculture knowledge and skills have in addressing agricultural production if inculcated among learners as early as in their primary school level. Thus in an effort to realize Vision 2030, one of the priority projects in the second medium term plan 2013-2017 was to initiate agricultural programme for schools. This programme aimed at training pupils in 35,000 primary schools and 7,000 secondary schools in agricultural skills and engaging them in irrigated agriculture (Ministry of Devolution and Planning, 2013). However, with the 2017 time line closely approaching and the inception of SDGs, there is nothing tangible that can be shown of the Government's agriculture programme for schools in ASALs. This was a well intended move in providing irrigation water to schools and its failure is a drawback to the ASAL schools in promotion of

DLA. However, besides the government's failure to commence the irrigation programmes in schools which would have played a role in promoting DLA, agriculture curriculum implementation still continues. There is need therefore to determine the level of DLA knowledge and skill acquisition among the learners taking agriculture in ASAL schools.

2.5 Development of Secondary School Agriculture Curriculum in Kenya

Agriculture has been taught in Kenya schools since colonial time (Konyango, 2010). Before independence, the education system was stratified and offered along racial lines. The British colonial Government had designed a curriculum purely for black Africans (Ngure, 2013) which emphasized on practicals, gardening and producing farm workers for serving European farms. The European farms mostly occupied the high potential zones and hence the agricultural practices taught to Africans then were those meant for cash crop growing and livestock rearing suited to such areas. The settler farms engaged high technology and trained labor and thus they reflected the expected outcome of implementing agricultural education curriculum. However, the natives' farms reflected arduous labor which was negative towards implementation of the curriculum and hence agricultural productivity in the ASALs. Majority of the Africans then were opposed to the curriculum because they felt that the colonialists trained them in preparation for manual work in the European farms. However, besides agriculture being taught through the colonial period, it was first taught in secondary school in 1959 (Konyango, 2014).

In 1959, vocational agriculture was started at Chavakali High School which was then a boys' day school with the intentions of reforming the curriculum to meet Kenyan needs (Kisilu, 2004). Robert Maxwell an Iowan farmer from West Virginia in the United States and an agriculture teacher helped implement the proposed curriculum (Amatsimbi & Masika, 2013). The objective was to prepare agriculture graduates for careers in trade, agriculture, industry and community leadership. The school had a school farm with a demonstration plot and to reinforce what was learnt in school, students had home demonstration plots. Learners were required to carry out a project on crop and livestock production as well as keep a comprehensive farm diary showing all activities carried out in the farm. Agriculture was to be integrated with rural development in order to promote employment through farming. For instance, the boys planted hybrid maize seeds issued in school and this persuaded farmers (their parents) to adopt the use of hybrid seeds and new modern farming methods (Amatsimbi & Masika, 2013). Namatsi (2013) notes that Chavakali ex-students established small-scale

tea and coffee farms which improved their income generation. The home demonstration plots helped them apply the skills learnt as well as appreciate their own rural environment. However, this initiative was carried out in a high rainfall potential area and any success from the pilot school offered very little to the ASALS as most agricultural practices were those that suit the high rainfall areas. Thus the foundation of the agriculture curriculum drawn at Chavakali High School lacked representation from the whole country. There is need to find ways of going back to the basics of practical agriculture as it was in Chavakali school to make it relevant for schools in ASALs.

In 1964, the Chavakali pilot programme was expanded to six other secondary schools (Konyango, 2014) and only one of such funded schools was in the ASAL region. The curriculum covered general agriculture, agricultural mechanics (farm structures, farm machinery), agricultural economics, crop production and animal husbandry (East African Examination Council [EAEC], 1969). Few agricultural practices covered DLA, for improved food production across crop and animal husbandry sections, yet a balanced curriculum should be a reflection of the whole nation. Crop production emphasized on plantation farming which focused mainly on crops that did well in high and medium potential areas. Principles of cultivation too gave little attention to land cultivation in ASAL areas stressing more on conventional tillage (EAEC, 1969). Vocational subjects emphasizing manual work were compulsory in the African Education system until 1966 when they were officially abolished (Government of Kenya [GoK], 1964). Since 1963 the government focused on transforming the school curriculum to make it responsive to socio-economic and political changes (Gikungu, Karanja & Thinguri, 2014). For this reason, the Ominde Commission of 1964 sought to realign the education inherited from the colonialists to be in tandem with the needs of the young independent nation (GoK, 1964). According to this commission, Kenya needed high level manpower to run the economy hence from 1967 the Education system was changed to being more intellectual and with less adaptive skills. Vocational subjects were scrapped in primary education. The education system overlooked the potential of vocational subjects in equipping learners with skills they could use for employment as well as economic development. Whereas high level manpower was needed, people still needed to be convinced that agriculture was a profitable and honorable occupation. This was necessary since agriculture was and still remains Kenya's economic mainstay. However, the Ominde Commission did not support vocational subjects and this could be a factor influencing implementation of practical subjects in the country.

The Government from 1974 gave incentives at all learning levels to attract more learners into schools (Wanyama & Nyang'ach, 2013). This overstretched the available learning and teaching facilities and lowered the quality of education offered. As a result, over 2,000 school graduates could not be absorbed in the economic sector and this created a big problem of educated unemployed. Thus Ominde's education system was accused of increased levels of unemployment among primary and secondary school leavers calling for a change in the education curriculum (Ngure, 2013). The unemployment levels were also attributed to the 7-4-2-3 education policy's lack of technical and vocational subjects as well as being highly academic. Recommendations made by the Ominde Commission of 1964 negatively influenced agriculture curriculum since the commission did not recognize the role of technical subjects in equipping learners with the necessary skills for employment through farming as well as rural development. It promoted elitism rather than relevance and thus the curriculum neglected ASAL areas and their needs.

The high numbers of educated unemployed youth made the Government of Kenya to think of a relevant education system to solve the unemployment problem. Thus in 1976 the National Committee on Educational Objectives and Policies (NCEOP) recommended the need for restructuring the education system to make it more effective in meeting the basic needs and promote income earning opportunities for school leavers (Mwiria, 2002). The Commission advocated for a change in the attitudes of pupils in favour of agriculture, productive manual labour and pre-vocational skills that would stimulate self-confidence and creativity related to self-employment. There is still need for a deliberate move to attain change in attitude including better remuneration for various categories of workers in the entire agriculture sector. Unless salaries of those who work close to the soil become comparable to other cadres particularly in ASALs where the working conditions harsh, they will remain undermined. Recommendations of NCEOP were later used by the Presidential working party under Mackay (1981), in proposing the 8-4-4 system which took effect from January 1985 (GoK, 1981). The new education system was expected to make graduates from the three education levels self-reliant, productive in agriculture, industries and commerce but this remains just an expectation. It was also expected to ensure that students acquired technical, scientific and practical knowledge vital for self and salaried employment, lifelong skills and nation building (Gikungu et al., 2014; GoK, 1988). Agriculture was to be offered once more in both primary

and secondary levels and for the first time technical courses were offered at other universities besides Egerton University.

In the 8-4-4 system, each school offering agriculture as an elective subject was expected to have a school farm or hire one (Saina et al., 2012). This far the 8-4-4 intentions were good in regard to agriculture as a technical subject. However, this promoted theoretical teaching of agriculture by doing away with the policy on land for agriculture and focused more on certification. Its implementation was an uphill task due to inadequate resources and untrained manpower hence its' intentions are yet to be realized. Due to poor prior preparation for the new system, many students went through the system without trained teachers to handle the technical subjects (KIE, 1995; Wanyama & Chang'ach, 2013). Lack of enough trained agriculture teachers during the launch of the 8-4-4 education system led to poorly prepared agriculture graduates who could not influence agricultural production including the ASALs. The resources and facilities required to implement agriculture curriculum included a viable school farm, laboratories, books, workshops, relevant equipment like machinery and hand tools, seeds, inputs and farming tools (Mwiria, 2002). When the Government launched the 8-4-4 system, it pledged to support the ASALs with the necessary resources and facilities while other regions of Kenya were asked to provide for their own schools in accordance with the cost-sharing policy. However, the support pledged by the government to the ASAL areas remained a promise and over time ASAL schools were to acquire the teaching resources necessary for proper secondary curriculum implementation on their own. Thus there is need to determine the availability of agriculture teaching learning resources in ASAL schools.

In regard to the content, the agriculture curriculum covered soils and soil fertility, water conservation supply and irrigation, land reclamation, farm layout, principles of crop production, crop parts and diseases, crop production practices, crop types, principles of livestock production, farm power tools, equipment and machinery, farm records, land tenure and land reform, production economics, farm accounts, agricultural marketing and agricultural organizations (KIE, 1992). The content fairly covered agricultural practices aimed at promoting DLA for improved agricultural production in ASALs. However, little was done to examine the practical implementation of these agricultural practices even as the curriculum underwent further reforms.

In 2002, the secondary school agriculture syllabus was reviewed and re-organized leading to the scrapping off of some of the content that was very relevant to ASAL areas (KIE, 2002).

The topic on land reclamation that addressed the degraded ASAL lands and how to bring them back to useful agricultural land was removed from the curriculum. This indicates the neglect the ASALs suffer in terms of inclusivity in the secondary school agriculture curriculum. However, the content on agricultural practices promoting DLA retained in the curriculum after the curriculum review in 2002 does not seem to benefit the ASAL areas. They continue to record extreme hunger and poverty (EAC, 2011). This has been attributed to poor integration between the school and the rural community as well as ineffective curriculum implementation (Konyango, 2010). Effective implementation of the curriculum is expected to be reflected in the exploitation of ASALS both in the school farm as well as in the surrounding communities. Proper implementation is important because dry land has been in existence before inception of education into the country and is currently home to a quarter of the Kenyan population (UN, 2011). Thus there is also need to study the factors that influence implementation of secondary school agriculture curriculum in ASALs.

Learners' achievement of the expected learning objectives of the 8-4-4 agriculture curriculum has been assessed regularly. Besides the internal assessment given by the subject teacher, the Kenya National Examination Council (KNEC) is mandated to assess the learners at the end of their fourth year in secondary school level. This is done through the Kenya Certificate of Secondary Education (KCSE). The method of assessment by KNEC has also undergone transformation over the years. Before 2005, the KNEC engaged external assessors who examined project work (Agriculture practical paper 3) and paper two was purely practical work. These practicals gave learners the opportunity to learn agricultural skills through application. Although external assessment had its shortcomings, it challenged learners and teachers too to take the project work more seriously. This enhanced acquisition of agricultural skills even in ASALs since learners knew they must have made good progress in their project to earn marks from the external assessors. The project and practical paper motivated teachers to teach agriculture through practicals, demonstrations and exposing learners to hands on activities. A Kenya National Examinations Council circular in 2002 had recommended the withdrawal of external agriculture assessors from the year 2006 and the agriculture project assessment task was left solely to the agriculture teacher (KNEC, 2002). Paper two which was a practical test examination was also replaced with a theory test paper. Withdrawal of the external assessors negatively influenced the practical implementation agriculture curriculum in schools.

By focusing more on theory and emphasizing less on practical aspects in agriculture as well as reducing the weight of the project paper to 10 percent, KNEC has been blamed for encouraging rote learning (Gikungu et al., 2014). The termination of the practical agriculture test and the changes effected on assessment of the project work has posed a challenge to implementation of practical agriculture. Once more, these changes worked against acquisition of agricultural skills in secondary schools through the examination system. This has encouraged teachers to focus more on the theory part of the syllabus, neglecting the practical aspects. Implementation of practical agriculture aspects and innovative teaching would promote agricultural production in rural areas including ASAL regions. The attention given to excelling in examinations irrespective of acquisition of practical skills has a negative influence on implementation of practical agriculture, which could help transform ASAL region livelihoods.

2.6 Implementation of Secondary School Agriculture Curriculum

Curriculum implementation is a process of helping a learner to acquire planned knowledge, skills, ideas and attitude aimed at enabling them function effectively in the society (Primrose & Alexander, 2013). Efforts to improve on agriculture curriculum implementation have come a long way since independence. In 1976, the Gachathi Report recommended several policies for secondary school agriculture meant to enhance the quality and effectiveness of agriculture curriculum implementation (GoK, 1976). As numbered in the report, they included:

"135. To make secondary education more pre-vocational with a view to producing trainable young people

136. To diversify the secondary school curriculum and give a stronger practical orientation

139. To give prominence to the teaching of agricultural sciences in secondary schools and to relate the teaching of other subjects to agriculture.

140. To give stronger emphasis to other applied subjects in secondary schools including industrial education for which the programme should be expanded, using equipment related to small-scale farming and to conservation.

145. To provide science with technical education related to agriculture and allied industries as well as more theoretical study of separate science subjects as alternative science curricular in the re-organized secondary school system.

243. To provide for training of sufficient teachers of agricultural sciences in anticipation of the subject becoming a prominent feature in the revised secondary school curriculum"

Recommendation number 139 of the 1976 Gachathi Report was one of the strongest recommendations in support of agriculture in schools. It was reinforced with recommendation 140 and 145 to the effect that stronger emphasis be put on the teaching of the applied subjects, and that the industrial education share facility with agriculture. In addition, to create continuity between secondary school agriculture and the University a panel was constituted to draw up an 'A' level agriculture syllabus. In order to reinforce the use of the school farm as a teaching facility in agriculture, the Ministry of Education (MoE) circulated a policy document on the management of the school farms. This school farm management policy emphasized on holiday farm attachment which was a way of providing not only a linkage to the farming profession but also a linkage to the reality and the practicality of farming. This linkage was meant to promote the practical implementation of the agriculture curriculum which would have played a great role in enhancing agricultural productivity in ASALs.

Although these policies and recommendations gave direction to the subject expectations over time, the actual implementation in schools is paramount. The agriculture curriculum implementation in a classroom set up involves two key players; the teacher who translates the curriculum objectives into the teaching learning process and the student who is the final consumer. Okogu (2011) indicated that a curriculum is effectively implemented when learners acquire the intended experiences, knowledge, skills, ideas and attitudes. The implementation of the agriculture curriculum should undoubtedly increase the opportunities for youths to acquire knowledge and skills for different professions in related areas (Osam, 2013). The secondary school agriculture curriculum was specifically meant to equip learners with lifelong skills and knowledge for self reliance and advanced studies in agriculture (GoK, 1988). Curriculum implementation thus influences the quality of agricultural skills acquired by secondary school leavers. However, as indicated earlier, curriculum implementation is influenced by factors that are learner related, teacher related, teaching resource related and school related (Njeru & Orodho, 2003; Puyate, 2012).

2.6.1 Teacher related factors influencing curriculum implementation

According to Ngure (2013) implementation can be influenced by teacher related factors. Agriculture teachers play a big role in ensuring effective curriculum implementation if learners are to gain the relevant technical skills and knowledge (Kamau & Orodho, 2014).

The teacher related factors influencing curriculum implementation include; training level, competence, attitude, principles, innovativeness, commitment, experience, teaching load, motivation and absenteeism (Kirima & Kinyua, 2016; Mapolisa & Tshabalala, 2013; Okogu 2011; Reche, Bundi, Riungu & Mbugua, 2012). As early as 1952, Binns and his commission emphasized on the need for trained personnel to handle curriculum implementation in schools (Gikungu, Karanja and Thinguri, 2014; Mackatiani, Imbovah, Imbova & Gakungai, 2016). The Gachathi report (GoK, 1976), pointed out in recommendation number 143 that agriculture was going to become a prominent subject in the revised secondary school curriculum, and hence the need for more qualified teachers. However, this prominence is yet to be realized. By analyzing the staffing of schools in relation to agriculture, the subject had attracted qualified and trained teachers in nearly all schools teaching agriculture up to 1984. The policy of using trained and qualified teachers dates back to the Chavakali pilot project, the USAID and the International Development Agency (IDA) programmes.

However, one of the criticisms that faced the 8-4-4 education system after rolling out was improper training of teachers to handle the technical subjects that were now compulsory in all schools (GoK, 1981). This led to recruitment of unqualified teachers of agriculture, inability of the Government to respond to financial demands of the system (Mwiria, 2002) thus denying the subject the needed resources for proper curriculum implementation. Additionally, there was rise of Diploma colleges being allowed to train agriculture teachers irrespective of resources or qualified agriculture trainers which jeopardized the quality of teachers trained to implement the agriculture curriculum. For the ASALS to benefit from school agriculture the agriculture teachers must be well educated and be thorough scientists, rural sociologists and technically competent in agriculture. These are the category of agriculture teachers who are able to influence DLA practices outside the school to the community and this is a prerequisite for effective agriculture curriculum implementation in the ASALS.

Past studies have indicated that qualified agriculture teachers appropriately interpret the syllabus and are able to determine the concepts to be taught and agricultural skills to be acquired (Sindale & Dlamini, 2013). Lack of enough motivation among technical teachers has been found to influence their morale of taking students through agricultural practices and projects (Puyate, 2012). A study by Owoeye and Yara (2012) found out that what a given teacher believes, knows and does highly influences the kind of knowledge such a teacher will pass to the learners. The study also found out that the teachers' attitude towards a curriculum influences a great difference between the intended and implemented curriculum. A study

done in Nigeria found out that a significant relationship existed between the availability of subject teachers and the implementation of skill based secondary school curriculum (Ofoha, Uchegbu, Anyikwa & Nkemdirim, 2009). Adequate staffing of effective agriculture teachers influences the practical implementation of agriculture curriculum. Thus determining the agriculture teachers' knowledge, skill, experience and attitude on agricultural practices in the curriculum that promote DLA is paramount in establishing whether learners are gaining agricultural skills necessary to make ASALs agriculturally productive.

The expectation of equipping learners with skills and knowledge on DLA presents agriculture teachers with a unique challenge which requires them to promote competencies in learners relevant for agricultural production (Indoshi et al., 2010). The effective implementation of agriculture curriculum is a product of good teaching. According to Mwiria (2002) good education depends on good teaching which in turn depends on good teachers. The teaching methods used by agriculture teachers are part of teacher related factors that may influence curriculum implementation. According to Primrose and Alexander (2013), teacher's choice of method to use depends on their technical knowhow and nature of content. Some of the methods used include; problem based, context based, student centered, demonstration, project, lecture, tutorial and seminars, fieldwork, inquiry method, discussion and computer based method (Ali & Muhammad, 2012; Okogu, 2011; Olatoye & Adekayo, 2010; Wootoyitidde, 2010). A study done in Nigeria indicated that most teaching methods and approaches used by teachers handling technical subjects encourage rote learning, memorization and regurgitation of facts (Ali & Muhammad, 2012). The Kenyan situation is not any different with agriculture teachers having deviated from the practical to theoretical teaching of the subject. A teacher should choose a teaching method that is flexible and able to broaden and develop learners' critical thinking (Okogu, 2011). Past studies have shown that using participatory methods of teaching fosters critical thinking, creative thinking and collaborative problem solving which are very crucial in agricultural education (Olatoye & Adekayo, 2010). Such methods are very appropriate when teaching agricultural practices that promote DLA if these practices are to enhance agricultural production in ASALs.

A study by Olatoye and Adekayo (2010) indicated that project based method challenged students to learn and work cooperatively in groups to seek solutions to the real world. Agriculture being a technical subject, teachers have no option but embrace the project method to enable students acquire the technical skills through experience. Although the secondary school agriculture syllabus suggests several projects for learners in their four year course,

there is need to establish whether teachers implement these projects in their schools. Active involvement of learners in agricultural activities through project exposes them to long lasting experiences and assists them think critically enhancing learning and retention. Carrying out agricultural projects aimed at promoting DLA in school project work like growing of vegetable seedlings on sunken beds, rearing adaptable livestock among others would equip learners with skills they would apply to promote agricultural production in ASALs. Agriculture teachers are thus expected to focus and direct their teaching effort towards teaching methods that promote acquisition of skills, attitudes and work-related knowledge among their learners.

The teaching method used by a teacher will also be influenced by the time allocated to the subject in question. Agriculture curriculum implementation is time demanding as Thobega, Subair, Mabusa and Rammolai (2011) found out that agriculture teachers needed more time to schedule their learners into agricultural projects and demonstration work as well as regular monitoring for effective learning. The best example is the time allocated to agriculture in the curriculum at the introduction of agriculture to schools in which the subject was allocated five lessons from form one to four each 40 minutes. This gave teachers enough time to implement the practical agriculture curriculum which favoured promotion of skills for agricultural production.

Table 1

Number of Lessons Allocated to School Agriculture in One of the First Six Agriculture Schools in 1965

School	Subject	Number of lessons			
		Form I Agric.	Form II Agric.	Form III Agric.	Form IV Agric.
Bungoma	English Grammar	6	6	5	6
Sec. School	English Literature	3	3	3	3
	Mathematics	7	7	7	7
	Biology	3	3	3	3
	Chemistry	2	2	3	3
	Physics	2	2	3	3
	History	3	3	3	2
	Geography	3	3	3	3
	Swahili	3	3	3	3
	Physical Education	2	2	2	2
	Agriculture	**5**	**5**	**5**	**5**
	Library	1	1	-	2
	Health Science	-	-	-	2

Source: Konyango, 2010

However, reforms in the curriculum over time have led to a decline in time allocation for agriculture in the school timetable. The time allocation currently favours the compulsory subject at the expense of technical subjects agriculture included. In addition timetabling of double lessons for technical subjects was also scrapped which leaves an agriculture teacher time constrained in implementing agriculture curriculum practically. Reducing the number of lesson allocation for the subject hinders practical implementation of the curriculum and hence influencing application of practical skills. Time allocation currently is 40 minutes per lesson and the number of lessons per subject is as shown in Table 2.

Table 2
Number of Lessons Allocated to School Agriculture as from 2006

Subject	Form 1	Form 2	Form 3	Form 4
English	7	7	8	8
Mathematics	6	6	7	7
Kiswahili	5	5	6	6
Biology	4	4	5	5
Chemistry	4	4	5	5
Physics	4	4	5	5
History	3	3	3	3
Geography	4	4	5	5
Rest	3	3	3	3
Business studies	3	3	4	4
Agriculture	**3**	**3**	**4**	**4**
Home science	3	3	4	4
Music	3	3	4	4
Computer studies	3	3	4	4

Source: KIE, 2006.

The curriculum reforms including reduced time allocated to agriculture calls for regular in-service training of agriculture teachers to enable them respond to the reforms. According to (Reche et al., 2012) agriculture is dynamic and therefore agriculture teachers need regular in-service training, workshops and seminars to keep abreast with any new information. Agriculture teachers would gain information and skill on new technologies and innovations which they would disseminate to their learners as part of their curriculum implementation. While curriculum implementation process is complex, teacher professionalism and competence also influences its implementation (Skopje, 2013). Thus agriculture teachers' ability to interpret agriculture curriculum objectives to their local environment would enhance learning. According to Ofoha et al. (2009) when teaching and learning is directed towards the needs of the learners, there is an accompanying tendency to make sure that they

fully understand the material being taught. The study also emphasized that a teacher's focus should be on how the learners understand, what meaning they make of their understanding and whether they can apply the knowledge and meaning in real-world situations. Agriculture teachers are thus very critical in agriculture curriculum implementation. Therefore agriculture teachers' full commitment in implementation of practical aspects of agriculture curriculum which is essential for exploitation of increased agricultural productivity in ASALs is fundamental.

Teachers also gauge acquisition of knowledge, skills and techniques in agriculture through assessment of what has been taught. A research by Napoli and Raymond (2004) found out that students have a tendency of focusing their study on the things that are assessed and graded. It also established that most assessments focus on low order types of outcomes instead of the higher order types which inculcate acquisition and application of skills and knowledge in technical subjects like agriculture. Agriculture examination paper administered under East African Examination Council (EAEC) back in 1969 was more practical oriented with the written paper and continuous assessment test accounting for 65 percent and 35 percent respectively. The written paper emphasizing the principles and the practical applications of principles in relation to the areas of coverage which included general agriculture, farm structures, farm machinery, agricultural economics, crop production and animal production. The continuous assessment test had three sections namely a) identification tests where students were expected to identify a wide range of plant and animal materials b) Projects where every student would carry out and write a detailed report on one practical animal project, and one practical crop project c) Farm diary where every student would keep a comprehensive farm diary on all aspects of the work of the school farm which would be continuously assessed and marked by the teacher. The dairy with marks would then be forwarded to EAEC.

This examination format was very practical and learners could be assessed on their level of skill acquisition on different agricultural practices promoting DLA on all areas in the curriculum then. This format of assessment required teachers to have implemented the curriculum practically. The prominence given to a subject in the school curriculum makes it attractive to both learners and their programmes. The design of the agriculture curriculum plays an important role in changing the attitudes of the learners to enable them function effectively in promoting agricultural development in their communities.

Reforms in the examination format of agriculture subject saw the Kenya National Examinations Council (KNEC) remove the practical examination paper in 2002. This has influenced the practical teaching of agriculture hampering skill acquisition on practices promoting DLA in ASALs. Subsequently KNEC also degraded the project paper thus the examination system emphasizes on theory rather than practical aspects especially for agriculture subject (Cheplogoi, 2011; Nyang'au et al. 2011). Assessment of agriculture as a subject needs to be more practical oriented besides the project paper given. This is to ensure that teachers emphasize on practical aspects in the curriculum which will be the only way to attain the fundamental objective of involving learners in practicals to assist them acquire useful agricultural skills. The emphasis given to project work in agriculture needs to be improved in the examination system to improve agricultural skill acquisition. Acquisition of agricultural skills to perform agricultural practices that promote DLA will go a long way in preparing the learners for gainful employment, further studies as well as promoting agricultural production in ASALs. Learners' continuous involvement in agricultural projects throughout the four years of study in secondary schools has not been documented and with reference to ASAL schools. Thus there is need to asses and document learners' involvement in agricultural projects as part of the learning experiences.

2.6.2 Teaching resource related factors

Teaching resources are a potent factor to quantitative education. Their availability, adequacy and relevance influence productivity and efficiency. A case in point is the combined harvester provided as part of machinery implement to Chavakali school during the piloting stage which continues to rust over the years apparently from the time it was brought to the school (Konyango, 2010). The workshop constructed in one of the schools funded by USAID, as an extension of the pilot programme to other schools, has been turned into a usual classroom. Such facilities remain unused for their irrelevance. Facilities have been found to develop problem solving skills and scientific attitudes among learners (Kabugi, 2013). Agriculture curriculum implementation is facility and resource demanding. Teaching of agriculture calls for availability of adequate resources. Agriculture curriculum implementation in Kenyan ASALs requires specific land preparation and planting equipments for DLA like animal or tractor drawn chisel and mould board ploughs, sub- soilers, planters, rollers among others (Mwenzwa, 2011). Such implement would help learners acquire skills on practices promoting DLA in ASALs.

According to Mwiria (2002) and Owoeye and Yara (2012), agriculture teaching resources include a viable school farm, library, laboratory, workshops, spacious class rooms, relevant equipment like, machinery, hand tools, inputs and farming tools. A spacious library with adequate and up to date agriculture books and other reference materials has been found to have a positive correlation to the performance of students in agriculture (Kabugi, 2013; Makori & Onderi, 2013). The school farm as a teaching learning facility should be easily accessible and large enough to accommodate all students during project or demonstration work. School farms should be model farms that the community can learn from (Nyang'au et al., 2011). They should reflect the societal needs with projects promoting local agricultural activities and adoption of practices that promote agricultural production.

However, Cheplogoi (2011) found out that proper teaching and learning of agriculture in secondary schools has been affected by inadequacy of the recommended text books and inability of schools to share instructional materials due to low purchasing power and bureaucracy respectively. Owoeye and Yara (2012) and Skopje (2013) established that there were inadequate teaching learning materials, poorly stocked school libraries as well as inadequate tools and equipments in workshops. Many schools were found to be financially constrained hence unable to support technical subjects in their schools (Abdi, 2010; Osam, 2013). Schools offering agriculture have no option but to provide the necessary teaching and learning resources if the curriculum is to be properly implemented. Teaching of agricultural practices promoting DLA in the secondary school curriculum will require provision of all the relevant resources for these practices to be of benefit to ASAL areas and the country at large. For schools to provide all these resources for learning purposes adequate financial support to the subject is paramount as it was during the introduction time in 1960s. Without financial grant, no viable agriculture curriculum can be implemented.

2.6.3 Funding

A friendly and conducive school environment provides a better platform for curriculum implementation. According to Makori & Onderi (2013), school learning environment should be clean, quiet, safe, comfortable and healthy in order to constitute an important component of successful teaching and learning process. However, funding of the implementation of secondary school agriculture curriculum cannot be over emphasized. The school managers comprising the school administration, Board of Management (BOM) and Parent Teachers

Association (PTA) play a key role in financing implementation of technical subjects among other development projects.

Funding of agriculture curriculum implementation dates back to the subject's inception in Kenya's education system. While accepting that formulation and implementation of education policies relating to curriculum improvement must take into account economic, political and social realities (Konyango, 2010) indications are that the Kenyan Vocational Agriculture programme covering the periods 1959–1970 was well funded. The funding of the programme by the Government between 1970–1984 are all evidences of support (GoK, 1970). The organized expansion programme to six schools in 1964 under USAID, 20 schools under World Bank and a planned expansion of 20 schools yearly gave agriculture a head start among other vocational subjects. Although this was without considering whether such extent of funding would be sustained, it set the foundation for funding as a pillar for an effective curriculum implementation. The support areas included the planned training of agriculture teachers, the posting of qualified agriculture teachers to man the subject at the inspectorate, Kenya National Examinations Council and the Kenya Institute of Education. This left no loop-hole to the implementation direction the subject was to take.

Since the introduction of Free Secondary Education (FSE) Policy was implemented in 2008, the emphasis shifted to increasing the transition rate from primary to secondary level (Republic of Kenya [RoK], 2008). This policy did not factor the availability of space in the already existing schools as well as the facilities available to support the indented student population at secondary school level. As a result, many public day schools were begun with the Constituency Development Fund support for more learners to benefit from the FSE. However these schools are characterized by poor infrastructure and inadequate teaching learning resources (Ndiku & Muhavi, 2013) which compromises on curriculum implementation. Majority of such schools are in the urban slums, rural areas as well as the ASALs. The FSE program involved provision of government subsidy on tuition fees, teaching and learning materials for all secondary school students in public schools. The breakdown of the funds allocated per student in Kenya shillings is as shown in Table 3.

Table 3

Allocation of Free Secondary Education per Vote Head per Student

Vote Head	Day Schools	Boarding schools
	G.O.K Subsidy (Kshs.)	G.O.K Subsidy (Kshs.)
Tuition	3,600	3,600
Boarding Expenditure Subsistence	0	0
Repairs, Maintenance and Improvement	400	400
Local Travel and Transport	400	400
Electricity, Water and Conservancy	500	500
Administrative costs	500	500
Activity	600	600
Personal Emolument	3,965	3,965
Medical	300	300
Total	10,265	10,265

Source: Ministry of Education, 2008 Circular.

Inadequate funds are sent to schools coupled with stiff rules of expenditure that fail to appreciate the unique needs of some of the schools. All schools are allocated the same amount despite their geographical disparities or special subjects taught that are financially demanding like the technical subjects. From the breakdown as given by the MoE, ASAL schools did not have any special gain from the policy regardless of the challenges faced in curriculum implementation.

The funding of agriculture subject today is therefore primarily at the hands of the school administrators. The preference and priority given to agriculture by the school head will largely influence resource availability for the subject (Kamau & Orodho, 2014). The school head teachers have been found to hinder secondary school agriculture curriculum implementation when they fail to provide the necessary resources or fail to enforce school policies that favour the subject (Nyang'au et al., 2011). According to Kabugi (2013), parents influence learner's choice of subjects and the few who support the subject do it not from the career aspect but for the view that it is a subject that can boost the students overall score. Curriculum implementation in agriculture will be fruitful if school head teachers reinforce the relevant policies that support the subject implementation. It will be meaningful when learners in ASALs as well as their parents get value of the knowledge and skills gained by utilizing

them in promoting DLA. Thus the need to determine the influence of funding as a school related factor on agriculture curriculum implementation in ASAL schools.

2.6.4 Student related factors

Over the years, it has not come out authoritatively how students who take practical subjects view themselves in comparison to those who take purely academic subjects. To avoid feeling disadvantaged, improved agriculture curriculum and government development policy touching on the rural areas, must assure them and their parents that they stand equal chance of developing to their full capacities, educationally and economically. This is because students hold the key to what is essentially transmitted and adopted from the authentic curriculum. They thus influence the teacher's choice of learning experiences which must accommodate students' diverse characteristics (Iraki, 2014). A study done in Nigeria found out that the nature of relationship between the teacher and students, perceived relevance of the learning resources, level of knowledge and skills that students bring into each learning institution, the student's intrinsic interest, the extent of use of a variety of teaching methods, the nature and extent of teacher feedback on students' progress and the extent of learner involvement in the learning process to be among student related factors that influence curriculum implementation (Idris et al., 2012). Students choosing to take agriculture need to choose it out of interest and appreciation of its value to an individual as well as the community. Such students have passion for the subject, are quick to take instructions and carry out their project work under very minimal supervision (Karue & Amukowa, 2013).

However, Okogu (2011) and Ogweno et al. (2014) established that age, gender, lower level school background, study habits, study times, class attendance and attitude are student related factors that influence curriculum implementation. A study by Brandt (2012) established that a student's attitude is related to their level of achievement and thus high achievers in a given subject are likely to have a positive attitude to the subjects they perform best. Kabugi (2013) also argues that a student's family home background, ethnicity, prior knowledge and experiences have an influence on implementation of a curriculum. Teachers need to be aware of the student related factors influencing curriculum implementation and find means of solving each if curriculum implementation is to be effective. There is need therefore to determine the influence of student related factors on implementation of agriculture curriculum in ASALs.

2.7 Theoretical Framework

This study was guided by Obonya's (2004) functional curriculum theory. The theory posits that the purpose of education is to acquire skills of adapting to that environment and acting to influence it thereby contributing to its development. According to Obonya, the learner's environment should determine the way education is carried out, including what is taught and how it is taught and learned. The bottom line of secondary school agriculture curriculum is relevancy of education for rural development. Elimination of rural poverty as experienced in the ASALS is one of the great public demands. According to Puyate (2012), the measure of an effectively implemented agriculture curriculum is evidenced in the performance of those who finally go to the land, live there and succeed. After all, the fundamental purpose of agricultural education is to ensure a better agriculture and make rural life as nearly perfect as possible.

The second theory was the endogenous growth theory (Kwabena, Paddison & Mitiku, 2006). This theory sees education as a process that changes the production technology itself. In this theory, education is seen as a subject to increasing returns so it could overcome the growth reducing effect of diminishing returns to physical capital. In their study they found out that an economy that made an economic choice of devoting more of its resources to accumulating knowledge had a permanently higher growth rate. Effective agriculture curriculum implementation must also prepare students for self reliance, equipping them with skills needed for successful farming. This will be a strategy for rural transformation and a promotion of agricultural production in ASALs. Additionally, Monteils (2012) indicated that production of knowledge by education induced a self sustained economic growth. This theory informed the study in that through proper secondary school agriculture curriculum implementation learners are able to acquire skills on agricultural practices and technologies that can be used in promoting DLA in ASAL areas. Secondary school agriculture teachers should therefore be able to single out these practices in the curriculum and inculcate them among the students. Modern production technologies are geared towards promoting realization of high yields per unit area hence an increase in returns obtained. The high returns will enhance food security, lower poverty levels as well as increase living standards not only in ASALs but all over the country.

2.8 Conceptual Framework

The study focused on selected factors influencing implementation of secondary school agriculture curriculum in Kenyan ASALs. The study had four independent variables; student related factors, teacher related factors, teaching resources and school related factors. The dependent variable was implementation of secondary agriculture curriculum in ASAL schools. The teacher related factors studied were teachers' technical knowhow, ability to translate syllabus objectives and teaching methods used. Among the teaching resources for DLA were agriculture textbooks, charts, models, videos, DLA tools, green houses, irrigation equipment and school farm. The level of financial support from the school administration was investigated. The student related factors included subject preference and choice, career aspirations, learner's home background and learning resources availability, adequacy and frequency of use. These independent variables were likely to influence the dependent variable which was implementation of secondary school agriculture curriculum in ASALs. The indicators of agriculture curriculum implementation were the level of students' acquisition of knowledge and skills on DLA and the type of agriculture projects they had been involved in within the school farm. Moderating variables that were likely to affect the influence of independent variables on the dependent variable were school category and involvement of other stakeholders. The community around the school is a key stakeholder since they are expected to be beneficiaries of agriculture curriculum implementation. Stakeholders are part and parcel of the schools and as a result they may have an effect on the influence of the independent variable on the dependent variable. Since they are hard to dissociate from the schools, they were controlled by holding them constant. The interaction between the variables was as represented in Figure 1.

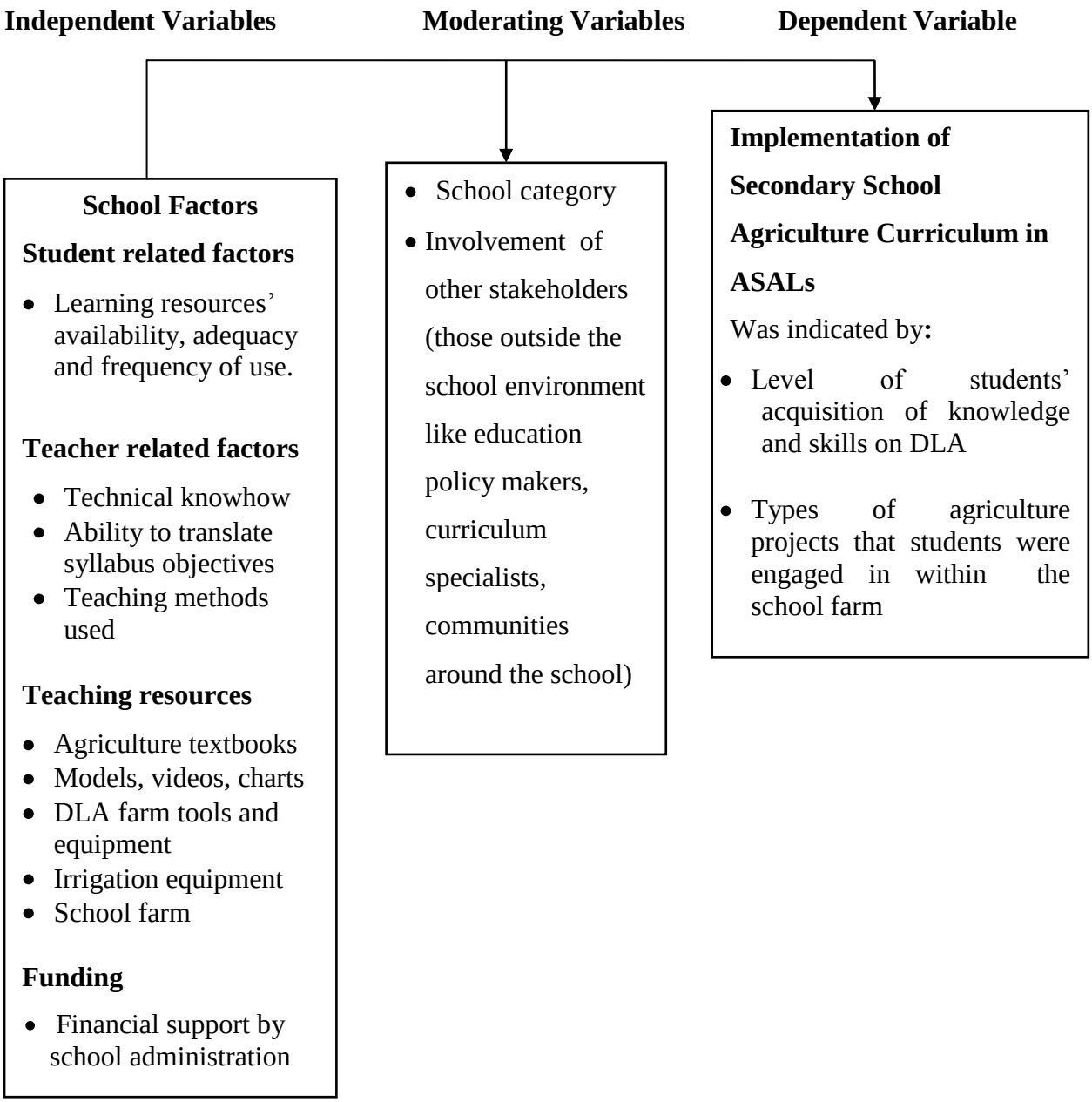

Figure 1: Conceptual framework showing interactions among variables in the implementation of secondary school agriculture curriculum in ASALs of Kenya

CHAPTER THREE
RESEARCH METHODOLOGY

3.1 Introduction

This chapter outlines the research procedure used in the study. It covers research design, location of the study, target population, sampling procedure and sample size, instrumentation, data collection, data analysis and summary of the analytical procedures.

3.2 Research Design

Descriptive survey research design was adopted for this study. The research design was deemed the best since the study was collecting data on an on-going agriculture curriculum implementation process. As Fraenkel and Wallen (2000) indicate, surveys are appropriate for conducting a study into a continuing process. In addition, Best and Khan (1993) noted that descriptive survey design is essential while gathering information about prevailing conditions or situations for the purpose of description and interpretation. The research design enables the researcher to determine, describe and report the nature of a situation as it exists at the time of study (Creswell, 2008; Gay, 1992; Mugenda & Mugenda 2003; Kothari & Garg, 2014). This design enabled the researcher to collect data from students, agriculture teachers and school head teachers on implementation of the agriculture curriculum. The data was used by the researcher to inform on the influence of the school factors on implementation of secondary school agriculture curriculum in ASALs as it was by the time of data collection.

3.3 Location of the Study

The study covered secondary schools in Kenya's ASAL counties of Baringo, Makueni and Narok. According to the Ministry of State for Development of Northern Kenya and other Arid Lands (2011), Baringo is an arid County while Makueni and Narok are categorized as Semi-Arid counties. Baringo County occupies 11,015 square kilometers and is located in the Central Rift Valley region with its economic hub being Kabarnet town. It borders several counties with Turkana County to the North, Laikipia to the East, Elgeyo Markwet to the West and Nakuru to the South (Baringo County Government, 2013). The primary source of economic livelihood for Baringo County is agro-pastoralism (Pipterer & Ndegwa, 2013). Makueni is in the lower Eastern region of Kenya with Wote as its economic hub. Makueni County covers 8,034.7 square kilometers. It borders several counties; Kajiado to the West, Taita Taveta to the South, Kitui to the East and Machakos to the North (Makueni County Government, 2013). Narok County is in the South Rift Valley region and its economic hub is

Narok town. The County occupies 17,999 square kilometers and borders the counties of Bomet to the North, Kisii to the west, Nakuru to the East and Kajiado to the South (Narok County Government, 2013). The main economic activity in this County is agro-pastoralism. These three counties are home to 2.3 Million people as per the 2009 Kenyan population census (Ministry of State for Development of Northern Kenya and other Arid Lands, (2011). These counties were targeted because they were within the larger area of study and had the ASAL characteristics of interest. Appendix R shows the location of Baringo, Makueni and Narok counties.

3.4 Target Population

The target population was 6,883 comprising 694 agriculture teachers, 589 school principals and 5,600 Form Three agriculture students in secondary schools in the counties of Baringo, Makueni and Narok. As at November 2014, Baringo County had a total of 156 secondary schools; Narok County had 94 while Makueni County had a total of 363 secondary schools (Baringo County Education Office, 2014; Makueni County Education Office, 2014; Narok County Education office, 2014). This gave a total of 613 secondary schools. Out of the 613 schools in the three counties, 589 were offering agriculture as a subject. The accessible population was 2,823 comprising 203 agriculture teachers, 2,470 form three agriculture students and 150 school principals in 150 schools that are in the sub-counties of Marigat, Mogotio, Makindu, Kibwezi and Narok North. Secondary schools were targeted because this is the point of departure after which students pursue different career paths. Agriculture teachers were targeted because they are trained on secondary school agriculture curriculum implementation. They also form the direct link between the curriculum and the learners in a classroom set up and are quick to identify curriculum deficits. The learners were targeted because they are the consumers of this curriculum and effective implementation is reflected in their transformation in terms of knowledge and skill gain as well as attitude change. The researcher chose form Three students because agriculture is an elective subject and by this level they had made a choice to take the subject. In addition, being in the third level they would have covered 75 percent of the entire curriculum and hence they were the best to use in determining their practical engagement in the agriculture curriculum implementation process. The school principals were targeted by virtue of their managerial positions and policy enforcement role in school. They play a key role in provision of finances that are necessary for proper implementation of the agriculture curriculum.

3.5 Sampling Procedure and Sample Size

The study used Multistage sampling because it enabled the researcher to divide the population into stages, sample the stages, repeat the process until the ultimate sampling units were obtained at the last hierarchical level (Lukman, 2012). Multistage sampling is commonly used when it is costly or impossible to form a list of all units in the target population and when greater accuracy has to be obtained by measuring fewer sub-units than many (Allena, Kilpatrick, Armstrong, Briggs, Grant & Pe´rez, 2002). Kenya has four ASAL regions namely North Eastern, Coast, Eastern and Rift valley. Out of the four ASAL regions, Eastern and Rift valley were purposively selected for this study for they are geographically centrally placed and are more accessible. From these two regions, three counties were purposively selected for this study considering their geographical spread and representation of all other ASAL counties. Table 4 gives a summary of the selected counties, total number of sub counties in each and the sub counties selected for the study in each County.

Table 4

Data Showing the Counties, Sub Counties and the Selected Sub Counties with ASAL Characteristics

County	No. sub counties	Selected sub counties
Baringo	Baringo Central	Mogotio
	Baringo North	Marigat
	Baringo East	
	Mogotio	
	Koibatek	
	Marigat	
Makueni	Kathonzweni	Kibwezi
	Kibwezi	Makindu
	Kilungu	
	Makindu	
	Makueni	
	Mbooni East	
	Mbooni West	
	Mukaa	
	Nzaui	
Narok	Narok South	Narok North
	Transmara East	
	Transmara West	
	Narok North	

Source: Baringo County Development Plan 2013, Makueni County Integrated Development Plan, 2013; Narok County Development Plan 2013

The three counties had a total of 19 sub counties out of which Five sub counties were proportionately sampled for the study. The proportionate sampled sub counties were purposively selected in order to target only those that have ASAL characteristics. Thus two sub-counties were selected from Baringo County, two from Makueni County and one from Narok County.

The sampling frame comprised all the 150 secondary schools that were offering agriculture subject in the selected sub-counties of Mogotio and Marigat in Baringo County, Narok North in Narok County and Kibwezi and Makindu in Makueni County (Baringo, Makueni and Narok County Education Reports, 2014). One agriculture teacher in each of the 150 secondary schools was included in the study. In cases where there were more than one teacher of agriculture in a school at time of data collection; random sampling was used to select only one teacher for the study. In the selection of agriculture students and school principals 116 schools that had agriculture students up to form three were picked. Proportionate random sampling was then used to select 29 schools from the 116 schools (See Table 5). Ten form three agriculture students were randomly selected through simple balloting from each of the 29 schools giving a total of 290 students. Sampling of ten students from each school was informed by Kathuri and Pals, (1993) proposal that the sample size selected should at least be 10 percent of the accessible population. The agriculture student sample size from the proportionately sampled schools in the selected sub-counties was as shown in Table 5.

Table 5

Number of Schools Sampled and Students Sample Size

Sub-County	No. of schools	No. of schools sampled	No. of students sampled
Mogotio	20	5	50
Marigat	16	4	40
Kibwezi	48	12	120
Makindu	16	4	40
Narok North	16	4	40
Total	116	29	290

Source: Baringo, Makueni and Narok County Education Reports (2014)

The school principals in all the 29 schools were purposively included in the study. Additionally, for triangulation of the researcher's content analysis results, five purposively selected experts in the department of agricultural education and extension were involved in the study. Purposive sampling enabled the researcher to select only those experts who had previous experience of teaching agriculture subject in secondary schools. The total sample size targeted was therefore 469.

3.6 Instrumentation

Four researcher developed semi-structured questionnaires were used to collect data. The first was the agriculture teachers' questionnaire (Appendix A) which consisted of five sections (A-E). The first section (A) gave the respondents' demographic data. Section (B) looked at teacher related factors that were likely to influence implementation of secondary school agriculture curriculum. Section (C) sought to obtain information on teaching resources that were likely to influence implementation of secondary school agriculture curriculum in ASALs. Section (D) sought agriculture teachers' opinion on implementation of secondary school agriculture curriculum in ASALs. Section (E) sought to look at the influence of funding on implementation of secondary school agriculture curriculum.

The second instrument was the agriculture students' questionnaire (Appendix B) which had three sections (A-C). Section (A) gave the respondents' demographic data. Section (B) looked at the student related factors likely to influence implementation of secondary school agriculture curriculum while section (C) sought to study the implementation of secondary school agriculture curriculum in ASALs. The third instrument was the secondary school principals' questionnaire (Appendix C) with two sections. Section (A) gave the respondents' demographic data while section (B) sought information on the provision of various agriculture teaching resources in their schools.

In addition to the questionnaires, a content analysis check list (Appendix D) was used to collect data on the extent to which secondary school agriculture curriculum covers content on DLA. Content deemed to address DLA was place categorised under four sub-themes. These sub-themes were soil and water conservation, minimum soil disturbances, rearing adaptable livestock and growing adaptable crops which were coded as A1, A2, A3 and A4 respectively. Appendix D had one section with four questions on the content analysis sub-themes. It was used to triangulate the researcher's content analysis results. Appendix E too had the four questions on arising from the sub themes of the content analysis and the topics deemed to

cover content on each. It was used to seek the opinion of the agriculture teachers on the adequacy of the identified topics and instructional objectives in addressing knowledge and skills that promote DLA in ASALs.

3.6.1 Validity of the Instruments

Validity is the degree to which results obtained from the analyzed data actually represent the phenomenon under study (Fraenkel & Wallen, 2000; Kothari & Garg, 2014; Mugenda & Mugenda, 2003). To ensure that the instruments had both content and face validity and to accurately measure the variables of interest in the study, each of the items in the instruments was discussed with the supervisors. The researcher gave attention to each study objective to ensure that it was fully addressed by the items contained in the respective instruments. The researcher also incorporated the comments and suggestions from the oral examination of the proposal at department and faculty levels, to further improve the instrument. Items that were not relevant were removed. Appropriate language, spacing and font type were observed to enhance the instruments' face validity.

3.6.2 Reliability of the Instruments

Reliability is a measure of the degree to which a research instrument yields consistent results after repeated trials (Fraenkel & Wallen, 2000; Kothari & Garg, 2014; Mugenda & Mugenda, 1999). A pilot study was done using a sample of 10 teachers of agriculture, 30 Form Three students of agriculture and three school principals from Nyahururu Sub-County of Laikipia County. The sample sizes were based on Baker (1994) who proposes an equivalent of 10-20 percent of the sample size for a pilot study. Nyahururu Sub County was chosen because it has similar characteristics to those of the study location. Piloting the instruments addressed their deficiencies and ambiguities which the researcher corrected before producing the final instruments for data collection.

The reliability of the instruments was estimated using Cronbach's Alpha Coefficient which is a measure of internal consistency. Cronbach's Alpha Coefficient was chosen because it requires a one test administration and it is the best for items with Likert scale (Tavakol & Dennick, 2011). According to Fraenkel and Wallen (2000), a Cronbach's alpha coefficient of at least 0.70 or higher is acceptable for research purposes. Thus the instruments' internal consistency for the teachers of agriculture questionnaire was 0.76 while that of agriculture students was 0.79. The coefficients were above the threshold, hence the instruments were considered fit for data collection. Reliability of the school principals' questionnaire and for

those used in content analysis was determined qualitatively by discussing all the items with the supervisors to ensure that they addressed the relevant objectives.

3.7 Data Collection Procedure

The researcher obtained an introductory letter from Egerton University's Graduate School (Appendix I). This facilitated the acquisition of a research authorization letter and permit from the National Commission for Science, Technology and Innovation (Appendices J and K). Official request to undertake the study and access the information from the agriculture teachers in the schools offering agriculture as well as Form Three agriculture students and school head teachers in the sampled schools was sought from the relevant Sub-County education offices (Appendices L, M, N, O, P and Q). The researcher then went to the respective schools introduced herself to the school principal after which she handed them their questionnaires and with their permission she did the same to the Agriculture subject teacher. All the school principals opted to read and respond to the questionnaires immediately. The researcher was therefore able to leave with the filled questionnaires. However, some of the teachers of agriculture who could not read and respond to the items immediately requested for time and a span of two days was agreed upon after which the researcher went back to collect them. The researcher also sought permission from the school principal and consulted with the teacher of agriculture on the appropriate time to meet the Form Three agriculture students in the sampled schools. The researcher briefly introduced herself to the student respondents and explained the importance of the study. This was necessary to facilitate informed consent of the learners as they participated in the study. The questionnaires were then administered to the respondents and they were given time to read through the items after which they were guided in filling them. Once through the questionnaires were collected each at a time as the researcher perused through to ensure that all items had been filled to avoid cases of missing data. Actual data collection took five months and was solely done by the researcher.

Deductive content analysis was done and the structure of analysis was operationalized on the basis of previous knowledge through literature review and the purpose of the study (Sindale & Dlamini, 2013). The researcher created a categorization matrix. Unconstrained matrix approach was used where different categories were created within the bounds (Glenn, 2009). This was guided by the principle of deductive analysis. Thus, sub-themes were used to determine the extent to which the topics and instructional objectives in the Kenya Secondary

school agriculture curriculum covered content and practices promoting DLA. After desktop research, five experts in the Department of Agricultural Education and Extension who had previous experience in teaching agriculture in high school were involved in triangulating the researcher's results. The identified experts were individually approached over their willingness to participate in the study after which the content analysis check list with the sub-themes and categorization matrix and a copy of the agriculture syllabus were mailed to them. Duration of one month was agreed to be enough for them to read and give their feedback. This was necessary to address the subjectivity associated with content analysis. Any topic and learning objective that was agreed to by at least three of the experts was taken in to be addressing content on DLA knowledge and practices. Once the data from the experts was obtained and analysed it was used to seek the agriculture teachers' opinion on the adequacy of the identified topics and instructional objectives in addressing knowledge and skills that promote DLA in ASALs. This opinion was sought from 18 agriculture teachers across the selected sub counties who had a teaching experience of over 10 years in ASAL secondary schools. However, the researcher was able to obtain feedback from 14 of them. At all levels, the researcher recognized the respondents' entitlement to privacy and accorded them their rights to confidentiality and anonymity. If any personal information is to be divulged for whatever reason, then the respondent's consent has to be sought.

3.8 Data Analysis

Descriptive and inferential statistics were used in data analysis. Descriptive statistics included frequencies, means, standard deviations and percentages. Inferential statistics included ANOVA and post-hoc tests. These were used to describe the characteristics of the respondents. They were also used in describing the learner related factors, teacher related factors, teaching resource related factors, funding, implementation of agriculture curriculum and content analysis results. The inferential statistics used in testing the hypotheses were Simple and Multiple Linear Regression. Simple Linear Regression was used to determine the influence that a change in funding level had on agriculture curriculum implementation in ASALs. Multiple Linear Regression was used to determine level of change that the learner, teacher and teaching resources related factors had on agriculture curriculum implementation as well as the direction of the influence of the predictor on dependent variable. Content analysis technique was used to analyse the data from the experts. Hypotheses were tested at a significance level of $\alpha = 0.05$. The Statistical Package for Social Sciences (SPSS) version 20 was used to compute the data collected. Table 6 gives a summary of the data analysis.

Table 6

A Summary of Data Analysis

Hypothesis	Independent Variables	Dependent Variable	Statistical tests
$H0_{1:}$ There is no statistically significant influence of student related factors on implementation of secondary school agriculture curriculum in selected arid and semi arid counties of Kenya.	Student related factors	Implementation of secondary school agriculture curriculum in ASALs	Multiple linear regression
$H0_2$ There is no statistically significant influence of teacher related factors on implementation of secondary school agriculture curriculum in selected arid and semi arid counties of Kenya.	Teacher related factors	Implementation of secondary school agriculture curriculum in ASALs	Multiple linear regression
$H0_3$ There is no statistically significant influence of teaching resources on implementation of secondary school agriculture curriculum in selected arid and semi arid counties of Kenya.	Teaching resources	Implementation of secondary school agriculture curriculum in ASALs	Multiple linear regression
$H0_4$ There is no statistically significant influence of funding on implementation of secondary school agriculture in selected arid and semi arid counties of Kenya.	Funding	Implementation of secondary school agriculture curriculum in ASALs	Simple linear regression

CHAPTER FOUR
RESULTS AND DISCUSSION

4.1 Introduction

This chapter presents the results of data analyses and discussion with reference to research objectives, hypotheses and research question as stated in Chapter One. The study area comprised five Sub counties from three counties namely Marigat and Mogotio in Baringo County, Makindu and Kibwezi in Makueni County and Narok North in Narok County. Three groups of respondents from schools in these Sub-counties participated in the study and these were the Form Three agriculture students, teachers of agriculture and the school principals. The aspects analysed and discussed included: Demographic characteristics of the respondents and implementation of agriculture curriculum in ASALs. Others are student related factors, teacher related factors, teaching resource availability, adequacy and frequency of use in schools and funding influence on implementation of secondary school agriculture curriculum in ASAL counties. The results on the level of students' acquisition of knowledge and skills on DLA are presented in section 4.3. The descriptive findings are presented in section 4.4 while the tests of hypotheses are presented in section 4.5.

4.2 Demographic Characteristics of the Respondents

The demographic characteristics of the form three agriculture students, agriculture teachers and school principals were as discussed in sections 4.2.1, 4.2.2 and 4.2.3.

4.2.1 Form three agriculture students

The total number of student respondents who participated in the study was 271 and their distribution per Sub-county was as shown in Figure 2.

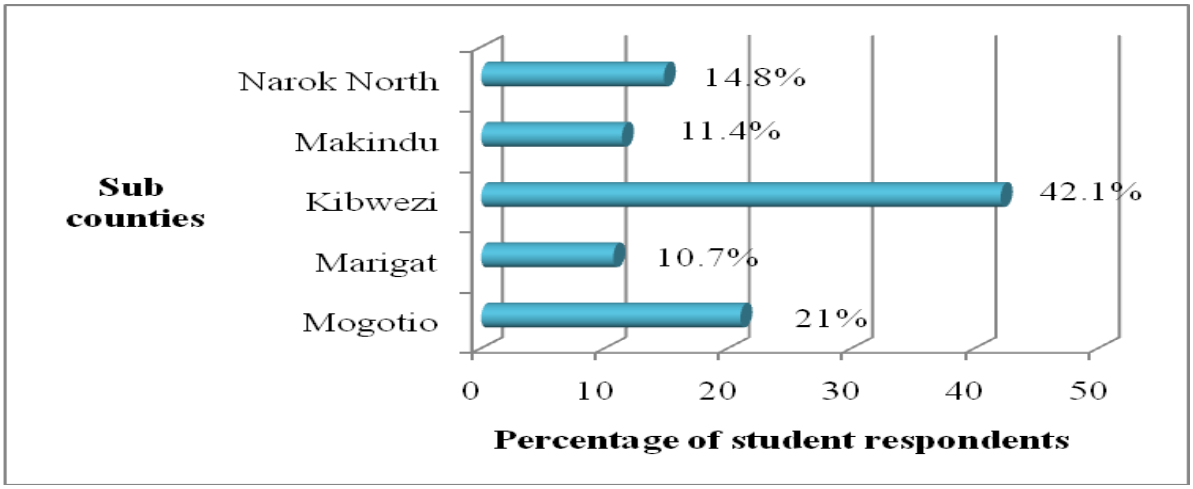

Figure 2: Distribution of student respondents by Sub-county

Kibwezi Sub County had the highest percentage proportion while Marigat had the least. This is because Kibwezi Sub County had the highest number of schools after the proportionate sampling hence it had the highest number of student respondents compared to all the other sub counties.

Gender of the respondents: Figure 3 presents gender distribution of the Form three agriculture students interviewed across the study locations.

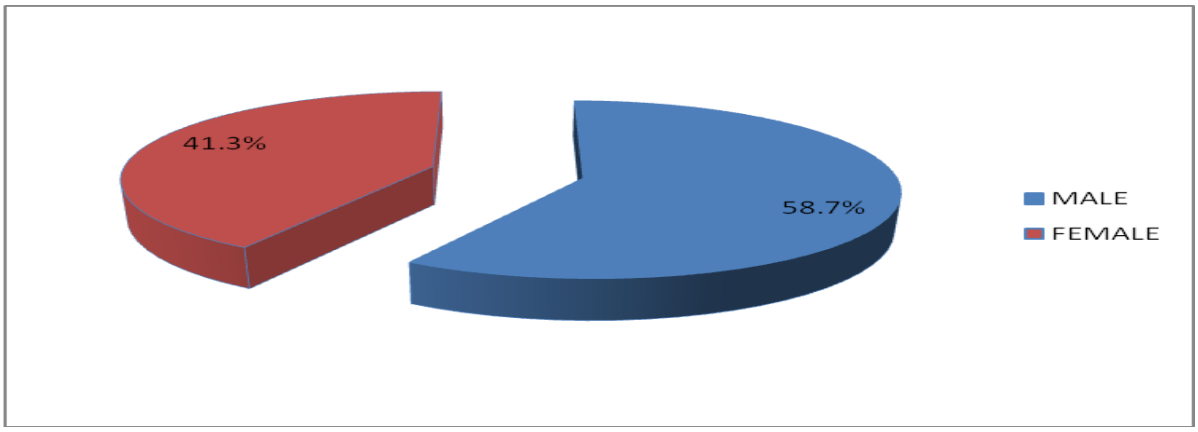

Figure 3: Distribution of student respondents by gender

A study by Eze, Ezenwaform and Obi (2015) indicated male dominance in the uptake of Agriculture subject and in these ASAL schools the scenario is similar. However, this stirs interest since a study done by Kyule, Nkurumwa and Konyango (2015b) indicated that most of the small-scale farming in the rural areas representing over 80 percent of the farming in the country, is done by women. This negatively affects agricultural development in ASALs since majority of the women who make up labour force in farms are not beneficiaries of agriculture curriculum implementation in secondary schools. Thus they lack basic skills on practices that promote DLA. There is a mismatch between what the girl child expects while in school and what they end up undertaking after school. The low enrolment of female students in the subject could be attributed to traditional and social patterns where the subject is viewed as meant for males, lack of proper guidance and counseling and parental influence on subject selection (Akyina, Oduro & Ansah-Hughes, 2015).

Age of the respondents: The respondents' age ranged between 15-23 years, with the mean age being 17 years. This is slightly above the expected age for their level of study as per the Ministry of Education. Only 17 percent of these respondents were within the correct age bracket for form three, 6.3 percent were under age while 76.6 percent were beyond the expected age. A study done by Abdullahi, Mlozi and Nzalayaimisi (2015a) found out that at

the appropriate age, learners are able to make informed decisions on their subject selection in schools. Therefore most of them made choices due to intrinsic and not extrinsic reasons. Figure 4 shows distribution of respondents by age.

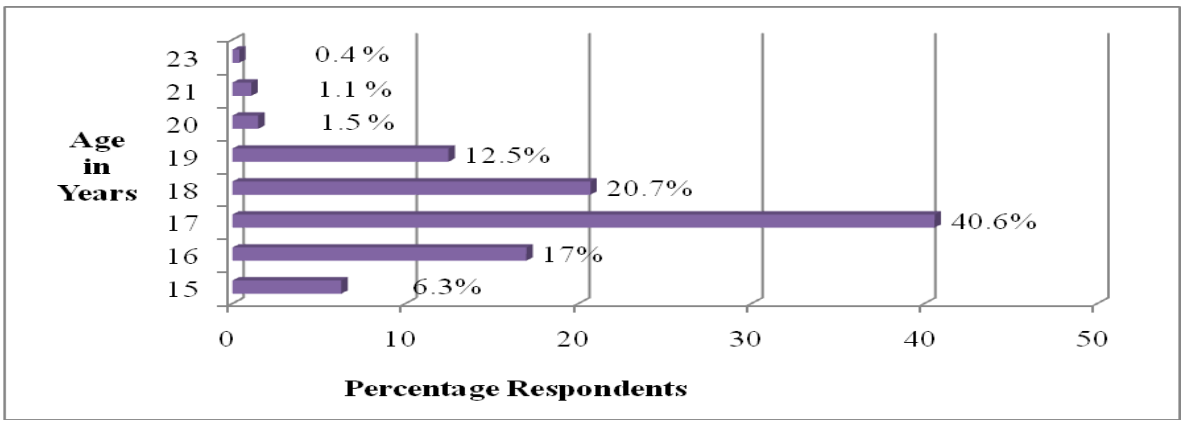

Figure 4: Distribution of respondents by age

Additionally, learners' age also influences curriculum implementation since when learners are appropriately placed in their respective classes they have basic knowledge and skills for effective learning and are not impaired by age related inadequacies. Some of the factors that have been attributed to late school going age in ASALs are accessibility and proximity of schools therefore learners have to be old enough to bear the distances and poverty leading to absenteeism hence repeating of classes. The cultural way of life of the communities in ASALs like nomadism has contributed a great deal towards late schooling (Abdullahi, Mlozi & Nzalayaimisi, 2015b). However, it is important to note that most of the over age respondents were male. This is because most of the over age female students in ASALs are prone to early marriage and pregnancies hence dropping out of school.

4.2.2 Demographic Characteristics of Agriculture Teachers

Out of the targeted sample size of 150 teachers of agriculture in the selected ASAL sub counties, filled questionnaires were obtained from 88 respondents representing a 59 percent response rate. Over half of the questionnaires were returned with Narok North and Marigat sub counties recording the least returns. This is attributed to the fact that some of the schools in these two Sub counties were inaccessible, means of communication are poor and some did not have agriculture teachers by the time data was being collected although they were offering the subject. The distribution of agriculture teacher respondents per Sub County was as shown in Figure 5.

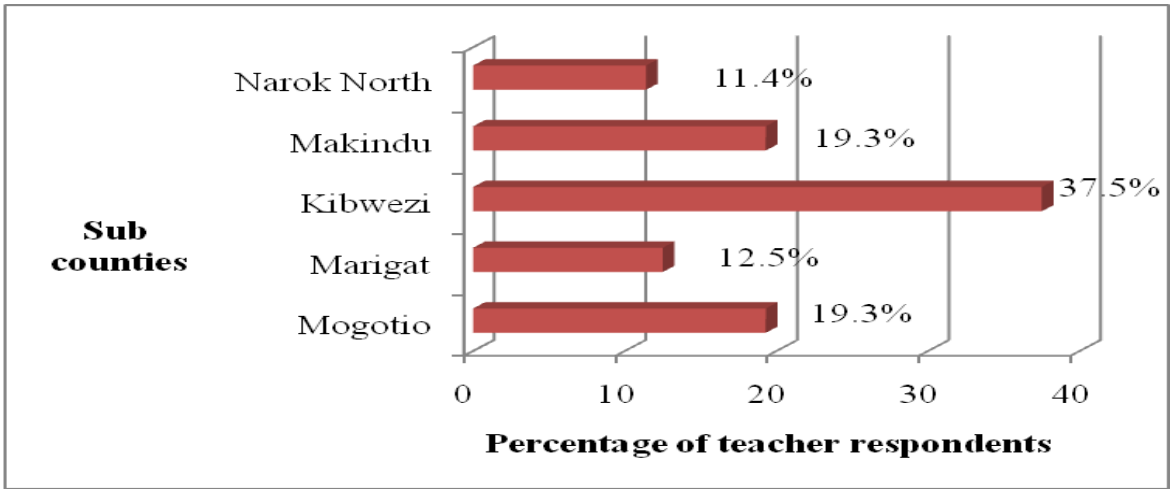

Figure 5: Distribution of agriculture teachers by Sub County

Gender of the respondents: Male teachers dominated the teaching personnel handling the subject in the ASAL counties as shown in Figure 6. The low percentage of female teachers and only in very few schools could be denying the female students role models to emulate in the area of agriculture.

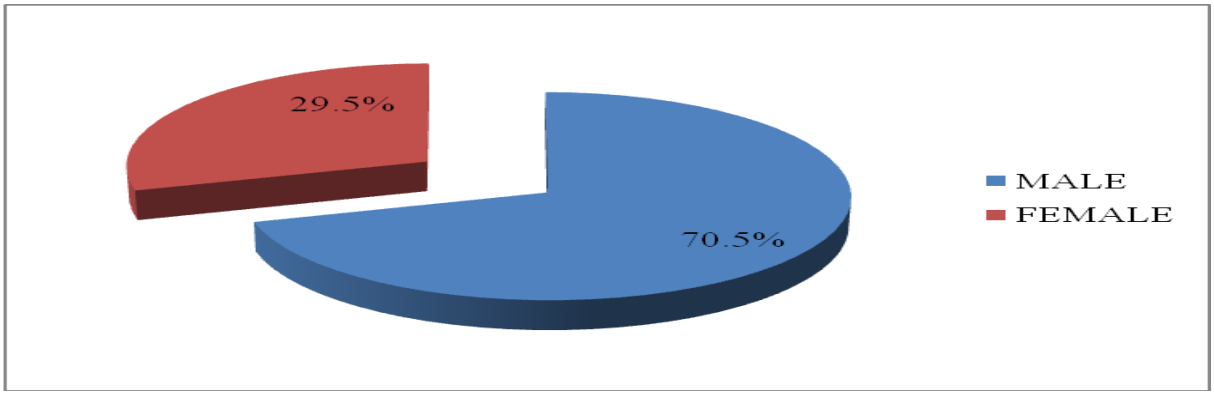

Figure 6: Distribution of respondents by gender

Age of the respondents: The age ranged between 20 and 54 years with the average age being 34 years. The results in Figure 7 indicate that 58 percent of the teachers in the ASAL counties are below the age of 35 years and hence categorised as youth. Since the youth are the most productive age group, it is expected that these teachers should be very committed in implementing the agriculture curriculum effectively in the ASAL schools. However, teachers within the age bracket of over 46 to 55 years were only 6.8 percent hence this is a subject that was being handled by teachers who were still very productive in regard to service delivery (Guancheng, Qiyu & Jingjuan, 2015).

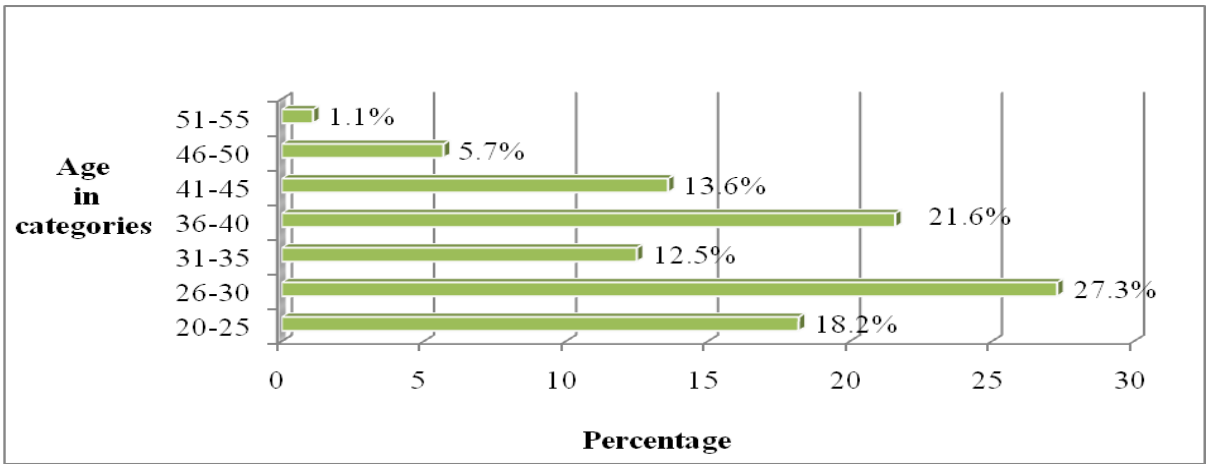

Figure 7: Distribution of respondents by age

Teaching experience: The results in Figure 8 indicate that more than half of the subject teachers in these counties had less than five years' teaching experience. Those with the wealth of teaching experience of over 20 years were only 5.6 percent. The young or new teachers in the profession are lacking mentorship into the implementation of agriculture curriculum. This is because there is a lot that a teacher acquires through experience and there is need to pass it to the young generation of curriculum implementers.

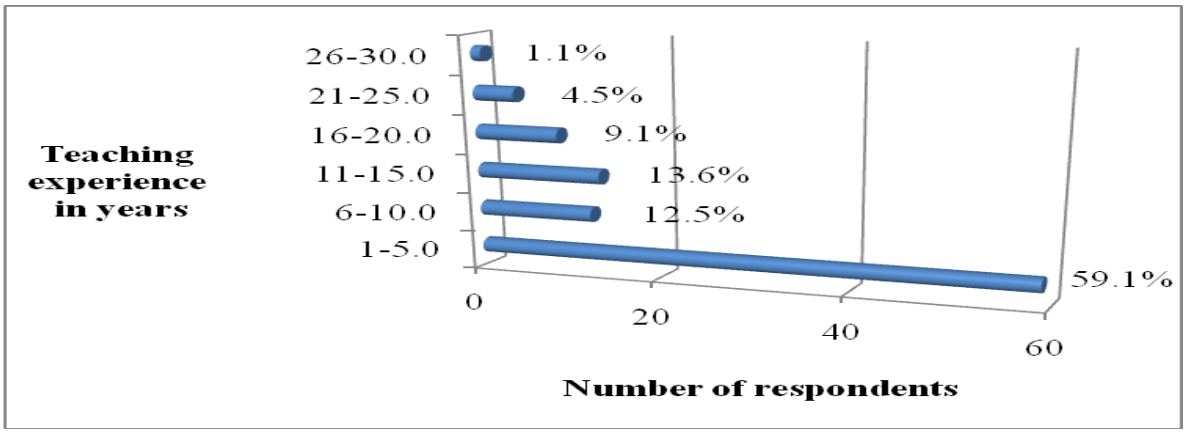

Figure 8: Number of years respondents have taught agriculture in secondary schools

Number of years of teaching agriculture in ASAL secondary schools: Respondents were asked to indicate how long they had taught agriculture in an ASAL school and the results were as shown in Figure 9. Close to 65 percent of all the teachers implementing the curriculum in ASAL counties had less than five years of teaching experience. Worth noting is that, the percentage retention of agriculture teachers declined drastically with increase in the number of years that the respondents taught in ASAL schools. This was due to massive transfer of teachers to areas that are ecologically friendly and to the fact that most of these teachers are employed by the schools on temporary basis. Thus, such teachers move out

whenever they get better paying jobs or working conditions elsewhere. There is need therefore, to devise mechanisms that will enhance teacher retention in ASAL schools so that curriculum implementation can be enhanced through teaching experience.

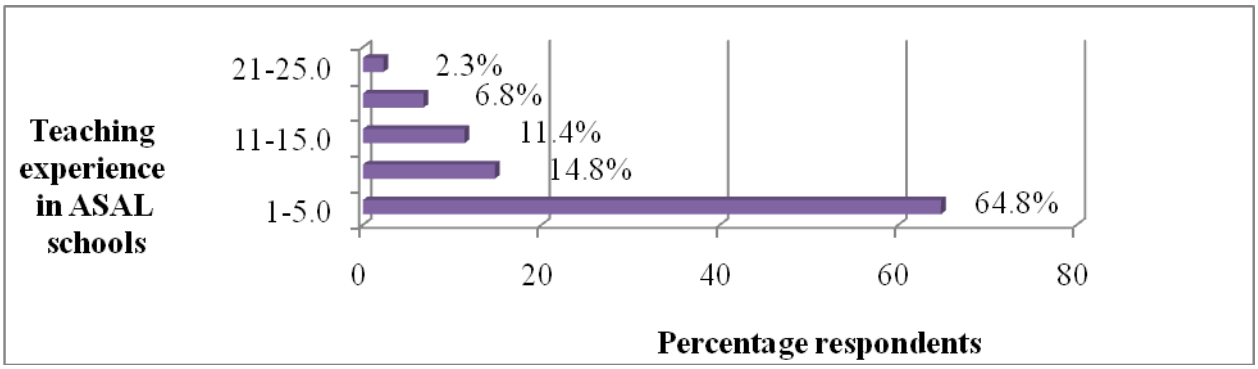

Figure 9: Number of years respondents have taught agriculture in ASAL secondary school

Teaching load: Respondents were asked to indicate the number of lessons they taught per week and the teaching load ranged from 10-32 lessons per week. Those with the maximum load of 27 lessons per week and below were 83 percent. Only 17 percent of the respondents had a teaching load that exceeded the maximum as required by the Ministry of Education (Ministry of Education, 2003). Past studies have found out that high teaching load negatively affects curriculum implementation hence there is need to ensure that teachers have manageable teaching load (Cheplogoi, 2014).

Respondents' second teaching subject: The Teachers Service Commission which is responsible for teacher employment in Kenya requires that a teacher trains in two teaching subjects. Respondents were thus asked to identify their second teaching subject. The results were as shown in Figure 10.

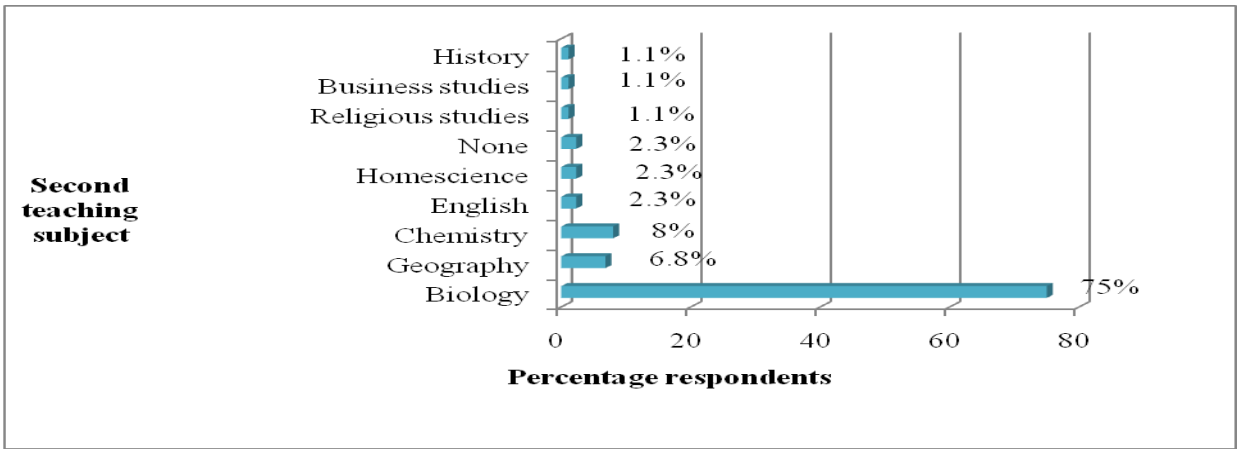

Figure 10: Distribution of respondents by their second teaching subject

Most of the respondents had biology as their other teaching subject while 2.3 percent of the respondents had agriculture as their only teaching subject. Presence of subject combinations that do not relate with agriculture is attributed to under staffing in schools. Shortage of teachers makes school administrations engage unqualified teachers to teach under staffed subjects. A study by Nina and Olga (2017) indicated that teachers' training dictates their competence levels which in turn influence the manner in which they implement the curriculum. Engaging unqualified teachers compromises on curriculum implementation not only in agriculture but on all subjects.

Teaching subject preference: Respondents were also asked to state the teaching subject they preferred most. The results as in Figure 11 indicate that 71.6 percent preferred teaching agriculture and only 28.4 percent preferred their other teaching subject. These results contradict the findings of Konyango & Asienyo (2015) that most of the teachers teaching agriculture have no preference for the subject. Thus teachers' preference for the subject was not a major reason for ineffective agriculture curriculum implementation in ASAL schools.

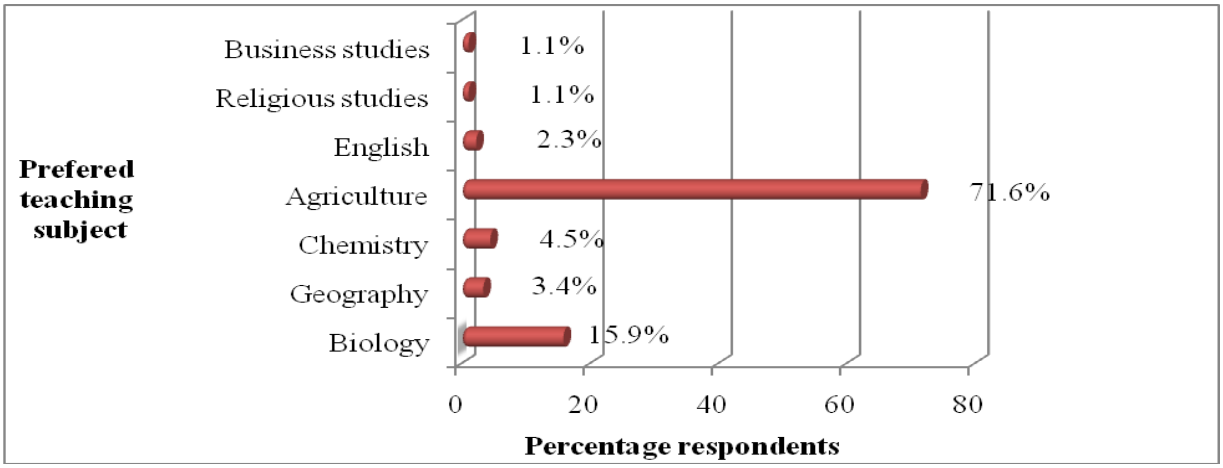

Figure 11: Distribution of respondents by teaching subject preference

Criteria for selecting form three agriculture students: Respondents were asked about the criteria used in their schools in selecting agriculture students at form three, and the results were as presented in Figure 12. Over 90 percent respondents indicated that selection was based on students' interest. Thus all the learners taking up the subject at this level are presumed to choose it out of personal interest and not by any external influence.

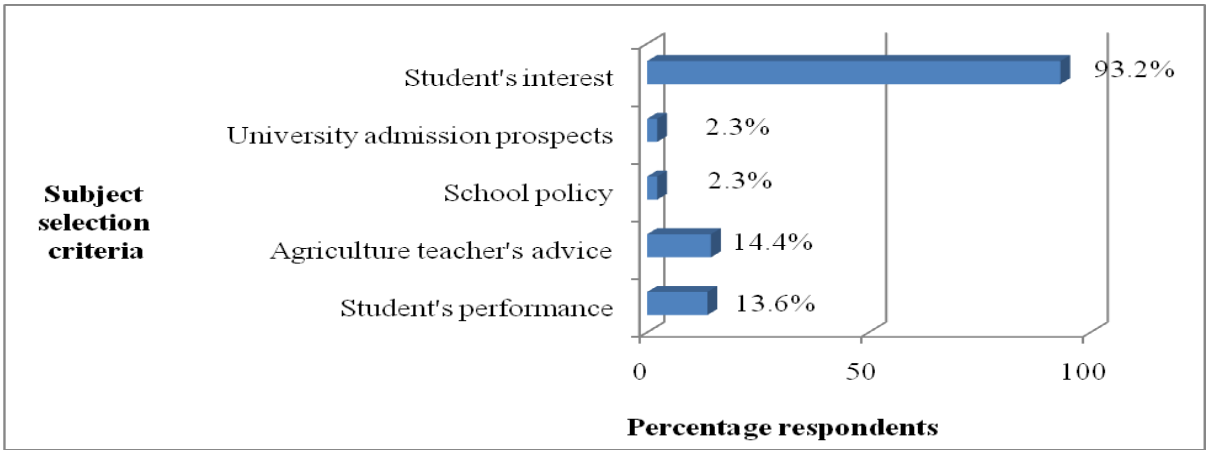

Figure 12: Criteria of selecting agriculture subject at form three

4.2.3 Demographic characteristics of the school head teachers

Gender of respondents: Figure 13 indicates that, of the 29 school head teachers who participated in the study, 72 percent were male while only 28 percent were female. This defies the requirements in the Kenyan constitution where one third gender rule must be observed in leadership positions (GoK, 2010). This is denying the female students enough role models to emulate in the learning institutions.

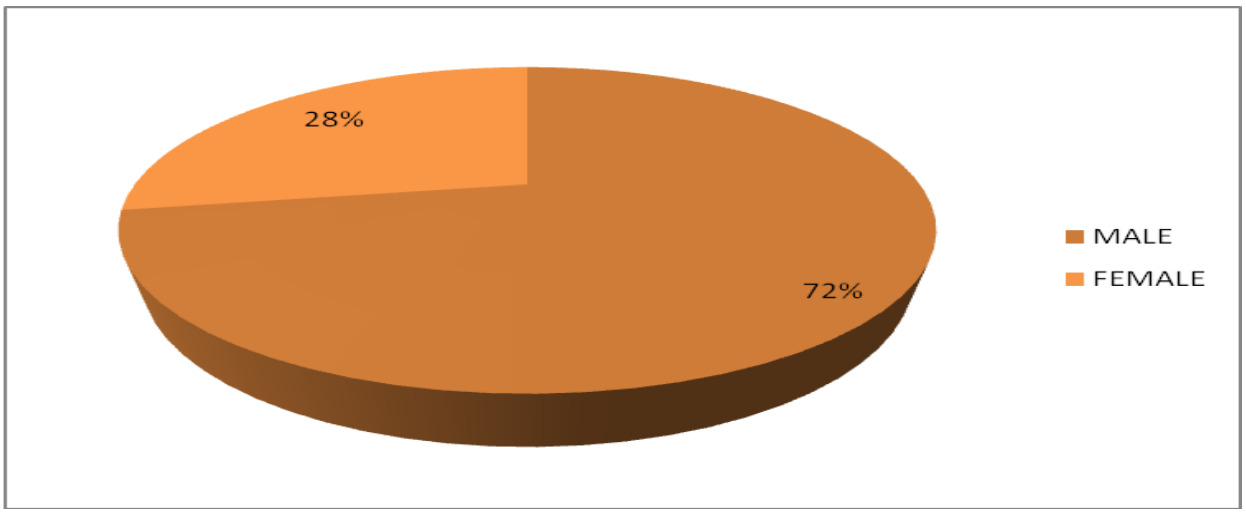

Figure 13: Gender of the school heads respondents

Age of the respondents: Figure 14 presents results on the respondents age. The school head teachers' age ranged between 37 to 56 years and the mean age was 45.5 years. The respondents' age was put into categories and 82.8 percent of the respondents were 50 years and below. Thus they were within the productive age and it is therefore expected that they offerred their best in leadership responsibilities of the schools they headed.

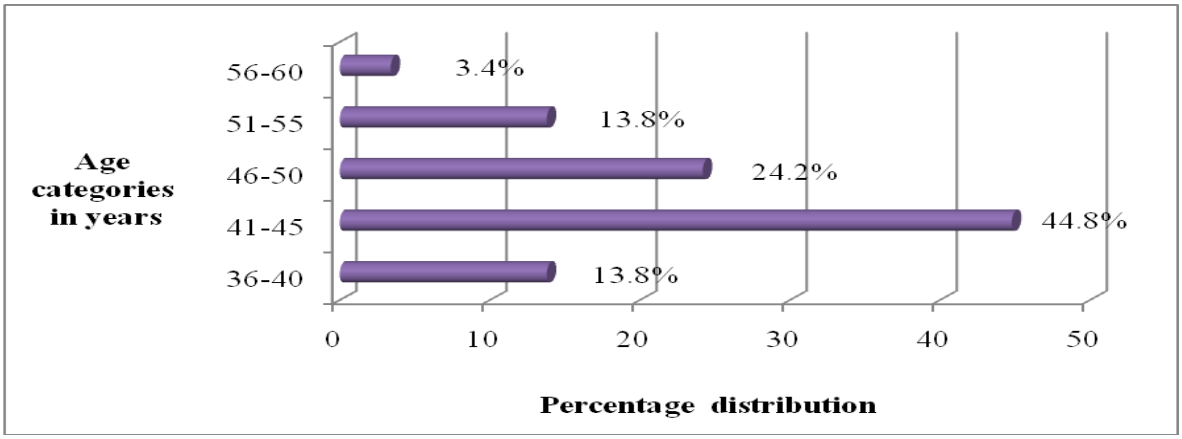

Figure 14: Age categories of the school heads respondents

It is important to note that the results indicate a steady transition decline in leadership of ASAL schools with increase in age from 46 years onwards. This trend could be attributed to attrition, job switching or early retirement. While it is good to have the young productive age in leadership it is equally important to have the experienced head teachers on board to guide and mentor young headteachers for the betterment of the education system.

4.3 Implementation of secondary school agriculture curriculum in ASALs

This section deals with the dependent variable which was to be indicated by learner's level of knowledge and skill acquisition on DLA and the type of agriculture projects that students were engaged in within the school farm. However, the types of agriculture projects were not used in this study as an indicator of the dependent variable. This is because the number of students found to have been involved in agriculture projects was too few to be a representative of the population. The study thus used learner's level of knowledge and skill acquisition on DLA as the measure of the dependent variable. The ultimate goal of agriculture curriculum implementation is to equip learners with agricultural knowledge and skills for agricultural development and self reliance after school. To measure the effectiveness of agriculture curriculum implementation in ASAL schools, it is necessary to measure the level of knowledge and skills relevant to DLA acquired by the learners.

Learners' knowledge level on Topics containing DLA content: Respondents were requested to rate their knowledge level on fourteen topics in the secondary school agriculture curriculum with content on DLA. A Likert scale of five points was used. The Cronbach's Alpha for the fourteen topics was 0.79 which is above the threshold for social studies hence it

was appropriate to use. The results on the respondents' knowledge level on DLA practices were as presented in Table 7.

Table 7

Knowledge Level on the Topics with DLA Content **n=271**

DLA Knowledge level on	Minimum	Maximum	Mean	Std. Deviation
Farm power and machinery	1.00	5.00	1.3506	.68231
Agroforestry	1.00	5.00	1.6384	.90382
Forage crops	1.00	5.00	2.0221	1.13181
Field management practices (ii)	1.00	5.00	2.9373	1.12864
Farm structures	1.00	5.00	3.2177	1.02588
Livestock rearing practices	1.00	5.00	3.4170	1.09862
Livestock breeds	1.00	5.00	3.4244	1.00775
Soil and water conservation	1.00	5.00	3.6273	.92568
Water supply & irrigation	1.00	5.00	3.6790	.95660
Nursery practices	1.00	5.00	3.7417	.86049
Planting	1.00	5.00	3.7454	.87227
Land preparation	1.00	5.00	3.7675	.77065
Field practices (i)	1.00	5.00	3.8155	.89189
Weed and weed control	1.00	5.00	3.8967	.94889

The researcher developed a scale for rating the knowledge and skill level in this study. Any score between 1-1.5 was categorized as very low, 1.6-2.4 as low, 2.5-3.3 as moderate, 3.4-4.2 as high and 4.3-5.0 as very high. The mean knowledge level for all the topics was moderate at 3.16. Farm power and machinery topic recorded a very low mean knowledge level but the respondents had low mean knowledge level on agroforestry and forage crops. The very low mean knowledge level on farm power and machinery was attributed to the fact that, being a form four topic most respondents had not covered it by the time of the study. Though agroforestry is also a topic in form four, respondents had better knowledge level on it than farm power and machinery which was attributed to the prior knowledge gained at primary school level. Most livestock rearing in ASALs is through pastoral nomadism with animals relying mostly on natural pastures. Thus the low knowledge level could be explained by the fact that most learners in ASAL backgrounds are unable to relate with pastures and fodder grown for livestock, their management and methods of preservation. Field management

practices (ii) and farm structures recorded a moderate mean DLA knowledge level among the respondents.

The remaining nine topics recorded a high mean knowledge level. These topics were: livestock rearing practices, livestock breeds, soil and water conservation, water supply and irrigation, nursery practices and planting. Others were land preparation, field practices (i) and weed and weed control. None of the topics posted a very high mean knowledge level. ASALs will benefit better from DLA content in the secondary school agriculture curriculum if we shall be able to produce secondary graduates with high and very high knowledge level on DLA related topics. This is because these learners need to be above board and well versed with DLA knowledge they can apply to solve ASAL agriculture related problems. As Akinwande, Olorundare and Uphai, (2016) noted, a well prepared human resource is a country's potential wealth. Thus with none of the fourteen topics scoring a very high mean knowledge level, a lot needs to be done to obtain extra ordinary knowledgeable human resource in the agriculture sector not just in the ASALs but across the country.

Learners' mean DLA knowledge level per Sub County: The mean DLA knowledge level among respondents per Sub-county was as presented in Table 8.

Table 8
Mean DLA Knowledge Level per Sub County

Sub County	N	Mean	Std. Deviation	Minimum	Maximum
Mogotio	57	3.2907	.46991	2.07	4.21
Marigat	29	3.3350	.31663	2.64	3.79
Kibwezi	114	3.0075	.47164	1.71	4.07
Makindu	31	3.0323	.59271	1.57	4.00
Narok-North	40	3.4000	.40722	2.43	4.14
TOTAL	271	3.1629	.48928	1.57	4.21

As the means across the Sub counties indicate, none of them is equipping their learners with very high knowledge level on topics with DLA content. This could explain the reason as to why ASALs have continued lagging behind and have not benefited much from the agricultural knowledge being offered in secondary schools.

A post hoc test was then done to establish whether these means were statistically different from each other. The results were as shown in Table 9. The DLA mean knowledge level for

Kibwezi Sub County was statistically significantly lower than that of Mogotio, Marigat and Narok North Sub counties while that of Makindu Sub County was statistically significantly lower than that of Narok North. This could be explained by the fact that, Kibwezi and Makindu are on the lower part of Makueni County which is extremely dry with minimal agricultural activities compared to the rest of the Sub counties.

Table 9
A Post Hoc Test Comparing the Mean DLA Knowledge Level across the Five Sub Counties **n=271**

Sub County	Sub County	Mean Difference	Std. Error	Sig.	95% Confidence Interval Lower Bound	95% Confidence Interval Upper Bound
Mogotio	Marigat	-.04425	.10588	.994	-.3351	.2466
	Kibwezi	.28321*	.07530	.002	.0764	.4900
	Makindu	.25847	.10359	.095	-.0261	.5430
	Narok North	-.10927	.09574	.784	-.3722	.1537
Marigat	Mogotio	.04425	.10588	.994	-.2466	.3351
	Kibwezi	.32746*	.09654	.007	.0623	.5926
	Makindu	.30272	.11992	.088	-.0267	.6321
	Narok North	-.06502	.11321	.979	-.3760	.2459
Kibwezi	Mogotio	-.28321*	.07530	.002	-.4900	-.0764
	Marigat	-.32746*	.09654	.007	-.5926	-.0623
	Makindu	-.02474	.09403	.999	-.2830	.2335
	Narok North	-.39248*	.08531	.000	-.6268	-.1582
Makindu	Mogotio	-.25847	.10359	.095	-.5430	.0261
	Marigat	-.30272	.11992	.088	-.6321	.0267
	Kibwezi	.02474	.09403	.999	-.2335	.2830
	Narok-North	-.36774*	.11107	.009	-.6728	-.0627
Narok North	Mogotio	.10927	.09574	.784	-.1537	.3722
	Marigat	.06502	.11321	.979	-.2459	.3760
	Kibwezi	.39248*	.08531	.000	.1582	.6268
	Makindu	.36774*	.11107	.009	.0627	.6728

*. The mean difference is significant at the 0.05 level.

These topics were further grouped on the basis of those with DLA knowledge on crop production, livestock production and soil and water conservation then a cross tabulation was done per the Sub counties. This was necessary to determine whether there were Sub counties that were well endowed with a given sector knowledge than the other. The topics put together under crop production comprised land preparation, planting, nursery practices, field practice (i), weed and weed control, field practices (ii) and forage crops. The Cronbach's alpha for the

six items was 0.70 (see Table 10) and the mean knowledge level for crop production per Sub County was as shown in Table 11.

Table 10

Cronbach's Alpha of the Topics Combined to Measure DLA Knowledge on Crop Production

Cronbach's Alpha	Cronbach's Alpha Based on Standardized Items	N of Items
.684	.702	6

Table 11

Mean DLA Knowledge on Crop Production across the Sub Counties

	N	Mean	Std. Deviation	Minimum	Maximum
Mogotio	57	3.5338	.59181	1.86	4.57
Marigat	29	3.5665	.33824	2.57	4.00
Kibwezi	114	3.2882	.50996	2.00	4.57
Makindu	31	3.3180	.63536	1.57	4.29
Narok-North	40	3.5929	.45355	2.14	4.43
Total	271	3.4180	.53470	1.57	4.57

Respondents in Makindu and Kibwezi Sub counties had moderate knowledge on crop production while those in Narok North, Marigat and Mogotio had high knowledge level. This could be attributed to the massive irrigation done in Marigat and Mogotio Sub-counties while Narok North is surrounded by Sub counties that produce diverse crops like wheat, barley maize and potatoes.

Three topics were combined to measure the DLA knowledge level on livestock production which included livestock breeds, livestock rearing practices and farm structures. The Cronbach's alpha was 0.70 and the mean knowledge level per Sub County was as shown in Tables 12 and 13 respectively.

Table 12

Cronbach's Alpha of the Topics Combined to Measure DLA Knowledge on Livestock Production

Cronbach's Alpha	Cronbach's Alpha Based on Standardized Items	N of Items
.692	.692	3

Table 13
Mean DLA Knowledge on Livestock Production across the Sub Counties

Sub County	N	Mean	Std. Deviation	Minimum	Maximum
Mogotio	57	3.7485	.65247	2.00	5.00
Marigat	29	3.7701	.63059	2.33	4.67
Kibwezi	114	2.9912	.77505	1.00	5.00
Makindu	31	2.9032	.78501	1.33	4.33
Narok-North	40	3.8667	.62612	2.33	4.67
Total	271	3.3530	.82179	1.00	5.00

The mean DLA knowledge level on livestock production is average at 3.35. However, Narok North, Mogotio and Marigat sub counties posted an above average knowledge level for the same. This could be attributed to the fact that the natives of these areas were purely pastoralists and this culture has dominated up to date.

The topics on water supply, irrigation and drainage, soil and water conservation and field practices (ii) were combined to measure DLA knowledge level on soil and water conservation and the results are as shown in Table 14.

Table 14
Mean DLA Knowledge on Soil and Water Conservation across the Sub Counties

Sub County	N	Mean	Std. Deviation	Minimum	Maximum
Mogotio	57	3.3743	.72940	1.67	5.33
Marigat	29	3.5287	.67564	2.33	5.67
Kibwezi	114	3.4883	.86920	1.67	6.00
Makindu	31	3.6022	.82740	2.33	5.33
Narok-North	40	3.8000	.79457	2.00	5.33
Total	271	3.5277	.81141	1.67	6.00

On soil and water conservation only respondents in Marigat, Makindu and Narok North had a mean of above average. However, Narok North posted the highest mean across the different Sub counties a scenario that was attributed to its geographical positioning. The County itself is multi-ecological with some areas very good for wheat and barley, others good for exotic livestock, horticulture and others are dry areas best for indigenous livestock. Although Narok North is categorized as an ASAL Sub-county, agricultural influence has slowly diffused in making the respondents better than their counterparts in other ASAL areas. Additionally, this Sub County cuts across Narok town which is popular for being cosmopolitan. The outsiders engage mostly in agriculture through rented land. This influx of people from other communities may also have contributed to better knowledge on the agricultural practices within the county.

The researcher sought to find out whether there was any significant difference in means on DLA knowledge level on crop production, livestock production and soil and water conservation. The results were as presented in Table 15. The ANOVA results indicated that the means on soil and water conservation were not statistically different while there was a statistically significant difference between the means obtained per Sub County on crop and livestock production.

Table 15

ANOVA Results Showing Difference Between the Mean DLA Knowledge for Soil and water Conservation, Crop Production and Livestock Production

DLA knowledge level on		Sum of Squares	df	Mean Square	F	Sig.
Soil & water conservation	Between Groups	4.657	4	1.164	1.789	.131
	Within Groups	173.108	266	.651		
	Total	177.765	270			
Crop production	Between Groups	4.858	4	1.214	4.466	.002
	Within Groups	72.337	266	.272		
	Total	77.194	270			
Livestock production	Between Groups	45.709	4	11.427	22.247	.000
	Within Groups	136.631	266	.514		
	Total	182.339	270			

A post hoc test was then done to establish which means were different from the rest and the results are shown in Appendix G. The mean DLA knowledge on crop production for Kibwezi Sub County was statistically significantly lower than that of Narok North and Mogotio Sub counties. This was attributed to the many agricultural activities that surround Narok North Sub County and the substantial irrigation done in Mogotio Sub County. Similarly, the mean knowledge levels on livestock production of Kibwezi and Makindu are statistically significantly lower than those of Narok North, Marigat and Mogotio which can be attributed to the culture of the natives of the three sub-counties of being pastoral nomads. This culture and the value they attach to livestock may have made them gain more knowledge on livestock production compared to Kibwezi and Makindu natives who were predominantly long distant traders with keen focus on handcraft.

Level of Skill acquisition - Respondents were also requested to rate their skill level on 23 practices that promote DLA in ASALs whose Cronbach's Alpha was 0.84 as in Table 16.

Table 16

Cronbach's Alpha on Practices Promoting DLA Covered in the Secondary School Agriculture Curriculum

Cronbach's Alpha	Cronbach's Alpha Based on Standardized Items	N of Items
.843	.842	23

The mean DLA skill level on all the practices was moderate at 2.71. The mean for each practice was as presented in Table 17. In ten (43.5 percent) practices the mean skill level recorded was low at below 2.4. These practices were zero tillage, growing multi-purpose fodder crops, improved fallowing, sunken bed preparation, construction of micro-catchments, insitu water harvesting, green house use, fruit tree grafting, agroforestry practices and pasture conservation measures. The researcher came across a simple sunken bed in one of the schools in Kibwezi Sub County (see Plate 2).

Plate 2: An improved sunken bed in one of the schools, Kibwezi Sub County
Source: Photograph by researcher in Kibwezi Sub County on 10th November 2015

The sunken bed was lined with a polythene paper to enhance water retention and hence utilize little amount of water. Improvisation and innovativeness in utilizing locally available materials is necessary for effective implementation of the agriculture curriculum. It is the teacher's ability to translate teaching objectives into learning activities and localizing the curriculum that will make a difference in equipping learners with agricultural skills. Seven practices (30.4 percent) recorded moderate mean skill level and they included; ridge furrowing, construction of physical water barriers, practices in growing adaptable crops, preparation of cultural water barriers, preparation of crop rotation programmes, use of herbicides and minimum tillage .

Table 17

Mean Skill Level on Practices Promoting DLA Covered in Secondary School Agriculture Curriculum

Skill level on	N	Minimum	Maximum	Mean	Std. Deviation
Zero tillage	271	1.00	5.00	1.7712	.88989
Growing multi-purpose fodder crops	271	1.00	5.00	1.7749	.94137
Improved fallowing	271	1.00	5.00	1.8524	.86943
Sunken bed preparation	271	1.00	5.00	1.9041	.94184
Construction micro-catchments	271	1.00	5.00	1.9631	.94991
Insitu water harvesting	271	1.00	5.00	1.9742	.99409
Green house use	271	1.00	5.00	2.0000	1.02920
Fruit tree grafting	271	1.00	5.00	2.0664	.93651
Agroforestry practices	271	1.00	5.00	2.2030	1.17037
Pasture conservation measures	271	1.00	5.00	2.3801	1.10864
Ridge furrowing	271	1.00	5.00	2.4871	1.03942
Construction of physical water barriers	271	1.00	5.00	2.5314	1.11801
Practices in growing adaptable crops	271	1.00	5.00	2.7970	1.07813
Preparation of cultural water barriers	271	1.00	5.00	2.8487	1.18759
Preparation of crop rotation programmes	271	1.00	5.00	3.1993	1.08737
Use of herbicides	271	1.00	5.00	3.2657	1.08674
Minimum tillage	271	1.00	5.00	3.3063	.99178
Irrigation	271	1.00	5.00	3.4834	1.02501
Livestock rearing practices	271	1.00	5.00	3.5498	1.01302
Timely planting	271	1.00	5.00	3.6273	.90135
Cover cropping	271	1.00	5.00	3.7085	.90670
Water harvesting methods	271	1.00	5.00	3.7565	.93080
Mulching	271	1.00	5.00	4.0185	.81402

Only six (26.1 percent) practices recorded a high mean skill level. These were; irrigation, livestock rearing practices, timely planting, cover cropping, water harvesting methods and mulching. None of the practices recorded very high mean. Generally, the respondents had moderate and low skill level in 73.9 percent of the DLA practices. The indication is that these respondents have no full competence to carry out these DLA practices. Thus ASALs may have to wait longer before they benefit from the DLA skills covered in secondary school syllabus. The low DLA skill acquisition is attributed to a number of factors that come out during this study and this include unavailability of most of the learning resources (refer to

Figure 20), inadequacy of learning resources and failure to put into use available learning resources. Others include failure to expose learners to project work as required in the syllabus (refer to Table 21, Figure 22 and Table 22) as well as the teaching methods used in implementing the curriculum (refer to Table 27).

Mean skill level on DLA practices across the sub counties: The mean skill level on practices promoting DLA across the five sub counties was determined and the results were as shown in Table 18.

Table 18: Mean Skill Level on practices promoting DLA across the Five Sub counties

Mean Skill Level on Practices Promoting DLA across the Five Sub Counties

					95% Confidence Interval for Mean			
	N		Std.	Std.	Lower	Upper		
	271	Mean	Deviation	Error	Bound	Bound	Minimum	Maximum
Mogotio	57	2.7216	.51907	.06875	2.5839	2.8593	1.65	4.00
Marigat	29	2.7631	.54225	.10069	2.5569	2.9694	1.17	3.74
Kibwezi	114	2.5835	.44055	.04126	2.5018	2.6653	1.22	3.43
Makindu	31	2.8415	.44404	.07975	2.6786	3.0044	1.87	3.57
Narok-North	40	2.9543	.37101	.05866	2.8357	3.0730	2.13	3.65

The DLA skill level across the five Sub-counties was moderate. However, the mean skill level for Narok North was statistically significantly higher than that of Kibwezi and Mogotio Sub counties. Though the total number of respondents per Sub County may have contributed to this difference, it may also be the agricultural endowment of Narok County which may have given the respondents opportunity to participate in most of these practices out of school and therefore acquiring the skills by doing.

4.4 Descriptive Findings

4.4.1 Learner related factors

This section deals with Objective One which was to determine the influence of learner related factors on implementation of secondary school agriculture curriculum in selected ASAL counties of Kenya. The learner related factors in this study were; the learner's home background, subject preference and choice, career aspirations, learning resource availability, adequacy and frequency of use as well as the teaching methods used.

Respondent's home background: Over 97 percent of the respondents in ASAL schools came from backgrounds where their parents/guardians practiced some form of agriculture as indicated by Figure 15.

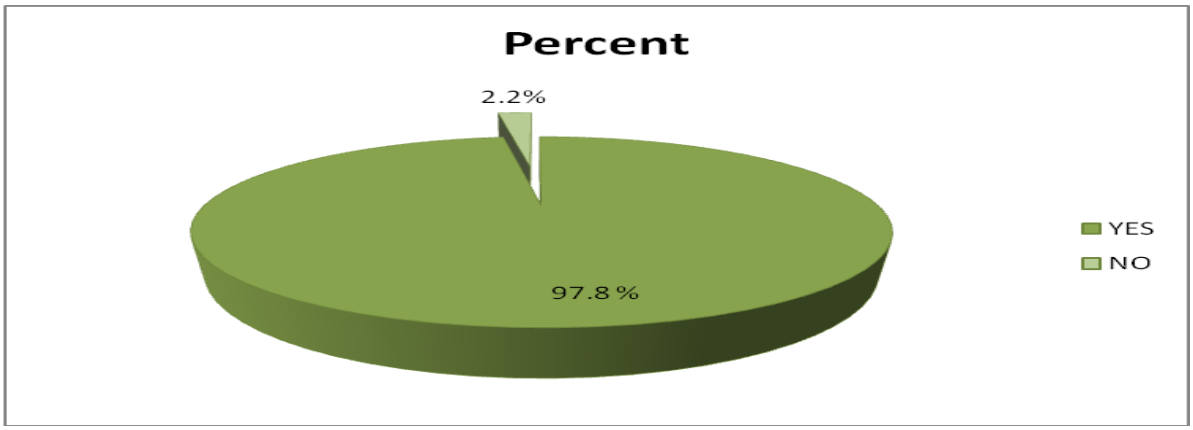

Figure 15: Percentage of respondents from homes that practiced agriculture

Learner's home background, prior knowledge and experiences have been found to influence agriculture curriculum implementation (Kabugi, 2013). Thus with the majority of the learners coming from backgrounds where agriculture is a familiar enterprise, this may have positively influenced agriculture curriculum implementation in ASAL schools.

Agricultural enterprises in ASAL counties: The respondents were asked to indicate the type of agricultural enterprises that their parents/guardians undertook. The results in Figure 16 indicate that the parents/guardians were involved in varying agricultural enterprises and some were engaged in more than one. Across the three counties, livestock rearing dominated in the ASAL regions while horticulture was the least. The results on dominance of livestock enterprise agree with the findings of Kyule, Konyango and Nkurumwa, (2015a) that livestock rearing is the economic mainstay in ASALs. Minimal involvement in horticulture is attributed to harsh weather conditions and erratic rainfall.

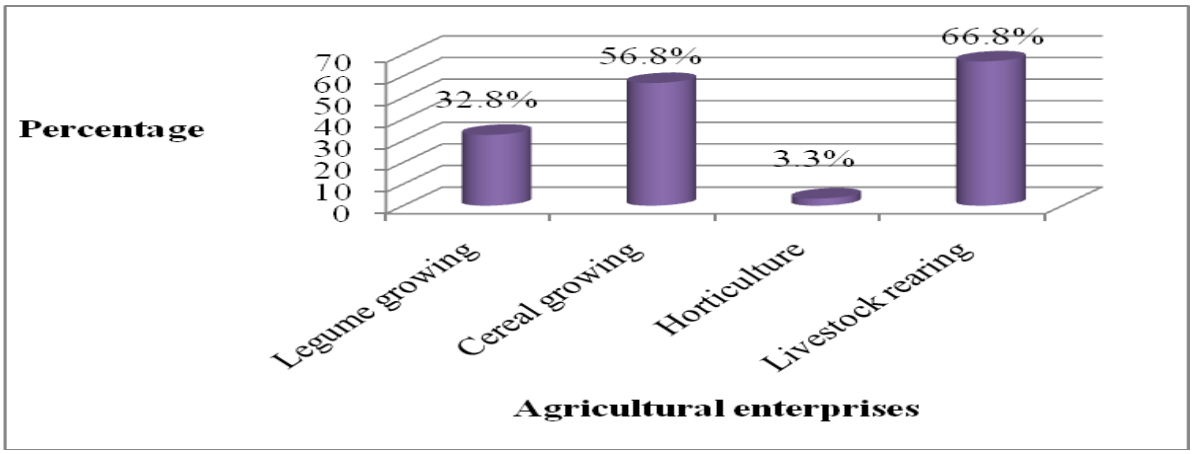

Figure 16: Agricultural enterprises undertaken by respondents' parents/guardians

Distribution of Agricultural enterprises per Sub County: The data was analysed to determine whether there were sub counties that were well endowed with specific agricultural enterprises than others. The results were as presented in Table 19.

Table 19
Distribution of Agricultural Enterprises per Sub County (n=265)

Sub county	Agricultural enterprises							
	Legume		Cereal		Horticulture		Livestock	
	Frequency	Percent	Frequency	Percent	Frequency	Percent	Frequency	Percent
Mogotio	4	4.6	18	11.7	2	22.2	38	21
Marigat	2	2.4	11	7.1	0	0	16	8.8
Kibwezi	52	58	85	55.2	4	44.4	76	41.9
Makindu	23	26	20	13	1	11.1	24	13.3
Narok North	3	9	20	13	2	22.2	27	15
Total Respondents	89		118		9		181	

From the results, Kibwezi Sub County recorded the highest involvement in all the enterprises. This is attributed to their close proximity to Kenya Agricultural and Livestock Research Organisation (KALRO) in Kiboko which has been engaging in research on dry land pulses, cereals and livestock. Low involvement recorded in Makindu Sub County which happens to be closer to the research institution is attributed to rural urban migration. Most of the inhabitants were attracted to the job opportunities in the research farm and hence moved from their rural farms. This movement impacted negatively on the natives' participation in agricultural production in their own farms (Makindu Sub-County agricultural office, 2015).

Scale of farming: The scale of farming was also determined and the results were as presented in Figure 17.

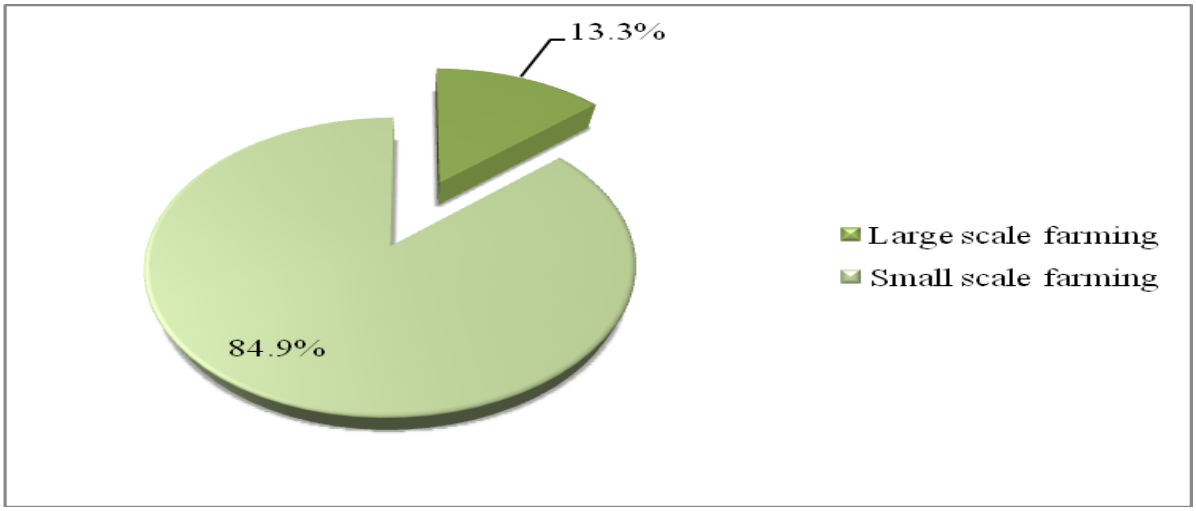

Figure 17: Scale of farming practiced by respondents' parents/guardians

Out of the 265 respondents' homes practicing agriculture, 84.9 percent were small scale farmers which agree with a previous study which indicated that over 80 percent of Kenya's farmers are small scale farmers (Kyule, et al., 2015b). Since small scale farmers are key in driving the agricultural sector in the country, they need to be equipped with skills on practices promoting DLA to exploit the agricultural potential in ASALs.

Subject choice and preference: Respondents were asked to indicate what factors influenced them to take up agriculture subject and their responses were as shown in Figure 18.

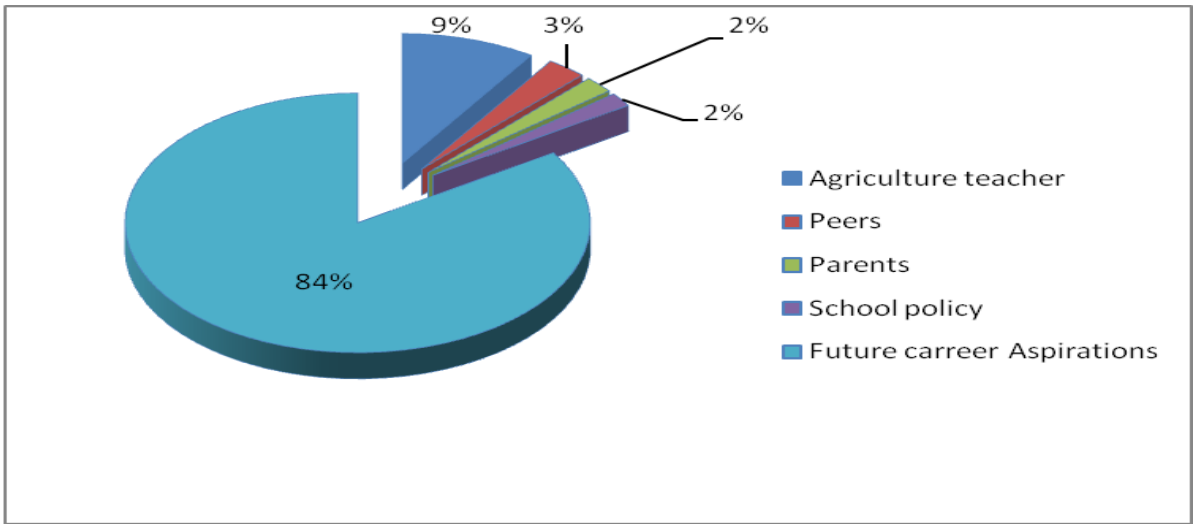

Figure 18: Factors influencing choice of Agriculture subject

Majority of the respondents chose the subject due to future career aspirations, which contradicts a study by Kabugi (2013), which found out that parents had a great influence on the learners' choice of subject. In this study, the parents influence on choice for agriculture subject was negligible at two percent. The learner's subject choice is attributed to their age

which makes them be independent in decision making regarding the career path way they took.

Career Aspiration: Respondents were asked to indicate the field of career that their parents wished they pursue as well as what they themselves would wish to pursue after high school. The results were as shown in Figure 19.

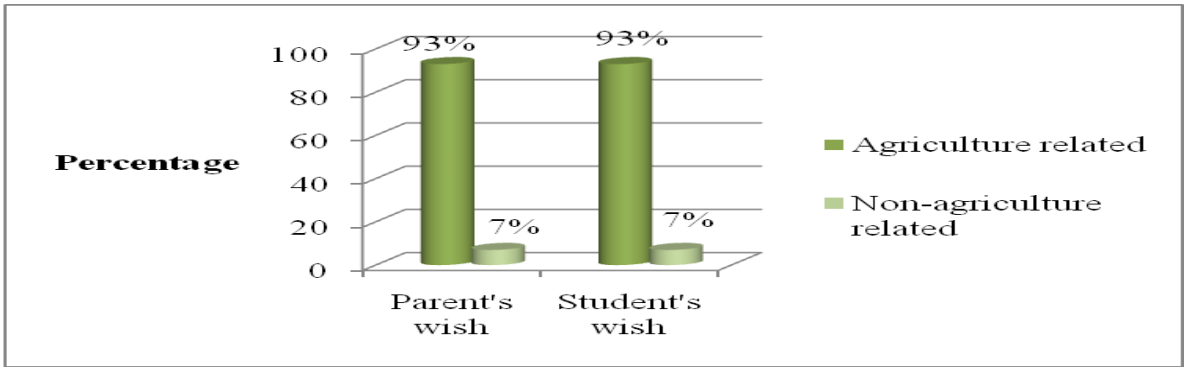

Figure 19: Respondents' career aspiration

Of the 271 respondents, 93 percent indicated that it was their parents wish as well as their own to pursue agriculture related careers. Only 7 percent of the respondents wished to pursue non-agriculture related careers with the support of their parents. This is a strong indication that parents had little/no influence on career choice for their learners. These results agree with those on subject choice in Figure 18 where learners were choosing the subject for future career aspirations. It may also be attributed to learner's background given that agriculture and especially livestock farming is a familiar venture to most of the respondents hence influencing their career aspirations. A study done by Kyule et al. (2015b) indicated that livestock rearing is the highest income earner for households in ASALs and this may have an influence on learner's choice of career.

Availability of learning resources: Eleven primary learning resources for agriculture subject had been identified. Respondents were asked to rate their availability in their respective schools**.** All respondents indicated availability of agriculture textbooks in their schools as shown in Figure 20.

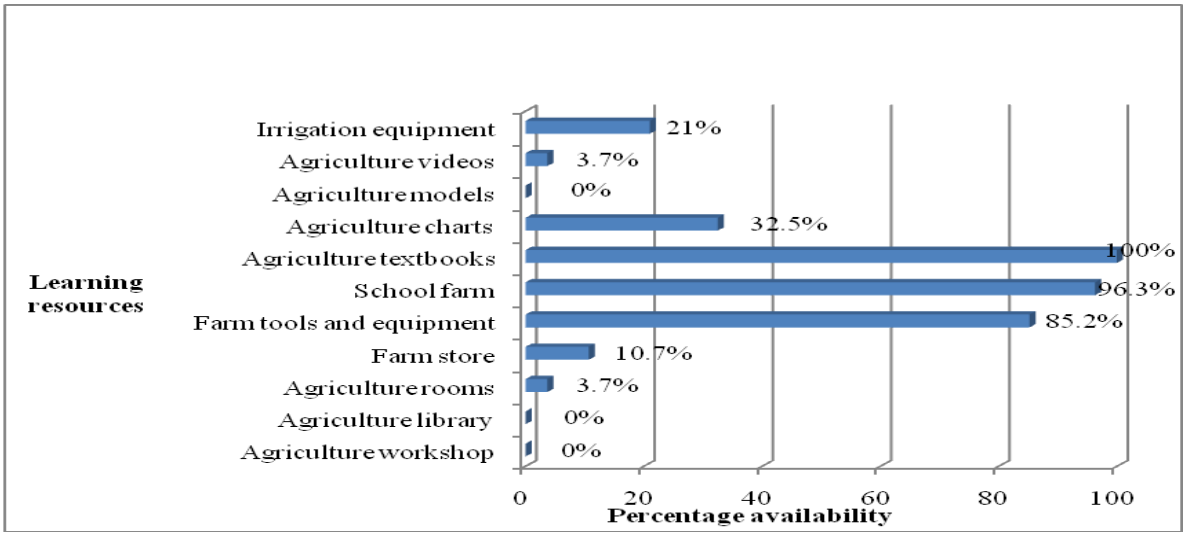

Figure 20: Availability/Absence of learning resources

Thus schools have invested a great deal in obtaining textbooks for learners. Most of the schools were found to have a school farm as well as farm tools and equipment. These results agree with those of a study done in Tharaka Nithi County which found out that all schools in the county had access to agriculture text books as well as a school farm (Muchiri & Kiriungi, 2015). Only 32.5 percent and 3.7 percent of all the respondents indicated availability of agriculture charts and agriculture videos in their schools respectively. These being ASAL areas where irrigation is paramount for agricultural learning projects to materialize, only 21 percent of the respondents had irrigation equipment in their schools. However, across the three counties, there was total absence of agriculture workshop, agriculture laboratory as well as agriculture models. An agriculture workshop was a key learning resource and for that reason when agriculture subject was being introduced in the curriculum in the late 1950's the funding agencies and the Government were building workshops in the schools offering agriculture then (Konyango & Asienyo, 2015). One school in the ASAL regions benefited from such funds. However, it is worth to note that the respondents in this school were not even aware of the existence of such a facility within their institution. This could be explained by the fact that the workshop in this school had been converted to a store for broken furniture (see plate 3) hence no longer used as a learning resource. This was a reflection of the loss of focus that agriculture curriculum implementation has taken from its practical and vocational ideal to theoretical implementation.

Plate 3: The status of the agriculture workshop in one of the ASAL schools

Source: Photograph by the researcher in a school in Narok North Sub County on 29th October 2015

Adequacy and frequency of use of learning resources by the respondents: Effective curriculum implementation is influenced by adequacy and frequency of use of learning resources. Respondents were therefore asked to rate the adequacy and frequency of use of the learning resources available in their schools. Their responses were as discussed below:

Adequacy and frequency of use of agriculture rooms: Only 3.6 percent respondents from Mogotio sub county indicated to have a specific room for their agriculture lessons which was moderately adequate and which they made use of during every lesson. Upon probing from the respondents it was clear that agriculture being an optional subject and blocked with other subjects at the same time, learners and their teacher locate for vacant rooms if available during the lesson time. This translates to time loss every lesson time affecting curriculum implementation. In some schools, the situation is too dire that students take their lessons under trees seated on stones. When the researcher visited one of the schools, the agriculture students remained in class in order to fill the questionnaires while the students taking business studies were to go and take their lesson from the place where the agriculture students usually meet during the lesson session. The situation was as shown in the Plate 4.

A study done in Thailand by Pakkapong, Junlex and Jaikaew, (2015) established that un conducive learning environment was an obstacle to effective teaching and learning of agriculture and hence hampered smooth implementation of the curriculum.

Plate 4: Learners taking a lesson under a tree seated on rocks for lack of enough classrooms
Source: Photograph by researcher in a school in Marigat Sub County on 14th October 2015

Adequacy and frequency of use of the farm store: The farm store was only available in two sub counties of Mogotio and Marigat as presented in Figure 21. Asked to rate it's adequacy and frequency of use as a learning resource, 19 respondents in Mogotio Sub County indicated it was moderately adequate and they used it occasionally. Ten respondents in Marigat Sub County rated the farm store as inadequate and they had never used it as a learning resource. The fact that these schools are in the ASALs which are attributed to little food production may have made school administrations and agriculture teachers not to see the need to construct farm stores. The non-use of those already existing farm stores explains the reason as to why learners never make use of them as learning resources. However, being an important resource in teaching content on adaptable crop production and livestock rearing its availability, adequacy and use in schools is essential.

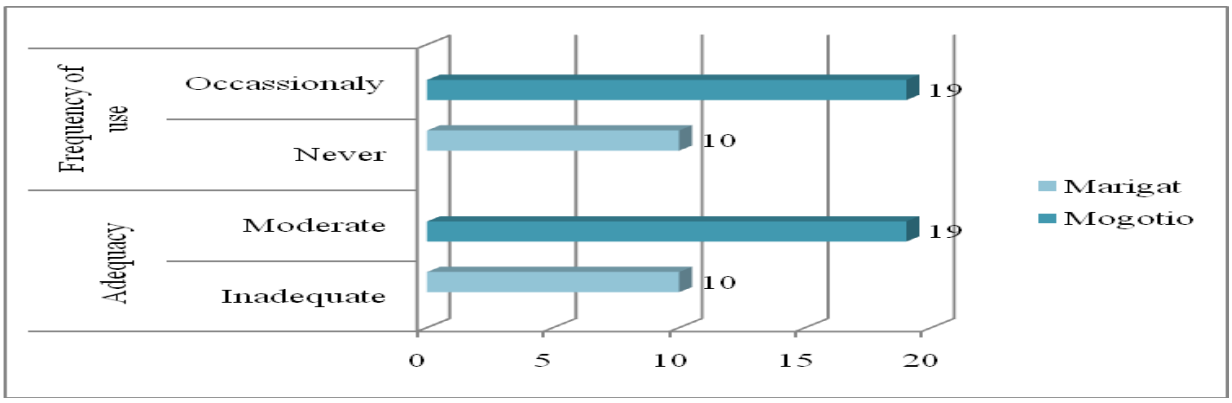

Figure 19: Adequacy and frequency of use of the farm store

Adequacy and frequency of use of farm tools and equipment: Respondents from all the five Sub counties had access to farm tools and equipment at different levels of adequacy and frequency of use as shown in Table 20.

Table 20 Per

Percentage Adequacy and Frequency of use of Farm Tools and Equipment per Sub County

Sub-county	N	Adequacy of farm tools and equipment			Frequency of use of farm tools and equipment		
		Inadequate	Moderate	Adequate	Never	Occasionally	Frequently
Mogotio	57	49.1	33.3	17.5	82.5	17.5	0
Marigat	20	0	100	0	100	0	0
Kibwezi	93	83.9	10.8	5.4	90.3	9.7	0
Makindu	20	100	0	0	100	0	0
Narok-North	40	50	25	25	60	40	0
N	230	146	59	25	195	35	0

Out of the 230 respondents who had access to farm tools and equipment in their schools, 63.5 percent (166) rated them as inadequate. Thus, if they were to use them during classroom instruction then they had to share and waste a lot of time waiting to use them. A percentage of 25.6 (59) of the respondents rated them as moderately adequate, meaning there was no individual access to these tools at any one time. Only 10.8 percent (25) indicated that they had individual access to farm tools and equipment whenever required. Regarding frequency of use, only 15 percent (35) made use of these tools occasionally while 85 percent (195) had never used them at all since form one. This is an indication that implementation of agriculture curriculum is no longer practical as intended but theoretical. In addition, of the 35 respondents who indicated to have used the farm tools occasionally only six had used them for project work. This could be a pointer that schools were still using agriculture learning resources to punish undisciplined learners. A study done in Mogotio Sub-county found out such punishment negatively affected curriculum implementation by influencing learners' attitude towards the subject and the abused resources (Cheplogoi, 2014). Farm tools are an independent topic in the agriculture syllabus. It offers learners the opportunity to know the appropriate tools and equipment to use while performing different farm operations in regard to the nature of the land. Learners would also make use of them in establishing adaptable crop production projects within the school farms and hence acquiring skills promoting DLA.

Thus availability, adequacy and use of farm tools in schools cannot be ignored if learners are to acquire relevant land preparation skills suited to ASALs.

Adequacy and frequency of use of the school farm: Respondents were asked to rate the adequacy and frequency of use of their school farm. The results are presented in Table 21. A total of 76.6 percent of those who had access to school farm said that it was adequate. This meant that land was not a hindrance to them when it comes to carrying out agricultural projects within the school. However, 97.7 percent comprising all the respondents from Mogotio, Marigat Kibwezi and Makindu sub counties had never used the school farm for classroom instruction purposes for the while they have been in their institutions. Only 20 percent of those in Narok North had made use of the school farm during classroom instruction.

Table 21
Percentage Level of Adequacy and Frequency of use of School Farm per Sub County

Sub-county		**Adequacy of school farm**			**Frequency of use of school farm**		
	n	Inadequate	Moderate	Adequate	Never	Occasionally	Frequently
Mogotio	57	15.8	0	84.2	100	0	0
Marigat	29	27.6	0	72.4	100	0	0
Kibwezi	114	22.8	0	77.2	100	0	0
Makindu	31	25.8	32.5	41.9	100	0	0
Narok-North	30	0	0	100	80	20	0
n	261	51	10	200	255	6	0

The practical aspect of agriculture subject in secondary schools was not handled seriously yet it stands out prominently in equipping learners with skills on practices that promote DLA. Active involvement of learners in classroom activities through project work in the school farm promotes co-operative learning and gives them the opportunity to apply their knowledge and skills to solve problems they face in the farm (Komba & Mwandanji, 2015; Waiganjo, Wambugu, Ngesa & Cheplogoi, 2014).

In an effort to clearly establish if project work was given enough attention in agriculture curriculum implementation, learners were asked to indicate how frequently their agriculture

teacher involved them in project work either as a group or individually. The results were as shown in Table 22.

Table 22

Learner Involvement in Agriculture Project Work

Frequency of involvement	Frequency	Percent
Never	265	97.8
Rarely	6	2.2
Oftenly	0	0
Very oftenly	0	0
Total	271	100

Over 97.8 percent of the respondents had never been involved in any project work within the school farm. This depicts the theoretical focus in the teaching of agriculture in ASAL schools. The results in Tables 22 and 23 are contrary to the expectation if learners are to acquire agricultural skills to make ASALs agriculturally and economically productive since skills can only be acquired by doing. Agriculture teachers who give learners the opportunity to carry out agricultural projects as part of the classroom instruction activities, help them acquire agricultural skills they can make use of even after school. The six respondents who had been involved in project work were requested to state the kind of project they were involved in and the results were as given in Figure 22 and Table 23.

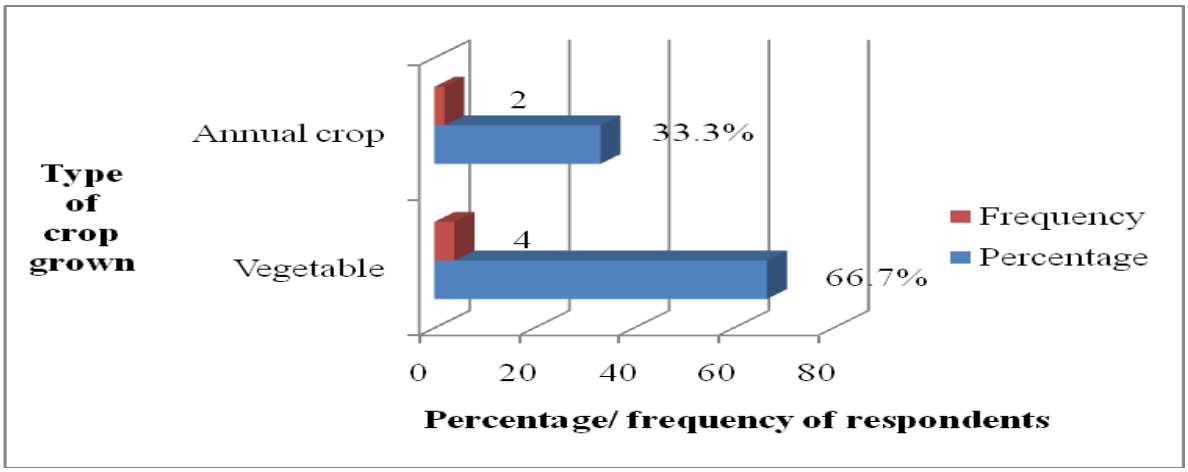

Figure 20: Type of crop grown during project work in school.

Four of these respondents were involved in vegetable growing while the other two were involved in growing of annual crops. The projects identified are of relevance to their ecological conditions and are part of the projects that learners are expected to be exposed to during secondary school agriculture curriculum implementation. The respondents were also

asked to indicate the type of livestock they reared during the project work and the results were as presented in Table 23.

Table 23
Type of Livestock Reared during the Project Work

Type of livestock reared	Frequency	Percent
None	3	50.0
Rabbit rearing	1	16.7
Other mammalian livestock	2	33.3
Total	6	100.0

Although all the six respondents were involved in crop growing, only three of them were involved in livestock rearing. Rabbit rearing is relevant as far as agriculture curriculum implementation is concerned and they are also suited to ASAL areas since they are hardy and have low food consumption requirements. Such projects go a long way in equipping learners with skills on rearing adaptable livestock in ASALs. Worth noting is the fact that the number of learners being involved in project work in schools is very dismal and this calls for teachers to be more practical in implementing the curriculum. Projects on livestock rearing have not been given the emphasis they deserve yet livestock rearing is the highest income earner in ASALs.

Adequacy and frequency of use of agriculture textbooks: The adequacy and frequency of use of agriculture textbooks was as presented in Table 24. Respondents in all the Sub-counties indicated to have access to textbooks. However the level of adequacy varied but the books were frequently used at least during every lesson.

Table 24
Adequacy and Frequency of use of Agriculture Textbooks per Sub County

Sub County		Adequacy of agriculture textbooks			Frequency of using agriculture textbooks		
	N	Inadequate	Moderate	Adequate	Never	Occasionally	Frequently
Mogotio	57	10	10	37	0	0	57
Marigat	29	0	18	11	0	0	29
Kibwezi	114	33	8	73	0	0	114
Makindu	31	18	0	13	0	0	31
Narok-North	40	0	0	40	0	0	40
Total	271	61	36	174	0	0	271

In this study, books were rated as adequate if the stipulation by the Ministry of Education was adhered to where the ratio of book sharing should be at least one book per two learners.

Therefore, where one agriculture textbook was shared by two respondents or each has their own book the status was adequate. If the ratio was 1:3, adequacy was rated as moderate while in cases where more than three respondents shared a book was rated as inadequate. Narok-North recorded 100 percent satisfaction with the adequacy of books. However, there is need to improve on book ratio among the 36 percent respondents where the sharing was beyond the expectation since when learners have insufficient access to learning materials curriculum implementation is slowed down (Okogu, 2011). However, the textbooks were 100 percent frequently used across all the sub counties and the books are of importance to learners in ASALs only if they have content on practices promoting DLA.

Adequacy and frequency of use of agriculture charts: Results were as shown in table 25.

Table 25
Adequacy and Frequency of use of Agriculture Charts per Sub County

Sub-county		**Adequacy of agriculture charts**			**Frequency of using agriculture charts**		
	N	Inadequate	Moderate	Adequate	Never	Occasionally	Frequently
Mogotio	9	9	0	0	0	9	0
Marigat	10	10	0	0	10	0	0
Kibwezi	49	49	0	0	10	39	0
Narok-North	20	20	0	0	0	20	0
Makindu	0	0	0	0	0	0	0
Total	88	88	0	0	20	68	0

As the results in Figure 20 indicate, only 32.4 percent (56) of the respondents had access to agriculture charts in their schools. However, they were rated as inadequate across all the sub-counties. It is important to note that although agriculture charts were available and inadequate, respondents had never used them in the sub-counties of Marigat and part of Kibwezi. In Mogotio and Narok North charts were occasionally used something that could be attributed to the fact that they are not enough to address at least every topic in the syllabus. All respondents from Makindu Sub County indicated unavailability of agriculture charts in their schools. This means that agriculture teachers need to go an extra mile and prepare teaching charts if the schools are unable to buy them. Charts break the monotony of classroom instruction and teachers cannot afford to continue ignoring the fact that they need

to diversify their teaching approaches if agriculture is to remain an interesting subject to learners.

Adequacy and Frequency of use of Irrigation Equipment: The adequacy and frequency of use of irrigation equipment was determined. Most schools used the watering cans thus adequacy was rated depending on students sharing ratio. Where the ratio of sharing the equipment was 1:2 or less they were rated as adequate. Where the ratio was 1:3 rating was moderate and inadequate for any other ratio. The results were as presented in Table 26. Only 21 percent respondents had irrigation equipment in their schools. However more than half of the respondents rated them as inadequate, ten rated them as moderately adequate while 3.7 percent (10) said they were adequate for their use. However, by form three third term, 19.2 percent (52) of these respondents had never used the equipment in any way. Only five of the six respondents from Narok North who had been involved in a project had made use of irrigation equipment.

Table 26
Adequacy and Frequency of use of Irrigation Equipment among the Respondents

Sub County		Adequacy of irrigation equipment			Frequency of using irrigation equipment		
	n	Inadequate	Moderate	Adequate	Never	Occasionally	Frequently
Mogotio	10	0	10	0	10	0	0
Marigat	18	8	0	10	18	0	0
Kibwezi	9	9	0	0	9	0	0
Makindu	10	10	0	0	10	0	0
Narok-North	10	10	0	0	5	5	0
n	57	37	10	10	52	5	0

This being ASAL schools where rain is erratic and the weather is harsh, irrigation is paramount. For schools to invest in irrigation equipment it is an indication that they have water sources. However, it is worth to note that for these learners to acquire DLA practices they need to be involved in relevant learning projects and be able to make use of such equipment in school. Further probing made it clear that majority of the respondents used irrigation equipment once in form four while they were managing the KCSE agriculture project. Curriculum implementation is a continuous process and therefore learners need to acquire knowledge and skills at each learning level.

Adequacy and frequency of use of agriculture videos: Results in Figure 20 show that only 3.7 percent respondents had access to agriculture videos. These respondents were all from Kibwezi Sub County and they used the videos frequently as a learning resource. Schools across the five Sub counties have not sufficiently invested in Agriculture videos as a learning resource, yet it makes learning interesting, breaks monotony and makes abstract concepts easy for learners to comprehend (Latir, Hamzah & Rashid, 2014). Videos on DLA innovations and technologies would be an eye opener to learners on the opportunities they can use to exploit the agricultural potential in ASALs.

Teaching methods used in curriculum implementation: Teaching is the process of facilitating learning. It involves the transfer of ideas, knowledge, skills, attitudes, beliefs and feelings to a learner, with the aim of bringing about particular changes in them. Past studies have indicated that the method of teaching a teacher uses can influence learners' ability to learn hence influencing curriculum implementation (Ali & Muhammad, 2012; Amankwah, 2016). In order to be effective in teaching, teachers need to vary their teaching approaches, be dynamic and vigilant in gauging how learners respond to their teaching style and use of teaching learning resources. Respondents were guided into the different teaching methods commonly used in the teaching of agriculture and requested to rate how frequently their agriculture teacher used each. The results were as shown in Table 27.

Table 27
Respondents' Rating of the Teaching Methods used by their Teachers of Agriculture

	Percentage proportion of using different teaching methods							
Frequency of use	Lecture	Discussion	Practicals	Demonstration	Projects	Field visits	Resource persons	Computer based instruction
Never	11.1	14	91.9	72.7	97.8	73.8	92.6	96.3
Occasionally	25.5	41	8.1	27.3	2.2	26.2	7.4	3.7
Frequently	63.5	45	0	0	0	0	0	0

The two most commonly used methods were lecture and discussion with most teachers lecturing while less than half frequently used the discussion method. Practicals, demonstrations, projects, field visits, use of resource persons and computer based instruction were not popular among agriculture teachers in ASALs. Past studies have shown that the method of teaching that a teacher uses influences the manner in which a curriculum is

implemented. Lecture and discussion methods promote theoretical teaching enhancing rote learning at the expense of agricultural skill acquisition (Waiganjo *et. al*., 2014). Methods that make learners passive do not give them the opportunity to practice their knowledge and skills in problem solving and thus rarely gain agricultural problem solving skills. This then translates to school leavers who have studied agriculture in secondary schools but are unable to participate in agricultural development. Although computer based instruction has been found to enhance learners motivation in active learning and consequently boosting agriculture curriculum implementation (Muchiri, Barchok & Kathuri, 2015), only 3.7 percent of the respondents were occasionally exposed to this method of instruction. This being a digital era and agricultural information is only a click away; there is need for teachers of agriculture to implement the agriculture curriculum in ways that meet the learners' expectations as digital natives.

Theoretical teaching has made agriculture fail to make an impression in the ASAL areas. A good teacher should be able to identify those critical agricultural skills that learners need to acquire to make individual progress and function proficiently in the society after school. Thus in ASALs teachers need to emphasize on DLA skills that will enable learners exploit the ASALs agriculturally. Failure to focus on such skills makes most youths feel inadequate and instead of taking up agriculture as an investment, they move to the urban centers to look for white collar jobs. Thus the teaching methods employed by agriculture teachers should be those that motivate learners to learn by doing for them to acquire the necessary skills in agricultural production (Muchiri et al., 2015).

4.4.2 Teacher related factors

This section dealt with Objective Two which was to determine the influence of teacher related factors on implementation of agriculture curriculum in selected ASAL counties of Kenya. The factors of interest in this study were teacher's technical knowhow, ability to translate syllabus objectives attributed to their training level and teaching methods used.

Overall Teacher's Level of Technical Knowhow on practices promoting DLA: On a scale of 1-5, respondents were asked to rate the extent to which their training equipped them with technical knowhow to teach agricultural practices and skills that may promote DLA. The results were as shown in Figure 23. From the results, 61.4 percent of the respondents had above average level of technical knowhow indicating that most teachers can effectively implement the DLA practices and skills covered in the curriculum appropriately. A small

proportion of 2.3 percent and 14.8 percent indicated to have none and little technical knowhow levels respectively. This could be attributed to the fact that 25 percent of the teachers are not trained hence their technical knowhow on DLA practices and skills could be inadequate. This has a negative influence on implementation of the agriculture curriculum in ASALs.

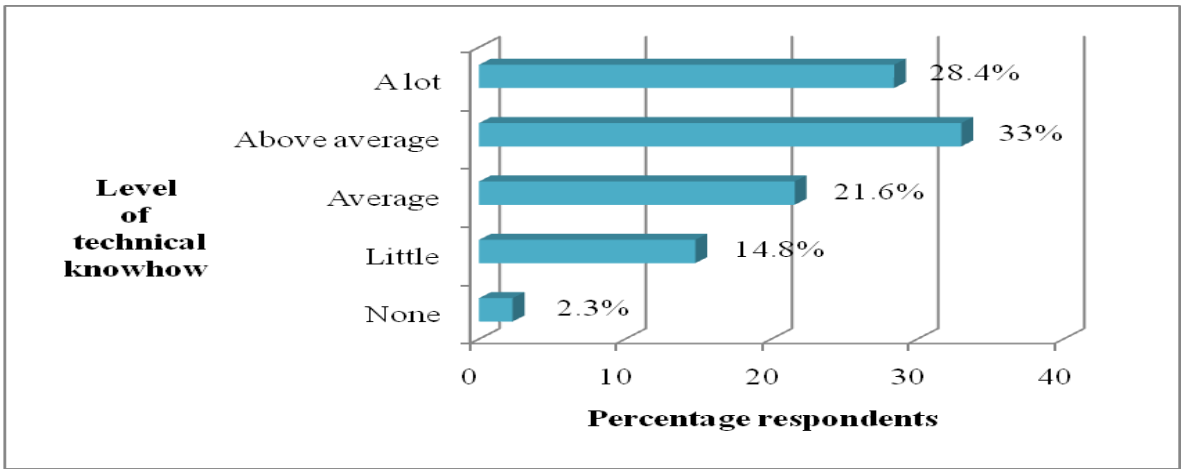

Figure 21: Teacher's level of technical knowhow

Teachers Level of Technical Knowhow on individual Agricultural Practices that Promote DLA: The researcher identified twenty agricultural practices that promote DLA and asked the respondents to rate their technical knowhow on each. The twenty items had a Cronbach's Alpha of 0.95. The results were as shown in Table 28.

Table 28

Teachers' Mean Technical Knowhow on Agricultural Practices that Promote DLA

TKH on Practices promoting DLA	N	Mean	Minimum	Maximum	Std Deviation
Insitu water harvesting	88	3.2500	1.00	5.00	1.18661
Use of sunken beds	88	3.2614	1.00	5.00	1.14966
Grafting technology	88	3.2955	1.00	5.00	1.16618
Preparation of micro catchments	88	3.3864	1.00	5.00	1.18837
Improved fallowing	88	3.3864	1.00	5.00	1.08735
Use of cultural water barriers	88	3.5000	1.00	5.00	1.07211
Zero tillage	88	3.5140	1.00	5.00	1.12438
Green houses and their use	88	3.5795	1.00	5.00	1.14190
Rearing adaptable livestock species	88	3.7045	1.00	5.00	1.03011
Construction of physical water barriers	88	3.7727	1.00	5.00	1.04746
Pasture conservation measures	88	3.8295	2.00	5.00	0.91251
Growing adaptable crop varieties	88	3.8750	2.00	5.00	1.02624
Agroforestry	88	3.8977	1.00	5.00	1.05089
Cover cropping	88	3.9318	1.00	5.00	1.05912
Minimum tillage	88	4.0000	1.00	5.00	1.02833
Methods of water harvesting	88	4.0000	1.00	5.00	0.97084
Irrigation	88	4.0341	1.00	5.00	0.96429
Mulching	88	4.0568	2.00	5.00	0.86247
Crop rotation	88	4.0795	2.00	5.00	0.96158
Timely planting	88	4.1932	1.00	5.00	0.89517

The researcher developed a scale that was used for rating agriculture teacher's level of technical knowhow on practices that promote DLA in ASALs. In this scale, any mean level between 1-1.5 was categorized as very low, 1.6-2.4 as low, 2.5-3.3 as moderate, 3.4-4.2 as high and 4.3-5.0 as very high. On average the respondents had a mean technical knowhow of 3.7 which was high. This contradicts the findings of the study done by Mapolisa and Tshabalala (2013) which found out that teachers lacked adequate skills to effectively implement vocational curriculum. On the individual DLA practices, respondents had moderate technical knowhow on the following practices; insitu water harvesting, use of sunken beds, grafting technology, preparation of micro catchments and improved fallowing. High technical knowhow was recorded on all the other practices that promote DLA.

However, respondents did not record very low, low or very high mean technical knowhow on any of the agriculture practices. Low level of technical knowhow on DLA practices or lack of it negatively influences implementation of the agriculture curriculum in ASALs. However,

teachers have room to enhance their skill acquisition on DLA practices and attain very high level of technical knowhow. A study by Nina and Olga (2017) indicated that teachers' competence levels influence the manner in which they implement the curriculum. To implement secondary school agriculture curriculum in ASAL schools, agriculture teachers need to poses very high technical knowhow on all the DLA practices. Very high level of technical knowhow will boost teachers' morale for better curriculum implementation in ASALs.

Ability to translate curriculum objectives: This was measured in terms of the respondents training level for effective teaching of agriculture. Results on teacher training are in Figure 24.

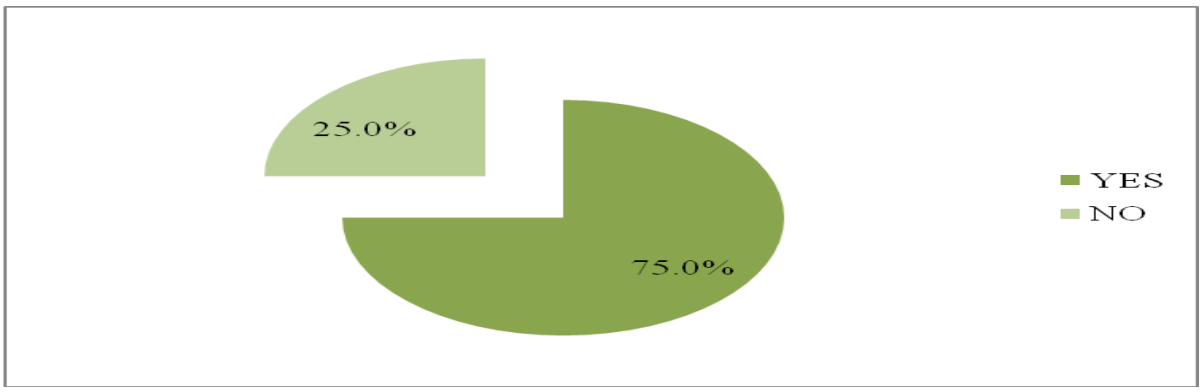

Figure 22: Percentage respondents trained to teach agriculture in secondary school

Asked on whether they were professionally trained to teach agriculture in secondary schools, 75 percent responded yes while 25 percent were not professionally trained teachers. The findings contradict the Governments' promise on ensuring that all schools had trained teachers (Ministry of Education, Science and Technology, 2005). This finding is an indication that majority of the personnel implementing the agriculture curriculum in ASALs are trained and qualified to do so. A study by Sindale and Dlamini, (2013) found out that qualified agriculture teachers appropriately interpret the syllabus and are able to determine the appropriate concepts to pass to learners. Thus the teachers' training level is expected to translate to better agriculture curriculum implementation and subsequently better equipped learners. However, learners rated their knowledge and skills on practices promoting DLA, as moderate with a mean of 3.16 and 2.71 respectively (refer tables 7 on page 54 and Table 17 on page 66). With majority of the teachers being trained, the output from the learners' interms of skill and knowledge acquisition is expected to be high or very high. This finding is

an indication that the majority of the personnel implementing the agriculture curriculum in ASALs are trained and qualified to do so.

The training level for the 68 professionally trained teachers was as presented in Figure 25. Most of the agriculture teachers are diploma and degree certificate holders and this is in line with the expectation of TSC as the body responsible for teacher employment. The few certificate holders are an indication that the qualifications to teach in secondary schools have gone up with time. Additionally, most of the institutions that offered certificate qualifications have either been upgraded to colleges or universities to offer diploma or degree courses.

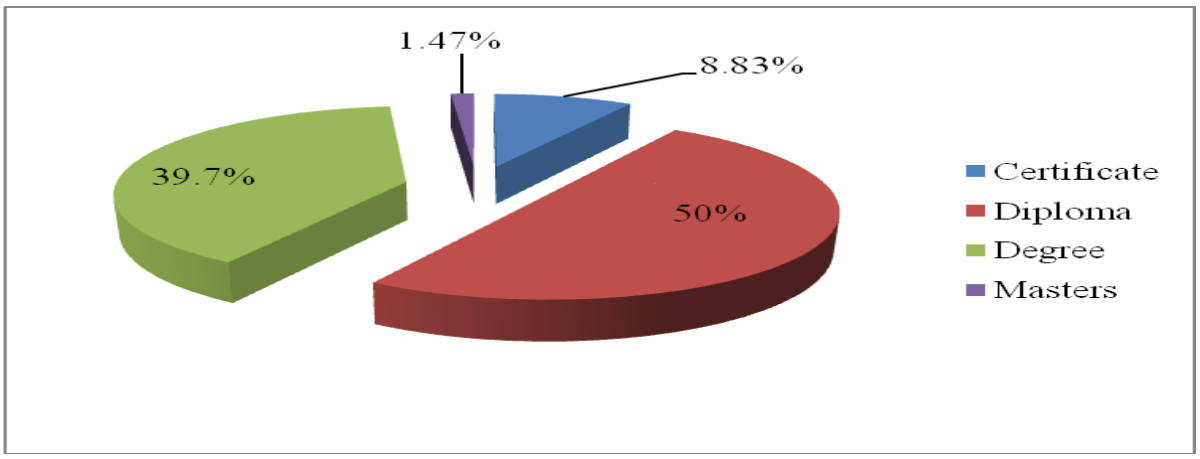

Figure 25: Training level of agriculture teacher respondents in ASAL secondary school

However, the researcher sought to determine the highest level to which the 22 untrained teachers of agriculture learnt agriculture. The results were as shown in Figure 26.

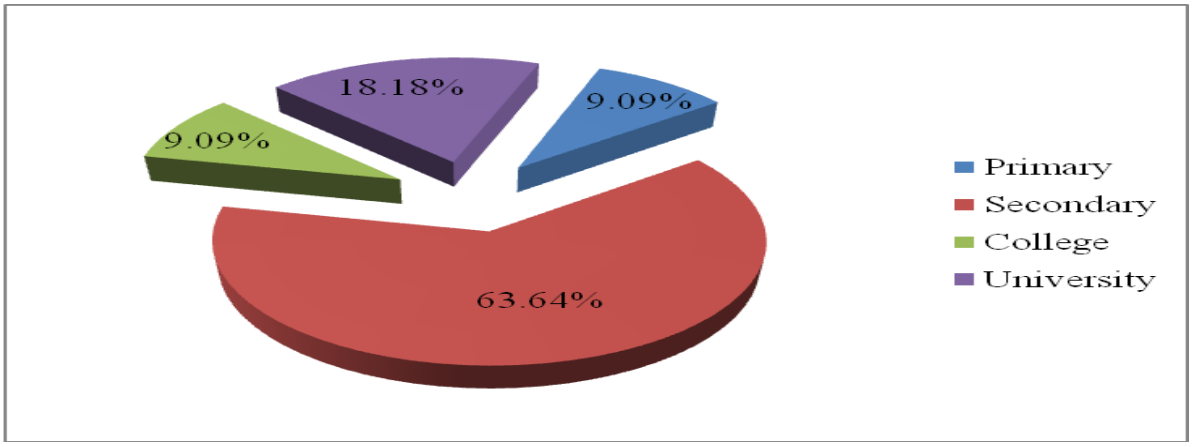

Figure 26: Highest level of learning agriculture for the untrained teacher respondents

The results clearly indicate that over 70 percent of the untrained teachers learnt agriculture up to either primary or secondary school levels. Therefore, they lack the basics of interpreting curriculum objectives into appropriate learning experiences for proper curriculum

implementation. The 27 percent with college and university qualifications as well lack the professional grip on how to implement the agriculture curriculum because they have no fundamentals of curriculum interpretation. This has a great influence on the quality of agricultural skills and knowledge that the learners are equipped with since quality and relevance of agriculture curriculum depends on the competence of the curriculum implementers (Konyango & Asienyo, 2015).

Teaching methods used by the respondents: Respondents' were provided with methods commonly used in the teaching of agriculture and asked to indicate how frequently they used each. The responses are as shown in Table 29.

Table 29d

Respondents' Percentage Ratings on the Teaching Methods they use in Implementing Agriculture curriculum

	Teaching methods							
Frequency of use	Lecture	Discussion	Practicals	Demonstration	Projects	Field visits	Resource persons	Computer based instruction
Never	15.9	1.1	5.5	2.3	5.7	13.6	29.5	69.3
Occasionally	52.3	34.1	67.0	56.8	79.5	79.5	65.9	28.4
Frequently	31.8	64.8	27.3	40.9	14.8	6.8	4.5	2.3

From the results, most teachers frequently use discussion method and occasionally use practical, demonstration, project, field visits and use of resource persons. A study done by Okogu (2011) indicated that use of active methods of teaching like projects, practical, demonstrations and field visits encourages creative thinking and acquisition of problem solving skills. Thus the occasional use of such methods in implementing agriculture curriculum in ASALs would equip learners with the relevant skills and knowledge that promote DLA. However, the results on teaching methods used obtained from the teachers and those obtained from the learners showed a great discrepancy (refer Table 27). Learners' results indicated frequent use of lecture and discussion methods and minimal use if any of practicals, projects and demonstrations. It is also clear that learners had not been involved in project work till form three level third term (refer Table 22). This then brings out another perspective that teachers know the best teaching methods for agriculture but they never use them and this influences the quality of DLA skills and knowledge acquired by learners in ASAL schools.

4.4.3 Agriculture teaching resources

This section dealt with Objective Three which sought to determine the influence of teaching resources on implementation of secondary school agriculture curriculum in selected ASAL counties of Kenya. Agriculture teacher respondents were asked of the availability, adequacy and frequency of use of agriculture teaching resources in their schools. The results were as presented in Figure 27.

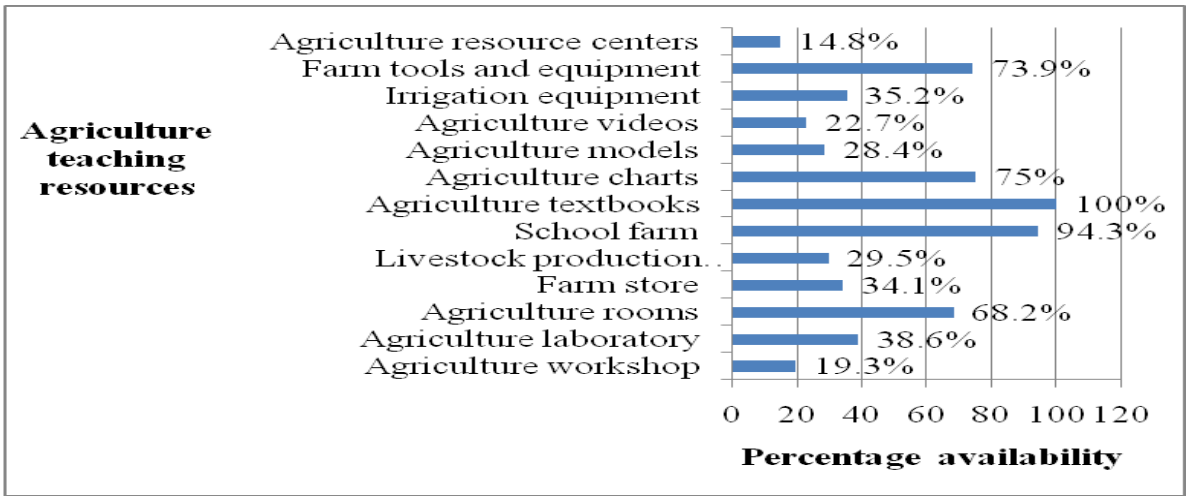

Figure 27: Teaching resources available in schools

Agriculture textbooks were available in all schools and this agrees with the results obtained from agriculture learners. Availability of the school farm and farm tools and equipment agree with availability as rated by learners. However, agriculture teachers rated the rest of the resources highly compared to the rating of the learners and this was an indication that some of these resources were available in schools but never being used. Hence learners never got the opportunity to know of their existence and interact with them. A case in point is the agriculture workshop in one of the schools where only the agriculture teacher knew of its existence as the learners rated it as unavailable. Thus availability of these resources and facilities is not enough, they have to be adequate and be put into use for proper agriculture curriculum implementation to be realized.

Adequacy and frequency of use of teaching resources: The adequacy and frequency of use of teaching resources was sought and the results were as shown in Table 30.

Table 30

Percentage Adequacy and Frequency of use of teaching Resources in ASAL Schools

Teaching resource		Percentage Adequacy			Percentage Frequency of use		
	N	Inadequate	Moderate	Adequate	Never	Occasionally	Frequently
Agriculture workshop	17	23.5	76.5	0	0	100	0
Agriculture laboratory	34	26.5	38.2	35.2	17.6	76.5	5.9
Agriculture rooms	60	20	23.3	56.7	5	15	80
Farm store	30	26.7	50.0	23.3	6.7	60	33.3
Livestock production structures	26	38.5	46.2	15.2	7.7	69.2	23.1
School farm	83	24.1	30.1	45.8	8.4	67.5	24.1
Agriculture textbooks	88	15.9	36.4	47.7	0	13.6	86.4
Agriculture charts	66	28.8	51.5	19.7	7.6	57.6	34.8
Agriculture models	25	48	32	20	8	68	24
Agriculture videos	20	45	40	15	20	65	15
Irrigation equipment	31	48.4	48.4	3.2	9.7	83.9	6.5
Farm tools and equipment	65	41.5	47.5	10.8	4.6	80.0	15.4
Agriculture resource centers	13	61.5	30.8	7.7	30.8	53.8	15.4

From the results obtained, none of the teaching resources was 100 percent adequate in all the schools. Most of the resources were either inadequate or moderately adequate, and this poses a challenge to the teachers when implementing the agriculture curriculum. Besides availability of agriculture textbooks in all the schools being at different levels of adequacy, they were the only resource that recorded 100 percent frequency of use. Agriculture rooms follow after the agriculture textbooks in the order of the most frequently used resource at 80 percent while agriculture charts come third at 34.8 percent. The school farm which is regarded as a very important resource for proper implementation of the agriculture curriculum, recorded 24.1 and 67.5 percent frequently and occasionally used respectively. The low frequency of use of the school farm explains the reason as to why only 2.2 percent of the learners had been involved in project work within the school farm. This is further complimented by the small proportion of teachers who frequently use farm tools and equipment as well as the irrigation equipment. A small proportion of teachers use agriculture charts, models and videos frequently yet they have been found to make learners understand better abstract concepts (Osam, 2013).

It is however important to note that there were teachers who had access to these teaching resources but never made use of them. Except for the agriculture workshop that was occasionally used across all the sub-counties, all the other agriculture resources recorded a proportion that is never put into use. There is need to establish why curriculum implementers would fail to utilize teaching resources even when availed to them. Minimal use of the available teaching resources among the teachers of agriculture concurs with the findings of Muchiri and Kiriungi (2015). Failure to make use of available teaching resources, compromises on the quality of DLA competence acquired by learners in ASAL schools.

Challenges faced by teachers of agriculture while implementing the curriculum in ASAL secondary schools: During the study, the following challenges were raised by teachers of agriculture as influencing implementation of agriculture curriculum in ASAL secondary schools. They included; drought/ inadequate rainfall, inadequate resources, bloated syllabus, students lack of interest in the subject and harsh climatic conditions. The results were as shown in Figure 28.

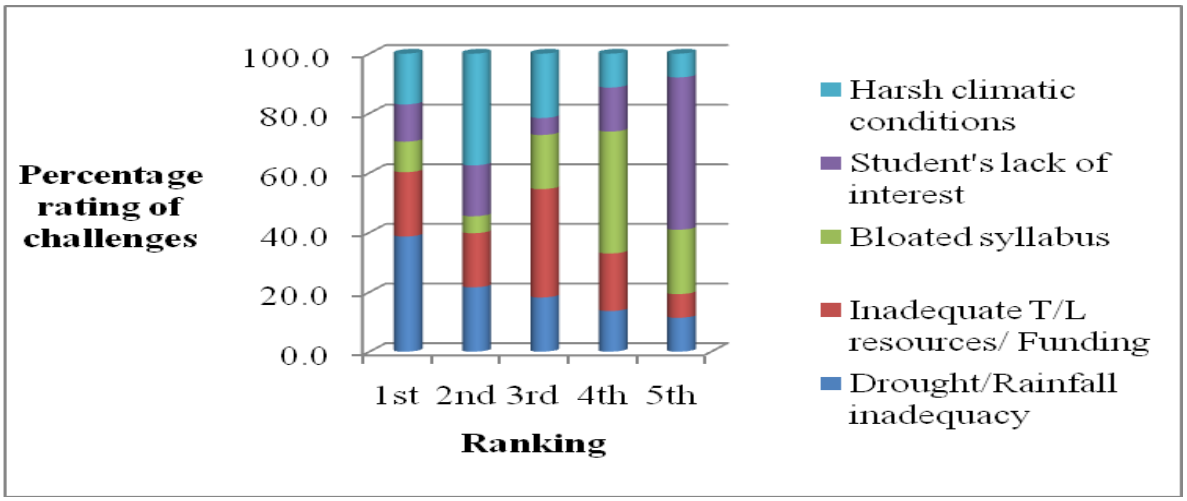

Figure 28. Challenges facing implementation of agriculture curriculum in ASAL schools

Drought was ranked as the greatest challenge towards agriculture curriculum implementation followed by harsh climatic conditions, inadequate resources, bloated syllabus and students lack of interest was ranked last. These being ASAL areas that receive erratic rainfall and are characterized by very high temperatures could be the reason for ranking drought and harsh weather conditions as the top most challenges. Drought being a reality in ASALs, there is need for agriculture teachers to be innovative and translate the curriculum objectives to address ASAL needs. Therefore emphasizing on practices that promote DLA would make the curriculum relevant to ASAL areas and overcome the drought challenge. The inadequate

resources could be attributed to the fact that when 8-4-4 system was initiated, the government through the ministry of education allowed schools to offer agriculture even without the primary resources for the subject implementation like a school farm. Hence the slow pace of acquiring these resources as the schools grow negatively influences implementation of agriculture curriculum. It also compromises on DLA skill acquisition especially for those in ASAL schools. The respondents' ranked students interest last which is contrary to studies done by Cheplogoi (2014) and Konyango and Asienyo (2015) which indicated that most learners had negative attitude towards the subject which could influence implementation of agriculture curriculum. The respondents' divergent opinion could be attributed to the fact that the subject is elective thus learners are presumed to take the subject out of interest. Teachers therefore perceive learners interest as the least hindrance to curriculum implementation (see Figure 18).

4.4.4 Funding

This section dealt with Objective Four which was to determine the influence of funding factor on implementation of secondary school agriculture curriculum in selected ASAL counties of Kenya. Implementation of agriculture curriculum occurs both in and out of class depending on the learning activity chosen by the teacher. Financial support by the school adminstration in terms of agriculture educational excursions and agriculture teacher professional advancement is paramount.

Support towards educational excursions: The school head teachers were asked to state the kind of support they provided educational excursions for their agriculture students. The results were as shown in Figure 29.

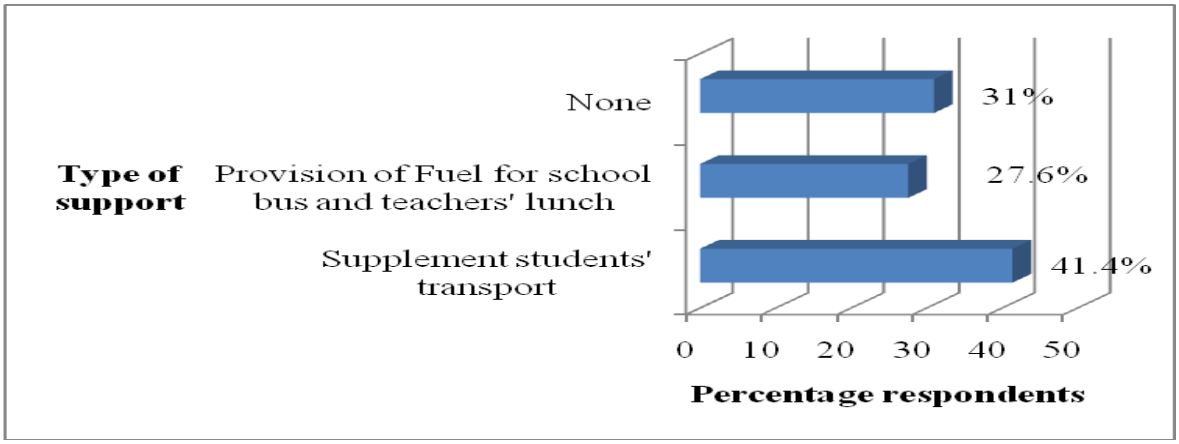

Figure 29: Type of support offered by school administrations to agriculture subject excursions

Most school administrations (69) percent were found to support educational excursions either by fueling the school buses for those who have them or by supplementing the transport cost and teachers lunch. However, 31 percent indicated not to offer any form of support and this was constraining the implementation of agriculture curriculum in secondary schools. Excursions provide learners with the opportunity to interact with the realia outside the school and they are a good avenue for boosting the attitude of the students towards agriculture.

Support towards agriculture teachers' professional development: The school heads were further asked to indicate the kind of support they offered to agriculture teachers towards skill and knowledge enhancement at school level. Their responses were as presented in Figure 30. At school level, over half of the school heads supported their agriculture teachers' skill and knowledge enhancement through attending County and Sub County subject workshops. These workshops focus more on reviewing performance of the subject in the KCSE results. Very few of them, at 6.9 and 6.9 percent respectively supported their teachers through attending agricultural shows and inviting KCSE examiners to their schools. However, 34.5 percent of the school heads did not support agriculture teachers' skill and knowledge acquisition at school level in any way. In addition, none of the support forms directly aimed at empowering the teachers on implementation of DLA practices in the curriculum. Lack of continuous support for the teachers on their professional development lowers their capability and morale to implement the curriculum.

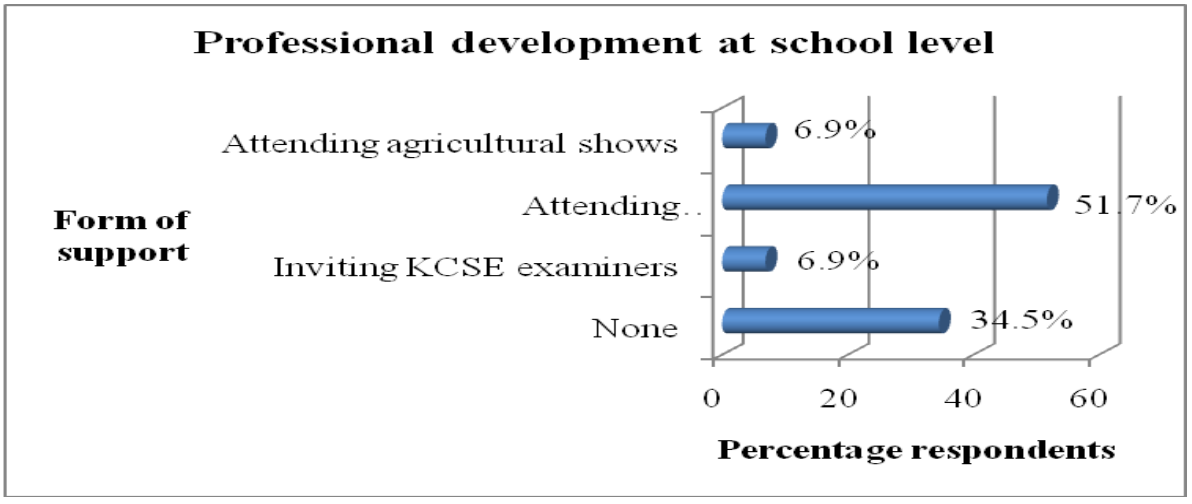

Figure 30: Support towards agriculture teachers' professional development

Past studies have shown that absence of continuous in service training for teachers' impacts negatively on their potential to implement the curriculum (Olajide, Odoma, Okechukwu,

Iyare & Okhaimoh, 2015). The failure of school heads to support agriculture teachers in enhancing their subject skills and knowledge is negatively influencing the manner in which they implement the curriculum. Teachers' effectiveness is measured on the quality of the learners they produce. Acquisition of DLA knowledge and skill level among learners in ASAL schools rated as moderate (see Tables 7 on page 54 and 17 on page 64). Thus agriculture curriculum implementation is failing in preparing school leavers who are competent enough to utilize agricultural skills acquired in transforming agricultural activities in ASALs.

School heads were asked ways by which agriculture curriculum implementation in their schools could be improved. The results were as presented in Figure 31. Most of the respondents (34.5 percent) gave priority to employment of more agriculture teachers in schools followed by 27.6 percent who felt that provision of adequate teaching learning materials would offer the necessary solution. Only 3.4 percent thought that popularizing the subject among the learners, adopting ICT integrated teaching and linkage between MoA and MoE respectively would improve agriculture curriculum implementation in their schools.

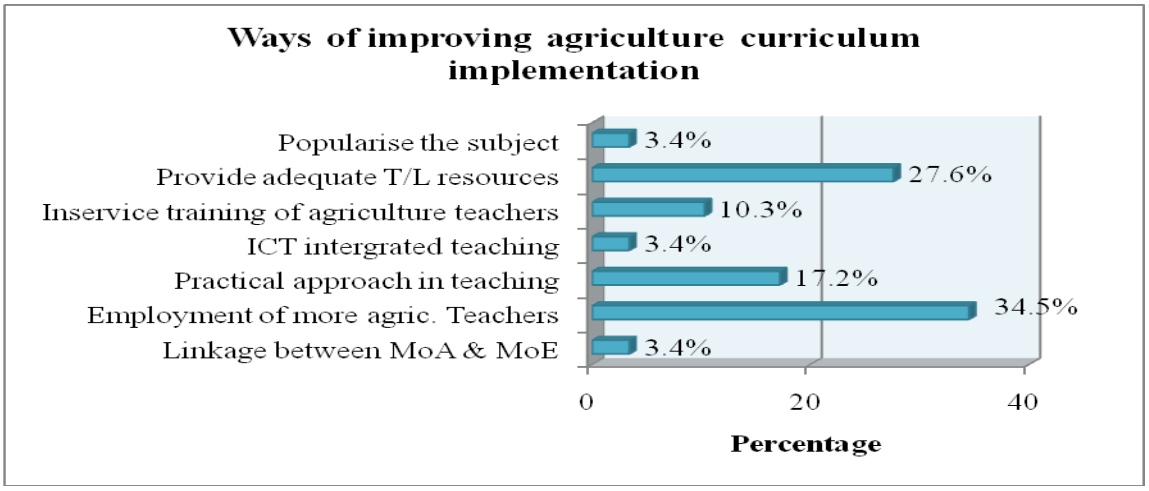

Figure 31: Ways of improving agriculture curriculum implementation in ASAL secondary schools

4.4.5 Content analysis

This section dealt with Objective Five which sought to determine the extent to which secondary school agriculture curriculum covers content on Dry Land Agriculture in Arid and semi-arid Counties of Kenya. The secondary school agriculture curriculum presents its content in form of topics. It has 33 topics broadly covering crop production, livestock production, farm power and machinery, farm structures, agricultural economics and

agroforestry (See Appendix H). This study however sought to find out the extent to which the topics presented in the curriculum cover content on DLA practices that serve to improve agricultural production in ASALs. These learning objectives were put under four sub themes namely; those aimed at soil and water conservation, minimum soil disturbance, rearing of adaptable livestock and growing of adaptable crops. The researcher analyzed the learning objectives in each topic focusing on those aimed at addressing the subject of concern. The focus on learning objectives was key since they specify what the learner is expected to achieve and be able to do after the learning process. General content on DLA may be meaningless unless the objectives of including it in the curriculum are clear. The results on data codification were as shown in Table 31.

Table 31

Data Codification in terms of the Sub-themes Codes and Frequency

Sub theme	Code	Frequency of objectives on the sub-theme
Soil and water conservation	A1	53
Minimum soil disturbance	A2	5
Rearing adaptable livestock	A3	46
Growing adaptable crops	A4	38

The results in Table 31 indicate that soil and water conservation had the highest number of objectives deemed to address DLA knowledge and skills followed by rearing of adaptable livestock while minimum soil disturbance had the least. It is also important to note that, learners' acquisition of DLA knowledge and skills reflected is subject to the teacher's interpretation of the objectives and choice of relevant learning experiences.

The topics, from which the relevant learning objectives were obtained, were grouped per the sub-theme and presented in Appendix F. Out of the 33 topics, 29 of them had objectives aimed at equipping learners with knowledge and skills to use to improve agricultural production in ASALs. It should be noted that some of the topics and objectives would address more than one sub theme. Topics and objectives that appeared more than once across the sub themes were only counted once to avoid duplication. The curriculum has a total of 228 objectives out of which 58.7 percent promote DLA. According to Shiundu and Omulando (1992) the learning objectives formulated during curriculum development process dictate the content to be developed. Though the secondary school agriculture curriculum has learning

objectives aimed at addressing DLA, a closer scrutiny at the content in the curriculum indicates neglect to the ASALs.

The researcher identified the following topics as among those whose objectives seem to address DLA but the emphasis on the content is contrary. The topic on livestock breeds gives a lot of emphasis on exotic breeds especially on cattle. Hardy livestock like camels and donkeys are only mentioned and very scanty details are given about them yet they are a source of livelihood to those in ASALs. The topic on livestock production VI (cattle) as well emphasizes on management of exotic cattle breeds which may not survive well in ASAL areas. The topic on livestock production V (Poultry) has emphasized on layers and table birds which may not do well in ASALs besides the high cost of production associated with them. A lot of research has been done on indigenous chicken that can be economically viable in ASALs. Egerton University is among the institutions that have engaged in research on indigenous chicken through the Indigenous Chicken Improvement Programme (INCIP) project (Menge, Kosgey & Kahi, 2010). Such information can be of use to farmers in ASAL areas if only shared to them. There is need to incorporate such information in the curriculum for the benefit of not only the ASAL regions but entire farming community. The topic on forage crops gives no emphasis on those fitted to ASALs as it has given emphasis on those grown in high and medium altitude areas. On crop production VI (Field practices II), little emphasis has been given on the management practices for annual crops suited to ASALs.

In addition, root crops have not been covered in the curriculum yet most of them are hardy and are a main source of food in ASALs. The topic on vegetable production does not give any attention to indigenous vegetables most of which do well in ASALs. Crop production III (Nursery practices) requires a learner to be able to prepare a nursery bed, however the content focuses only on raised nursery beds which are not be applicable in ASALs. The topic on farm power and machinery emphasizes on mechanization yet over 80 percent of the farmers in ASALs are small scale to whom mechanization would not be economically viable. There is no single topic that stands out in covering land reclamation. Dry and ASAL lands are categorized as waste lands and their reclamation methods vary. Reclamation is necessary if such lands are to be brought back to agricultural productivity. Thus, in future agriculture curriculum review process, the topics identified may be priority areas for consideration. With these shortcomings in mind, the teacher of agriculture in an ASAL school has the

responsibility of interpreting the curriculum objectives and exposing learners to learning activities that make the curriculum relevant to their ecological conditions.

According to Academic Technology Centre (2013), learning occurs through the cognitive domain in which the learner is expected to obtain outcomes related to knowledge, skill and attitude. Informed by the Bloom's taxonomy, the learning objectives under each sub-theme were categorized as per the expected outcome either under knowledge or skill acquisition. The categorization on expected outcome is presented in column three of Appendix F in pages 143-147 and a summary of the distribution of the learning objectives focusing on knowledge and skills in each sub-theme is presented in Figure 32.

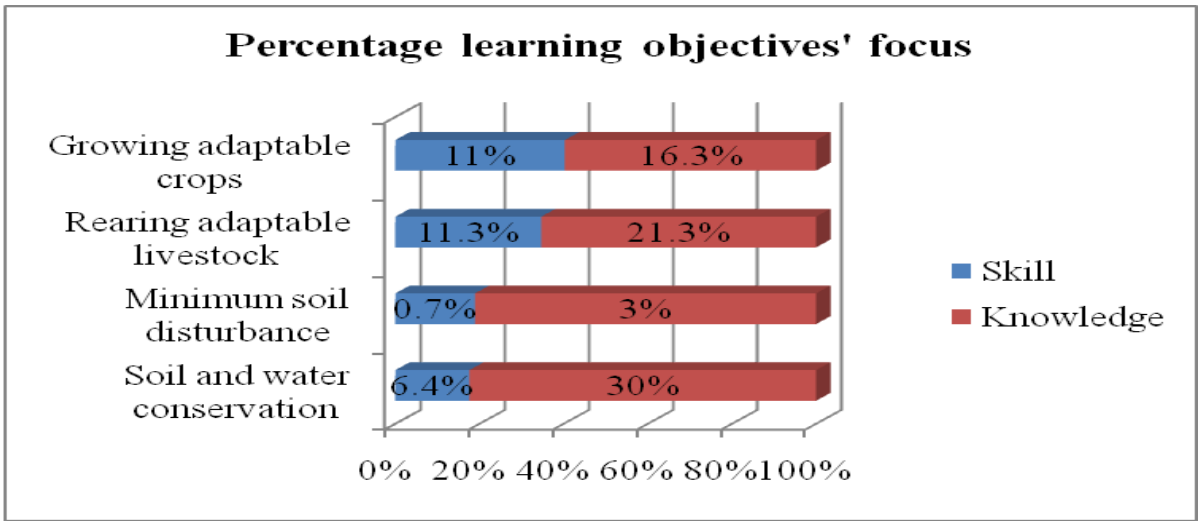

Figure 32: Distribution of learning objectives towards DLA skill and knowledge acquisition

The results in Figure 32 show that only 29.4 percent of the learning objectives focus on DLA skill acquisition. The focus on knowledge acquisition is overwhelming with 70.6 percent of the learning objectives. Curriculum implementation is guided by the learning objectives. Learning objectives also determine the choice of learning activities. Thus the curriculum's inclination towards knowledge as opposed to skill acquisition makes implementation to focus more on theory and little of practical work. This inclination contradicts the expectation that introduction and implementation of agriculture in secondary schools would equip learners with skills and knowledge for problem solving and self-reliance (Konyango & Asienyo, 2015). In this study the focus is on skills and knowledge for use in enhancing agricultural productivity in ASALs. Agriculture students will gain the competence on DLA practices if they practically engage in them hence gaining the skills. Thus, the focus on DLA skill acquisition in the secondary school agriculture curriculum has not been given sufficient attention. This partly explains the reasons as to why learners' acquisition of skills was rated

moderately (Refer table 17) and learners' involvement in projects was minimal or totally absent (Refer Table 22). The framing of the learning objectives in the agriculture curriculum may need to be reviewed to focus more on skill acquisition. Emphasis on DLA skills will enable learners to gain the competencies they require to exploit ASALs agriculturally.

The researcher further sought the agriculture teachers' opinion on the extent to which the topics based on the learning objectives presented in Appendix F addressed the DLA sub-themes. Instrument labeled Appendix E was used. The results are as shown in Tables 32, 33 34 and 35. The respondents were to rate the extent of coverage for each topic in the four sub themes on a five point Likert scale as either no coverage at all, very inadequately, inadequately, adequately and very adequately. The responses were scored and the mean coverage for each topic on each sub theme was obtained. The results for the topics with content on soil and water conservation were as presented in Table 32.

Table 32
Extent to which the Secondary School Agriculture Curriculum Topics Cover Content on Soil and Water Conservation

Topics with DLA content on soil and water conservation	N	Mean Coverage	Minimum	Maximum	Std Dev.
Agricultural Economics II (Land Tenure and Land Reforms)	14	2.2143	1	4	1.12171
Soil fertility II (inorganic fertilizers)	14	2.5000	1	4	1.01905
Factors influencing agriculture	14	2.6429	1	4	1.00821
Crop production II(Planting)	14	3.0000	1	4	1.10940
Weeds and Weed Control	14	3.0000	1	5	1.17670
Agroforestry	14	3.2143	1	5	1.25137
Crop Production 1 (Land preparation)	14	3.2857	2	4	0.72627
Soil fertility 1 (Organic manures)	14	3.2857	2	4	0.61125
Crop production IV (Field practices)	14	3.2857	2	4	0.72627
Water supply, irrigation and drainage	14	3.7143	2	5	0.82540
Soil and Water Conservation	14	4.7143	4	5	0.46881

The researcher developed scale was used in rating the extent to which each of these topics cover soil and water conservation. From the results in Table 32, only the topic on soil and water conservation was viewed to cover content on soil and water conservation very

adequately with a mean of 4.7. The topic on water supply, irrigation and drainage covered the content adequately while agricultural Economics II covered the content very inadequately. The rest of the topics had a mean ranging between 2.5 and 3.3 and hence they inadequately cover content on soil and water conservation.

The extent to which the secondary school agriculture curriculum topics cover content on minimum soil disturbance was also analyzed and the results are as shown in Table 33.

Table 33

Extent to which the Secondary School Agriculture Curriculum Topics Cover Content on Minimum Soil Disturbance

Topics with DLA content on minimum soil disturbance	N	Mean Coverage	Minimum	Maximum	Std Dev.
Soil fertility 1 (Organic manures)	14	2.2857	1	4	1.13873
Crop production IV (Field practices)	14	3.0000	1	5	1.03775
Crop Production 1 (Land preparation)	14	3.5000	1	5	1.22474

The topic on soil fertility I covers content on minimum soil disturbance very inadequately, the one on crop production IV has inadequate coverage while crop production I was rated as adequately covering content on minimum soil disturbance. Minimum soil disturbance is the only sub-theme that had the least topics addressing it among the four sub-themes.

The extent to which the secondary school agriculture curriculum topics cover content on rearing adaptable livestock was also analyzed and the results are as shown in Table 34.

Table 34

Extent to which the Secondary School Agriculture Curriculum Topics Cover Content on Rearing Adaptable Livestock

Topics with DLA content on rearing adaptable livestock	N	Mean Coverage	Minimum	Maximum	Std Dev.
Factors influencing agriculture	14	1.7857	1	4	1.18831
Introduction to agriculture	14	2.2143	1	4	0.97496
Farm structures	14	2.5000	1	5	1.50640
Livestock health I(Introduction to livestock health)	14	2.6429	1	5	1.21574
Livestock health III (Diseases)	14	2.8571	1	5	1.35062
Livestock health II (Parasites)	14	2.9286	1	5	1.07161
Livestock production II (Nutrition)	14	2.9286	1	5	1.07161
Livestock production V (Poultry)	14	2.9286	1	5	1.43925
Livestock production IV (Livestock rearing practices)	14	3.0714	1	5	1.32806
Livestock production III (Selection and breeding)	14	3.2143	1	5	1.12171
Livestock production VI (Cattle)	14	3.3571	1	5	1.21574
Livestock production I (common breeds)	14	3.6429	2	5	1.08182

Results in Table 34 show that, only the topic on livestock production 1 (common breeds) was rated as adequately covering content on rearing adaptable livestock. The topics on factors influencing agriculture and introduction to agriculture were rated as having inadequately covered the sub theme. The rest of the topics (69.7 percent) were rated as having average coverage of the content on rearing adaptable livestock. This concurs with the findings of a study by Kipkemei, Mose, Chumo, Kosgei, Chepng'eno and Boit (2015) which found out that, farmers with secondary school agriculture knowledge had a low diversification rate on livestock production compared to crop production. This could be attributed to the limited extent to which topics on livestock production cover the necessary content on rearing of adaptable livestock. With past studies indicating that livestock rearing is the largest income earner in ASAL regions (Kyule et al., 2015a) there is need to improve on the relevant content on rearing adaptable livestock to maximize on the returns obtained in this sector.

The results of the extent to which the secondary school agriculture curriculum topics cover content on growing adaptable crops are shown in Table 35.

Table 35

Extent to which the Secondary School Agriculture Curriculum Topics Cover Content on Growing Adaptable Crops

Topics with DLA content on growing adaptable crops	N	Mean Coverage	Minimum	Maximum	Std Dev.
Farm tools and Equipments	14	1.7143	1	4	0.99449
Farm Power and Machinery	14	2.2143	1	5	1.25137
Crop production I (Land preparation)	14	2.5714	1	4	0.85163
Water supply, irrigation and drainage	14	2.7857	1	4	1.05090
Crop pests and diseases	14	2.8571	1	4	0.94926
Crop production IV (Field Practices)	14	2.9286	1	5	1.07161
Crop production III (Nursery practices)	14	3.1429	1	5	1.23146
Forage crops	14	3.1429	1	5	1.09945
Crop Production VI (Field practices II)	14	3.2143	1	5	1.25137
Crop production II (Planting)	14	3.2857	1	5	1.20439
Crop production V (Vegetables)	14	3.2857	1	5	1.48989

As shown in the results in Table 35, none of the topics in this sub-theme was rated as either having addressed adaptable crop growing adequately or very adequately. Those topics with a mean content coverage ranging between 2.5-3.3 were 82 percent hence rated as having averagely covered content on growing of adaptable crops. The rest of the topics were rated as having inadequately addressed this sub-theme. This could be attributed to the fact that these topics focus more on conventional crop production that is suited to medium and high altitude areas and give little attention to growing of adaptable crops in ASALs.

The respondents were asked to rate the extent to which secondary school agriculture curriculum topics in general cover DLA content and their responses are as in Figure 33.

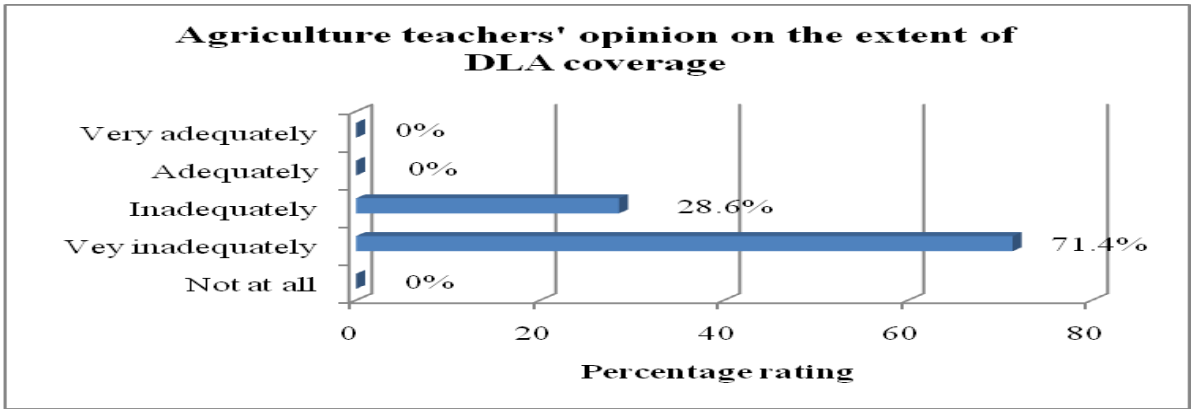

Figure 33: Extent to which secondary school agriculture curriculum covers content on DLA

Figure 33 is gives a reflection of agriculture teachers' interpretation of the curriculum as far as DLA is concerned. Over 70 percent of the agriculture teachers indicated that DLA coverage in the curriculum is very inadequate. Teachers being the curriculum implementers who should translate learning objectives into learning activities have this opinion besides the content analysis results showing 58.7 percent coverage. This could be attributed to the disparity between the learning objectives and the content itself. It could also be attributed to the learning objectives focusing more on knowledge rather than skill acquisition (Refer Figure 32). It then calls for teachers of agriculture to be innovative enough in translating the learning objectives into learning experiences that are relevant to ASAL areas.

4.5 Test of Hypotheses

Tests of hypotheses were carried out to establish whether there was any influence of the independent variables (student related factors, teacher related factors, teaching resources and funding factors) on the dependent variable (implementation of secondary school agriculture curriculum in ASALs). These hypotheses were derived from objectives (i), (ii) (iii) and (iv).

4.5.1 Test of Hypothesis One

Hypothesis One stated that "There is no statistically significant influence of student related factors on implementation of secondary school agriculture curriculum in selected arid and semi arid counties of Kenya". Multiple Linear Regression was used to test this hypothesis. This was to determine any significance of the influence of agriculture learning resources on implementation of agriculture curriculum. The items combined in measuring learning resources were 33 in number and had a Cronbach's alpha of 0.78. Learning resources were measured in terms of their availability, adequacy and frequency of use. The scores for each were used to create the index levels after which the mean levels were then computed. An index on the level of DLA knowledge and skill acquisition was obtained by scoring all the

responses on DLA knowledge acquisition and all those on skill acquisition. The level of agriculture curriculum implementation was then obtained by computing the mean DLA knowledge and skill acquisition. To test this hypothesis, the indicators for learning resources were then compared to agriculture curriculum implementation through regression. The results were as shown in Tables 36a, b and c.

Table 36a

Model Summary of Multiple Linear Regression between Learning Resources and Agriculture Curriculum Implementation

Model	R	R Square	Adjusted R Square	Std. Error
1	.254[a]	.064	.054	.41702

a. Predictors: (Constant), Mean availability of Learning Resources, Adequacy of Learning Resources, Mean frequency of use of Learning Resources.

b. Dependent Variable: Agriculture curriculum implementation.

From the model, (R^2 =.064) is the coefficient of determination and it shows that the predictor learning resource availability, adequacy and frequency of use represents 6.4 percent variation in the level of agriculture curriculum implementation. The adjusted R^2 gave an idea of how well the model generalizes, and ideally its value should be the same or very close to R^2. In this case the value of adjusted R^2 is .054, showing that if the data was derived from the population rather than the sample it would account for 5.4 percent less variance in agriculture curriculum implementation.

Multiple linear Regression test results for hypothesis one were as summarized in Table 36b.

Table 36b: ANOVA Table Summary of Agriculture Curriculum Implementation

ANOVA Table Summary of Agriculture Curriculum Implementation

Model		Sum of Squares	df	Mean Square	F	Sig.
1	Regression	3.198	3	1.066	6.129	.000[b]
	Residual	46.432	267	.174		
	Total	49.629	270			

a. Dependent Variable: Agriculture curriculum implementation

b. Predictors: (Constant), Mean availability of learning resources, Adequacy of learning resources, Mean frequency of use of learning resources.

The study findings revealed that learning resource availability, adequacy and frequency of use had a statistically significant influence on agriculture curriculum implementation. Thus the study rejects the null hypothesis and accepts the alternative hypothesis that "There is statistically significant influence of learning resources on implementation of secondary school agriculture curriculum in selected arid and semi arid counties of Kenya". This agrees with the results of Muchiri and Kiriungi (2015), that for teaching to be effective learning resources must be provided and it is the effective teaching that culminates into an effective curriculum implementation.

Coefficients of Agriculture curriculum implementation were also determined and were as presented in Table 36c.

Table 36c: Coefficients of Agriculture Curriculum Implementation

Coefficients of Agriculture Curriculum Implementation

Model		Unstandardized Coefficients		Standardized Coefficients			Collinearity Statistics	
		B	Std. Error	Beta (β)	t	Sig.	Tolerance	VIF
1	(Constant)	2.663	.123		21.647	.000		
	Availability of Learning Resources	1.424	.370	.312	3.847	.000	.534	1.872
	Adequacy of Learning Resources	-.208	.194	-.092	-1.075	.284	.478	2.093
	frequency of use of Learning resources	-.553	.505	-.072	-1.096	.274	.822	1.216

a. Dependent Variable: Agriculture curriculum implementation

The table shows the estimates of β values and the contribution for each predictor to the model. The β value tells about the strength of the influence of each predictor on agriculture curriculum implementation. A positive β value indicates a positive influence of the predictor on the dependent variable whereas a negative coefficient represents a negative influence. The β value for availability of learning resources on agriculture curriculum implementation had a positive coefficient thus a positive influence while adequacy and frequency of use of those learning resources had a negative coefficient therefore negative influence. From these results, the regression equation derived is as follows:

$y= \alpha + B_1X_1 + B_2X_2 + B_3X_3$

$Y = 2.663 + 0.312\ X_1 – 0.092\ X_2 - 0.072\ X_3$

Where Y = Implementation, $X_{1=}$ Availability of learning resources, X_2 = Adequacy of learning resources and X_3 = Frequency of use of learning resources.

Thus any unit increase in availability of learning resources results in 0.312 increase in implementation of agriculture curriculum while a unit increase in adequacy and frequency of use of agriculture learning resources resulted to 0.092 and 0.072 decline in agriculture curriculum implementation. This clearly indicates that learning resources are paramount in implementation of agriculture curriculum implementation. However, the negative influence exhibited by learning resource adequacy and frequency of use on implementation is attributed to the fact that most of these resources are inadequate for the learners and the few that are adequate are never put into use (Refer to Plate 3 in page 74 and Table 9 in page 59). This agrees with the findings of Idris et al. (2012) that learning resources are relevant to enhancement of curriculum implementation only when they are put into use.

4.5.2 Test of hypothesis two

Hypothesis Two stated that "There is no statistically significant influence of teacher related factors on implementation of secondary school agriculture curriculum in selected arid and semi arid counties of Kenya". This hypothesis was tested using multiple linear regression. The mean level of each of the indicators of the teacher related factors was obtained which were then correlated with the mean level of curriculum implementation. Qualification level was recoded and the value used as the mean. The computed value for the technical knowhow on practices promoting DLA was obtained then the mean calculated and the same was done for the level of using different teaching methods. The results were as presented in Tables 31a, b and c.

Table 37a

Model Summary of Multiple Linear Regression between Teacher Related Factors and Agriculture Curriculum Implementation

Model	R	R Square	Adjusted R Square	Std. Error
	.264[a]	.070	.036	.35203

The R value in the model summary table of results indicates that 7 percent of the change in agriculture curriculum implementation is as a result of a unit change in the teacher related factors. The adjusted R^2 indicated that if the data was obtained from the population then

teacher related factors would account for 3.6 percent less variance in agriculture curriculum implementation.

Multiple Linear Regression test results for hypothesis two were as shown in table 37b.

Table 37b

ANOVA Table Summary of Agriculture Curriculum Implementation

Model		Sum of Squares	df	Mean Square	F	Sig.
	Regression	.778	3	.259	2.093	.107[b]
	Residual	10.410	84	.124		
	Total	11.188	87			

a. Dependent Variable: Agriculture curriculum implementation

b. Predictors: (Constant), Teaching method, Highest qualification for agriculture teaching, Technical knowhow mean levels.

The findings revealed that teacher related factors indicated by teaching methods used, highest qualification and technical knowhow did not have a statistically significant influence on agriculture curriculum implementation. The study thus accepts the null hypothesis which states that there is no statistically significant influence of teacher related factors on implementation of secondary school agriculture curriculum in selected arid and semi arid counties of Kenya. This could be explained by the fact that regardless of the teachers' level of qualification and technical knowhow, they have held onto the conventional teaching methods that have little impact on agricultural skill and knowledge acquisition.

The Coefficients of Agriculture Curriculum Implementation were also determined and presented in Table 37c.

Table 37c : on

Coefficients of Agriculture Curriculum Implementation

Model		Unstandardized Coefficients		Standardized Coefficients			Collinearity Statistics
		B	Std. Error	Beta (β)	T	Sig.	VIF
1	(Constant)	3.591	.340		10.557	.000	
	Highest teacher qualification	-.020	.034	-.065	-.611	.543	1.032
	Technical knowhow mean level	-.048	.055	-.100	-.864	.390	1.197
	Teaching method used	-.287	.169	-.193	-1.701	.093	1.164

a. Dependent Variable: Agriculture curriculum implementation

The β values indicate a positive influence of teacher qualification and a negative influence of technical knowhow and teaching methods on agriculture curriculum implementation. From these results, regression equation derived was as follows: $y= \alpha + B_1X_1+B_2X_2+B_3X_3$

$Y= 3.591 - 0.020\ X_1 – 0.048\ X_2 – 0.287\ X_3$

Where Y = Implementation, X_1= Highest qualification, X_2 = Technical knowhow and X_3 =Teaching method used.

Thus a unit increase in qualification for teaching agriculture, technical knowhow and teaching method use (teacher related factors) results in 0.020, 0.048 and 0.287 decline respectively in agriculture curriculum implementation. These results could be an indicator towards a mismatch between what the agriculture curriculum emphasizes and what the societal needs are. The tendency of the agriculture curriculum to lean more on knowledge rather than skill acquisition influences agriculture curriculum implementation negatively. Thus the trained teachers do not optimally apply their technical knowhow on DLA practices as well as the appropriate teaching methods to implement the curriculum practically. This leads to incompetent secondary school agriculture graduates who are unable to exploit the ASAL agriculturally. The findings disagree with those of a study done in Illinois which found out that the quality of teacher training influenced the teacher's ability in conducting supervised agricultural experience programmes (Dyer & Osborne, 1996). The disparity between the agriculture curriculum and the societal expectation could explain the teachers' inability to exploit their technical knowhow and inappropriate choice of teaching methods hence negatively influencing practical implementation of agriculture curriculum in ASALs.

4.5.3 Test of hypothesis three

Hypothesis Three stated that "There is no statistically significant influence of teaching resources on implementation of secondary school agriculture curriculum in selected arid and semi arid counties of Kenya". Multiple linear regression was used. The items combined to measure teaching resources were 33 and had a Cronbach's Alpha of 0.87. Teaching resources were measured in terms of their availability, adequacy and frequency of use. The scores for each were used to create the index levels after which the mean levels were then computed. The indicators for the teaching resources were then compared to that of agriculture curriculum implementation through regression and the results were as shown in tables 38a, b and c.

Table 38a

Model Summary of Multiple Linear Regression between Teaching Resources and Agriculture Curriculum Implementation

Model	R	R Square	Adjusted R Square	Std. Error
	.367[a]	.134	.103	.33955

The R^2 in Table 33a indicated the variability measure in agriculture curriculum implementation accounted for by teaching resource availability, adequacy and frequency of use which was 13.4 percent. The adjusted R^2 which was 10.3 percent is the change in the agriculture curriculum implementation as a result of the change in the availability, adequacy and frequency of use of the teaching resources if the data was to be generalized to the population and not the study sample.

The ANOVA table indicates that the regression equation is highly significant with an F= 4.346 and P= 0.007. Thus the model is excellent in determining the influence of teaching resource availability, adequacy and frequency of use on implementation of agriculture curriculum in ASAL counties. The Multiple linear regression test results for hypothesis Three were as presented in Table 38b.

Table 38b of

ANOVA Table Summary of Agriculture Curriculum Implementation

Model		Sum of Squares	df	Mean Square	F	Sig.
	Regression	1.503	3	.501	4.346	.007[b]
	Residual	9.685	84	.115		
	Total	11.188	87			

a. Dependent Variable: Agriculture curriculum implementation

b. Predictors: (Constant), Mean availability of teaching resources, Mean adequacy of teaching resources, Mean frequency of use

The ANOVA table results indicate that teaching resource availability, adequacy and frequency of use significantly influenced agriculture curriculum implementation. The study thus rejects the null hypothesis and accepts the alternative hypothesis that "There is statistically significant influence of teaching resources on implementation of secondary school agriculture curriculum in selected arid and semi arid counties of Kenya". This agrees with previous studies conducted by Cheplogoi (2014), Kabugi (2013) and Muchiri and

Kiriungi, (2015) which found out that lack of teaching materials influenced implementation of agriculture curriculum in schools.

The contribution of each predictor to the model was determined and the results were as presented in Table 38c.

Table 38c

Coefficients of Agriculture Curriculum Implementation

Model		Unstandardized Coefficients		Standardized Coefficients			Collinearity Statistics	
		B	**Std. Error**	**Beta (β)**	**t**	**Sig.**	**Tolerance**	**VIF**
1	(Constant)	3.053	.102		29.992	.000		
	Mean availability of teaching resources	-.090	.346	-.047	-.259	.796	.312	3.201
	Mean Adequacy of teaching resources	-.099	.167	-.093	-.593	.555	.420	2.382
	mean frequency of use	-.309	.266	-.251	-1.160	.249	.221	4.535

a. Dependent Variable: Agriculture curriculum implementation

The negative β values for the teaching resource indicators denote a negative influence of teaching resources on curriculum implementation. This could be explained by the fact that even when available, these resources are never adequate and oftenly never used. A good example is the case of the workshop in one of the schools in the study area and the results of the descriptive statistics as discussed earlier in the document. The results indicate that provision of teaching resources adds value to agriculture curriculum implementation only when the resources are put into use.

The regression equation derived is as follows: $Y= \alpha + B_1X_1+B_2X_2+B_3X_3$

$Y = 3.053 -0.09X_1 - 0.099X_2 - 0.309X_3$

Where, Y = Implementation, X_1 = Availability of teaching resources, X_2 = Adequacy of teaching resources and X_3 = Frequency of use of agriculture teaching resources.

4.5.4 Test of hypothesis four

Hypothesis Four stated that "There is no statistically significant influence of funding on implementation of secondary school agriculture curriculum in selected arid and semi arid counties of Kenya". This hypothesis was tested using Simple linear regression. The results were as presented in Tables 39 a, b and c.

Table 39a

Model Summary of Simple Linear Regression between Funding and Agriculture Curriculum Implementation

Model	R	R Square	Adjusted R Square	Std. Error
	.248[a]	.062	.051	.34938

The R^2 value indicates that any unit change in funding will result to 6.2 percent change in the implementation of agriculture curriculum. The adjusted R^2 gives 5.1 percent change in agriculture curriculum implementation that funding would account for if data was obtained from the population.

The ANOVA table (39b) results were used determine whether Hypothesis Four was to be accepted or rejected.

Table 39b

ANOVA Table Summary of Agriculture Curriculum Implementation

Model	Sum of Squares	df	Mean Square	F	Sig.
Regression	.690	1	.690	5.654	.020[b]
Residual	10.498	86	.122		
Total	11.188	87			

a. Dependent Variable: Agriculture curriculum implementation
b. Predictors: (Constant), Support on funds allocation

From the ANOVA table it is clear that the regression equation is significant with an F = 5.654 and P = 0.020. This is thus an excellent model in explaining the influence that funding has on agriculture curriculum implementation. Thus funding has a significant influence on agriculture curriculum implementation. The study therefore rejects the null hypothesis and accepts the alternative hypothesis that "There is statistically significant influence of funding on implementation of secondary school agriculture curriculum in selected arid and semi arid counties of Kenya". This is explained by the fact that agriculture curriculum implementation

is capital intensive and funds are required to buy the necessary inputs as well as facilitate agriculture related activities like field excursions. These results agree with those of Makori and Onderi (2013) who established that financial support by the school administration provides a friendly and conducive platform for curriculum implementation. The financial grants offered by the government and foreign bodies like United States Agency for International Development (USAID) and the International Development Agency (IDA) of the World Bank at the inception of agriculture in secondary schools signified that funding was paramount in implementing a viable agriculture curriculum (Konyango & Asienyo, 2015) .

Table 39c gives the influence of the predictor on dependent variable.

Table 39c
Coefficients of Agriculture Curriculum Implementation

	Unstandardized Coefficients		Standardized Coefficients			Collinearity Statistics	
Model	**B**	**Std. Error**	**Beta** (β)	**t**	**Sig.**	**Tolerance**	**VIF**
(Constant)	3.015	.113		26.594	.000		
Support on funds allocation	-.093	.039	-.248	-2.378	.020	1.000	1.000

a. Dependent Variable: Agriculture curriculum implementation

The coefficients table shows the values for the constant which was 3.015 and the beta values for deriving on agriculture curriculum implementation.

The regression equation derived is as follows: $y= \alpha + B_1X_1$.

$$Y = 3.015 -0.093$$

Where, Y = Implementation and X = Funding allocation

The negative influence could be attributed to the low funding towards the subject from the school administrations since only 22.7 percent of them provided funds towards agriculture curriculum implementation in their schools.

CHAPTER FIVE
SUMMARY, CONCLUSIONS AND RECOMMENDATIONS

5.1 Introduction

This chapter outlines a summary of the study including the background, methodology and the main research findings. It also gives conclusions and recommendations made, based on the principal findings in chapter four.

5.2 Summary of the Study

One of the expected outcomes of agriculture curriculum implementation in secondary schools is that it will make a positive contribution to agricultural development in surrounding communities, through integration of relevant agricultural activities in the curriculum. In ASALs the emphasis would be mainly on DLA. ASALs have remained agriculturally under-exploited with persistent food shortages which could partly be attributed to ineffective implementation of the agriculture curriculum. This study sought to determine the influence of school factors namely; student related, teacher related, teaching resource related and funding factors on implementation of secondary school agriculture curriculum in Kenyan ASALs.

The study adopted descriptive survey design. Multistage sampling coupled with proportionate, purposive and simple random sampling was used to collect data from a sample of 271 Form Three agriculture students, 88 agriculture teachers, 29 school head teachers and five experts. A total of 393 persons responded which was 84 percent response of 496 persons targeted. Four questionnaires were used to collect primary data from the targeted samples of respondents in Baringo, Makueni and Narok counties while a check list was subjected to the experts to triangulate desktop research results by the researcher. Desktop research was done to determine the extent to which the secondary school agriculture curriculum covers content on DLA. Data was analyzed using both descriptive and inferential statistics.

The study revealed that close to 89 percent of all the learners taking agriculture at Form Three level in ASAL secondary schools come from home backgrounds where some form of agriculture was practiced. Despite this kind of background, their parents had little influence on learners' choice for the subject. It also revealed that most of the students choose agriculture due to future career aspirations and 93 percent would wish to pursue agriculture related careers after high school. Regarding learning resource availability, agriculture textbooks were available in all the sampled schools. This was followed in terms of percentage

availability by school farm and farm tools and equipment. However, agriculture workshop, agriculture laboratory and agriculture videos were indicated as being unavailable among all the learner respondents. On frequency of use, the textbooks were rated to be used often by the agriculture students. Only 15 percent of all the respondents had used the farm tools and equipment and only 2.3 percent had ever been involved in project work within the farm. However, besides agriculture textbooks being available in all schools 36 percent of the learners rated them as being inadequate. Form three agriculture students rated the school farm as adequate at 76.6 percent while only 10.8 percent rated farm tools and equipment as adequate.

While school administrations support is crucial in agriculture curriculum implementation, 31 percent of the school heads indicated to have never supported agriculture teachers' professional development in any way. Data obtained from agriculture teachers revealed that over half of the respondents had above average technical knowhow on practices promoting DLA. This is a clear indication that such teachers could effectively implement agriculture curriculum in ASALs. Over 70 percent of the teachers' were trained to teach agriculture in secondary schools. In addition, there are unqualified teachers implementing agriculture curriculum in the ASAL areas, of which 18.2 percent do not have an agriculture background or have learnt agriculture up to secondary school level. Teachers frequently used discussion method of teaching, close to half frequently used demonstrations while lecture method was the third frequently used. Projects, field visits, practicals and use of resource persons were ranked as occasionally used in that order. However, the triangulation results obtained from the learners' perspective on the teaching methods used by their teachers explain otherwise with most of them frequently using lecture and discussion methods.

Among the teaching resources, teachers rated agriculture textbooks as being available in all schools followed by school farm, agriculture charts and farm tools and equipment. In regard to level of adequacy, agriculture rooms were rated highest by 56.7 percent of respondents followed by agriculture textbooks and school farm by 47.7 and 45.8 percent respectively. Agriculture textbooks were rated most frequently used by 86.4 percent followed by agriculture rooms at 80 percent and agriculture charts at 34.8 percent. During the study, agriculture teachers raised challenges they faced in implementing agriculture curriculum in ASAL schools. Drought was ranked the top most followed by harsh climatic conditions, inadequate resources or funding, bloated syllabus and students' lack of interest in the subject

in that order. In the content analysis, 29 out of the total 33 topics had objectives aimed at equipping learners with knowledge and skills to use to improve agricultural production in ASALs. The results indicated that 58.7 percent of the learning objectives in the agriculture curriculum address DLA knowledge and practices.

Four hypotheses were tested. Hypothesis one was tested using Multiple Linear Regression. It was found that learning resources have a statistically significant influence on agriculture curriculum implementation. Null hypothesis two was tested using Multiple Linear Regression and it was found that teacher related factors had no statistically significant influence on agriculture curriculum implementation. Multiple Linear Regression was also used in testing hypothesis three and it was established that teaching resources had a statistically significant influence on agriculture curriculum implementation. Hypothesis four was tested using simple linear regression and it was established that funding had a statistically significant influence on agriculture curriculum implementation.

5.3 Conclusions

In view of findings from this study, the following conclusions are made:

a. Student related factors namely learning resource availability, adequacy and frequency of use have a significant influence on agriculture curriculum implementation in ASAL secondary schools.
b. Teacher related factors do not have a significant influence on agriculture curriculum implementation in ASAL secondary schools. The disparity between the agriculture curriculum emphasis and the societal expectations lead to teachers' inability to exploit their technical knowhow and inappropriate choice of teaching methods hence compromising on practical implementation of agriculture curriculum in ASALs.
c. Teaching resources have a negative influence on agriculture curriculum implementation in ASAL schools. Inadequacy of teaching resources and failure to use available resources hinders teachers' ability to implement the agriculture curriculum practically in ASAL schools.
d. Level of funding influences agriculture curriculum implementation in ASAL schools. Inadequate financial support towards agriculture teacher professional development and agriculture subject excursions hinders the teacher's potential in implementing agriculture curriculum in ASAL schools.

e. The learning objectives in the secondary school agriculture curriculum focus more on content that leads to knowledge acquisition for passing examinations rather than skill acquisition for enhanced agricultural production in relation to DLA. This negatively affects practical agriculture curriculum implementation in ASAL schools.

5.4 Recommendations

Based on the conclusions, the following are the recommendations of the study:

a. The Government of Kenya through the Ministry of Education, BoM, teachers of agriculture, county governments and all other stakeholders need to ensure improvement in the provision of agriculture learning resources in ASAL schools. Improvement in the provision of learning resources will enable learners to acquire relevant agriculture knowledge and skills they can use for self sustainability after school.

b. Agriculture teacher training need to be innovative and practical oriented to enable them to translate and implement the agriculture curriculum in ASAL schools practically. There is need for continuous professional development for agriculture teachers to enhance their technical knowhow on DLA practices and the ability to translate curriculum objectives to learning activities relevant to ASALs.

c. The Government through the Ministry of Education, school administration, teachers of agriculture, county governments and all other stakeholders need to consider the strategies availing adequate teaching resources for effective implementation of practical aspects of agriculture curriculum in ASAL secondary schools. There is also need to review the relevancy of the teaching resources to reflect on the agricultural technologies and innovations that the society needs today. This review is necessary even as the government embarks on introduction of a competence based curriculum.

d. The Ministry of Education, County governments and school administrations should play a leading role in funding the implementation of agriculture curriculum as well as professional development of agriculture teachers in ASAL schools. This will empower both the learners and the teachers of agriculture and in turn translate to nurturing agriculture graduates with the competency in agricultural skills.

e. Curriculum developers and reviewers need to review the secondary school agriculture curriculum learning objectives to focus more on skill rather than knowledge

acquisition which will promote practical implementation of the curriculum necessary for preparation of competent human resources who can exploit ASALs agriculturally. Curriculum reviewers may also need to increase the DLA content in secondary school to cover a wider scope focusing more on the deficient topics among them; livestock production (1), crop production (V), livestock production (IV), livestock production (V), forage crops and crop production (VI). An independent topic on land reclamation is necessary not only for ASALs but for other waste lands.

5.5 Suggestions for Further Studies

During the study, the following gaps were realized which if addressed, would improve agriculture curriculum implementation in ASAL schools.

a. There is need to carry out a census on the level of availability of agriculture teaching and learning resources in schools. This is occasioned by the different responses obtained in the triangulation results over the same from learners and teachers of agriculture.

b. Some of the teaching resources available in schools are never used by agriculture teachers while implementing the agriculture curriculum. There is need to determine the causes for this scenario in order to give due diligence.

c. Although content analysis results indicate that 58.7 percent of the learning objectives in the agriculture curriculum address DLA knowledge and practices, over 70 percent of agriculture teachers felt that the coverage was very inadequate. There is need to get their opinion for this scenario as well.

d. There is need to relate agricultural productivity obtained in ASALs to the secondary school agriculture curriculum through the quality of graduates produced.

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APPENDIX A

QUESTIONNAIRE FOR SECONDARY SCHOOL TEACHERS OF AGRICULTURE

Introduction

I am Ms. Miriam Nthenya Kyule, a student at Egerton University undertaking a PhD in Agricultural Education. As part of my studies I am undertaking a research, which aims to generate information on the Influence of School Factors on Implementation of Secondary School Agriculture Curriculum in Kenya's Arid and Semi-Arid Lands (ASALs). This research was necessitated by potential in agriculture subject in economic and agricultural development in these areas. I wish to request you to participate in this study by responding to the items in this questionnaire. Your responses will be treated with utmost confidentiality and for research purposes only.

Section A: Demographic Data of the Respondent

Name _____ (Optional) School _____

County_____ Sub-County_____

School Category: Extra-County ☐ County ☐ Sub-County ☐ Private ☐

1. Gender Male ☐ Female ☐
2. Your age in years _____

3a. For how many years have you taught agriculture in secondary school(s)? _____

b. How many years have you taught agriculture in an ASAL secondary school(s)? ____

4a. Are you a professionally trained agriculture teacher? Yes ☐ No ☐

b. If yes, what is your highest qualification in regard to agriculture as your teaching subject?

Certificate ☐ Diploma ☐ Degree ☐ Masters ☐ PhD ☐

c. If No, what is the highest level to which you did agriculture?

Primary school ☐ Secondary school ☐ College ☐ University ☐

d. What is your total teaching load per week? _____

e. What is the enrollment of the 2015 form three agriculture class? _____

f. Which of the criterion below does your school use in selection of agriculture students in form three?

i. Student's performance in agriculture ☐
ii. Agriculture teacher's advise ☐
iii. School policy ☐
iv. University admission prospects ☐

v. Students interest ☐

g. On average what category of students chooses agriculture in your school?

Very bright ☐ Bright ☐ Average ☐ Weak ☐ Very weak ☐

h (i). As a policy, a teacher should teach two subjects. Besides agriculture which is your other teaching subject? _____

(ii). Of the two teaching subjects, which one do you prefer most? _____

SECTION B: Teacher related factors on implementation of secondary school agriculture curriculum

5. To what extent did your training in agriculture equip you with technical knowhow to teach agricultural practices and skills in the secondary school agriculture curriculum that may promote Dry Land Agriculture (DLA)?

None ☐ Little ☐ Average ☐ Above average ☐ A lot ☐

6a. On a scale of 1-5 rate your technical knowhow on the following practices. Put a tick (√) appropriately.

Teachers' level of technical knowhow on agricultural practices that promote DLA	**None**	**Little**	**Average**	**Above average**	**A lot**
	1	**2**	**3**	**4**	**5**
Mulching					
Zero tillage					
Minimum tillage					
Cover cropping					
Use of Sunken beds					
Insitu water harvesting					
Use of cultural water barriers					
Construction of physical water barriers					
Methods of water harvesting					
Preparation of micro catchments					
Agroforestry					
Irrigation					
Green houses and their use					
Crop rotation					
Timely planting					
Rearing adaptable livestock species					
Pasture conservation measures					
Improved fallowing					
Growing adaptable crop varieties					
Grafting technology					

b. How frequently do you use the following methods in teaching agriculture? Put a tick (√) appropriately.

Teaching Method	Frequency of use		
	Never	Occasionally	Frequently
	1	2	3
Lecture			
Discussion			
Practicals			
Demonstration			
Projects			
Field Visits			
Use of resource persons			
Computer based Instruction			

SECTION C: Teaching Resources used in Implementation of Secondary School Agriculture Curriculum

7. Are the following agriculture teaching resources available in your school? If yes, how would you rate their adequacy and frequency of use? Put a tick (√) appropriately.

Resource	Availability		Level of Adequacy			Frequency of Use		
	Yes	No	Inadequate	Moderate	Adequate	Never	Occasionally	Frequently
Agriculture work shop								
Agriculture laboratory								
Agriculture rooms/classes								
Farm store								
Livestock production structures								
School farm								
Agriculture textbooks								
Agriculture Charts								
Agriculture Models								
Agriculture Videos								
Irrigation equipment								
Farm tools and equipment								
Agriculture resource centers								

SECTION D: Agriculture Teachers' Opinion towards Implementation of Secondary School Agriculture Curriculum in ASALs

8. Read the statements in the table below and on a scale of 1-5 assign each a number which best describes your opinion by putting a tick (√) appropriately.

Statements related to practices that promote DLA	**Strongly disagree**	**Disagree**	**Undecided**	**Agree**	**Strongly agree**
	1	**2**	**3**	**4**	**5**
The topic on types and use of mulches can be taught effectively theoretically					
Assigning students to agriculture project is time wasting					
Zero tillage is difficult to practice in crop production					
Minimum tillage is effective in conserving soil moisture.					
Growing of cover crops has little impact on soil and water conservation.					
Sunken beds are difficult to construct					
Insitu water harvesting is very effective in soil water conservation.					
Teaching agriculture is very tiring					
Use of cultural water barriers is easy to adopt					
Constructing physical water barriers is tiring					
Water harvesting is expensive					
Preparation of micro catchments is difficult					
Agriculture is a boring subject					
Growing of trees is a very tedious practice					
Irrigation makes crop production labourious					
Green houses can have a significant effect in improving food production in ASALs					
It is possible for students to study agriculture on their own and pass well					
Green houses are not efficient in water conservation					

Agriculture related careers are as rewarding as non-agriculture related careers.					
It is very easy to practice crop rotation in ASALs					
It is difficult to observe timely planting in ASALs					
Livestock breeds is a boring topic to teach					
Pasture conservation measures are easy to adopt					
Growing fast maturing pulses during fallowing is easy to adopt					
I enjoy teaching agriculture					
Growing adaptable crop varieties is an expensive venture					
Grafting technology is complex for the students					

SECTION E: School Related Factors on Implementation of Secondary School Agriculture Curriculum

9a. On a scale of 1-5 rate the level of support given to you by the school administration in implementing agriculture curriculum in your school. Put a tick (√) appropriately

School Administration Support	**None**	**Little**	**Average**	**Above average**	**A lot**
	1	**2**	**3**	**4**	**5**
Allocation of funds					
Facility provision					
School policy reinforcement					
Staffing					

b. Are there other stakeholders who support agriculture curriculum implementation in your school? Yes ☐ No ☐

c. If Yes, list at least two of them.

i. _____

ii. _____

9b. Below are challenges faced by teachers of agriculture while teaching DLA concepts in ASAL schools. In an ascending order, rank them as applies in your school. Use numerical values from one onwards (1-5/6).

i. Drought/ inadequate rainfall

ii. Inadequate resources

iii. Bloated syllabus

iv. Students lack of interest in the subject

v. Harsh climatic conditions

vi. Any other (specify)_____

c. Suggest one way each of overcoming the two top most challenges as ranked in 9a above.

i. _____

ii. _____

Thank you for your time and responses

APPENDIX B

QUESTIONNAIRE FOR SECONDARY SCHOOL AGRICULTURE STUDENTS

Introduction

I am Ms. Miriam Nthenya Kyule, a student at Egerton University doing a PhD in Agricultural Education. As part of my studies I am undertaking a research, which aims to generate information on the Influence of School Factors on Implementation of Secondary School Agriculture Curriculum in Kenya's Arid and Semi-Arid Lands (ASALs). This research was necessitated by potential in agriculture subject in economic and agricultural development in these areas. I wish to request you to participate in this study by responding to the items in this questionnaire. Your responses will be treated with utmost confidentiality and for research purposes only. Answer each question according to the instructions given. Put a tick against the appropriate answer where options have been provide (√).

Section A: Demographic Data of the Respondent

Name of respondent _____ (Optional)

County……..… …….. Sub-County…….……..

School Category: Extra County ☐ County ☐ Sub-County ☐ Private ☐

1. Gender Male ☐ Female ☐
2. Age in years…….

SECTION B: Learner Related Factors in Secondary School Agriculture Curriculum

3. Who influenced you to take up agriculture?
   a) Agriculture teacher ☐
   b) Peers ☐
   c) Parents ☐
   d) School policy ☐
   e) Future career aspirations ☐
   f) Others (Specify) ……

4a. What kind of career do your parents wish you pursue after high school?

i. Agriculture related ☐
ii. Non- agriculture related ☐
iii. None ☐

b. What career would you wish to pursue after high school?

i. Agriculture related ☐
ii. Non- agriculture related ☐
iii. None ☐

5a. Do your parents practice agriculture at home? Yes ☐ No ☐

b. If yes, to what extent do they practice agriculture?

Large scale farming ☐ Small scale farming ☐

c. What type of farming enterprises are they involved in?

Legume growing ☐ Horticulture ☐ Cereal growing ☐

Livestock rearing ☐

d. If No, what could be the reasons for not practicing agriculture?

i. Landlessness ☐

ii. Stay in urban center ☐

iii. Unfavorable weather ☐

iv. Lack of capital to buy farm inputs ☐

v. Any other reason (Specify)_____

6a. Are the following agriculture learning resources available in your school? If yes, rate their adequacy and how frequently you use them? Put a tick (√) appropriately.

Resource	**Availability**		**Level of Adequacy**			**Frequency of Use**		
	Yes	**No**	**Inadequate**	**Moderate**	**Adequate**	**Never**	**Occasionally**	**Frequently**
			1	**2**	**3**	**1**	**2**	**3**
Agriculture Work shop								
Agriculture Laboratory								
Agriculture rooms/classes								
Farm store								
Farm tools and equipment								
School farm								
Agriculture textbooks								
Agriculture Charts								
Agriculture Models								
Agriculture Videos								
Irrigation equipment								

b. Below are teaching methods used by teachers of Agriculture. Indicate how frequently your agriculture teacher uses each of them.

Teaching Method	**Frequency of use**		
	Never	**Occasionally**	**Frequently**
	1	**2**	**3**
Lecture			
Discussion			
Practicals			
Demonstration			
Projects			
Field Visits			
Use of resource persons			
Computer based Instruction			

SECTION C: Implementation of Secondary School Agriculture Curriculum in ASALs

7a. The following are topics and subtopics covered in secondary school agriculture with content that serves to promote dry land agriculture. Rate your knowledge level about each. Put a tick (√) appropriately.

Topics with DLA practices	**Sub topic with DLA content**	**Knowledge Level**				
		None	**Very little**	**Little**	**Average**	**Above average**
		1	**2**	**3**	**4**	**5**
Land preparation	Seedbed preparation, Minimum tillage/Zero tillage					
Water supply, irrigation and drainage	Water supply, Irrigation					
Livestock breeds	Indigenous Livestock breeds					
Planting	Selection of adaptable planting materials, timing of planting, depth of planting					
Nursery practices	Nursery establishment, Mulching, watering, shading, Grafting					
Field practices (I)	Crop rotation, Earthing up, weed control					
Livestock rearing practices	Practices for rearing adaptable species, beekeeping					

Farm structures	Construction of structures for ASAL adaptable species					
Soil and water conservation	Establishment of cultural water conservation measures, construction of physical water barriers like terraces, trash lines etc					
Weed and weed control	Cultural weed control, Chemical weed control					
Field practices (II)	Management practices in production of ASAL adaptable annual crops					
Forage crops	Establishment and management of adaptable forage crops and agroforestry fodder trees/shrubs					
Farm power and Machinery	Choice and use of appropriate farm implements in ASALs like sub-soilers, ridgers planters etc					
Agroforestry	Establishment, management & harvesting of agroforestry trees suited to ASALs					

7b. The following are agricultural practices covered in secondary school agriculture curriculum which serve to promote DLA. Rate your skill level in carrying out each of the practices. Put a tick (√) appropriately.

DLA practices	**Skill level**				
	None	**Very Little**	**little**	**Average**	**Above average**
	1	**2**	**3**	**4**	**5**
Mulching					
Zero tillage					
Practising minimum tillage					
Practicing cover cropping					
Preparing sunken beds					
Insitu water harvesting					
Ridge furrowing					
Use of herbicides					
Construction cultural water barriers					

Construction of physical water barriers					
Water harvesting methods					
Construction of micro - catchments					
Agroforestry practices					
Irrigation					
Green house use					
Livestock rearing practices					
Pasture conservation measures					
Growing multi-purpose fodder crops					
Improved fallowing					
Preparation of crop rotation programmes					
Timely planting					
Practices involved in planting drought resistant crops					
Grafting early maturing fruit trees like mangoes, citrus fruits					

7c i). How often does your agriculture teacher involve you either individually or as a group in project work within the school farm?

Never ☐ Rarely ☐ Often ☐ Very often ☐

ii. List one type of crop or livestock reared during the project period.

Crops _____

Livestock _____

iii. In the table below, indicate the type of project you may have been involved in the given areas and the practices carried out. If you have not been involved in any, indicate Not Applicable (N/A)

Area of coverage	Type of project	List at least one practice carried out in the process where applicable
Farm structures	1. 2.	
Soil and water conservation	1. 2.	

Thank you for your time and responses

APPENDIX C

QUESTIONNAIRE FOR SECONDARY SCHOOL PRINCIPALS

Introduction

I am Ms. Miriam Nthenya Kyule, a student at Egerton University doing a PhD in Agricultural Education. As part of my studies I am undertaking a research, which aims to generate information on the Influence of School Factors on Implementation of Secondary School Agriculture Curriculum in Kenya's Arid and Semi-Arid Lands (ASALs). This research was necessitated by potential in agriculture subject in economic and agricultural development in these areas. I wish to request you to participate in this study by responding to the items in this questionnaire. Your responses will be treated with utmost confidentiality and for research purposes only.

Section A: Demographic Data of the Respondent

County_____ Sub-County_____

School Category: Extra-County ☐ County ☐ Sub-County ☐ Private ☐

1. Gender Male ☐ Female ☐
2. Age in years _____
3. For how many years have you been a principal in your current secondary school? _____

Section B: Agriculture Resource provision in Secondary Schools

4a. How many teachers of agriculture are in your school? _____

b. How many are trained teachers of agriculture? _____

c. On average what is their teaching load per week?_____

d. Is the enrolment in agriculture on the increase in your school? Yes ☐ No ☐

5. Which of the following resources has your school provided for the teaching of agriculture?

Resources	**Provision status**	
	Yes	**No**
Agriculture work shop		
Agriculture laboratory		
Agriculture rooms/classes		
Funding		
Farm tools and equipment		
School farm		

Agriculture textbooks		
Agriculture Charts		
Agriculture Models		
Agriculture Videos		
Irrigation equipment		

6a. Are there any challenges facing the teaching and learning of agriculture in your school?

Yes ☐ No ☐

b. If yes, in order of priority state two major challenges faced

i. _____

ii. _____

c. On a scale of 1-5 rate the level of support that the school administration provides towards implementation of agriculture curriculum in your school. Put a tick (√) appropriately.

School Administration Support	**None**	**Little**	**Average**	**Above average**	**A lot**
	1	**2**	**3**	**4**	**5**
Allocation of funds					
Facility provision					
School policy reinforcement					
Staffing					

7a. Do agriculture students in your school attend any educational excursions?

Yes ☐ No ☐

b. What support does the school administration provide for educational excursions for agriculture students? _____

8. What kind of support do you offer to agriculture teachers in terms of skill and knowledge enhancement at school level? _____

9. In order of priority, suggest two ways in which the teaching of agriculture can be improved in your school?

i. _____

ii. _____

Thank you for your time and responses

APPENDIX D

CONTENT ANALYSIS ON PRACTICES PROMOTING DRY LAND AGRICULTURE COVERED IN THE KENYA SECONDARY SCHOOL AGRICULTURE CURRICULUM

Introduction

I am Ms. Miriam Nthenya Kyule, a student at Egerton University doing a PhD in Agricultural Education. As part of my studies I am undertaking a research, which aims to generate information on the Influence School Factors on Implementation of Secondary School Agriculture Curriculum in Kenya's Arid and Semi-Arid Lands (ASALs). This research was necessitated by potential in agriculture subject in economic and agricultural development in these areas. I wish to request you to participate in this study by responding to the items in this instrument as part of analyzing the secondary school agriculture curriculum content.

The curriculum has been attached for your reference. Kindly study it and guided by the categorization matrix provided, indicate the topic and learning objectives that aim at promoting Dry Land Agriculture as per the guiding research questions. In this study, DLA will refer to all agricultural practices in the secondary school agriculture curriculum which may serve to improve agricultural production in ASALs. Your responses will be treated with utmost confidentiality and for research purposes only.

Content analysis categorization matrix

The categorization matrix guided the content choice in response to the guiding questions

Which learning objectives address soil and water conservation?	Water preservation and harvesting
	Soil erosion maintenance
	Soil fertility enhancement
	Agroforestry practices
	Water retention in the soil
Which learning objectives address minimum soil disturbance?	Cultivation types
	Farming practices promoting least soil disturbance
Which learning objectives address rearing of adaptable livestock?	All types of adaptable livestock
	Livestock rearing practices
	Feeding of livestock
	Management practices of livestock
Which learning objectives address growing of adaptable crops?	All types of adaptable crops
	Crop management practices
	Planting
	Land preparation when growing adaptable crops

APPENDIX E

A QUESTIONNAIRE FOR SELECTED SECONDARY SCHOOL AGRICULTURE TEACHERS

Introduction

I am Ms Kyule M., a student at Egerton University pursuing a PhD in Agricultural Education. As part of my studies I am undertaking a research, which aims to generate information on Content Analysis for Secondary School Agriculture Curriculum with a focus on Kenya's Arid and Semi-Arid Lands (ASALs). This research was necessitated by potential in agriculture subject in economic and agricultural development in these areas. I wish to request you to participate in this study by responding to the items in this instrument as part of analyzing the secondary school agriculture curriculum content.

The curriculum has been attached for your reference. Kindly study it and guided by the learning objectives that aim at promoting Dry Land Agriculture for each identified topic, respond to the research questions given. In this study, DLA will refer to all agricultural knowledge and practices in the secondary school agriculture curriculum which may serve to improve agricultural production in ASALs. Your responses will be treated with utmost confidentiality and for research purposes only.

1. To what extent do the following topics cover content on soil and water conservation?

S/No.	Topic	Not at all	Very Inadequately	Inadequately	Adequately	Very adequately
		1	2	3	4	5
2	Factors influencing agriculture					
4	Crop Production 1 (Land preparation)					
5	Water supply, irrigation and drainage					
6	Soil fertility 1 (Organic manures)					
9	Soil fertility II (inorganic fertilizers)					
10	Crop production II (Planting)					
12	Crop production IV (Field practices)					

20	Agricultural Economics II (Land Tenure and Land Reforms)					
21	Soil and Water Conservation					
22	Weeds and Weed Control					
33	Agroforestry					

2. To what extent do the following topics have cover content on minimum soil disturbance?

S/No.	Topics	Not at all	Very Inadequately	Inadequately	Adequately	Very adequately
4	Crop production I (Land preparation)					
6	Soil fertility I (Organic Manures)					
12	Crop production IV (Field Practices)					

3. To what extent do the following topics cover content on rearing of adaptable livestock?

S/No.	Topics	Not at all	Very Inadequately	Inadequately	Adequately	Very adequately
1	Introduction to agriculture					
2	Factors influencing agriculture					
7	Livestock production I (common breeds)					
14	Livestock health I (Introduction to livestock health)					
15	Livestock health II (Parasites)					
16	Livestock production II (Nutrition)					
17	Livestock production III (Selection and breeding)					
18	Livestock production IV (Livestock rearing practices)					
19	Farm structures					
26	Livestock health III					

	(Diseases)					
27	Livestock production V (Poultry)					
28	Livestock production VI (Cattle)					

4. To what extent do the following topics cover content on growing adaptable crops?

S/No.	Topics	Not at all	Very Inadequately	Inadequately	Adequately	Very adequately
3	Farm tools and Equipment					
4	Crop production I (Land preparation)					
5	Water supply, irrigation and drainage					
10	Crop production II (Planting)					
11	Crop production III (Nursery practices)					
12	Crop production IV (Field Practices)					
13	Crop production V (Vegetables)					
24	Crop Production VI (Field practices II)					
25	Forage crops					
29	Farm Power and Machinery					

5. To what extent does the secondary school syllabus cover topics that are relevant to ASALs?

Not at all ☐ Very Inadequately ☐ Inadequately ☐ Adequately ☐ Very adequately ☐

APPENDIX F

TOPICS AND LEARNING OBJECTIVES ADDRESSING DLA IN EACH SUB THEME

Soil and Water Conservation		
Topic	**Learning Objectives**	**Focus**
Factors influencing agriculture	a. Explain biotic factors influencing agriculture	K
	b. Define soil	K
	c. Describe the process of soil formation	K
	d. Describe soil profile	K
Crop Production 1 (Land preparation)	a. Explain the importance of land preparation.	K
	b. Prepare a piece of land ready for crop production.	S
Water supply, irrigation and drainage	a. State the sources of water for the farm	K
	b. Describe collection, storage, pumping and conveyance of water	K
	c. Describe water treatment and explain its importance	K
	d. Define irrigation	K
	e. Define drainage	K
	f. Explain the importance of drainage	K
	g. Describe the methods of drainage	K
	h. Explain how agriculture activities pollute water and how this can be prevented	K
	i. Demonstrate an appreciation for clean water in farming and life in general	K
Soil fertility 1 (Organic manures)	a. Define soil fertility	K
	b. Explain how soil fertility can be maintained	K
	c. Describe how soil loses fertility	K
	d. Define and distinguish organic matter, manure and humus.	S
	e. Explain the importance of organic matter in the soil.	K
	f. Describe the different organic manures.	K
	g. Prepare compost manure	S
	h. Demonstrate a caring attitude towards soils	K
Soil fertility II (inorganic fertilizers)	a. List the essential elements	K
	b. Classify the essential elements	K
	c. State the role of each macro-nutrient.	K
	d. Describe the deficiency symptoms of the macro-nutrient.	K
	e. Identify and classify fertilizers	S
	f. Describe the properties of various fertilizers.	K

	g. Describe soil sampling and testing procedures	K
	h. Use appropriate methods of fertilizer application.	S
	i. Calculate fertilizer application rates	S
	j. Explain how soil acidity and alkalinity affect crop production.	K
Crop production II(Planting)	a. Demonstrate an appreciation for economical use of land.	K
Crop production IV (Field practices)	a. State the importance of crop rotation.	K
	b. State the importance of mulching in crop production	K
	c. Describe the importance of various field practices in crop production	K
	d. Carry out various filed practices.	S
Agricultural Economics II (Land Tenure and Land Reforms)	a. Describe tenure systems	K
Soil and Water Conservation	a. Define soil erosion	K
	b. Explain the various factors that influence erosion	K
	c. List the agents of erosion	K
	d. Describe the various types of erosion	K
	e. Describe the various methods of erosion control	K
	f. Demonstrate a caring attitude towards soil and water	K
	g. Carry out soil erosion control measures	S
	h. Describe water harvesting and conservation techniques	K
	i. Describe micro-catchments and their uses	K
	j. Design and construct a micro-catchment	S
Weeds and Weed Control	a. Describe ways of controlling weeds.	K
	b. State harmful effects of weeds	K
	c. Control weeds	K
Agroforestry	a. State the importance of agroforestry	K
Minimum Soil Disturbance		
Crop production I (Land preparation)	a. Describe the various types of cultivation.	K
	b. Relate cultivation operation to correct tools and or implements	K
	c. Prepare a piece of land ready for crop production.	S
Soil fertility I (Organic Manures)	a. Demonstrate a caring attitude towards soils.	K
Crop production IV (Field Practices)	a. State the importance of mulching in crop production	K
Rearing of Adaptable Livestock		
Introduction to agriculture	a. Demonstrate an appreciation for the wide and	K

	varied opportunities in agriculture.	
Factors influencing agriculture	a. Relate crop and livestock distribution to soils in different regions.	S
Livestock production I (common breeds)	a. Describe the various breed characteristics.	K
Livestock health I(Introduction to livestock health)	a. Define health and disease.	K
	b. Describe signs of sickness in animals.	K
	c. State the predisposing factors of livestock diseases.	K
	d. Categorize animal diseases.	K
	e. Carry out disease control practices.	S
	f. State the importance of maintaining livestock healthy.	K
	g. Demonstrate a caring attitude towards livestock.	K
Livestock health II (Parasites)	a. Describe host parasite relationship	K
	b. Identify different parasites	S
	c. Describe the life-cycle of parasites	K
	d. Explain methods of parasite control in livestock	K
Livestock production II (Nutrition)	a. Identify and classify livestock feeds	S
	b. Describe digestion and digestive systems of cattle and poultry	K
	c. Compute a livestock ration	S
	d. Prepare balanced ration for various livestock	S
	e. Demonstrate a caring attitude towards livestock	K
Livestock production III (Selection and breeding)	a. Select breeding stock	S
	b. Describe breeding systems	K
	c. Identify signs of heat in livestock.	S
	d. Describe methods used in serving livestock.	K
	e. Demonstrate a caring attitude towards livestock	K
Livestock production IV (Livestock rearing practices)	a. Describe livestock rearing practices.	K
	b. Carry out livestock rearing practices.	S
	c. Demonstrate a caring attitude towards livestock	K
Farm structures	a. Construct and maintain farm structures	S
Livestock health III (Diseases)	a. Carry out simple control measures of livestock diseases.	S
Livestock production V (Poultry)	a. Select eggs for incubation	S
	b. Describe broodiness and natural brooding	K
	c. Describe brooder and brooder management	K
	d. Describe conditions necessary for artificial incubation.	K
	e. Describe rearing systems	K
	f. Describe the feeding for each age and category	K

	of poultry.	
	g. Identify stress and vices.	S
	h. State the causes of stress and vice and stress in poultry	K
	i. State the effects of vices and stress in poultry	K
	j. State control measures of vices and stress	K
	k. Describe marketing of eggs and poultry meat.	K
	l. Select sort and grade eggs for marketing	S
	m. Demonstrate an appreciation of poultry production as an economically lucrative activity.	K
Livestock production VI (Cattle)	a. Raise young stock	S
	b. Demonstrate a caring attitude towards livestock	K
	c. Milk using correct procedure and technique.	S
	d. Demonstrate am appreciation of cattle production as an economically lucrative activity.	K
Growing of Adaptable Crops		
Farm tools and Equipment	a. Identify various farm tools and equipment	K
	b. Describe the use of various tools and equipment	K
Crop production I (Land preparation)	a. Describe the various types of cultivation.	K
	b. Relate cultivation operation to correct tools and or implements	S
	c. Prepare a piece of land ready for crop production.	S
Water supply, irrigation and drainage	a. Describe methods of irrigating land.	K
	b. List the equipment used in irrigation	K
	c. Grow a crop through irrigation	S
Crop production II (Planting)	a. State the correct planting materials for various crops.	K
	b. Select and prepare planting materials.	S
	c. Determine the optimum time of planting	K
	d. State the factors which determine the depth of planting.	K
	e. Describe the planting procedures for different crops.	K
	f. State the factors that determine seed rate, spacing and plant population.	K
	g. Calculate plant population	S
	h. Demonstrate an appreciation for economical use of land	K

Crop production III (Nursery practices)	a. Select a suitable site for a nursery	S
	b. Prepare a nursery bed	S
	c. Manage a nursery bed	S
	d. Transplant crops from a nursery	S
	e. Bud a seedling	S
	f. Graft a seedling	S
Crop production IV (Field Practices)	a. Draw a crop rotation programme	K
	b. Describe the importance of various field practices in crop production	K
	c. Carry out various filed practices.	S
	d. State the correct stage for harvesting various crops.	K
	e. Describe harvesting practices for various crops.	K
Crop production V (Vegetables)	a. Grow a vegetable crop from nursery establishment to harvesting	S
	b. Demonstrate an appreciation of agriculture as an economically lucrative activity.	K
Crop pests and diseases	a. Carry out general disease and pest control measures	S
Crop Production VI (Field practices II)	a. Describe management practices in crop production	K
	b. Carry out management practices for a given crop	S
	c. Demonstrate an appreciation of agriculture as an economically lucrative activity.	K
Forage crops	a. Describe the ecological requirements of forage crops.	K
	b. Describe the establishment and management of pastures and fodder.	K
	c. Describe forage utilization and conservation	K
Farm Power and Machinery	a. Describe the various tractor implement	K
	b. Describe the various animal drawn implement	K

Key: K- represents Knowledge, S- Represents skill

Source: KIE, secondary school agriculture syllabus

APPENDIX G

A POST HOC TEST COMPARING THE MEAN DLA KNOWLEDGE LEVEL ON SOIL AND WATER CONSERVATION, CROP PRODUCTION AND LIVESTOCK PRODUCTION ACROSS THE FIVE SUB COUNTIES

Dependent Variable	Sub County	Sub County	Mean Difference	Std. Error	Sig.	95% Confidence Interval Lower Bound	95% Confidence Interval Upper Bound
DLA knowledge level on crop production	Mogotio	Marigat	-.03267	.11895	.999	-.3594	.2940
		Kibwezi	.24561*	.08460	.032	.0133	.4780
		Makindu	.21586	.11638	.344	-.1038	.5355
		Narok-North	-.05902	.10756	.982	-.3544	.2364
	Marigat	Mogotio	.03267	.11895	.999	-.2940	.3594
		Kibwezi	.27828	.10846	.080	-.0196	.5762
		Makindu	.24853	.13472	.350	-.1215	.6186
		Narok-North	-.02635	.12718	1.000	-.3757	.3230
	Kibwezi	Mogotio	-.24561*	.08460	.032	-.4780	-.0133
		Marigat	-.27828	.10846	.080	-.5762	.0196
		Makindu	-.02975	.10563	.999	-.3199	.2604
		Narok-North	-.30464*	.09583	.014	-.5679	-.0414
	Makindu	Mogotio	-.21586	.11638	.344	-.5355	.1038
		Marigat	-.24853	.13472	.350	-.6186	.1215
		Kibwezi	.02975	.10563	.999	-.2604	.3199
		Narok-North	-.27488	.12478	.182	-.6176	.0678
	Narok-North	Mogotio	.05902	.10756	.982	-.2364	.3544
		Marigat	.02635	.12718	1.000	-.3230	.3757
		Kibwezi	.30464*	.09583	.014	.0414	.5679
		Makindu	.27488	.12478	.182	-.0678	.6176
DLA Knowledge level on soil & water conservation	Mogotio	Marigat	-.15447	.18401	.918	-.6599	.3509
		Kibwezi	-.11404	.13087	.907	-.4735	.2454
		Makindu	-.22788	.18003	.712	-.7223	.2666
		Narok-North	-.42573	.16639	.081	-.8827	.0313
	Marigat	Mogotio	.15447	.18401	.918	-.3509	.6599
		Kibwezi	.04043	.16778	.999	-.4204	.5012
		Makindu	-.07341	.20841	.997	-.6458	.4990
		Narok-North	-.27126	.19675	.642	-.8117	.2691
	Kibwezi	Mogotio	.11404	.13087	.907	-.2454	.4735
		Marigat	-.04043	.16778	.999	-.5012	.4204
		Makindu	-.11385	.16341	.957	-.5627	.3350
		Narok-North	-.31170	.14825	.222	-.7189	.0955
	Makindu	Mogotio	.22788	.18003	.712	-.2666	.7223

		Marigat	.07341	.20841	.997	-.4990	.6458
		Kibwezi	.11385	.16341	.957	-.3350	.5627
		Narok-North	-.19785	.19304	.844	-.7280	.3323
	Narok-	Mogotio	.42573	.16639	.081	-.0313	.8827
	North	Marigat	.27126	.19675	.642	-.2691	.8117
		Kibwezi	.31170	.14825	.222	-.0955	.7189
		Makindu	.19785	.19304	.844	-.3323	.7280
DLA	Mogotio	Marigat	-.02158	.16347	1.000	-.4706	.4274
Knowledge level		Kibwezi	.75731*	.11626	.000	.4380	1.0766
on livestock		Makindu	.84531*	.15994	.000	.4060	1.2846
production		Narok-North	-.11813	.14783	.931	-.5241	.2879
	Marigat	Mogotio	.02158	.16347	1.000	-.4274	.4706
		Kibwezi	.77889*	.14906	.000	.3695	1.1883
		Makindu	.86689*	.18515	.000	.3584	1.3754
		Narok-North	-.09655	.17479	.982	-.5766	.3835
	Kibwezi	Mogotio	-.75731*	.11626	.000	-1.0766	-.4380
		Marigat	-.77889*	.14906	.000	-1.1883	-.3695
		Makindu	.08800	.14517	.974	-.3107	.4867
		Narok-North	-.87544*	.13171	.000	-1.2372	-.5137
	Makindu	Mogotio	-.84531*	.15994	.000	-1.2846	-.4060
		Marigat	-.86689*	.18515	.000	-1.3754	-.3584
		Kibwezi	-.08800	.14517	.974	-.4867	.3107
		Narok-North	-.96344*	.17150	.000	-1.4345	-.4924
	Narok-	Mogotio	.11813	.14783	.931	-.2879	.5241
	North	Marigat	.09655	.17479	.982	-.3835	.5766
		Kibwezi	.87544*	.13171	.000	.5137	1.2372
		Makindu	.96344*	.17150	.000	.4924	1.4345

*. The mean difference is significant at the 0.05 level.

APPENDIX H

CONDENSED KENYA CERTIFICATE OF SECONDARY EDUCATION AGRICULTURE SYLLABUS – REVISED 2002

General objectives

1. Develop an understanding of agriculture and its importance to the family and the nation.
2. Promote interest in agriculture as an industry and create awareness of opportunities existing in agriculture and related sectors.
3. Demonstrate that farming is a dignified and profitable occupation.
4. Enhance skills needed in carrying out agricultural practices.
5. Provide a background for further studies in agriculture
6. Develop self-reliance, resourcefulness and problem solving abilities in agriculture.
7. Develop occupational outlook in agriculture.
8. Enable schools to take an active part in national development through agricultural activities.
9. Create awareness of the role of agriculture in industrial and technological development.
10. Enhance understanding of the role of technology and industrialization in agricultural development.
11. Promote agricultural activities which enhance environmental conservation
12. Promote consciousness of health promoting activities in agricultural production.

FORM ONE

1.0.0. INTRODUCTION TO AGRICULTURE

1.1.0. Specific objective

By the end of the topic, the leaner should be able to:-

a. Define agriculture
b. State the main branches of agriculture
c. Describe farming systems
d. Explain the role of agriculture in the economy and demonstrate an appreciation of its importance to the country.
e. Demonstrate an appreciation for the wide and varied opportunities in agriculture.

Content

- Definition of agriculture
- Branches of agriculture - Crop and livestock farming, agricultural economic and agricultural engineering
- Farming systems - Intensive and extensive,

- Methods of farming- Mixed, organic, pastoral nomadism, shifting cultivation and agroforestry
- Role of agriculture to the economy

2.0.0 FACTORS INFLUENCING AGRICULTURE

2.1.0 Specific objectives

By the end of the topic, the learner should be able to:-

a. Explain the human factors influencing agriculture
b. Explain biotic factors influencing agriculture
c. Explain how climatic factors influence agriculture
d. Define soil
e. Describe the process of soil formation
f. Describe soil profile
g. Determine soil constituents
h. Classify soils by physical characteristics
i. Explain chemical properties of soils
j. Relate crop and livestock distribution to soils in different regions.

Content

- Human factors, Biotic factors, Climatic factors, Edaphic factors

3.0.0 FARM TOOLS AND EQUIPMENT

3.1.0 Specific objectives

By the end of the topic, the learner should be able to:

a. Identify various farm tools and equipment
b. Name parts of various farm tools and equipment.
c. Describe the use of various tools and equipment
d. Carry out maintenance practices on tools and equipment
e. Demonstrate an appreciation for care and maintenance of tools.

Content

- Garden tools and equipment, Workshop tools and equipment- Woodwork tools and equipment, Metalwork tools and equipment, Livestock production tools and equipment, Plumbing tools and equipment, Masonry tools and equipment

4.0.0 CROP PRODUCTION I (LAND PREPARATION)

4.1.0 Specific objectives

By the end of the topic, the learner should be able to:-

a. Explain the importance of land preparation.
b. Describe the various types of cultivation.
c. Relate cultivation operation to correct tools and or implements

d. Prepare a piece of land ready for crop production.

Content

- Land preparation – Definition, Importance
- Operations in land preparation – Land clearing, Primary cultivation, secondary cultivation, tertiary operations, Sub-soiling
- Minimum tillage

5.0.0 WATER SUPPLY, IRRIGATION AND DRAINAGE

5.1.0 Specific objectives

By the end of the topic, the learner should be able to:

a. State the sources of water for the farm
b. Describe collection, storage, pumping and conveyance of water
c. Describe water treatment and explain its importance
d. Define irrigation
e. Explain the importance of irrigation
f. Describe methods of irrigating land.
g. List the equipment used in irrigation
h. Grow a crop through irrigation
i. Carry out maintenance on irrigation equipment and facilities.
j. Define drainage
k. Explain the importance of drainage
l. Describe the methods of drainage
m. Explain how agriculture activities pollute water and how this can be prevented
n. Demonstrate an appreciation for clean water in farming and life in general.

Content

- Water supply- Sources of water, Collection and storage. Pumps and pumping, Water conveyance, water treatment, uses of water in the farm
- Irrigation- Definition, methods of irrigation
- Drainage – Methods of drainage
- Water pollution

6.0.0. SOIL FERTILITY 1 (ORGANIC MANURES)

6.1.0. Specific Objectives

By the end of the topic, the learner should be able to

a. Define soil fertility
b. Explain how soil fertility can be maintained
c. Describe how soil loses fertility
d. Define and distinguish organic matter, manure and humus.
e. Explain the importance of organic matter in the soil.

f. Describe the different organic manures.
g. Prepare compost manure
h. Demonstrate a caring attitude towards soils

Content

- Soil fertility- Definition, ways by which soil looses fertility, ways by which soil gains fertility
- Organic manures- Green manure, Farmyard and compost manure

7.0.0. LIVESTOCK PRODUCTION I (COMMON BREEDS)

7.1.0. Specific objective

By the end of the topic, the learner should be able to

a. Name various livestock species
b. Define the terms livestock, breed and type
c. Describe the various breed characteristics
d. State the origin of various livestock breeds.
e. Classify the various breeds into types
f. Name the external parts of the various livestock species.
g. Demonstrate an appreciation of the socio-economic value of livestock

Content

- Importance of livestock
- Livestock species covered are Cattle (exotic and indigenous), goats, sheep, pigs, poultry, rabbits and camels. Each is discussed under; Breed origin and characteristics, type of breed, external parts of each livestock species, typical body conformation.

8.0.0. AGRICULTURAL ECONOMICS I (BASIC CONCEPTS AND FARM RECORDS)

8.1.0 Specific objects

By the end of the topic, the learner should be able to:-

a. Define economics and agricultural economics
b. Explain basic concepts of economics
c. Describe the importance of agricultural economics
d. Explain the importance of farm records
e. Describe the different types of farm records
f. Keep farm records

Content

- Definition- Economics, agricultural economics
- Basic economic concepts – Scarcity, preference and choice, opportunity cost
- Use of farm records and types of farm records

FORM TWO

9.0.0 SOIL FERTILITY II (INORGANIC FERTILIZERS)

9.1.0 Specific Objective

By the end of the topic, the learner should be able to:

a. List the essential elements
b. Classify the essential elements
c. State the role of each macro-nutrient.
d. Describe the deficiency symptoms of the macro-nutrient.
e. Identify and classify fertilizers
f. Describe the properties of various fertilizers.
g. Describe soil sampling and testing procedures
h. Use appropriate methods of fertilizer application.
i. Calculate fertilizer application rates
j. Explain how soil acidity and alkalinity affect crop production.

Content

- Essential elements- Macro nutrients, their role in plant growth and their deficiency symptoms.
- Inorganic fertilizers – Classification, identification and properties of fertilizers
- Soil sampling and soil testing

10.0.0 CROP PRODUCTION II (PLANTING)

10.1.0 Specific objective

By the end of the topic; the learner should be able to:

a. State the correct planting materials for various crops.
b. Select and prepare planting materials.
c. Determine the optimum time of planting
d. State the factors which determine the depth of planting.
e. Describe the planting procedures for different crops.
f. State the factors that determine seed rate, spacing and plant population.
g. Calculate plant population
h. Demonstrate an appreciation for economical use of land

Content

- Types of planting materials- seeds, vegetative materials
- Selection of planting materials- their suitability to the ecological conditions, preparation o planting materials, Timing of planting, plant population and planting depth

11.0.0 CROP PRODUCTION III (NURSERY PRACTICES)

11.1.0 Specific objectives

By the end of the topic, the learner should be able to:

a. Describe a nursery bed
b. Distinguish between a nursery bed, a seedling bed and a seed bed.
c. State the importance of a nursery bed.
d. Select a suitable site for a nursery
e. Prepare a nursery bed
f. Manage a nursery bed
g. Transplant crops from a nursery
h. Bud a seedling
i. Graft a seedling
j. Explain the importance of budding, grafting. Layering and tissue culture.
k. Describe damage caused by animals on tree seedlings and how to prevent it.

Content

- Definition of a nursery bed, establishment of a nursery bed, Routine management in a nursery bed, budding, grafting, layering, transplanting of seedlings

12.0.0 CROP PRODUCTION IV (FIELD PRACTICES)

12.1.0 Specific objectives

By the end of the topic, the learner should be able to:

a. Define crop rotation
b. State the importance of crop rotation.
c. Draw a crop rotation programme
d. Distinguish terms used in crop farming.
e. State the importance of mulching in crop production
f. Describe the importance of various field practices in crop production
g. Carry out various filed practices.
h. State the correct stage for harvesting various crops.
i. Describe harvesting practices for various crops.

Content

- Crop rotation- Definition, importance, Rotational programmes
- Mulching- Meaning, importance, types of mulches, Advantages and disadvantages of mulches.
- Routine field practices- Thinning, Rogueing, Gapping, Training/staking/ propping, Pruning, Earthing up, Crop protection, Harvesting, Post harvest practices, Storage.

13.0.0 CROP PRODUCTION V (VEGETABLES)

13.1.0. Specific objective

By the end of the topic, the learner should be able to:

a. Grow a vegetable crop from nursery establishment to harvesting
b. Keep crop production records
c. Market farm produce
d. Demonstrate an appreciation of agriculture as an economically lucrative activity.

Content

- Vegetable crops covered are: Tomatoes, cabbages, kales, carrots, onions. Each discussed under ecological requirements, nursery establishment, transplanting, field management and harvesting.

14.0.0 LIVESTOCK HEALTH I (INTRODUCTION TO LIVESTOCK HEALTH)

14.1.0. Specific objectives

By the end of the topic, the learner should be able to:

a. Define health and disease
b. Describe signs of sickness in animals.
c. State the predisposing factors of livestock diseases.
d. Categorize animal diseases.
e. Carry out disease control practices.
f. State the importance of maintaining livestock healthy.
g. Demonstrate a caring attitude towards livestock.

Content

- Definition of health and disease, Importance of keeping livestock healthy, Pre-disposing factors of livestock diseases, signs of ill – health in livestock
- Classification of livestock diseases

15.0.0. LIVESTOCK HEALTH II (PARASITES)

15.1.0. Specific objectives

By the end of the topic, the learner should be able to:

a. Describe host parasite relationship
b. Identify different parasites
c. Describe the life-cycle of parasites
d. Explain methods of parasite control in livestock

Content

- Host parasite relationship
- External, internal parasites

16.0.0. LIVESTOCK PRODUCTION II (NUTRITION)

16.1.0. Specific objective

By the end of the topic, the learner should be able to:-

a. Identify and classify livestock feeds
b. Describe digestion and digestive systems of cattle, pig and poultry
c. Define terms used to express feed values.
d. Compute a livestock ration
e. Prepare balanced ration for various livestock
f. Demonstrate a caring attitude towards livestock.

Content

- Feeds and feeding, digestive systems, digestion in cattle, pig and poultry.
- Appropriate livestock handling techniques while feeding.

FORM THREE

17.0.0 LIVESTOCK PRODUCTION III (SELCTION AND BREEDING)

17.1.0. Specific objectives

By the end of the topic the learner should be able to:

a. Describe reproduction and
b. Reproductive systems,
c. Select breeding stock
d. Describe breeding systems
e. Identify signs of heat in livestock.
f. Describe methods used in serving livestock.
g. Demonstrate a caring attitude towards livestock.

Content

- Reproduction and reproductive systems-Cattle and poultry
- Selection- Factors to consider in selecting a breeding stock, methods of selection
- Breeding- definition, terms used in breeding, breeding systems.
- Signs of heat in cattle, pigs, rabbits.
- Methods of serving livestock, signs of heat in livestock, signs of parturition

18.0.0 LIVESTOCK PRODUCTION IV (LIVESTOCK REARING PRACTICES)

18.1.0 Specific Objectives

By the end of the topic the learner should be able to:-

a. Describe livestock rearing practices.
b. Carry out livestock rearing practices.
c. Demonstrate a caring attitude towards livestock

Content

- Routine livestock rearing practices - Feeding practices, Parasites and disease control practices, Breeding practices, Identification, Debeaking, Tooth clipping, Culling Dehorning, Shearing, castration, Management during parturition.
- Bee Keeping (Apiculture)- Importance, colony, siting of the apiary and hive, stock the bee hive, management (feeding, predator and pest control), honey harvesting and processing
- Fish farming (aquaculture)- Importance, types of fish kept in farm ponds, management harvesting, processing and preservation.

19.0.0 FARM STRUCTURES

19.1.0 Specific Objectives

By the end of this topic, the learner should be able to:

a. Describe parts of a building
b. Identify materials for construction
c. Describe various farm structures and their uses.
d. Describe sitting of various structures.
e. Construct and maintain farm structures

Content

- Farm building and structures – Siting and parts of a building.
- Livestock buildings and structures- Crushes, Dips, Spray race, Dairy shed/parlor, Calf pens, Poultry houses and structures, Rabbit hutches/ rabbitry, Piggery/pigsty, Fish ponds, Silos (for silage), Zero grazing unit, Bee hives.
- Farm stores
- Green houses- Meaning, construction and uses
- Farm fences- Types, uses, Gates and passes in fences

20.0.0 AGRICULTURAL ECONOMICS II (LAND TENURE AND LAND REFORM)

20.1.0 Specific objectives

By the end of the topic, the learner should be able to:

a. Define the term tenure
b. Describe tenure systems
c. Describe land reforms

Content

Land tenure- Definition, tenure systems, land reform and land reform measures.

21.0.0 SOIL AND WATER CONSERVATION

21.1.0 Specific objectives

By the end of the topic, the learner should be able to:

a. Define soil erosion
b. Explain the various factors that influence erosion

c. List the agents of erosion
d. Describe the various types of erosion
e. Describe the various methods of erosion control
f. Demonstrate a caring attitude towards soil and water
g. Carry out soil erosion control measures
h. Describe water harvesting and conservation techniques
i. Describe micro-catchments and their uses
j. Design and construct a micro-catchment

Content

- Soil erosion- Definition, types of soil erosion.
- Soil erosion control- Cultural / biological control- Grass strips, Cover crops, Grassed waterways, Contour farming and strip cropping, Mulching, Afforestation/forestation Physical/structural controls- Stone lines, Filters/strip, Trash lines, Terraces- level, graded, broad based narrow-based, Bench, fanya juu, fanya chini, Bunds, Cut-off drains/diversion ditches, Gabions/porous dams, Ridging.
- Water harvesting roof catchment- Rock catchment, Weirs and dams, Ponds, Retention ditches/level terraces
- Micro catchments – Types, Laying out and construction methods, Uses

22.0.0 WEEDS AND WEED CONTROL

22.1.0 Specific Objectives

By the end of the topic, the learner should be able to:

a. Define a weed
b. Identify weeds
c. Classify weeds
d. Explain the characteristics which make the weeds competitive.
e. Describe ways of controlling weeds.
f. State harmful effects of weeds
g. Control weeds
h. Exercise safety measures to oneself, to crops and to the environment while controlling weeds.

Content

- Weeds - Definition of weed, weed identification and classification, competitive ability of weeds, harmful effects of weeds.
- Weed Control Methods - Classes of herbicides, Methods of application, Safety measures in use of chemicals, Mechanical weed control, Cultural weed control, Biological weed control and Legislative weed control.

23.0.0 CROP PESTS AND DISEASES

23.1.0 Specific Objectives

By the end of the topic, the leaner should be able to:

a. Define pest and disease
b. State the main causes of crop diseases.
c. Describe the harmful effects of crop pests and diseases,
d. Identify and classify some of the common pests and diseases.
e. Carry out general disease and pest control measures
f. Demonstrate a caring attitude towards the environment while controlling pests and diseases

Content

- Definition- Classification of pests, mode of feeding, crops attacked Identification of common pests, harmful effects of pests and pest control measures.
- Diseases- Definition, classification of diseases according to cause, identification of common diseases, harmful effects of diseases and disease control measures.

24.0.0 CROP PRODUCTION VI (FIELD PRACTICES II)

24.1.0 Specific Objectives

By the end of the topic; the learner should be able to:

a. Describe management practices in crop production
b. Carry out management practices for a given crop
c. Demonstrate an appreciation of agriculture as an economically lucrative activity.

Content

- Production of Maize, millet, sorghum, beans, rice- Raising from seed bed preparation to harvesting
- Harvesting of Cotton, pyrethrum, sugarcane, tea and coffee.

25.0.0 FORAGE CROPS

25.1.0 Specific Objectives

By the end of the topic, the learner should be able to:

a. Define and classify pastures
b. Identify forage crops
c. Describe the ecological requirements of forage crops.
d. Describe the establishment and management of pastures and fodder.
e. Describe forage utilization and conservation

Content

- Pastures- Definition, classification, establishment, management, utilization.

- Fodder crops - Ecological requirements, Establishment and management, Production per unit area, Utilization.
- Forage conservation- Hay making, Silage making, Standing pasture

26.0.0. LIVESTOCK HEALTH III (DISEASES)

26.1.0. Specific objectives

By the end of the topic, the learner should be able to:-

a. Describe causes and vectors of main livestock diseases
b. State the incubation period.
c. Describe the signs of each disease.
d. State the predisposing factors where applicable.
e. Carry out simple control measures of livestock diseases.
f. Demonstrate a caring attitude towards livestock

Content

- Protozoan diseases- East coast fever, Anaplasmosis, Coccidiosis, Trypanosomiasis (Nagana)
- Bacteria diseases- Fowl typhoid Foot rot, Contagious abortion (Brucellosis), Scours, Blackquarter, Mastitis, Anthrax, Pneumonia
- Viral diseases – Rinderpest, Foot and mouth, Newcastle, Fowl pox, Gumboro, African swine fever
- Nutritional diseases - Milk fever, Bloat
- These diseases should be studied under the following: Animal species attacked, cause/causal organism/agent and or vector, Predisposing factors (where applicable), Incubation period (where applicable), Signs and symptoms of diseases and control measures of the diseases.

FORM FOUR

27.0.0 LIVESTOCK PRODUCTION V (POULTRY)

27.1.0 Specific Objectives

By the end of the topic, the learner should be able to:-

a. Identify parts of an egg
b. Select eggs for incubation
c. Identify suitable sources of chicks.
d. Describe broodiness and natural brooding
e. Describe brooder and brooder management
f. Describe conditions necessary for artificial incubation.
g. Describe rearing systems
h. Describe the feeding for each age and category of poultry.
i. Identify stress and vices.
j. State the causes of stress and vice and stress in poultry
k. State the effects of vices and stress in poultry

l. State control measures of vices and stress
m. Describe marketing of eggs and poultry meat.
n. Select sort and grade eggs for marketing
o. Demonstrate an appreciation of poultry production as an economically lucrative activity.

Content

- Parts of an egg, Incubation, sources of chicks, brooding, rearing systems, chicken feeding, stress and vices in chicken and marketing.

28.0.0 LIVESTOCK PRODUCTION VI (CATTLE)

28.1.0 Specific objectives

By the end of the topic, the learner should be able to:

a. Raise young stock
b. Demonstrate a caring attitude towards livestock
c. Describe milk by its components.
d. Describe milk secretion and let-down
e. Milk using correct procedure and technique.
f. Describe marketing of beef cattle and milk
g. Demonstrate am appreciation of cattle production as an economically lucrative activity.

Content

- Raising young stock – Feeding, Weaning, Housing, Routine practices
- Milk and Milking- Milk composition, Milk secretion and let down, Clean milk production, Dry cow therapy
- Marketing of milk, Marketing beef cattle.

29.0.0 FARM POWER AND MACHINERY

29.1.0 Specific Objectives

By the end of the topic the learner should be able to:

b. Describe various sources of power in the farm.
c. Describe various systems of tractor
d. Describe the various tractor implements, their uses and maintenance.
e. Describe the various animal drawn implements, their uses and maintenance.
f. Describe tractor service and maintenance practices.

Content

- Sources of power in the farm, Tractor engine, systems of the tractor, tractor service maintenance, tractor drawn implements, their uses and maintenance, Animal drawn implements, uses and maintenance.

30.0.0 AGRICULTURAL ECONOMICS III (PRODUCTION ECONOMICS)

30.1.0 Specific Objectives

By the end of the topic, the learner should be able to:

a. Explain various parameters of national development
b. Relate national development to agricultural production.
c. State the factors of production and explain how each affects production.
d. Describe how the law of diminishing returns relates to agricultural production.
e. Describe agricultural planning and budgeting in a farm business.
f. State sources of agricultural support services/
g. Describe risks and uncertainties in farming explain ways of adjusting to risks and uncertainties.

Content

- National income , Household – firm relationship, Gross domestic product (GNP), Per Capital Income, Contribution of agriculture to national development
- Factors of production- Land, labour, capital, management
- Production function curves, Economic laws and principle, Farm planning, Farm budgeting

31.0.0 AGRICULTURAL ECONOMICS IV (FARM ACCOUNTS)

31.1.0 Specific Objectives

By the end of the topic, the learner should be able to:

a. State the importance of farm accounts
b. Distinguish and describe the various financial documents and their uses.
c. Prepare and analyze financial statements
d. Identify various books of accounts and their uses.

Content

- Financial documents – Invoices, Receipts, Delivery notes and Purchase orders.
- Books of accounts – Ledger, Journal, Inventory and Cash book. Financial statements - Cash analysis, Balance sheet and Profit and loss account.

32.0.0 AGRICULTURAL ECONOMICS V (AGRICULTURAL MARKETING AND ORGANIZATIONS)

32.1.0 Specific Objectives

By the end of the topic, the learner should be able to:

a. Define market and marketing
b. Describe the various types of markets
c. Describe how the law of supply and demand affects the prices of agricultural products.
d. State various marketing functions, agents and institutions.
e. Identify problems in marketing of agricultural products.
f. List various agricultural organizations.
g. Describe the role of each of the agricultural organization.

Content

- Market and marketing, Types of markets, Demand, supply and price theory, Marketing functions, Problems of marketing agricultural products and possible solutions, Marketing boards, agents and institutions, Cooperatives, Associations and Unions.

33.0.0 AGROFORESTRY

33.1.0 Specific Objectives

By the end of the topic, the learner should be able to:

a. Define agroforestry
b. State the importance of agroforestry
c. Describe various forms of agroforestry
d. Explain the importance of trees
e. Select appropriate trees for different uses.
f. Describe tree nursery management and transplanting.
g. Explain routine tree management
h. Select appropriate sites for trees in the farm and other areas.
i. Describe various methods of tree harvesting

Content

- Definition of agroforestry, forms of agroforestry, importance of agroforestry, importance of trees and shrubs, types of tree nurseries, transplanting tree seedlings, care and management of trees, agroforestry practices, sites for agroforestry trees, tree harvesting methods.

APPENDIX I

GRADUATE SCHOOL LETTER OF THE STUDY APPROVAL

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

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

OFFICE OF THE DIRECTOR GRADUATE SCHOOL

ED11/0472/14 28th July, 2015

Ref:..... **Date:**.....

The Secretary,
National Council of Science and Technology,
P. O. Box 30623-00100,
NAIROBI.

Dear Sir,

RE: REQUEST FOR RESEARCH PERMIT – MIRIAM NTHENYA KYULE
REG. NO. ED11/0472/14

This is to introduce and confirm to you that the above named student is in the Department of **Agricultural Education and Extension, Faculty of Education and Community Studies**

She is a bonafide registered Ph.D student in this University. Her research topic is entitled **"Influence of Selected Factors on Implementation of Secondary School Agriculture Curriculum in Arid and Semi-Arid Lands of Kenya: Case of Baringo, Makueni and Narok Counties".**

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

Yours faithfully,

DIRECTOR, BOARD OF POST GRADUATE STUDIES * EGERTON UNIVERSITY P.O. Box 536, EGERTON
03 JUL 2015

Prof. M.A. Okiror
DIRECTOR, BOARD OF POSTGRADUATE STUDIES

MAO/ear

APPENDIX J

AUTHORIZATION LETTER FROM THE NATIONAL COUNCIL FOR SCIENCE, TECHNOLOGY AND INNOVATION

NATIONAL COMMISSION FOR SCIENCE, TECHNOLOGY AND INNOVATION

Telephone: +254-20-2213471,
2241349, 310571, 2219420
Fax: +254-20-318245, 318249
Email: secretary@nacosti.go.ke
Website: www.nacosti.go.ke
When replying please quote

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

Ref: No.

Date:

2nd October, 2015

NACOSTI/P/15/8676/7458

Miriam Nthenya Kyule
Egerton University
P.O Box 536-20115
EGERTON.

RE: RESEARCH AUTHORIZATION

Following your application for authority to carry out research on ***"Influence of selected factors on implementation of secondary school agriculture curriculum in arid and semi-arid lands of Kenya: Case of Baringo, Makueni and Narok Counties,"*** I am pleased to inform you that you have been authorized to undertake research in **Baringo, Makueni and Narok, Counties** for a period ending **2nd October, 2016.**

You are advised to report to **the County Commissioners and the County Directors of Education, Baringo, Makueni and Narok Counties** 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.

SAID HUSSEIN
FOR: DIRECTOR GENERAL/CEO

Copy to:

The County Commissioner
Baringo County.

The County Director of Education
Baringo County.

APPENDIX K

RESEARCH PERMIT

THIS IS TO CERTIFY THAT:
MS. MIRIAM NTHENYA KYULE
of EGERTON UNIVERSITY - NJORO,
536-20115 egerton,has been permitted
to conduct research in *Baringo ,*
Makueni , Narok Counties

on the topic: *INFLUENCE OF SELECTED FACTORS ON IMPLEMENTATION OF SECONDARY SCHOOL AGRICULTURE CURRICULUM IN ARID AND SEMI-ARID LANDS OF KENYA: CASE OF BARINGO, MAKUENI AND NAROK COUNTIES*

for the period ending:
2nd October,2016

.....
Applicant's Signature

Permit No : NACOSTI/P/15/8676/7458
Date Of Issue : 2nd October,2015
Fee Recieved :Ksh 2000

.....
Director General
National Commission for Science, Technology & Innovation

APPENDIX L

BARINGO COUNTY DIRECTOR OF EDUCATION AUTHORIZATION LETTER

REPUBLIC OF KENYA

MINISTRY OF EDUCATION, SCIENCE & TECHNOLOGY
STATE DEPARTMENT OF EDUCATION

OFFICE OF THE COUNTY DIRECTOR
(**BARINGO COUNTY**).

Our Email:countyedubaringo@gmail.com
Tel / Fax: 053/21282

P.O. BOX 664
KABARNET

REF: BAR/CDE/RESEARCH.GEN/VOL.1/NO. 27/138

15/10/2015

MIRIAM NTHENYA KYULE
EGERTON UNIVERSITY
P.O. BOX 536 – 20115
EGERTON

RE: RESEARCH AUTHORIZATION

This office has received your letter Ref: **NACOSTI/P/15/8676/7458** dated 2ND OCTOBER,2015 requesting for authority to allow you carry out research "Influence of selected factor on implementation of Secondary School Agriculture curriculum in arid and semi arid lands of Kenya" case of Baringo, Makueni and Narok **Counties".**

We have granted you permission to conduct the research. The authorities concerned are therefore requested to give you maximum support.

We take this opportunity to wish you well during this research.

COUNTY DIRECTOR OF EDUCATION BARINGO 15 OCT 2015 P.O. Box 554 - 30600, KENYA

DANIEL K. K. MOSBEI
COUNTY DIRECTOR OF EDUCATION
BARINGO.

APPENDIX M

BARINGO COUNTY COMMISSIONER'S AUTHORIZATION LETTER

OFFICE OF THE PRESIDENT

Telephone. 053-21285
Fax. (053)-21285
E-Mail:
baringocountycommissioner@yahoo.com
baringocountycommissioner@gmail.com

When replying please quote:

MINISTRY OF INTERIOR AND CO-ORDINATION OF NATIONAL GOVERNMENT

COUNTY COMMISSIONER'S OFFICE,
BARINGO COUNTY,
P.O. BOX 1 - 30400
KABARNET.

REF.NO.ADM.18/2 VOL.I/108

15TH OCTOBER, 2015

TO WHOM IT MAY CONCERN:

RE: RESEARCH AUTHORIZATION

This is to confirm that **MIRIAM NTHENYA KYULE** of Egerton University has been authorized to carry out research on ***"Influence of selected factors on implementation of secondary school agriculture curriculum in arid and semi-arid lands of Kenya: Case of Baringo, Makueni and Narok Counties."*** *for a period ending* ***2nd October, 2016.***

Please accord her the necessary assistance as she undertakes her research in Baringo County.

COUNTY COMMISSIONER
BARINGO COUNTY

N. K. TONUI
For: COUNTY COMMISSIONER
BARINGO COUNTY

APPENDIX N

NAROK COUNTY DIRECTOR OF EDUCATION AUTHORIZATION LETTER

REPUBLIC OF KENYA
MINISTRY OF EDUCATION SCIENCE AND TECHNOLOGY
STATE DEPARTMENT OF EDUCATION

Telegrams: "EDUCATION", NAROK
Telephone: 020- 3532912
FAX NO. 050-22391
When replying please quote;

Ref. CDE/NRK/RES/68/VOL1/41

COUNTY DIRECTOR OF EDUCATION
NAROK COUNTY
P.O BOX 18
NAROK

DATE: 21th October, 2015

TO WHOM IT MAY CONCERN

RE: RESEARCH AUTHORIZATION –MIRIAM NTHENYA KYULE

The above mentioned is a ph.D Student of Egerton University

She has been authorized to carry out a research on **"Influence of selected factors on implementation of secondary school agriculture curriculum in arid and semi-arid lands of Kenya"** in Narok County.

Please accord her the necessary assistance.

ABDIHAMID MAALIM
COUNTY DIRECTOR OF EDUCATION
NAROK COUNTY.

C.C
- The County Commissioner – **Narok**
- Miriam Nthenya Kyule

APPENDIX O

NAROK COUNTY COMMISSIONER'S AUTHORIZATION LETTER

OFFICE OF THE PRESIDENT

MINISTRY OF INTERIOR
AND
COORDINATION OF NATIONAL GOVERNMENT

Telegram: **"COUNTY"**, Narok County
Telephone: Narok [050] 22305/22435
Email. Countycommissioner86@yahoo.com
If calling or telephoning ask for the undersigned.
When replying please quote;

County Commissioner's Office
Narok County,
P.O. Box 4 – 20500
NAROK

OUR REF: CC/NRK/15/6/vol.1/21 **22nd October, 2015**

All Deputy County Commissioners
NAROK COUNTY

RE: RESEARCH AUTHORIZATION, MIRIAM NTHENYA KYULE

The bearer of this letter is a student of Egerton University.

She has been authorized to carry out Research on ***"Influence of selected factors on implementation of secondary school agriculture curriculum in arid and semi-arid lands of Kenya, Case of Baringo, Makueni and Narok Counties".***

The purpose of this letter is to request you to accord her the necessary assistance.

M.N. MUTINDIKA (OGW)
COUNTY COMMISSIONER
NAROK

Copy to **Miriam Nthenya Kyule**

APPENDIX P

MAKUENI COUNTY COMMISSIONER'S AUTHORIZATION LETTER

THE PRESIDENCY

MINISTRY OF INTERIOR AND COORDINATION OF NATIONAL GOVERNMENT

Telegram:
Telephone:
Fax:
Email: *makuenicc@yahoo.com*

COUNTY COMMISSIONER
MAKUENI COUNTY
P.O. Box 1-90300
MAKUENI

Ref: MKN/CC/ADM.6/1 VOL.I/107

Date: 2nd November, 2015

Mirriam Nthenya Kyule
Egerton University
P.O Box 536- 20115
EGERTON

RE: RESEARCH AUTHORIZATION

Reference is made to Director General/Chief Executive Officer National Commission for Science Technology and Innovation letter **Ref:NACOSTI/P/15/8676/7458** dated **2nd October , 2015.**

You are hereby authorized to undertake research on ***"Influence of selected factors on implementation of secondary school agriculture curriculum in arid and semi- arid lands of Kenya: Case of Makueni County"*** for a period ending 2nd October, 2016.

By a copy of this letter the all Deputy County Commissioners Makueni County are requested to accord you the necessary assistance for the success of your research work.

M.N. LAIRUMBI
FOR: COUNTY COMMISSIONER
MAKUENI

Cc
All Deputy County Commissioners
MAKUENI COUNTY

County Director of Education
MAKUENI COUNTY

APPENDIX Q

MAKUENI COUNTY DIRECTOR OF EDUCATION AUTHORIZATION LETTER

REPUBLIC OF KENYA

Tel: 044-33318
FAX: @gmail.com
Email:cdemakueni@gmail.com
When replying please quote

County Director of Education Office,
P.O. Box 41,
MAKUENI.

MINISTRY OF EDUCATION

MKN/C/ED/5/33 VOL 1/97 **3/11/ 2015**

Mirriam Nthenya Kyule
Egerton University
P.O Box 43844-01000
Nairobi

TO WHOM IT MAY CONCERN

RE: RESEARCH AUTHORIZATION– MIRRIAM NTHENYA KYULE

This is to confirm to you that **Mirriam Nthenya Kyule of Egerton University** has been authorized to conduct out a research as per letter dated 2/10/2015 ref. no **NACOSTI/P/15/8676/7458** on **"influence of selected factors on implementation of secondary school agriculture curriculum in arid and semi-arid lands of Kenya: case of Makueni County for the period ending 2nd October 2016.**

You are however expected to ensure that you conduct the exercise professionally.

Kindly give her all the assistance required.

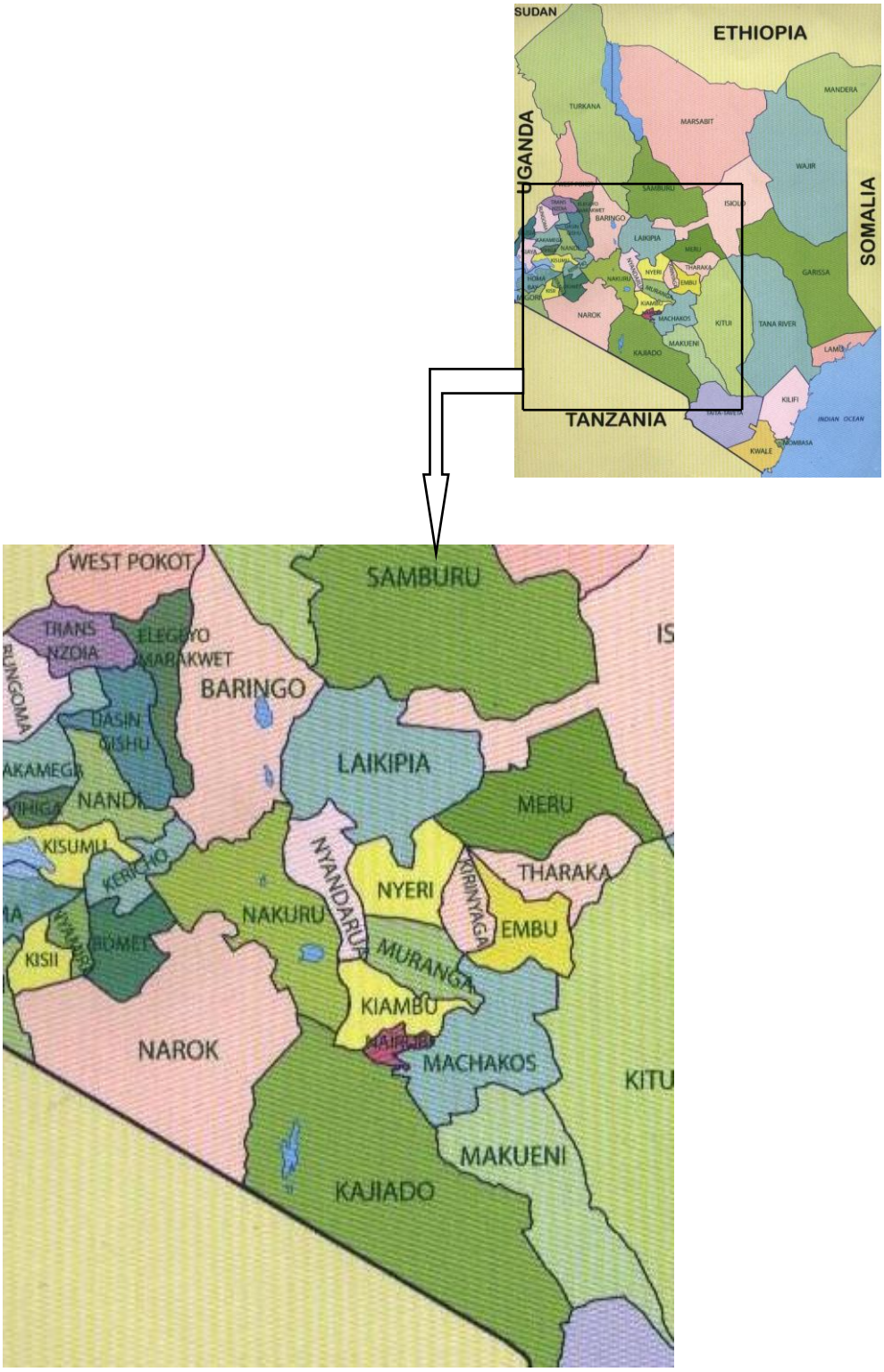
COUNTY DIRECTOR OF EDUCATION DATE: 03/11/15 P.O. BOX 41-90300 MAKUENI MAKUENI COUNTY

Kimani G.N
Ag. County Director of Education
Makueni.

ISO 9001:2008 CERTIFIED SGS

APPENDIX R

MAP OF BARINGO, MAKUENI AND NAROK COUNTIES



Source: Republic of Kenya, (2014)