International Journal of Educational Research and Technology
P-ISSN 0976-4089; E-ISSN 2277-1557
IJERT: Volume 15 [4] Decemebr 2024:06-23

Website: www.soeagra.com/ijert.html
DOI: 10.15515/ijert.0976 4089.15.4.623

Relationship between Availability Status of the School Farm Facilities and the Level of Acquisition of Agricultural Skills among Secondary School Students in Kenya

Robert Ouko Recha, Miriam Nthenya Kyule, Lydia Nkatha Kinuthia
Egerton University, Kenya
Corresponding author's Email: recharobert@gmail.com
ORCID ID: https://orcid.org/0009-0007-3652-6804

ABSTRACT
One of the objectives of teaching Agriculture at the secondary school level is to equip learners with practical agricultural skills as this is considered one of the ultimate panacea to addressing unemployment and food insecurity. The school farm is considered a necessity in the teaching and learning of Agriculture for acquisition of practical skills. This study aimed at establishing the relationship between availability status of the school farm facilities and the acquisition of agricultural skills. Correlational research design was adopted. The study targeted 1532 secondary school teachers and 4327 form three students in Malava Sub-County. The accessible population comprised of the 171 teachers of Agriculture and 2532 form three Agriculture students. Based on Nassiuma formula, 15 schools were sampled. Using the Yamane formula, 150 form three students of Agriculture were sampled. One Agriculture teacher was selected from each of the sampled school. Questionnaires and an observation guide were used to gather data. A pilot study was carried out in Khwisero Sub-County to determine the instruments' reliability where Cronbach's alpha of 0.89 and 0.72 were obtained for the agriculture teachers and students' questionnaires respectively. Reliability of the observation guide was determined qualitatively by discussing the items with expert data analysts from Egerton University. Chi-square test of relationship was used to analyse the findings of this study aided by the Statistical Package for Social Sciences (SPSS) version 26. The study established that availability status of school farm facilities does not significantly contribute to students' level of acquisition of agricultural skills. Based on the findings, the study recommended that the government of Kenya through the Ministry of Education and school managements should not only improve on availability status of the school farm facilities but also find ways of improving on other factors such as level of access, adequacy and utilization of the school farm to ensure practical teaching of Agriculture for skill acquisition.
Keywords: Agriculture Teaching, secondary school level

Received 10.09.2024 Revised 12.10.2024 Accepted 20.11.2024

CITATION OF THIS ARTICLE
Robert O R, Miriam N K, Lydia N K. Relationship between Availability Status of the School Farm Facilities and the Level of Acquisition of Agricultural Skills among Secondary School Students in Kenya. Inter. J. Edu. Res. Technol. 15[4] 2024; 06-23.

INTRODUCTION

Educational facilities according to Edokpolor and Dumbiri (2019) are the tangible assets that can easily be seen and observed in learning institutions where they contribute directly or indirectly to the teaching and learning processes by providing a conducive environment. The school farm is arguably one of the most relevant facilities in agricultural education. Machisu, Opondo, Nakhumicha and Mosi (2022) affirm that school farms provide a laboratory that enhances the quality of secondary school agricultural education. In the developed world, the concept of school agricultural farming began in the early 19th century. Christie (2016) points out that during this period, school farms were established across the United States of America, Australia and Europe with a goal of improving the quality of education through actively involving children in the learning process. Pascoe and Wyatt-Smith (2013) pointed out that in Australian schools, there are many different types of school gardens in practice which include; indigenous gardens, kitchen gardens, garden clubs, and permaculture gardens which cover a wide array of aspects of the school curriculum.

One of the long-lasting objectives that guides agricultural education in Africa is to produce appropriately prepared human resources for public and private employment in agricultural activities (Evelia, 2014;

Njeru, 2017). With the rise in unemployment, austerity and food insecurity in the wake of the 21st century, the United Nations Educational, Scientific and Cultural Organization (UNESCO, 2016) point out that there have been deliberate attempts to improve practical teaching of Agriculture at school level so as to equip learners with skills that can be replicated in the field of work. Jones et al. (2017) posit that major international funders have channelled billions of dollars in agricultural education and training systems as a means to prepare and expand contemporary agricultural workforce and to support economic growth. There has also been a change in curricula in some of the African countries aimed at accommodating Agriculture as a core subject (Jjuuko, Tukundane & Zeelan, 2019). Despite all these attempts, constraints still exist in the teaching and learning of practical Agriculture at the basic level. Chemjor (2016) for instance points out that few teachers use supervised practical lessons in the school farm and there is an inadequacy of farm tools and implements.

Teaching and learning of Agriculture in Kenyan secondary schools serves two fundamental objectives. First, the learners should develop basic principles of agricultural production relevant to Kenya in general and specifically to their own environments. Secondly, learners should be engaged in practical agricultural activities which aim at assisting them to acquire useful agricultural skills (KIE, 2006). For these objectives to be achieved, students should be involved in hands-on activities during Agriculture lessons. The school farm facility is used as a laboratory where Agriculture students can carry out their projects. With laboratory experience, the students will have an opportunity to translate what they have learned in the classroom to practical realities thus enhancing their acquisition of practical agricultural skills (Onwumere, Modebelu & Chukwuka , 2016). Over the years, the number of students enrolling for Agriculture has tremendously increased. Even after being made optional following the 2002 educational reforms, reports from the Kenya National Examination Council (KNEC, 2019) revealed that Agriculture still remains the most popular optional subject among the technical subjects among students. The table 1 below gives a summary of the national enrolment in Agriculture from the year 2017 to 2022.

Table 1: *National Agriculture Candidature in Kenya since 2017*

Year	Total Candidature	Agriculture Students
2017	611,952	247,265
2018	660, 204	278,658
2019	697,222	289,315
2020	734,350	300,878
2021	822,933	317,692
2022	877,773	327,993

Source: Kenya National Examination Council, 2022

Despite this rise in enrolment trend, majority of Kenyan youth are less engaged in agriculture something that is culminating to rampant youth unemployment, food insecurity (Sebotsa, Nkurumwa & Kyule, 2021). It is however quite absurd that according to a report from the Kenya Institute for Public Policy Research and Analysis (KIPPRA, 2017), approximately 64 percent of unemployed persons in Kenya are the youth mostly who live in the rural areas and devoid of vocational skills. It is uncertain whether these learners are taken through practical aspects of Agriculture while in school. It was therefore imperative to determine the availability status of the school farm facilities in secondary schools in Malava Sub-County, Kakamega County, Kenya.

Statement of the Problem

Education for sustainable development aims not only at enhancing literacy levels but also equipping learners with life-long skills that can help them to take a centre role in economic development. Agriculture is the mainstay of the Kenyan economy. Practical Agriculture at the secondary school level can be very important in producing competent human resource who are capable of promoting self-employment as well as participating in agricultural production value chain hence food security. The school farm serves as the main avenue through which learners can put into practical use the theoretical concepts learnt in classroom through demonstrations, experiments and projects. Since Agriculture attracts high student enrolment in Kenyan secondary schools, practical teaching of the subject through use of the school farm can provide an opportunity for learners to acquire competence-based training which emphasizes on participatory learning. To the contrary, most of the out- of- school youth lack practical agricultural skills thus tend to be less engaged in agriculture-related activities and careers. The rise in unemployment and food insecurity can be mainly attributed this, though there may be other underlying reasons. It would therefore be imperative to investigate the extent to which the school farms availability status contribute to students' acquisition of practical agricultural skills.

Objectives of the Study

I. To document the types of facilities available on the school farms in secondary schools in Malava Sub-County
II. To determine the relationship between the availability status of the school farm facilities and the acquisition of agricultural skills among secondary school Agriculture students in Malava Sub-County

Research Questions

I. What are the types of facilities available on the school farms in secondary schools in Malava Sub-County?
II. What is the relationship between the availability status of the school farm facilities and the acquisition of agricultural skills among secondary school Agriculture students in Malava Sub-County?

LITERATURE REVIEW

The School Farm Facility and Practical Teaching of Agriculture

Secondary schools need to meet the national goals of education such as provision of quality education. Wanyama (2020) posits that the criterion for determining quality should not only consider academic achievement but also factor in the adequacy and state of facilities. Facilities refer to the school plant which include the classroom, library, toilet facilities, offices, school buildings and infrastructures that would likely motivate students towards learning (Mlawa, 2018). In support of this, Ojuok, Gogo and Olel (2020) outlined that good and adequate facilities will ensure learning environment is learner friendly and will make teaching and learning enjoyable to both the teacher and the learner. Learning takes place when the learner interacts with the environment which in this case refers to the facilities (Ogweno, 2015).

The school farm is one of the most essential facilities required for the practical teaching of Agriculture. A school farm is to the Agriculture teacher and learners what a science laboratory is to a science teacher and learners (Konyango & Asienyo, 2015). Iderawumi (2020) outlined the objectives of a functional school farm to include; (i) earning income to the school through the sale of surplus produce (ii) providing students with an opportunity to put theory into practice (iii) providing farming practice to the learners (iv) improving background knowledge (v) solving individual farming problems (vi) Carrying out experimentations. School farm is one of the prerequisites for effective implementation of agricultural curriculum in secondary schools as it is here where students carry out hands-on activities that equip them with the necessary skills required in the job market (Aholi, 2018).

Iderawumi et al. (2021) defined the school farm as a selected plot of land in the school environment where students carry out practical agriculture both in crop production and animal husbandry. The concept of garden-based learning has been well embraced and is predominant as school farms are used as laboratories for hands-on learning of Science, environmental studies and other subjects. The Food and Agriculture Organization (FAO) promotes the use of school farms for experiential learning, through which education and nutrition can be improved (Machisu et al., 2022). According to Chukwudum and Ogbuehi (2013), students, especially those without agricultural background gain insightful experience by being actively involved in practical activities on the school farm thus arousing their interest and love for Agriculture. Such experiential learning provides a form of non-formal education that prepares future farmers beyond the classroom.

An ideal school farm for the teaching and learning of Agriculture should have four mandatory sections or facilities which include; demonstration plots, commercial plot, museum plots and project plots. The project plots are reserved for students' project work such as the annual KNEC projects for the form fours. Bett (2022) suggests that animal units such as rabbit, poultry, pig and dairy units should also be available for teaching where students will learn management practices of the animals. Involvement of learners in agricultural activities through project exposes them to long lasting experiences and assists them think critically enhancing learning and retention (Kyule et al., 2016). Carrying out agricultural projects such as growing of crops, rearing livestock among others can equip learners with practical farming skills they would apply to promote agricultural production. Agriculture teachers are therefore expected to focus and direct their teaching effort towards teaching methods that promote acquisition of skills, attitudes and work-related knowledge among their learners. Evelia (2014) reiterates that the school farm does not exist in isolation, but rather required to have various basic farm facilities and implements and machinery to practically demonstrate farming operations that largely enhances the learning of agricultural practices.

The teaching of agriculture should be as practical as possible if the learners are to grasp the skills that are expected of them. The farm is one of the resources that a teacher needs for establishing museum plots, demonstration plots as well as students doing agriculture projects in line with the syllabus (Waiganjo,

2021). According to Waiganjo and Waweru (2018), students engaged in farm education gain exposure to direct learning experience that equips them with farming practices pertaining to crop and livestock production. Utilization of the school farm impacts skills such as teamwork, critical thinking, problem solving, communication, cooperation among learners, which in turn enhances academic achievement. Experimental learning improves learners' quality of education through involvement in the learning process, as a result generating positive attitude towards Agriculture subject. A study by Onwumere et al. (2016) on the influence of school farms on the teaching of agricultural sciences established that the farms have positive influence on teaching of the subject, since Agriculture teachers have high regard for the farms in the first place. Research findings from Njura et al. (2020) showed an increased level of cognitive and affective components of learning through the inclusion of instructional hands-on activities on school farms in comparison to control group participants without hands-on experience.

Well-designed school farm curricula ensure that students are given the opportunity to flex their entrepreneurial prowess through practical exercise. Agribusiness is on the rise from preparation of fields to planting to marketing and processing of agricultural products. School farms serves as the platform for students to gain the ability to independently manage and control farm affairs which is a basic attribute of entrepreneurs. School farms provide students with supervised occupational experience in agricultural productivity as well as encouraging record keeping among students which tends to prepare students for agriculture-related occupations (Aholi, 2018).

The UNESCO (2012) report indicated that lack of financial resources hindered the expansion of facilities which led to specific problems in vocational subjects like Agricultural Science. In some incidences, the courses apparently are largely limited to theoretical classroom presentation because of lack of farmland. Those that have farmland also mostly experience shortage of simple farm tools, irrigation equipment and consumables such as fertilizers. All these require a lot of funds, without which it is not possible to build sound attitudes to farming since the practical aspect cannot be provided. Iderawumi et al. (2021) posit that Agriculture as a practical subject requires facilities like land, equipment and a well-equipped laboratory. These facilities demand a lot of funds which many schools are not able to afford, hence making it difficult for such schools to undertake the needed practical work in Agriculture. It is essential for students to learn and practice skills in a good quality school farm. However, in most cases this is not possible because the schools do not have good quality farms due to inadequate funds.

Developed nations such as Finland and the USA have placed more emphasis on practical teaching of Agriculture by making use of the school farm so as to maximise on the connection between agricultural practice and education (Muthomi, 2017). Educators originally utilized gardens at school sites in the USA to mitigate the perceived negative effects of urban life on their students as well as provide an opportunity to connect youth to nature and improve their physical health since the early 1890s (Gardens et al. 2017 and Cairns, 2017). Diaz et al. (2018) attenuate that school garden programs continue to grow across the USA with much national support and attention and are becoming aligned with newly designed garden curricula as these curricula emerge in schools, districts and state education departments. Duncan et al. (2016) points out that garden curricula primarily targets elementary level students because of the ease of blending school standards and science curriculum. In Finland, schools use school farms so as to make learning of Agriculture real and authentic with the objective of preparing students for careers in agriculture (Rissanen et al., 2019). Enthusiasm for school gardening in high income countries has spurred their promotion in low-income countries by foreign donors and non-governmental organizations (FAO, 2015). Generally in African countries, school agricultural farms have now become regular features and are included in national education policies and wide-scale school garden classes. However, Schreinemachers et al. (2019) observed that the promotion of school gardening in low-income countries has happened in the absence of rigorous evidence for impact. In Nigeria for instance, research findings from Lawal et al. (2014) indicated that some secondary schools did not have school farms where the students could be taught how to acquire relevant entrepreneurial and saleable skills in the practical aspects of the subject. The frequent use of the school farm as a punishment ground for offenders in most schools makes students to associate it with punishment rather than perceive it as a facility for teaching and learning practical agriculture for skill acquisition (Chukwudum & Ogbuehi, 2013 and Okiror et al., 2017).

School farming is not new in Kenya, particularly in the rural areas where it dates back to the colonial period. Farming, especially in the rural primary schools, was promoted by the government through the so-called 4-K clubs, an acronym for Kuungana, Kufanya na Kusaidia Kenya, which means "get together, act and help Kenya". The major goals of the programme were: (1) to teach the youth improved methods of agriculture; (2) to teach the youth to appreciate agriculture and the dignity of labour with respect for agriculture as a profession; (3) to help the youth produce food for their families and to sell; (4) to develop leadership skills among the youth and adults through voluntary participation in agricultural programmes; and (5) to change

adult farmers' attitudes and practices (Foekan & Owuor, 2017). The scholars further attest that this practice has become one of the ways schools respond to increases in food prices, reduced government subsidies while at the same time maintaining affordable school fees for parents.

The Chavakali pilot project of 1960 proved to be the pinnacle for practical agriculture in Kenyan secondary schools (Maxwell, 1965). Documentary evidence from (GoK, 1970) shows that it was a policy for each school offering vocational agriculture to have at least 2 hectares parcel of land for not only practical farming activities but also for purposes of promoting enthusiasm and a willingness to learn by doing among students. This was also a way of relating vocation agricultural course to the entire school program; to the development of the region and the country and to the life and future of the students.

In 1976, the Gachathi Report recommended several policies to enhance the quality and effectiveness of secondary school Agriculture curriculum implementation(Government of Kenya, 1976). It had strong recommendations in support of Agriculture in schools. In addition, to create continuity between secondary school Agriculture and the University, a panel was constituted to draw up an 'A' level Agriculture syllabus. The school farm being a crucial teaching resource facilitating implementation of practical agriculture, the Ministry of Education (MoE) circulated a policy document on the management of the school farms (Kyule et al., 2018). The scholars further point out that the school farm management policy emphasized 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 play a role in enhancing acquisition of practical agricultural skills for self-sustainability upon graduation. Despite the prospects and opportunities in practical Agriculture, Konyango and Mutisya, (2017) affirm that the trend as at now, agriculture is taught in nearly all schools both rural and urban schools in high rise buildings. This completely violates the vision of school agriculture.

Research findings from Manyasi, (2019) established that farmers who studied Agriculture as a subject at the secondary school level tend to have higher farm productivity in terms of yields obtained in comparison to their counterparts who never studied Agriculture at the secondary school level. Study of Agriculture for skill acquisition demands the use of the school farm for extensive project work. This study aimed at establishing the relationship between the availability status of the school farm facilities and the acquisition of practical farming skills among secondary school students in Malava Sub-County, Kakamega County, Kenya.

RESEARCH METHODOLOGY

Research Design

Correlational research design was adopted for this study. This research design involves collecting data on several variables for each individual in a sample without manipulation and working out the correlation coefficient. The purpose of correlational studies is to reveal relationships between naturally occurring variables through the use of correlational statistics. Edmonds and Kennedy (2016) pointed out that this research design is useful in studying problems in education since it permits the study of relationships between many variables simultaneously. This design not only enables a researcher to analyse the relationship between several variables in a single study but also shows the degree and direction of the relationship between the variables under study (Cohen, Manion & Morrison, 2018; Curtis, Comiskey & Orla, 2016). This research design was therefore deemed appropriate for this study since it enabled the researcher to establish how the availability status of various school farm facilities correlate with acquisition of practical agricultural skills among the form three students of Agriculture.

Location of the Study

The study was undertaken in secondary schools in Malava Sub-County, Kakamega County.The Sub-County covers an area of about 427.40 Km^2 of which 391.00 Km^2 is arable land. Geographically, the area lies at latitude 0^0 26'N and longitude 34^0 5"E. The Sub-County comprises of seven wards which include; Butali-Chegulo, East Kabras, South Kabras, Manda Shivanga, Shirugu-Mugai, Chimuche and West Kabras. The Sub-County had a total population of 280,132 based on the 2019 census (Kenya National Bureau of Statistics, 2020). The average annual rainfall ranges from 1300mm to 1900mm per year. Eighty percent (80%) of the population in the Sub-County primarily depends on agriculture for survival. The poverty levels are still significant due to farmers' ignorance, traditions and cultures which tends to lower adoption rates of modern farming technologies (Kinyangi, 2014). There are two sugar factories in the Sub-County which are Butali Sugar Company located in Butali- Chegulo ward and West Kenya Sugar Company located in East Kabras ward. Apart from sugarcane farming, the soils and climatic conditions favour growing of other crops such as maize, sweet potatoes, cassava on a subsistence basis. (Akenga, Ali, Anam & Walyambillah, 2014). Poultry keeping, dairy and beef farming are also common on a small-scale basis. This study area was

selected since besides agriculture being the main economic activity in the area, all secondary schools offer Agriculture and the enrolment trend in the subject has been on the rise over the past years.

Target Population

Target population refers to the population to which the researcher wishes to generalize the findings of a study while accessible population refers to the portion of the target population that the researcher can access (Matula, Kyalo, Mulwa & Gichuhi, 2018). The target population for this study consisted of the 1532 secondary school teachers and 4327form three students from the 50 secondary schools in the Sub- County (Malava Sub-County Education Office, 2019).The accessible population comprised of 171 teachers of Agriculture and 2532 form three Agriculture students. Secondary schools were targeted because it is at this level that Agriculture is taught as an independent subject and therefore the use of the school farm facility for acquisition of practical farming skills is crucial. Agriculture teachers were targeted for this study because they have in-depth knowledge on all aspects of Agriculture subject, including the school farm facilities that contribute to practical teaching of the subject. Form three agriculture students were selected because they have already done subject selection and have also covered a considerable number of practical topics in Agriculture and therefore have interacted much more with the various facilities on the school farm.

Sample Size and Sampling Procedure

The school was the sampling unit. There are 50 public secondary schools in Malava Sub-County. In determining the number of schools to participate in this study, the formula recommended by Nassiuma, (2000) was used. Based on this formula, 15 schools were sampled.

$$n=\frac{NC^2}{C^2+(N-1)e^2}$$

Where

n= required sample size (number of schools)
N= total population (50**)**
C= coefficient of variation (0.2)
e= margin error (0.05)

$$n=\frac{50\times0.2^2}{0.2^2+(50-1)0.05^2}$$

n=15

The schools were then put into their respective categories which include; National, Extra-County, County and Sub-County categories. Based on data from the Malava Sub-County Education Office (2019), there are 5 Extra-County, 13 County and 32-Sub-County schools. The Sub-County does not have any National school. The proportional sampling formula by Salkind (2014) determined the number of schools required from each category to participate in this study.

$$n_h= n\frac{N_h}{N}$$

Where;

n_h=Number of schools required from each school category
n= The required number of schools (15)
N_h= Total number of schools belonging to a particular school category
N= Total number of schools (50)

Based on this formula, 9 Sub-County, 4 County and 2 Extra-County schools were sampled. This ensured equal representation of all categories of schools so as to avoid bias. The school category was taken as the strata with an intention of finding out whether it has any moderating effect on the relationship between the dependent and independent variables.

To determine the sample size of students to participate in this study, the formula by Yamane (1967) was used as follows.

$$n=\frac{N}{1+N(e^2)}$$

Where;

n= The required sample size
N= Population size (4327 form three students)
Allowable error= (0.08)

$$n=\frac{4327}{1+4327(0.08^2)}$$

n= 150

Mugenda and Mugenda (2003) recommend the sample size to be increased by at least 10 percent to take care of non-response. Based on this recommendation, there was an additional 15 form three Agriculture students. Therefore, a total of 165 form three Agriculture students from the 15 schools were sampled in this study. The total number of form three Agriculture students from each of the sampled schools was first be determined. Proportionate sampling was then be used such that the school with the highest number of form three students taking Agriculture will contribute the highest number in the sample size.

One Agriculture teacher was purposively selected from each of the 15 sampled schools. In schools with more than two teachers of Agriculture, the teacher with more years of experience was selected to participate in the study. The teacher with more experience in teaching Agriculture was selected due to the vast experience in the organization and utilization of the school farm. This gave a total of 180 respondents.

Table 2 *: Sample Distribution by School Category*

School category	Number of schools	Number of schools to be sampled	Number of students to be sampled	Number of teachers to be sampled
Extra-County	5	2	22	2
County	13	4	44	4
Sub-County	32	9	99	9
Total	50	15	165	15

Source: (Malava Sub-County Education Office, 2019)

RESULTS AND DISCUSSION

The first objective of the study was to document the types of facilities available on the school farms in secondary schools in Malava Sub-County. This was done by assessing the physical presence of the various sections on the school farm such as the project plots, commercial plot, demonstration plots, museum plots and farm structures which are all considered vital in the practical implementation of Agriculture subject.

The respondents were asked to indicate whether their respective schools had the school farm facility. Table 3 shows the students' and teachers' responses on the availability of the school farm.

Table 3: *Availability of the School Farm*

		Students n=165			**Teachers n=15**		
School farm available		**Response in frequencies and percentages**					
		Teachers' response			**Students' response**		
		Yes	**No**	**Total**	**Yes**	**No**	**Total**
	Freq	15	0	15	165	0	165
	%	100	0	100	100	0	100

The results from both the students and teachers showed that all the sampled schools had a school farm and therefore this means that practical implementation of Agriculture is feasible in all these schools. These findings however contradict those from Evelia (2014) which revealed that some public secondary schools in Masaba North Sub-County completely lacked a school farm due to a combination of administrative, environmental or economic factors. The teachers of Agriculture were perceived to be having a better understanding on the type of tenure system under which the school farm operated. They were therefore asked to indicate the type of tenure system under which the school farm operated. Figure 1 shows the responses.

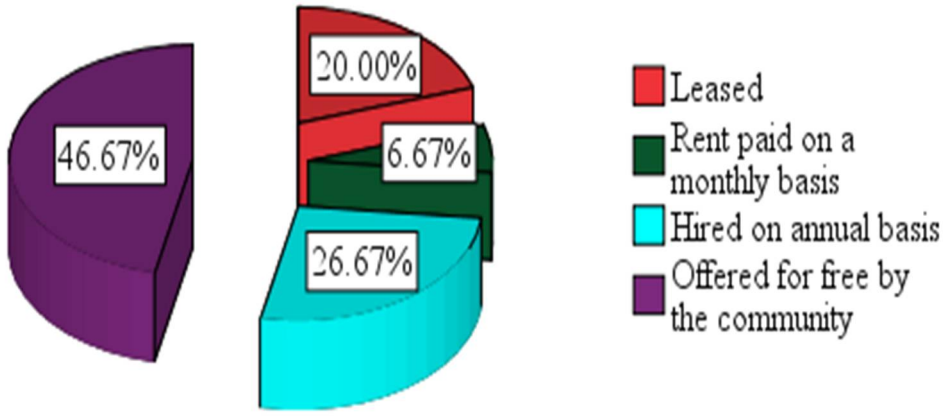

Figure1: *Tenure under which the School Farm Operates*

It was evident that most school farms (46.67%) have been offered for free by the community. In such a way, the surrounding community plays a fundamental role in the implementation of practical Agriculture. Apart from offering the farm to schools, a study by Okon (2016) established that a sound relationship between the neighbouring community and the school promotes the practical teaching of Agriculture using the school farm in other ways such as offering of labour to the school farm, provision of farm implements and providing security to the projects on the school farm especially when schools close for holidays.

Management of the school farm greatly determines the extent to which it is made available for instructional purposes. The teachers of Agriculture were therefore asked to indicate who manages the school farm. Figure 2 summarises the responses.

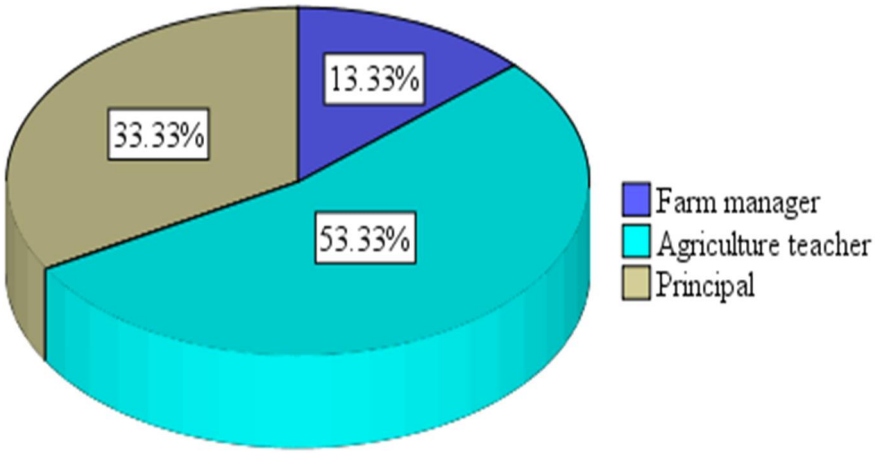

Figure2: *Management of the School Farm*

Majority of the school farms (53.33%) are under the management of the teachers of Agriculture. Apart from curriculum implementation which mainly involves the application of pedagogical skills, teachers of Agriculture are trained on various aspects of farm management. Their training bequeaths them with sufficient skills and knowledge in some other agricultural sectors like agribusiness management, agronomy, veterinary medicine, agronomy and many more (Mwikali, 2018). Teachers of Agriculture as the curriculum implementers understand the importance of practical Agriculture and therefore, being in charge of the management of most school farms in Malava Sub-County should translate to better utilization and more student access with the aim of ensuring skill acquisition among students.

To determine the various types of facilities present on the school farms, both sets of respondents were asked to tick against the various facilities that were on their school farms. The response are summarised in table 4.

Table 4: *Facilities on the School Farm*

Students n=165 **Teachers n=15**

Facility		Response in frequencies and percentages					
		Teachers' response			Students' response		
		Yes	No	Total	Yes	No	Total
Museum plots	Freq	3	12	15	23	142	165
	%	20	80	100	13.9	86.1	100
Project plots	Freq	15	0	15	165	0	165
	%	100	0	100	100	0	100
Commercial farm	Freq	9	6	15	104	61	165
	%	60	40	100	63	37	100
Demonstration plots	Freq	8	7	15	66	99	165
	%	53.33	46.67	100	40	60	100
Farm structures	Freq	9	6	15	78	87	165
	%	60	40	100	47.3	52.7	100

A functional school farm should have various facilities such as demonstration plots, project plots, museum plots, farm structures and the commercial farm (KIE, 2006). These sections play a crucial role in the implementation of practical Agriculture and therefore a school farm without these sections cannot be effectively utilized in the implementation of practical aspects of Agriculture. Agro-ecological requirements in terms of aspects such as rainfall, altitude, temperature and soil vary among various types and varieties of crops as it dictates various aspects of crop production such as growth rate, quality and quantity of produce, disease infection and pest infestation (Recha, 2018). Crops such as tea and coffee for instance thrive best under high altitude of range between 1400-2000 metres above sea level, cool temperatures of 18-22 degrees Celcius and well distributed rainfall ranging between 1000-1500 millimetres per year (FAO, 2017). On the other hand, crops such as cotton, finger millet, sorghum, sisal and some drought tolerant varieties of maize such as Katumani thrive best in low altitudes of below 500 metres above sea level and low rainfall below 250 millimetres per annum (Radeny, Rao, Ogada, Recha & Dawit, 2022). The secondary school Agriculture curriculum recommends agronomic practices on various ecologically diverse crops. Museum plot is a section on the school farm where exotic varieties of crops that have been discussed in the Agriculture syllabus are grown.

The climatic and edaphic conditions in Malava Sub-County do not favour the growth of high altitude and low altitude crops some of crops some of which have been extensively discussed in the Agriculture syllabus. Crop museums in secondary schools in Malava Sub-County should have high altitude crops such as coffee and tea as well as the low altitude crops such as millet. This section should therefore be of vital relevance in the implementation of practical aspects of Agriculture in secondary schools in Malava Sub-County in a number of ways such as; (i) Enable the learners to understand the impacts of climate variability on various aspects of crop production such as pest infestation, disease infection, growth rate and general productivity (ii) Enable students physically interact and carry out agronomic practices on exotic crops that are not common in their locality (iii) Enable teachers and learners appreciate the ecological diversity of Kenya with respect to crop production.

Though these crops, may face various challenges emanating from environmental stress such as high incidences of disease infection, pest infestation and stunted growth, their presence on the school farm is necessary as far as agronomical skill acquisition is concerned. With majority of the respondents (86.1% of the students and 80% of teachers) reporting the absence of a crop museum paints a gloomy picture as far as acquisition of agronomical skills in exotic crops is concerned. These findings resonate with those from Konyango and Mutisya (2017) which established that under the 8-4-4 system, Agriculture is being offered in high-rise buildings with less emphasis on the school farm and its associated facilities such as museum plots which hinders the achievement of the objective of teaching secondary school Agriculture for skill acquisition.

Concerning the availability of demonstration plots, responses from the teachers slightly contradicted those from the students as eight teachers (53.33%) reported that the facility exists on their school farms while majority of the students (60%) reported of the non-existence of this section. Affirmation from the observation guide revealed that eight schools had demonstration plots as indicated by the teachers. The difference in opinion between the two sets of respondents can be attributed to the fact that the section is hardly put into use and therefore students in some of the schools were unaware of its existence. During the

Chavakali pilot project, agriculture was meant to be vocational and therefore, the school farm had well maintained demonstration plots where students were guided on how to carry out various agronomic practices with the aim of replicating these skills back at their home farms (Saeturn, 2017). The absence of demonstration plots on some of the school farms is a reflection of the loss of focus that agriculture curriculum implementation has taken from its practical and vocational ideal to theoretical implementation Regarding the availability of farm structures on the school farm, majority of the students (52.7%) reported that the facility does not exist on their school farms while 47.3% agreed that the facility exists on their school farms. This contradicts the results from the teachers as majority of the teachers (60%) indicated the existence of the facility with 40% indicating the non-existence of the facility. Based on the observation guide, farm structures existed in majority of the schools (60%) but had been left in a state of disuse and therefore the learners never knew of their existence. This reflects findings from Kyule (2017) in Baringo, Makueni and Narok Counties which established that due to too much focus on theoretical Agriculture, vital facilities for implementation of practical Agriculture such as the workshop had been had been converted to a store for broken furniture and therefore the leaners never knew of its existence and purpose in relation to teaching and learning of Agriculture.

Project plots were available in all the schools. This could be explained by the fact that the Kenya National Examinations Council (KNEC) requires each school offering Agriculture to allocate project plots to students at form four for carrying out projects specified by the KNEC as part of their Kenya Certificate of Secondary Education (KCSE) exam. Majority of the students (63%) reported that their school farms had the commercial farm. Affirmations from the teachers were in line with that from the students as nine teachers (60%) agreed to the existence of the commercial section. This is quite surprising since some sections that are deemed vital for the implementation of practical agriculture such as museum plots lack in most of these school farms. These findings conform to those from Waiganjo (2021) in Nakuru County which established that school principals perceive the school farm as an income generating unit and therefore tend to commercialize a larger portion of the school farm. To safeguard the commercial farm, students' access to the school farm may be partially or completely restricted to minimize on incidences like theft and vandalization of the commercialized crops and livestock which violates the objective of teaching Agriculture for skill acquisition in secondary schools.

In order to determine the specific crops found on the museum plots, the 23 students whose schools had museum plots were asked to indicate the various crops found on the section. Figure 3 presents a summary of the findings from the students.

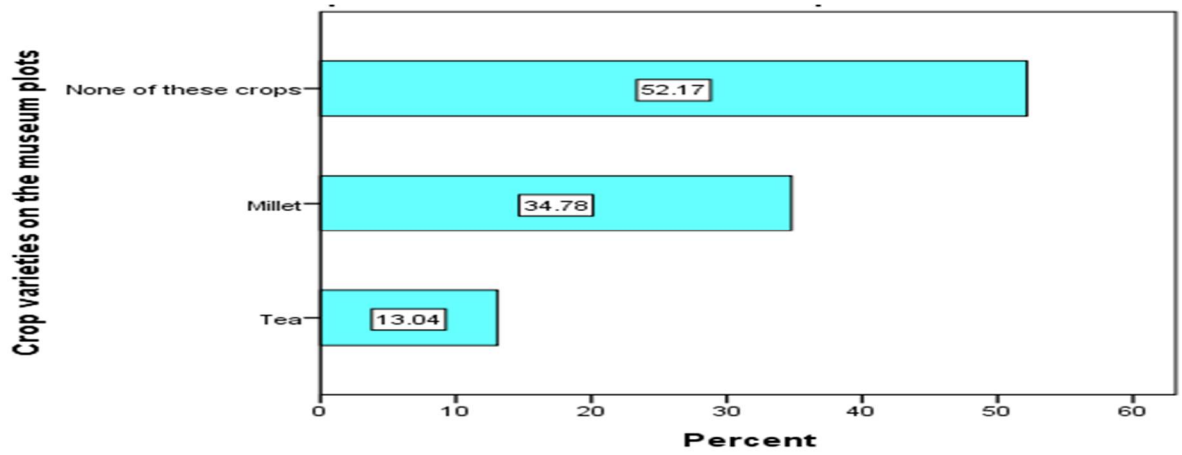

Figure 3: *Crop Varieties on the Museum Plots*

From the results, it was evident that millet was the most widely cultivated crop on the crop museum section while tea was the least cultivated crop. The cultivation of millet has been discussed in the form three Agriculture syllabus under the topic of field crops. Millet is considered as a drought tolerant crop thus suitable for the arid and semi-arid areas. Considering the fact that over 80% of Kenya is considered to be arid and semi-arid, Kyule and Konyango (2019) recommended that equipping students with practical agronomic skills on drought tolerant crops such as millet can significantly contribute to the exploitation of these areas which can help to boost food security. However, majority of the respondents (52.17%) reported that none of these crops existed on their museum plots. This denotes that though some schools had reserved land for the purpose of establishing museum plots, Agriculture teachers in these schools made no deliberate attempts to establish the exotic crops discussed in the syllabus such as coffee and tea This has an implication that students in these schools have no exposure to the practical agronomic practices carried

out on these crops. Based on the observation guide, some of the museum plots had crops that have not been discussed in the secondary school Agriculture syllabus such as groundnuts, Irish potatoes, soya beans and sunflowers. By virtue of not having been discussed in the syllabus, it was obvious that these crops were being cultivated for other purposes other than teaching and learning of Agriculture.

According to FAO (2017), coffee and tea are very crucial for the economic growth of Kenya in terms of foreign exchange and job creation. Cotton is also being touted as a potential high value crop in the near-future as the Kenyan government is envisaging on how to re-stabilize the textile industries such as Kikomi and Rivatex (GoK, 2015). It is therefore worthy equipping students with the agronomic skills on such crops in preparation for the job market as well as pursuing courses such as agronomy at the university or college level. These findings however are contrary and could possibly be one of the reasons behind the youth, including those who studied Agriculture at secondary school being devoid of practical farming skills.

In order to determine the specific types of structures and buildings found on the school farm, the respondents (Nine teachers and 78 students) who had indicated that their school farms had buildings and structures were asked to specify. The summary of the results are presented in table 5.

Table 5*: Structures and Buildings Found on the School Farm*

Students n=78 Teachers n=9

Structures and buildings		**Response in frequencies and percentages**					
		Teachers' response			**Students' response**		
		Yes	**No**	**Total**	**Yes**	**No**	**Total**
Dwelling houses for farm workers	Freq	3	6	9	23	55	78
	%	33.3	66.7	100	29.5	70.5	100
Storage structures	Freq	8	1	9	78	0	78
	%	88.9	11.1	100	100	0	100
Sheds for equipment and machinery	Freq	1	8	9	12	66	78
	%	11.1	88.9	100	15.4	84.6	100
Workshops	Freq	5	4	9	33	45	78
	%	55.6	44.4	100	42.3	57.7	100
Livestock structures	Freq	9	0	9	78	0	78
	%	100	0	100	100	0	100

From the results, it was evident that Sheds for equipment and machinery were absent on most school farms as reported by 84.6% of the students and 88.9% of the teachers. The teaching of practical Agriculture for skill acquisition demands the use of an array of farm machinery and equipment (KIE, 2006). The practical implementation of the topic on farm power and machinery demands the learners to actively interact with farm machinery and implements such as the tractor, tractor drawn implements such as the trailer, mould-board ploughs and disc ploughs. A spacious shed should serve as a storage site for these implements as well as provide a conducive environment outside the classroom where the Agriculture students interact with these implements and machinery during the Agriculture lessons. The absence of sheds is an indicator of the non-existence of farm implements and machinery. This seems to contradict the objective of teaching Agriculture for skill acquisition.

Reports on the availability of the workshop facility among the students seemed to contradict that of the teachers as majority of the teachers (55.6%) indicated that the facility existed on their school farms while majority of the students (57.7%) reported that the facility did not exist on their school farms. The differences among the teachers' and students' opinion regarding the availability of the workshops in the sampled schools can be attributed to the use of the facility for other purposes other than the teaching and learning of Agriculture. From the researcher's observation guide, it was evident that the workshop in one of the sampled schools had been converted into a store thus the learners were unaware of its existence in the school. These findings conform to those by Kyule (2017) in Makueni, Narok and Baringo counties which established that workshops have been converted into stores for accommodating broken furniture as a result of emphasis on academic excellence. 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). The workshop serves as a store for farm tools and equipment which are fundamental for the operation of the school farm.

In order to establish the type of livestock structures found on the school farms, the 78 student respondents who had indicated that their school farms had livestock structures were asked to indicate the specific ones that existed on their school farms. The results are indicated in figure 4.

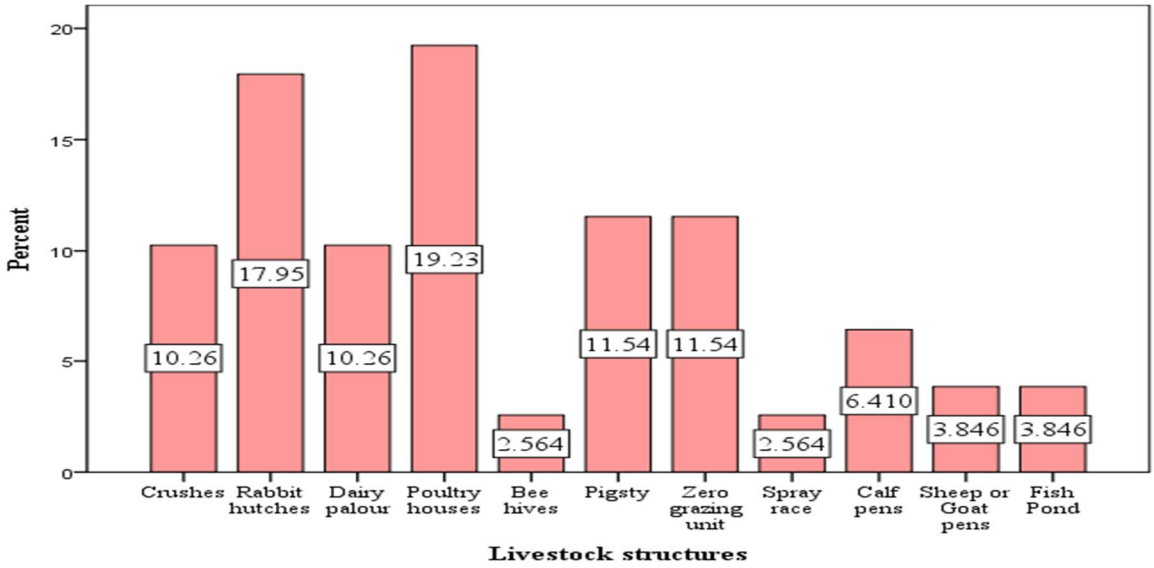

Figure 4: *Livestock Structures on the School Farm*

Poultry houses and rabbit hutches were reported to be the most common livestock structures. Past studies on poultry and rabbit farming indicated that both the two enterprises have one similarity in that they require relatively less space to set up in comparison to other enterprises in livestock production (Mutsami, 2018; and Afodu et al. 2022). The 100% transition policy, Free Day Secondary Education (FDSE) and the general rise in human population have resulted to very high enrolment in schools and consequently, the need to set up extra classrooms as well as other physical buildings such as laboratories, lavatories and dormitories. Mlawa (2018) pointed out that this has led to the encroachment of space that had been reserved for other purposes such as playgrounds and school farms. Due to space limitation, teachers of Agriculture tend to opt for setting up farm structures that require limited space. The absence of structures such as fishponds, beehives and spray races can be attributed to their large space requirement. Bee hives for instance should be sited far from the school compound to minimize on accidents and for this reason, schools with limited space cannot be in a position to have them.

Practical lessons on livestock routine management practices such as dehorning, hoof trimming, vaccination, identification, ear-notching and drug administration can only take place when the livestock under study are confined which demands the use of farm structures. Besides housing livestock, the topic on farm structures has been discussed in the form three Agriculture syllabus. According to the KIE (2006), the topic has five objectives which are to enable the learner to; describe parts of a building, identify materials for construction, describe various farm structures and their uses, describe siting of various structures and construct and maintain farm structures. For these stated objectives to be achieved, students must have maximum exposure to these structures. Despite the paradigm shift to Competence Based Education, much still has to be done to improve on the availability status of farm structures in secondary schools in anticipation for the implementation of Competence Based Agriculture since according to Ndambuki, Recha and Karani (2024), the first cohort of students from the Junior Secondary level which is currently being hosted in primary schools will join the Senior Secondary level.

Competence Based Agriculture currently being offered under the 2-6-3-3-3 education system is anticipated to take a more practical approach towards the teaching and learning of Agriculture. At the junior secondary school level, the subject is considered as being core and according to Ngunyu (2023), by the end of grade 8, the agricultural skills acquired should enable the learner to grow crops and rear animals as profitable agriculture enterprises through sustainable and ethical practices for self-reliance and economic development. The topic on livestock production has been extensively covered in grades 7 and 8 with various recommended routine management activities which calls for the availability and use of various farm structures. With some schools having adequate space to set up livestock structures while others having limited space, sustainability in the teaching and learning of practical agriculture for skill acquisition can only be achieved by sharing of resources among schools whereby students from schools without these structures can be taken to those schools with the structures during Agriculture lessons.

In addition to the livestock structures, the respondents were asked to indicate the types of storage structures available on their school farms. Figure 5

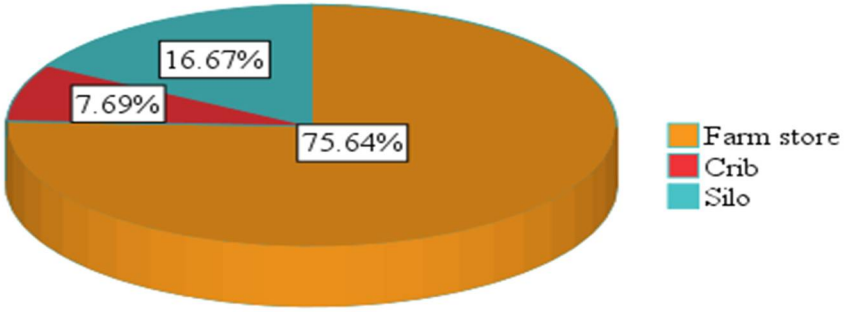

Figure 5: *Post-Harvest Structures found on the School Farm*

According to the FAO (2019) report on the state of food security and nutrition in the world, post- harvest losses were reported be among the key factors hindering the achievement of food security globally. In Sub-Saharan Africa, qualitative and quantitative post-harvest losses in grains alone were estimated to deny the farmers approximately 1.6 billion US dollars annually (Olorunfemi & Kayode, 2021). The Gok (2015) report on agricultural productivity revealed that through post-harvest losses, Kenyan farmers lose approximately over half a million dollars annually. Grains such as maize as well as perishable produce such as vegetables and fruits require good and timely post-harvest practices prior to storage to retain their quality as Gathambiri, Owino, Imathiu and Mbaka (2021), attribute the perishability to the high levels of moisture content at the time of harvesting. This calls for proper post-harvest handling prior to storage.

Despite maize being the staple food for majority of Kenyans, a study by Asige and Omuse (2022) revealed that poor post-harvest handling of the crop as a result of limited technical know-how among farmers on post-harvest practices leads to rotting of grains as well as high incidences of aflatoxin which not only leads to economic losses to the farmers but also poses greater health risk to the consumers. Practical skills and in-depth knowledge on modern cost-effective post-harvest technologies could help smallholder farmers tackle postharvest losses which could in turn boost on food security and steer African nations; Kenya inclusive into middle-income economies (Koskei, Bii, Musotsi & Muturi, 2020).

One of the characteristics of an effective curriculum is the ability to incorporate new emerging technologies that are relevant to the current societal needs and for this reason, Namwambah (2020) advocates for dynamism in curricula to help in churning out a skilful workforce capable of spurring societal development. Storage technology has undergone transformative changes over time due to various dynamics affecting productivity such as climate change, commercialization, mechanization and technological advancement (Gathambiri et al., 2021). For this reason, Olorunfemi and Kayode (2021) argue that traditional storage structures such as granaries which have major limitations such as being prone to pest attack and theft, permit rotting of grains and limited in size are considered obsolete and unfit for modern farming. A study by Fufa et al. (2021) recommended modern storage structures such as Purdue Improved Cowpea Storage (PICS) bags, hermetic containers, plastic bins, volcanic bins, metal silos and zero energy cool chamber (ZECC).

The topic on Field Practices which is the fourth topic in the form two Agriculture syllabus aims at exposing the learner to post-harvest practices. According to the form two course book authored by Kahuria, Otieno, Wachira, Muggah and Njagi, (2018), the topic theoretically introduces the learner to the various forms of post-harvest practices namely; threshing, drying, cleaning, packing, dusting, sorting and grading without any suggested learning activities requiring the teacher to practically guide the learner through these post-harvest practices. Furthermore, very scanty information with only a few diagrammatic illustrations have been provided regarding granaries which are considered an obsolete form of storage technology. Failure of the secondary Agriculture curriculum to incorporate modern storage technologies with majority of the respondents (75.64%) reporting of having the traditional farm stores adduces the fact that the agricultural skills pertaining to post-harvest practices imparted into the learners is quite obsolete thus irrelevant to the current societal needs.

The topic on Forage Crops at form Three introduces the learners to the establishment, management, conservation and utilisation of various forage crops. With land becoming scarce coupled with climate change which have resulted to shortage of natural pastures, sustainability of the livestock sector rests entirely on the adoption of modern fodder conservation techniques among farmers (Mukasa et al., 2017). Silage making is one of the methods of conserving forage crops whereby silos are used in the storage of silage. However, with only 16.67% of the student respondents having silos on their school farms, it was evident that majority have not been practically exposed to the silage making process within the school farm.

Competence Based Agriculture being offered under the CBE takes a more practical approach towards the teaching of post-harvest practices. At grade eight, the topic has been extensively covered with much emphasis on simpler post-harvest structures such as wooden crates, cartons, baskets, sisal bags, jute bags and mesh bags. It is worth noting that most of these storage structures are cost-effective, require limited space, portable, reusable and can be easily made by the students under the guidance of the teacher. This therefore places students in those schools without post-harvest facilities on the school farms in a better position to acquire hands-on skills in post-harvest practices.

To determine the relationship between availability status of the school farm facilities and the level of acquisition of agricultural skills, chi-square test for independence was used. The summary is presented in table 6.

Table 6*: Availability of the School Farm and Level of Acquisition of Agricultural Skills Chi-Square Test*

Scale	Value	Df	p-value
Pearson Chi-Square	8.750	8	.634
N	165		

The chi-square test results reveal that the relationship between availability status of the school farm and level of acquisition of agricultural skills is not statistically significant at .05 level of significance since p>.05. This implies that the mere availability of the school farm facilities does not guarantee agricultural skill acquisition among the students. These findings resonate with those from Dhakal (2017) which established that skills are acquired from experiential learning which can only be achieved when the learners actively interact with resources and facilities.

The dependent variable (level of acquisition of agricultural skills) was measured by assessing the status of projects and demonstrations on the school farm in crop and livestock production. Considering the fact that agricultural skills can be acquired from other sources such as engaging in farming at home as well as field trips to agricultural farms, the researcher considered it imperative to assess the status of projects and demonstrations initiated by the learners on the school farm and use it as the indicator for the dependent variable. Assessing the status of these practical activities would enable the researcher to decipher specifically the level of skills the learners have acquired from exposure to the school farm.

The researcher made use of the observation guide to assess the status of the projects and demonstrations on the school farm. For practical activities on livestock production, the assessment majored on such factors like the cleanliness of the livestock structures, external parasite control, identification practices, hoof trimming and dehorning in cattle, sheep and goats. For crop related projects and demonstrations the extent to which field practices such as weeding, pest control, disease control, pruning, soil and water conservation and spacing were used as the basis of assessment. A Likert scale of five points was used. The Cronbach's Alpha for the four areas of under consideration was 0.71 which is slightly above the recommended 0.71 for social sciences hence it was deemed suitable for use. The results were summarized in table 7.

Table 7: *Status of Projects and Demonstrations on the School Farm*

Status of	N	Minimum	Maximum	Mean	Std. Deviation
Projects in Crop production	15	1.00	3.00	1.867	.7432
Projects in Livestock production	15	1.00	3.00	2.000	.8452
Demonstrations in Crop production	15	1.00	3.00	1.933	.8837
Demonstrations in Livestock production	15	1.00	4.00	2.400	1.1212

The researcher developed a scale for rating the status of the projects and demonstrations on the school farms. Any item that scored a mean of between 1-1.5 was categorized as very poor, 1.6-2.4 as poor, 2.5-3.3 as average, 3.4-4.2 as good and 4.3-5.0 as very good. The mean status level for all the areas was poor at 2.05. During the observations, the researcher encountered projects and demonstrations that were not properly maintained in most of the schools. Weed, disease and pest infestation were very common for the projects and demonstrations in crop production while in animal production, dirty and leaking livestock structures were common in most schools. This clearly reflected the low level of access and utilization. The practical activities in livestock production had a slightly higher mean than those on crop production. This can be attributed to the fact that carrying out management practices on some livestock species such as rabbits demands less time in comparison to crop production. Furthermore, livestock are less affected by short-term weather conditions such as hailstones, heavy rains and strong winds which can have devastating effects on crops.

According to Kyule (2017), school agriculture is aimed at preparing the learners for the world of work. The study therefore sought to establish how willing the students were to venture into agricultural career upon

graduating from secondary school based on the level of skills they had acquired from engaging in practical agriculture at school. The summary of the results have been presented in figure 6.

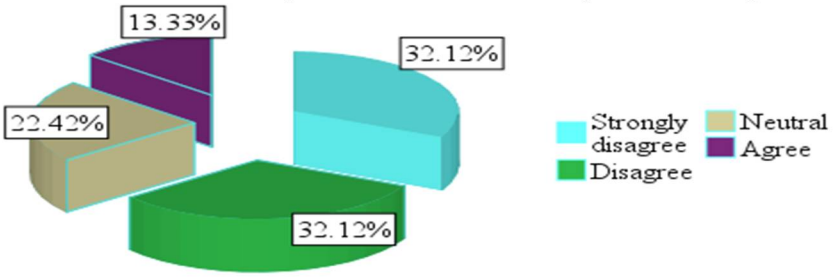

Figure 1: *Willingness to Venture into Agriculture*

It was quite ironical that majority of the students (32.12%) strongly disagreed with a similar percentage disagreeing and only a paltry 13.33% agreeing. It was surprising that no student strongly agreed to the statement. The unwillingness of majority of the students to venture into agriculture is hinged on the low level of practical skills as this study has established. The findings resonate those from Sebotsa et al (2021) that the youth tend to shy away from agriculture; inclusive of those who studied agriculture up to form four level. Such youth would be more willing and ready to find white collar jobs which are rather becoming scarce and this consequently leads to the high unemployment that Kenya is currently facing. Equipping the students with agricultural skills can perhaps be a panacea to this problem.

CONCLUSIONS

a) Secondary schools in Kenya have school farms for practical teaching of Agriculture subject.
b) These school farms however lack crucial facilities such as museum plots, demonstration plots and project plots.
c) Commercialization of the school farms by the school managements for purposes of profit making have resulted to the in-availability of school farm facilities necessary for the practical teaching of Agriculture.

RECOMMENDATIONS

a) Teachers of Agriculture as the curriculum implementers with support from the school management should work towards setting up various facilities such as project plots, demonstration plots, museum plots and farm structures for practical implementation of Agriculture.
b) The government of Kenya through the Ministry of Education should regulate on the commercialization of school farms by imposing rules and regulations governing the use of school farms.

REFERENCES

1. Afodu, O., Balogun, O., Afolami, C., Akinboye, O., Akintunde, A., Ayo-Bello, T., Ndubuisi-Ogbonna, L., Shobo, B., & Adefelu, A. (2022). Influence of Poultry Farmers Coping Strategies of High Cost of Feed on Food Security Status in South-west Nigeria. *Badeggi Journal of Agricultural Research and Environmet*, *4*(3), 43–51.
2. Aholi, S. S. (2018). *Relationship between the learning of agriculture in secondary schools and employment creation by out-of-school youth in Emuhaya Sub-County, Vihiga County, Kenya* [Masters thesis]. Egerton University.
3. Akenga, P., Ali, S., Anam, O., & Walyambillah, W. (2014). Determination of selected micro and macronutrients in sugarcane growing soils at Kakamega North District, Kenya. *Journal of Applied Chemistry*, 34–41.
4. Asige, M. L., & Omuse, O. D. (2022). Influence of Post-Harvest Technology on Food Security in Narok East Sub-County, Kenya. *Interdisciplinary Journal of Rural and Community Studies*, *4*(1), 1–15.
5. Bett, A. (2022). *Influence of Teacher Related Factors On Use of Practical Methods In Teaching Agriculture In Secondary Schools In Bureti Sub-County Kenya* [Masters thesis]. Egerton University.
6. Cairns, K. (2017). Connecting to food: Cultivating children in the school garden. *Children's Geographies*, *15*(3), 304–318. https://doi.org/10.1080/14733285.2016.1221058
7. Christie, F. (2016). National curriculum co-ordination: Some lessons from the CDC's Language Development Project. *Australian Journal of Education*, *29*(2), 150–160. https://doi.org/10.1177/000494418502900207
8. Chukwudum, E. O., & Ogbuehi, U. G. (2013). Effective utilization of the school farm as instructional initiative for developing agricultural interest among primary school children in Nigeria. *Academic Journal of Interdisciplinary Studies*, *2*(6), 113–118. https://doi.org/10.5901/ajis.2013.v2n6p113
9. Cohen, L., Manion, L., & Morrison, K. (2018). *Research Methods in Education* (8th ed.). Routledge.
10. Curtis, E. A., Comiskey, C., & Dempsey, O. (2016). Importance and use of correlational research. *Nurse Researcher*, *23*(6), 20–25. https://doi.org/10.7748/nr.2016.e1382

11. Diaz, J. M., Warner, L. A., & Webb, S. T. (2018). Outcome Framework for School Garden Program Development and Evaluation: A Delphi Approach. *Journal of Agricultural Education*, *59*(2), 143–165. https://doi.org/10.5032 /jae.2018.02143
12. Duncan, D. W., Collins, A., Fuhrman, N. E., Knauft, D. A., & Berle, D. C. (2016). The Impacts of a School Garden Program on Urban Middle School Youth. *Journal of Agricultural Education*, *57*(4), 174–185. https://doi.org/10.5032/jae.2016.04174
13. Edmonds, W. A., & Kennedy, T. D. (2016). *An applied guide to research designs: Quantitative, qualitative, and mixed methods* (2nd ed.). Sage Publications.
14. Edokpolor, J. E., & Dumbiri, D. N. (2019). Resource adequacy and utilization for teaching and learning effectiveness in vocational education programmes in south-south Nigerian universities. *Journal of Vocational Education Studies*, *2*(1), 1–12. https://doi.org/10.12928
15. FAO. (2015). *Setting up and Running A School Garden: A Manual for Teachers, Parents and Communities*. Rome: Food and Agriculture Organization of the United Nations. http://www.fao.org/24/b-23456x.pdf
16. FAO. (2017). *Kenya's tea and coffee sectors under climate change: An impact assessment and formulation of a climate smart strategy*. Rome, Italy. http://www.fao.org/3/a-i4824e.pdf
17. Foekan, D. W. J., & Owuor, S. (2017). School farming and school feeding in Nakuru town, Kenya: Practice and potential. *ASC Working Paper Series*, *76*. https://hdl.handle.net/1887/13008
18. Fufa, N., Zeleke, T., Melese, D., & Daba, T. (2021). Assessing storage insect pests and post-harvest loss of maize in major producing areas of Ethiopia. *International Journal of Agricultural Science and Food Technology*, *7*(1), 193–198. https://doi.org/10.17352/2455-815X.000106
19. Gardens, S., Gardens, W., Gardens, T., & Gardens, V. (2017). *Grown from the Past: A Short History of Community Gardening in the United States*. https://communityofgardens.si.edu /exhibits/show/history community gardens/schoolgarde ns
20. Gathambiri, C. W., Owino, W. O., Imathiu, S., & Mbaka, J. N. (2021). Post-harvest losses of bulb onion (Allium cepa L.) in selected Sub-Counties of Kenya. *African Journal of Food, Agriculture, Nutrition and Development*, *21*(2), 17529–17544. https://doi.org/10.18697/ajfand.97.20145
21. Government of Kenya. (1976). *The report of the national committee on educational objectives and policies*. Nairobi: Government Printer.
22. Iderawumi. (2020). *Establishment of a school farm and gardening*. Introduction to Agricultural Systems: Principles and Practices.
23. Iderawumi, A. M., Joshua, F., Abiodun, I. M., Abiodun, O. S., Adebola, O. W., Tivsoo, A., & Timilehin, J. (2021). Innovative techniques of operating school farm. *Farming and Management*, *6*(1), 21–28. https://doi.org/10.31830/2456-8724.2021.004
24. Jjuuko, R., Tukundane, C., & Zeelen, J. (2019). Exploring agricultural vocational pedagogy in Uganda: Students' experiences. *International Journal of Training Research*, *17*(3), 238–251. https://doi.org/10.1080/ 14480220.2019.1685161
25. Jones, K., Williams, R. J., & Gill, T. B. (2017). "If you study, the last thing you want to be is working under the sun:" an analysis of perceptions of agricultural education and occupations in four countries. *Agriculture and Human Values*, *34*(1), 15–25. https://doi.org/10.1007/s10460-016-9685-4
26. Kahuria, R., Otieno, M., Wachira, A., Muggah, C., & Njagi, D. G. (2018). *Secondary Agriculture Form Two Students' Book* (4th ed.). Kenya Literature Bureau.
27. Kenya Institute for Public Policy Research and Analysis [KIPPRA]. (2020). *Kenya Economic Report-2020: Sustaining Kenya's Economic Development by Deepening and Expanding Economic Integration in the Region*.
28. Kenya National Bureau of Statistics. (2020). *Kenya Population and Housing Census Reports*.
29. Keraga Shibru, A., Osiru, M., & Aklilu, H. M. (2016). Higher Agricultural Education in Ethiopia: Current status and future prospects. *African Journal of Rural Development (AFJRD)*, *1*(2), 151–158.
30. KIE. (2006). *"Evaluation of the Secondary School Curriculum".* Kenya Literature Bureau, Nairobi.
31. Kinyangi, A. A. (2014). *Factors influencing the adoption of agricultural technology among smallholder farmers in Kakamega North Sub-County, Kenya* [Masters' thesis]. University of Nairobi.
32. Konyango, J. J. O., & Mutisya, D. L. (2017). International Aid and Funding of Vocational Education: Lessons on Vocationalization of School Agriculture-Kenya 1959-1984. *International Journal of Research Studies in Agricultural Sciences*, *3*(11), 57–64.
33. Koskei, P., Bii, C. C., Musotsi, P., & Muturi Karanja, S. (2020). Post-harvest storage practices of maize in Rift Valley and Lower Eastern regions of Kenya: A cross-sectional study. *International Journal of Microbiology*, *5*(3), 1–13. https://doi.org/10.1155/2020/6109214
34. Kyule, M. N., Konyango, J. J. J., & Nkurumwa, O. A. (2016). Irony in the teaching of Agriculture in Kenya's arid and semi-arid secondary schools: The students' and teachers' perspective. *International Journal of Innovative Research and Advanced Studies*, *3*(10), 65–71.
35. Kyule, M. N., Konyango, J. J., & Nkurumwa, A. O. (2018). Teachers in the implementation of practical agriculture curriculum in Kenya's arid and semi-arid secondary schools. *Problems of Education in the 21st Century*, *76*(4), 533–543.
36. Lawal, O. I., Omoleye, O., & Oketoobo, E. A. (2014). Competency capacity building needs of Agricultural science teachers in utilization of school farm for skill acquisition among secondary school students. *International Journal of Education and Literacy Studies*, *2*(3), 1–6.

37. Machisu, V., Opondo, V., Nakhumicha, A., & Mosi, R. O. (2022). Influence of School Agricultural Farms on Academic Performance in Agriculture in Secondary Schools. *Journal of Agriculture and Extension*, *4*(1), 390–399.
38. Malava Sub-County Education Office. (2019). Secondary school statistics and enrollment data,November 2019 Returns. *Available at SSRN 3521170*.
39. Manyasi, A. N. (2019). *Contribution of women graduates of secondary school agriculture subject to agricultural productivity in Navakholo, Kakamega County, Kenya* [MastersThesis]. Masinde Muliro University of Science and Technology.
40. Matula, P. D., Kyalo, D. N., Mulwa, A. S., & Gichuhi, L. W. (2018). Academic research proposal writing: Principles, concepts and structure. *Nairobi, Kenya: Applied Research & Training Services*.
41. Maxwell, R. H. (1965). *Progress Report AID/afr-298 West Virginia University USAID Project Kenya Vocational Agriculture Education July-Dec 1967*.
42. Mlawa, H. A. (2018). *Impact of fee free primary education on pupils' enrollment and school physical facilities in Ikungi district of Singida region in Tanzania* [PhD Thesis]. The University of Dodoma.
43. Mugenda, O. M., & Mugenda, A. G. (2003). Research methods: Quantitative and Qualitative Approaches. *African Centre for Technology Studies*.
44. Muthomi, E. (2017). *Challenges and opportunities for youth engaged in agribusiness in Kenya* [Masters Research Project]. United States International University-Africa.
45. Mwikali, V. V. (2018). *The relationship between selected agriculture teachers' job satisfaction factors and public Secondary School students' performance in agriculture at KCSE in Nyeri County, Kenya* [Masters' thesis]. Egerton University.
46. Namwambah, T. D. (2020). Principles of rational pedagogy: An insight on Kenya's competence based curriculum (CBC). *IOSR Journal of Research & Method in Education*, *10*(2), 01–10. https://doi.org/10.9790/7388-1002050110
47. Nassiuma, D. K. (2000). *Survey sampling: Theory and methods*. Nairobi University Press.
48. Ndambuki, R., Recha, R. O., & Karani, A. (2024). An Investigation of the teacher preparedness in the implementation of the Competence-Based Agriculture subject curriculum at Junior Secondary Schools in Kenya. *International Journal of Education, Technology and Science*, *4*(2), 1873–1892.
49. Ngunyu, P. (2023). *Agriculture grade 8 learner's book*. Mountain Top Education Publishers Ltd. https://www.mountainpublishers.com
50. Njeru, L. K. (2017). Youth in agriculture; perceptions and challenges for enhanced participation in Kajiado North Sub-County, Kenya. *Greener Journal of Agricultural Sciences*, *7*(8), 203–209. https://doi.org/10.15580/GJAS.2017.8.100117141
51. Njura, H. J., Kubai, K. I., Taaliu, S. T., & Shem Khakame, K. (2020). The Relationship between Agricultural Teaching Approaches and Food Security in Kenya. *Education Research International*, *2020*, 1–18. https://doi.org/10.1155/2020/8847864
52. Ojuok, J. O., Gogo, J. O., & Olel, M. A. (2020). Influence of Physical Facilities on Academic Performance in Constituency Development Fund (CDF) Built Secondary Schools in Rachuonyo South Sub-County, Kenya. *African Educational Research Journal*, *8*(3), 462–471. https://doi.org/10.30918/AERJ.83.19.026
53. Okiror, J. J., Hayward, G., & Winterbottom, M. (2017). Towards in-service training needs of secondary school agriculture teachers in a paradigm shift to outcome-based education in Uganda. *The Journal of Agricultural Education and Extension*, *23*(5), 415–426. https://doi.org/10.1080/1389224X.2017.1338593
54. Okon, U. A. (2016). *Insecurity of school farms and teaching of Agricultural subject in secondary schools in Akwa Ibom State*. *7*(1).
55. Olorunfemi, B. J., & Kayode, S. E. (2021). Post-harvest loss and grain storage technology-a review. *Turkish Journal of Agriculture-Food Science and Technology*, *9*(1), 75–83. https://doi.org/10.24925/turjaf.v9i1.75-83.3714
56. Onwumere, M., Modebelu, M. N., & Chukwuka, I. E. (2016). Influence of school farm on teaching of agricultural science in Senior Secondary Schools in Ikwuano Local Government Area, Abia State. *Open Access Library Journal*, *3*(6), 1–6.
57. Pascoe, J., & Wyatt-Smith, C. (2013). Curriculum literacies and the school garden. *Literacy Learning: The Middle Years*, *21*(1), 34–47.
58. Radeny, M., Rao, E. J., Ogada, M. J., Recha, J. W., & Solomon, D. (2022). Impacts of climate-smart crop varieties and livestock breeds on the food security of smallholder farmers in Kenya. *Food Security*, *14*(6), 1511–1535. https://doi.org/10.1007/s12571-022-01307-7
59. Recha, C. W. (2018). Local and regional variations in conditions for agriculture and food security in Kenya. *International Journal of Agriculture Innovations and Research*, *8*(4), 1–28.
60. Rissanen, I., Kuusisto, E., Tuominen, M., & Tirri, K. (2019). In search of a growth mindset pedagogy: A case study of one teacher's classroom practices in a Finnish elementary school. *Teaching and Teacher Education*, *77*, 204–213.
61. Salkind, N. J. (2014). *100 questions (and answers) about statistics*. SAGE Publications.
62. Schreinemachers, P., Ouedraogo, M. S., Diagbouga, S., Thiombiano, A., Kouamé, S. R., Sobgui, C. M., Chen, H. P., & Yang, R. Y. (2019). Impact of school gardens and complementary nutrition education in Burkina Faso. *Journal of Development Effectiveness*, *11*(2), 132–145. https://doi.org/10.1080/19439342.2019.1624595
63. Sebotsa, K. O., Nkurumwa, A., & Kyule, M. (2021). Effect of utilization of social media platforms on youth participation in agriculture in Njoro sub-county, Kenya. *International Journal of Agricultural Extension*, *8*(3), 235–250. https://doi.org/10.33687/ijae.008.03.3400
64. UNESCO. (2012). *Global education digest 2012: Education for Sustainable Development: Assessment of resource and facility provision in education*. UNESCO Institute for Statistics Montreal.

65. UNESCO. (2016). *Youth and Skills: Putting education to work.*
66. Waiganjo, M. M. (2021). *Relationship between Selected Teacher, Institutional and Curriculum Factors and Teaching Approaches used by Agriculture Teachers in Public Secondary Schools in Nakuru County, Kenya* [PhD Thesis]. Egerton University.
67. Waiganjo, M. M., & Waweru, B. N. (2018). Improving agricultural productivity through effective teaching of agriculture science to girls in secondary schools, Kenya. *International Journal of Innovative Research and Advanced Studies*, *5*(11), 24–28.
68. Wanyama, E. G. A. (2020). Contribution of School Administrators to Physical Facilities in Enhancement of Students' Academic Performance in Secondary Schools in Kenya: An Emperical Study of Secondary School Administrators in Emuhaya and Vihiga Sub Counties. *East African Scholars Publiusher, Kenya*, *3*(8), 334–348. https://doi.org/10.36349/EASJEHL.2020.v03i08.001
69. Yamane, T. (1967). *Statistics, An Introductory Analysis,* (4th ed., Vol. 213). Harper and Row CO. USA.