Available online at **globets.org/journal**
International Journal of Education, Technology and Science
4(4) (2024) 2199–2225

IJETS
International Journal of Education Technology and Science

RELATIONSHIP BETWEEN LEVEL OF ADEQUACY OF THE SCHOOL FARM AND THE ACQUISITION OF AGRICULTURAL SKILLS AMONG SECONDARY SCHOOL STUDENTS

(Research article)

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Received: 29.05.2024 Revised version received: 14.10.2024 Accepted: 17.10.2024

Abstract

Teaching and learning of Agriculture at the secondary school level aims at improving the learners' agripreneural skills so as to enable them take an active role in the agricultural value chain in the future. Proper implementation of the Agriculture curriculum in Kenyan secondary schools can thus help in mitigating the rampant youth unemployment and food insecurity. Owing to its vocational nature, the implementation of Agriculture demands the incorporation of an array of resources and facilities; the school farm being considered the most important. It is within this facility where students get the opportunity to engage in practical activities thus reinforcing the theoretical concepts learnt. This study sought to determine the relationship between level of adequacy of the school farm and the acquisition of agricultural skills among secondary school students in Malava Sub-County, Kakamega County, Kenya. Correlational research design was adopted. Using the Yamane formula, 150 form three students of Agriculture were sampled from 15 schools. One Agriculture teacher was selected from each of the sampled school. Questionnaires and an observation guide were used to gather data. 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 adequacy of the school farm significantly contributes to acquisition of agricultural skills.

Keywords: Practical agricultural skills; School farm; Agriculture; Secondary schools

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DOI: https://doi.org/10.5281/zenodo.14222628

1. Introduction

Rapid changes in technology and the need to avert the menace of food insecurity and poverty have brought changes in the education systems in many countries and agricultural education is not an exception (Haruna, Asogwa & Ezhim, 2019). According to Ekamilasari, Permanasari and Pursitasari (2021), there is need to get more and more technical agricultural skills which calls for a type of education that can assist the learner to make certain critical decisions related to modern farming techniques. Mulder (2017) posits that competent human resources are an asset in the economy of any country world over since education is seen as a tool for empowering human resource. The education system of a country plays a major role in the development of human and natural resources through equipping the learners who are perceived as the future generations with relevant skills (Ray, Panigrahi & Shasani, 2022). (Mukembo, Edwards and Robinson (2020) argue that the shift in agricultural production to meet the increasing demand for food can only be achieved sustainably with a strong drive in agricultural education

Agricultural education is a type of vocational training that equip learners with the knowledge and skills in productive agriculture; the training of both the head and the hands of the learners (Haruna et al., 2019). In contrast to general education, Cheruiyot (2018) reiterated that agricultural education is skill-oriented as it involves a lot of outdoor activities that are crucial in equipping learners with practical skills. Being vocational in nature, the successful implementation of the agriculture curriculum for skill acquisition entirely depends on an array of facilities and resources available. The school farm is arguably the most important facility as far as the implementation of practical aspects of Agriculture is concerned as Iderawumi (2020) points out that it gives the learners a chance to put into practice what has been learned in the classroom thus improving on their agricultural skills. In the USA, Australia and Europe school gardening can be traced back to the early 19th century with an aim of producing skillfully oriented graduates for the agriculture sector (Christie 2016).

The scathing effects of unemployment and food insecurity have pushed most African nations into revising their curricular to accommodate practical Agriculture (UNESCO, 2016; Jjuuko, Tukundane & Zeelen 2019). In addition to this, Jones et al. (2017) affirm that major international funders have channeled billions of dollars in agricultural education and training systems as a means to prepare and expand contemporary agricultural workforce and to support economic growth. 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.

One of the fundamental objectives of teaching Agriculture in Kenyan secondary schools is to engage learners in hands-on activities with the aim of helping them to acquire useful agricultural skills that are to be replicated in the world of work (KIE, 2006). 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 high enrolment however

seems to put pressure on the available facilities encouraging rote learning which ends up producing unskilled graduates aggravating food insecurity and youth unemployment.

Contribution of Agriculture to the Kenyan Economy

The role of agriculture as a source of economic growth both globally and within nations has shifted over the past several decades. Phillips (2020) attributes this shift to globalization which encompasses technological advancements and industrialization thus placing more focus on the creation and distribution of agricultural technologies in order to improve on production efficiency. Data from the United Nations Food and Agricultural Organization, (FAO, 2019) indicates that 38 percent of the world's economically active population was engaged in agriculture with projections indicating a rise in the percentage by the year 2030. The report further revealed that agriculture also guarantees food security, supplies raw materials to agro-based industries and also earns foreign exchange.

In the African continent, the numbers make an even stronger case for agriculture as a key sector for creation of employment and a source of economic growth. Based on a report by (OECD/FAO, 2016), agriculture contributes 3-60 percent of GDP in African countries. Mukasa, Woldemichael, Salami and Simpasa (2017) further point out that the sector employs almost 65-75 percent of the workforce in Africa. To the contrary, agricultural potential in Africa remains untapped. This is evident from the fact that FAO (2018), projects that poverty and hunger are to worsen by the year 2030 if proper interventions will not have been put into place. Ekezie (2020) posits that to alleviate poverty and hunger and achieve sustainable development in the African continent, a well- trained workforce in the agricultural sector is vital. School Agriculture can play a pivotal role in averting this looming situation by taking a more practical approach in order to channel out a skilful workforce. Practical teaching of Agriculture in schools cannot be achieved without the provision and utilization of the school farm facility which will form the basis of this study.

In Kenya, vision 2030 deemed agriculture as a crucial sector which is expected to steer the economy to an anticipated annual growth of approximately 10 percent. The sector contributes to 30 percent of the GDP and employs almost 80 percent of the national labour force (RoK, 2017). Agriculture is therefore pivotal to the achievement of a globally competitive and prosperous country with good living standards for the citizens by the year 2030 (RoK, 2016). Furthermore, agriculture is expected to deliver on Kenya's regional and global commitments such as the African Union Agenda 2063, Comprehensive Africa Agricultural Development Programme (CAADP) and the Sustainable Development Goals (SDGs) (UNESCO, 2017). The country has a great Agricultural potential which if well tapped can help to steer the nation to a middle-income economy. According to Boulanger, Dudu, Ferrari, Mainar-Causapé, Balié and Battaglia (2018), Kenya as a country is endowed with a vast agricultural land which is approximately 587,000km^2 out of which 576,076km^2 is arable.

To achieve the expected transformation in the agricultural sector, the education sector needs to play its role by preparing human resource who are arguably competent through experiential learning in schools (Kyule & Konyango, 2019). Despite having a

great agricultural potential, much has not been achieved especially in terms of food security and employment creation. Kyule and Konyango attribute this to the theoretical teaching which is strictly academic with little reference to students' future employment and labour market needs. The scholars further pointed out lack of active linkages and communication between employers and secondary schools to be another hindrance to practical teaching of Agriculture in Kenyan secondary schools.

According to the global food security index of 2017, the country is food insecure and was ranked position 86 out of 113 countries based on the International Food Research Policy, [IFPRI], (2017). This was confirmed by findings from the Parliamentary Budget office (2018) which revealed that the country has become a major importer of basic food commodities such as maize, milk, wheat, sugar, potatoes, rice and beans. The government tends to spend much on food importation rather than investing in other income generating projects (RoK, 2017).

Shortage of skilled workforce in the agriculture sector to effectively make use of the agricultural potential hinders achievement of food security. Kyule (2017) points out the over-reliance on foreign human resource in implementing Kenya's agricultural projects such as the Galana-Kalalu remains to be one of the stumbling blocks towards the achievement of food security. These foreign investors do not share in Kenya's vision but only interested in economic gains thus the projects they initiate hardly materialize. Training of our own students in a practical manner using relevant resources can not only assure the country of a competent workforce in the agriculture sector but can also help the government on the expenditures incurred on hiring foreign expertise. Njura, Kubai, Taaliu and Khakame (2020) reiterate that teaching secondary school Agriculture should not only impart knowledge but also integrate aspects of food security which is a key indicator of economic growth.

Though it is envisaged that the agriculture sector has the potential to offer job opportunities to the Kenyan youth, unemployment rate still remains high. According to 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. Muma (2016) asserts that one of the challenges for creating employment in Kenya is the inappropriate agricultural education at all levels. Since over 40 percent of the KCSE candidates opt for Agriculture subject among several vocational subjects offered in the secondary school curriculum (KNEC, 2019), it means then that if practically taught in schools by using relevant resources and facilities, Agriculture can be used to prepare a skilled workforce that can improve the agricultural productivity. If secondary school leavers are adequately equipped with basic agricultural skills, unemployment levels can be alleviated which can in turn contribute to the rapid economic transition of Kenya into a middle economy within a short time frame.

Practical Agriculture Education in Secondary Schools

Practical agriculture is seen as the act and practices of various agricultural activities. Fuseini, (2020) points out that practical agriculture involves the acquisition of skills and

knowledge in agriculture with the view of imparting these knowledge and skills into prospective farmers for better productivity. Practical agriculture in schools goes beyond the classroom and involves laboratory experiments, observations carried out on the school farm, field excursions to agro-based demonstration farms and extensive farm work (Bett, 2022). Practical agriculture in schools aims at equipping the learners with practical farming skills which are on demand in the labour market. Fuseini, (2020) defines practical farming skills as the psychomotor domain which involves demonstration of manipulative skills using tools, machines and equipment to carry out practical operations and to solve practical problems.

At the secondary school level, Agriculture subject is considered pre-vocational since it inculcates relevant knowledge and skills into the learners in preparation for entry into the world of work or further studies. It is generally agreed that practical work facilitates the process of acquisition of basic knowledge and skills that prepares the students for occupations in agriculture-related sectors. Amadi and Nnodim (2018) argue that these knowledge and skills sustains the learners after school therefore making them self- reliant, productive and employers of labour. Kimaro and Towo, (2015) assert that the experiences acquired during the formative period of an individual's life leave their mark on personal efficacy, which may set the future direction of a persons' life course by affecting their choices and achievements. Farmers with secondary school agricultural knowledge diversify more crop productivity and are in a position to achieve sustainability in farming compared to their counterparts without the knowledge (Chepng & Boit 2015; Areri 2023)). Practical agriculture in schools has been a strong base where the learners' inquisitive minds are being introduced to the interesting and practical aspect of the subject.

Education systems in the developed countries pay much emphasis to the practical aspect of agriculture with the aim of enhancing agripreneurship among the youth (Van der Merwe, 2024; Arumugam & Manida, 2023; Jones, 2018). The scholars points out that in these countries, practical Agriculture which is basically vocational education is acknowledged as an integral part of the national curricula for career preparation purposes. Deliberate attempts are therefore made to ensure that Agriculture is not only taught within classrooms but also supplemented with practical activities. In china technical and vocational institutions have undergone tremendous development and reforms since the founding of the peoples' republic of China in 1949 with the aim of equipping as many youth as possible with practical skills necessary for economic development (Wang & Guo, 2019). In Taiwan, schools have started to take action systems and to strengthen their vocational programs so as to create awareness on such pertinent issues like food security and environmental conservation (Ho, Chen & Hsu, 2017). The participation of students in any hands-on activity gives students the opportunity to develop their talent and interest beyond the formal classroom environment. In the USA, farm projects which are also referred to as Supervised Agricultural Experiences (SAE) are conducted on the school farms for a period of not less than six months annually (Roberts & Harlin, 2017)

Despite the prospects and opportunities in practical teaching of Agriculture for skill acquisition, many African countries still face numerous challenges in implementation of practical Agriculture in schools.The challenge facing teaching in most African countries and which also directly relates dynamics of holistic agricultural education is availability, adequacy and appropriateness of facilities to be used to facilitate holistic education necessary for the

learner (Kapinga, 2017). Tapiwa (2021) further points out that other challenges include; lack of tools, funds, qualified teachers of Agriculture and shortage of land especially in urban schools. Research findings from Rutoh (2022) affirmed that heavy workloads among Agriculture teachers makes it difficult for them to engage students on practical sessions on the school farm. Implementation of practical Agriculture requires large land, farm machinery, farm tools, farm structures and well-equipped farms to run practical projects. Most schools have poorly equipped school farms with limited number of animals and crop varieties which do not support the teaching of practical Agriculture using project- based learning (Nyang'au, Kibett & Ngesa, 2011). Simiyu (2021) posits that inadequacy of funds to run practical education have reduced the effectiveness of undertaking practical education in subjects like Agriculture.

In Kenya, Agriculture is offered as an optional subject at the secondary school level. The course is tailored with the primary goal of inculcating a sound understanding of the subject among learners and appreciation of its importance to the society and the nation at large. It is also aimed at enlightening learners on the vast opportunities existing in the sector and other arms of the economy related to it, while also providing the skills necessary for carrying out agricultural activities, in addition to opening path for higher learning. Practical Agriculture is championed in secondary schools through students' participation in agricultural activities mostly through the Young Farmers Club of Kenya (YFCK) project activities. The YFCK enables students to participate in agricultural activities such as livestock production, crop production, ploughing contests and agricultural field trips (Mugambi, Obara & Kyule 2022). Through such activities, students get an opportunity to apply the agricultural principles and practices learnt in class. The inclusion of Paper 3 (443/3), which is a project examination by the Kenya National Examinations Council ensures also that students participate in project activities on the school farm.

Adequacy of the School Farm Facility

A considerable number of variables that operate in the teaching-learning process invariably affect the learning outcomes among students. One important variable that directly impacts the quality of learning among students is the adequacy or lack of school facilities that aid in the reinforcement of knowledge and skills (Limon, 2016). Majority of researchers and educationists who have contributed to the discourse on education for sustainability have aptly argued that facilities are critical ingredients in achieving holistic and sustainable education. There is a large body of literature which underscores and supports the importance of facilities (Chonjo, 2018; Wambua et al., 2018; Ojuok et al., 2020). The scholars emphasized that the relevance, effectiveness, availability, accessibility and adequacy of these facilities significantly contributes to students' learning outcomes. It can be inferred from the literature that schools' facilities have a positive relationship with school effectiveness.

School facilities are important dynamics of holistic education and cannot be underestimated in any discourse related to school outcomes. School facilities are the space interpretation and physical expression of the school curriculum and should be put at the Centre of all efforts geared towards producing meaningful education (Ndirangu et al. 2016). School facilities provide a conducive learning environment for acquisition of skills. School facilities

have to be monitored not only to ensure compliance with the recommended international standards but also to minimize disparities across the country and provide its citizens equal access to education. Figueroa et al. (2016) posit that the ratios of students to classrooms, toilets and other facilities can be used to estimate the size of the school facilities in comparison with the student population that it serves. The UNESCO (2012) guidelines on education for sustainable development recommend a student facility ratio of 25:1.

Inadequacy, in-availability and poor condition of school facilities brings about critical concerns on teachers' and students' general welfare. Consequently, it becomes imperative that the functions school facilities fulfill in in the student acquisition and learning of life-long knowledge and skill competencies should be taken into account by policy makers and administrators when designing a curriculum that provides equitable and efficient education. Limon (2016) reiterates that stakeholders should realize that there exists an obvious, direct relationship between student learning outcomes and the quality and adequacy of school facilities. Deficiencies in school facilities result to serious ramifications in student learning and achievement as well as impairment of teaching standards.

The Kenya Institute of Curriculum Development in collaboration with UNESCO (2012) acknowledge that practical agricultural education is key to acquisition of farming skills which can help steer the country to a middle economy. The Education sector is responsible for empowering citizens with knowledge, skills, attitudes and competencies on modern farming skills. The official position of the Ministry of Education is that the teaching of agriculture should be experiential and learner centered through provision of necessary resources and facilities. The foregoing position of the Government of Kenya through the Ministry of Education emphasizes the fact that agricultural education should be perceived as a lifelong process that translates into developing the learner holistically in the three main domains of cognitive, psychomotor and affective.

The most commonly used variable in establishing the adequacy of facilities in schools is the class size or simply the number of students who the resource or facility is meant to serve during the lesson. Class size is generally regulated by the maximum number of students legally permitted to enroll in a single class. Teaching effectively takes place when the class size is relatively manageable to the teacher. The recommended student-facility ratio based on the UNESCO standards is 25:1. Anekeya (2015), observed that teachers find it easy to manage a smaller class, give individualized attention, prepare for the lessons, grade students and give feedback. Ong'amo et al. (2017) concurs with these findings and further adds on that a smaller Student- facility ratio enhances skill acquisition especially if the facilities seem scarce since each and every student gets access to the available facilities and resources.

Countries which happen to be members of the Organization for Economic Co-operation and Development (OECD) tend to have made laudable steps in ensuring manageable class sizes. In Finland for example, the average student-teacher ratio is 13:1 which in turn favours practical teaching of resource intensive subjects for acquisition of hands-on skills. In African countries, the desire to have an education system functioning as well as in OECD member countries with reference to provision of adequate facilities for teaching of Agriculture for skill acquisition is far from reality. Tapiwa (2021) observed that majority of African countries have tailored their education systems to accommodate Agriculture as a core subject without necessarily envisaging the adequacy of fundamental facilities such as the school farm

that are crucial for the implementation of the practical aspect of the subject. The aftermath of this policy has been a tremendous increase in class size beyond the average standards leading to shortages of land for practical work and tools for use. Findings from (UNICEF, 2013) reveals that large class size impedes quality education in majority of the African countries.

In Kenya, there have been various factors which have greatly contributed to significant changes in enrolment and provision of educational resources and facilities in schools. Among these factors, increase in human population and educational reforms remain to be the most outstanding (UNICEF, 2013). It is perceived that over time, there has been a rapid increase in student enrolment in Kenyan schools thus putting pressure on the available resources and facilities. In the year 2012 for instance, the Student Teacher Ratio (STR) in public secondary schools had grown to 41:1(MoEST, 2014). The various educational reforms have also resulted to more citizens accessing education thus increasing class size. Reports from the Ministry of Education (2017) indicate that the free day secondary school education programme has also led to an increase in student enrolment at the secondary school level. With the increase in class sizes, the adequacy of facilities for practical education in subjects like Agriculture should be considered to ensure acquisition of hands-on skills among the learners. Though Agriculture was made optional following the 2002 educational reforms, the subject remains quite popular among the students thus having increased enrolment. Table 1 gives a summary of the enrolment trend in the subject during a five year span.

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

Writing on the implication of class size on the teaching of Agriculture subject, Waiganjo et al., (2019) affirmed that large class sizes is one of the major challenges in the teaching of practical Agriculture using practical projects. Large class sizes are not easy to manage hence this takes time for teachers to organize the class and running in short of time. Large class sizes were seen to give teachers problems in terms of management and conducting practical projects due to limited resources in many schools. Findings from Tapiwa (2021) indicate that many schools have no farms to run viable practical projects. This is in line with findings from Evelia (2014) which indicated that due to inadequacy of the school farm facility, only the form four students are allocated plots to carry out their project work which begins in late January and ends in September. During this period, the other Agriculture students in the lower forms are hardly exposed to any practical work in Agriculture despite the syllabus

providing for practical activities in Agriculture across the different classes. This goes against the objective of school Agriculture of equipping practical skills to the learners.

One of the challenges around the use of the school farm is the fact that the teacher of Agriculture and the school principal may have different perspectives concerning the usage of the school farm. The school principal may view the farm as a source of income and hence consider giving a portion of it to the students as a waste of resources. On the other hand, the agriculture teacher views the farm as a useful teaching resource that is likely to enhance the teaching-learning process (Konyango & Asienyo, 2015). This difference in views about the farm indicates that the Agriculture subject teachers face the fact that the school may not have or may not avail adequate land for use by the Agriculture teacher and the Agriculture students for teaching and learning purposes. This might negatively impact on the acquisition of practical farming skills among the learners.

Based on the Kenya National Examinations Council (KNEC) guidelines, a project plot allocated to each learner for practical Agriculture should always be 12 square metres. This is deemed as the approximate size of land suitable for practical Agriculture at the secondary school level. Evelia (2014) recommended that schools with inadequate school farms should have several options such as attaching themselves to neighboring farms, or hiring a farm from the neighbouring community. Although Machisu et al. (2022) established that utilization of the school farm significantly contributes to improved academic achievement among Agriculture students in the KCSE, little has been done to establish how the level of adequacy of the school farm facility contributes to acquisition of practical agricultural skills among Agriculture students in Kenyan schools, which this study intents to investigate.

Theoretical Analysis and Application

This study was hinged on the Pragmatic Theory that was theorized by John Dewey in 1908. Pragmatists hold the view that since learning is a life-long process, it should be geared towards bequeathing the learners with skills thus recommend a practical approach to teaching and learning. This theory was deemed fit for this particular study since a hands-on approach to the implementation of the Agriculture curriculum by allocating adequate sections of the school farm for project use can go a long way in bolstering their level of agricultural skills which in turn will produce practically oriented graduates who will take an active position in the agriculture value-chain thus addressing the glaring menace of food insecurity and youth unemployment.

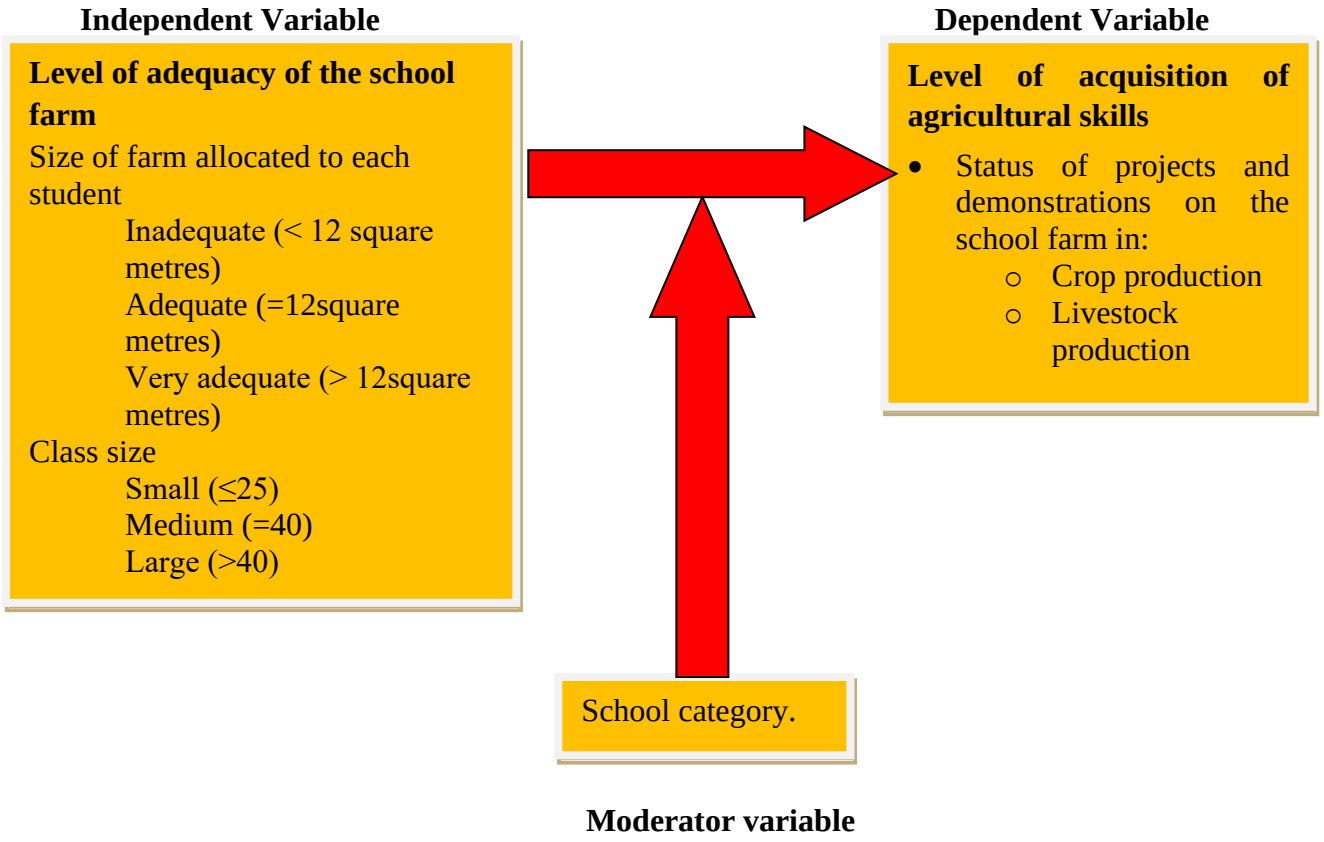

Figure 1: Conceptual framework showing relationship between variables in the study

In this study, Level of adequacy of the school farm was the independent variable. It was measured in terms of class size in relation to the average size of the school farm facility in square metres allocated to each student. The Dependent Variable which is acquisition of agricultural skills was measured in terms of the status of the demonstrations and projects in both crop and livestock production on the school farm. Moderator variables influence the effects of the independent variable on the dependent variable. For this study, school category was the moderator variable whereby students in different school categories may have varying levels of adequacy of the school farm due to variations in enrolment in Agriculture subject. This was controlled through inclusion of different categories of schools in the study.

1.2. Objective of the Study

The study was guided by the following research objective;

i. To determine the relationship between the level of adequacy of the school farm and the acquisition of agricultural skills among secondary school Agriculture students in Malava Sub-County

1.2.1 Research Hypothesis

The study tested the following null hypothesis;

i. There is no statistically significant relationship between the level of adequacy of the school farm and the acquisition of agricultural skills among secondary school Agriculture students in Malava Sub-County

2. Method

2.1 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.

2.2 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 research design was therefore deemed appropriate for this study since it enabled the researcher to find out how several school farm factors; availability, adequacy, accessibility and level of utilization correlate with acquisition of practical agricultural skills among the form three agriculture students.

2.3. Sampling Procedures

There are 50 public secondary schools in Malava Sub-County all offering Agriculture. The Nassiuma, (2000) formula was used to determine the number of schools to participate in this study. Fifteen participated in the study.

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

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

$$n=15$$

The proportional sampling formula by Salkind (2014) was used to determine the exact number of various school categories to participate in this study.

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

Using this formula, nine Sub-County, four County and two Extra-County schools participated in this study. Categorization of schools avoided any bias and established the moderating effect on the relationship between the dependent and independent variables. 165 form Three Agriculture students and 15 teachers of Agriculture were sampled from the 15 schools.

2.3.1 Sample Size, Power, and Precision

The Yamane (1967) formula of sample size determination was used to determine the required sample size of the student respondents as follows.

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

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

$$n= 150$$

In addition to the 150 students, there was an additional 15 students based on the Mugenda and Mugenda (2003) recommendation that a sample size should be increased by at least 10 percent to cater for non-response. This gave a total of 165 form three Agriculture students. Proportionate sampling was used such that the school having the largest number of form three Agriculture students contributed the highest number in the sample size. Using purposive sampling, one teacher of Agriculture was sampled from each school. 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)

3. Results and discussion

The study sought to establish the size of farm allocated to students for instructional purposes. The teachers of Agriculture were deemed as being better placed to approximate the size of the school farm compared to their students thus the information was sought from them. The findings are summarily presented in figure 2.

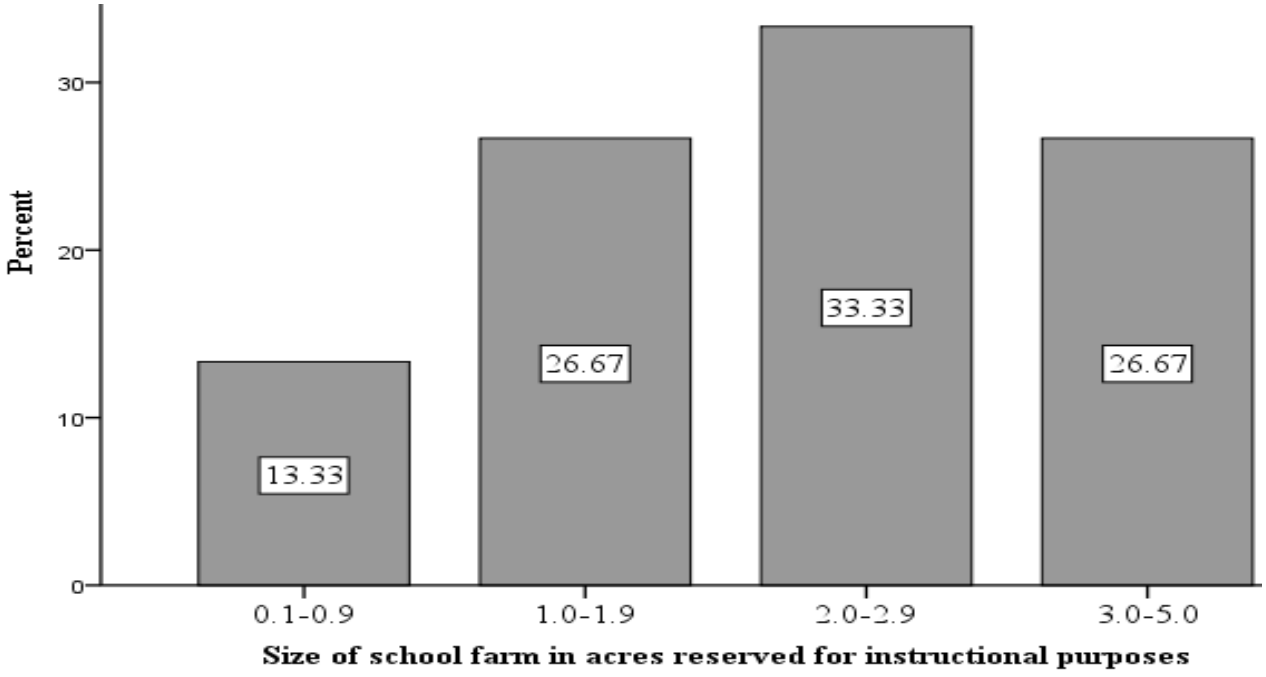

Figure 2: Size of the School Farm Allocated to Students

Summarily, 86.67% reported having more than one acre of the school farm reserved for instructional purposes. One acre of land is approximately 0.40 hectares which is also equivalent to 4000 square meters. Considering the fact that the KNEC recommends project plots measuring 12 square meters, one acre of land can therefore accommodate 333 project plots. These findings imply that with proper farm planning, majority of secondary schools in Malava Sub-County are better placed to set up the various school farm facilities and structures necessary for the practical implementation of the Agriculture curriculum. Teacher innovativeness is a crucial aspect during the curriculum implementation process as Shikanga et al. (2022) posit that it determines the ability of the teacher to plan, organize, and improvise the existing resources for achievement of the set objectives. For this case, teacher innovativeness through such ways as coming up with projects and farm structures that require less physical space as well as organizing the Agriculture students into functional groups can ensure sustainable implementation of the Agriculture curriculum in the 13.33% schools that had less than one acre. Administrative support through means such as leasing of land from the neighboring community members can also address the shortage.

The results from the teachers however included the commercial section. This section is always considered as an income generating unit for the school and for this reason, it is not commonly used for instructional purposes in most schools as students' access may be limited (Waiganjo, 2021). Based on the observation guide, this section had been allocated the largest portion, exceeding three acres in some schools. Though schools seem to have adequate land, more emphasis is laid on commercialization at the expense of practical Agriculture curriculum implementation for skill acquisition. Findings from this study however seem to contradict those from Evelia (2014) which revealed that majority of school farms in Masaba North range between 0.25-0.5 acres and attributed the shortage to the rapid increase in human population.

To evaluate the class size with respect to the available school farm, the respondents were requested to indicate the total number of form three students who had enrolled for Agriculture. The summary of the results have been presented in figure 3

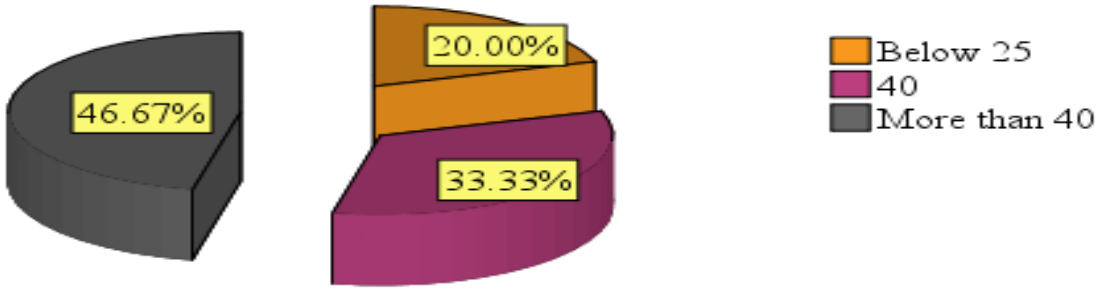

Figure 3: Class Size

According to the MoEST (2014) regulations, a class size exceeding 40 students is considered to be large, that having a maximum of 40 students is considered to be average while that of less than 25 students is small. Class size was comparatively smaller in the County and Extra-County schools to the Sub-County schools. With Agriculture being an optional subject, it was expected that the class size would reduce at form three after the learners had done subject selection. However, this seemed contrary especially in the Sub-

County schools. Sub-County schools have a narrow range of optional subjects to choose from leading to very high enrolments in Agriculture (Waiganjo, 2021).

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 teacher of Agriculture had allocated them plots for project activities either as individuals or in groups. From the findings, 100 % of the students reported that they had never been allocated individual plots. However, the results for plot allocation in groups were as shown in the table 3.

Table 3: Allocation of Group Plots

Frequency of allocation	Frequency	Percent
Never	124	75.2
Rarely	30	18.2
Sometimes	11	6.7
Often	0	0
Very often	0	0
Total	**165**	**100**

Over 75.2 percent of the respondents had never been allocated plots in groups which was a clear indicator that they had never been involved in any Agriculture project work on the school farm. Denying students the opportunity to engage in practical activities in groups hinders them from nurturing their communication, collaborative and problem solving skills which according to Momanyi and Rop (2020) are considered vital for the 21st century learner. The CBE aims at instilling these skills among the learners and for this reason, interactive learning through project work has been prioritized especially in the implementation of Competence Based Agriculture curriculum. Unlike in the 8-4-4 system where projects were presented as suggested learning activities to be conducted after topic completion, in the CBA, project work has been integrated in the teaching-learning process with learners expected to keep a track record of their project work. Furthermore, the project work in CBA are examinable unlike in the 8-4-4 where only the KNEC projects at form four were examinable. With such changes, it is anticipated that more focus will be project-based learning which will in turn promote practical implementation of the Agriculture curriculum for skill acquisition.

In order to determine the effectiveness of the groups, the 24.9% respondents who had reported having been allocated project plots in groups were requested to state the size of groups that participated in the project work. The results were as presented in Figure 4.

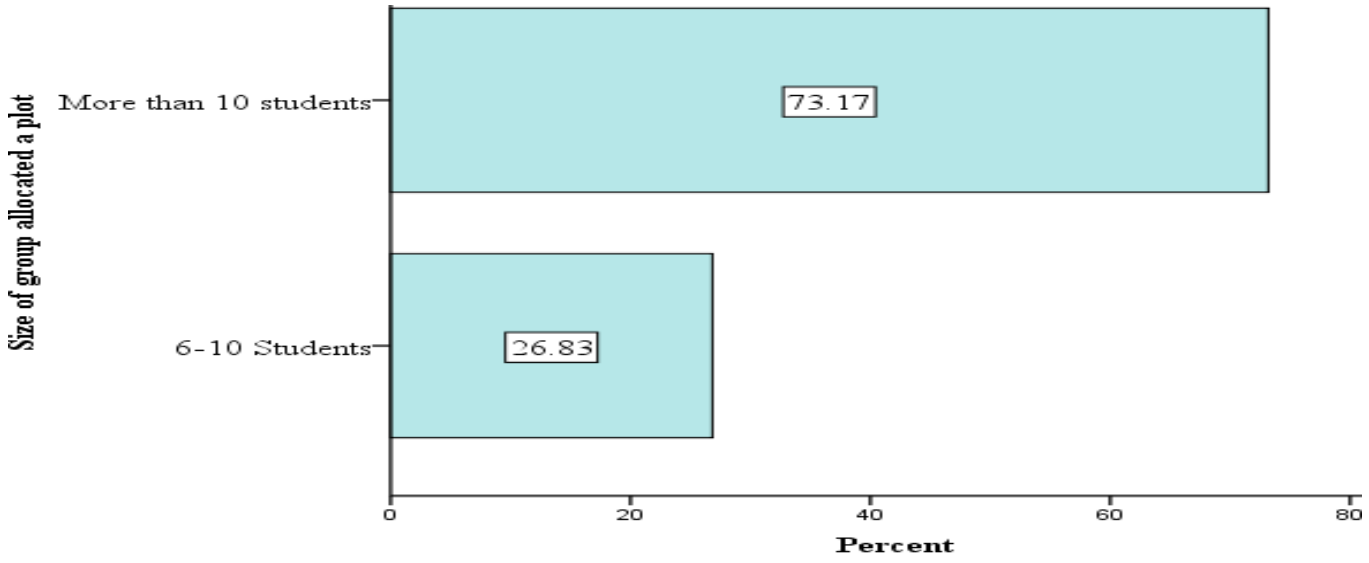

Figure 4: Group Size in Plot Allocation

Majority of the respondents (73.17%) reported of sometimes being in groups of more than ten students. A past study by Moluayonge and Park (2017) affirmed that in large groups exceeding five, not all the students get an opportunity to be active participants in the learning activity as majority of them become passive participants. By engaging such large groups in project activities, then it is more likely that majority of the learners will be passive participants thus will not acquire the practical skills under study. Such students upon completing secondary school education will most likely be devoid of practical farming skills thus will not be in a position to venture into farming or pursue agriculture-related careers. The ultimate impact of this is the continued rise in youth unemployment and food insecurity. This completely violates the objective of teaching secondary school Agriculture for skill acquisition with the hope of reducing unemployment, boosting food security and steering Kenya into a middle economy by the year 2030.

The Young Farmers club of Kenya (YFCK) is a youth organization whose members include secondary school students as well as out-of school youth. One of the objectives of the YFCK is to mould the youth into productive future farmers through active involvement in farming projects. Mugambi et al. (2022) observed that it has proved to be effective in equipping life-long farming skills among many students, especially those who fail to further their studies beyond the secondary school level to train young people to be productive future farmers. Study findings from Ndambuki, Konyango and Kyule (2024) established that the projects initiated and maintained by such youth organizations on the school farm are often used by the teachers of Agriculture for instructional purposes especially in situations where the school farm is inadequate to allow for students to have individual plots. To determine if active YFCK existed in the sampled schools, the students were asked to indicate whether an active YFCK existed in their schools. The results were as shown in figure 5.

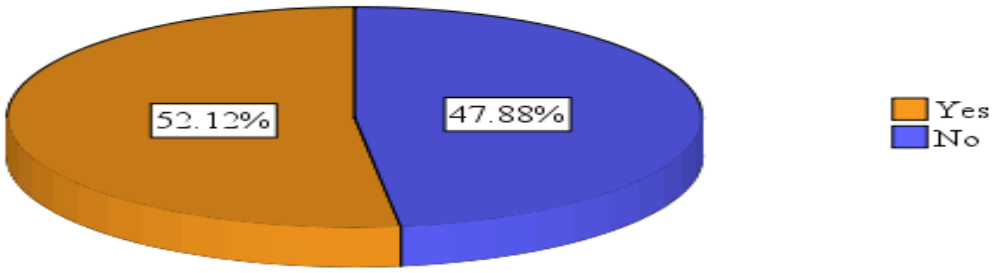

Figure 5: Presence of an Active Young Farmers Club

Based on the findings, it was established that majority of the schools (52.12%) had active YFC. It was therefore expected that the YFC members in these schools could initiate projects on the school farm that can be utilized for practical implementation of the Agriculture curriculum. The study further probed to establish whether the YFC members had been allocated a section of the school farm for conducting project work. The respondents who had reported having active YFC in their schools were therefore requested to indicate whether the YFC members had been allocated a section on the school farm. The results were presented in figure 6.

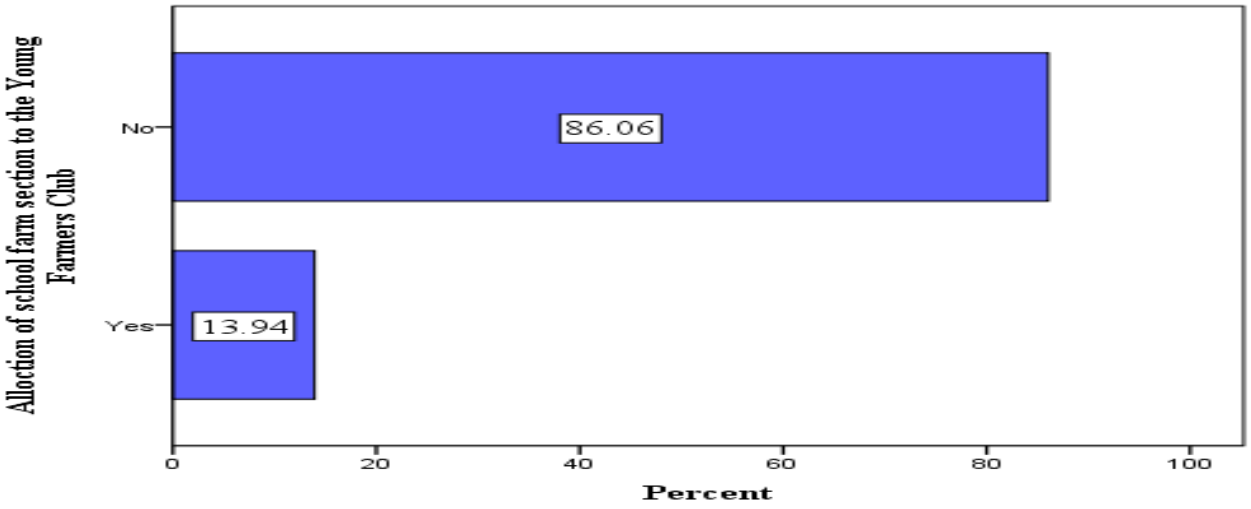

Figure 6: Allocation of Farm to the YFCK

From the findings, it was contrary to the expectation as majority of the respondents (86.06%) reported that the YFC members had never been allocated a section of the school farm for project work. By not being allocated a portion of the school farm for project work, it was certain that the though active, the YFC members in these schools hardly in project activities for skill acquisition. With such low exposure to project activities, the objective of the YFCK of shaping the youth into productive future farmers still remains a pipe dream among secondary schools in Malava Sub-County.

The study further sought to establish the adequacy of school farm facilities which include the project plots, museum plots, commercial farm and demonstration plots. Table 4 gives a summary of the results

Table 4: Level of Adequacy of the School Farm Facilities

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

Facility		**Teachers' Responses**			**Students' Responses**		
		Not available	**Inadequate**	**Adequate**	**Not available**	**Inadequate**	**Adequate**
Demonstration plots	Freq	7	7	1	99	55	11
	%	46.67	46.67	6.76	60	33.3	6.7
Commercial farm	Freq	6	1	8	61	12	92
	%	40	6.7	53.3	37	7.3	55.7
Museum plots	Freq	12	3	0	142	23	0
	%	80	20	0	86.1	13.1	0
Project plots	Freq	0	9	6	0	154	11
	%	0	60	40	0	93.3	6.7

From the results, the museum plots were not available in most of the schools as reported by 80% of the teachers and 86.1% of the students. Project plots were inadequate as reported by 60% of the teachers and 93.3% of the students. Demonstration plots were also missing in majority of the schools as reported by 60% of the student respondents. It is however worth noting that the commercial farm was the most adequate section among the sampled schools as reported by 53.3% of the teachers and 55.7% of the students. From the researchers' observation, a particular school for instance had three acres reserved for sugarcane growing and less than 0.25 acres allocated to students as project plots with demonstration plots and the crop museum missing. Though students can be exposed to the agronomic practices on this section, access and utilization may be restricted. The high rate of absence and inadequacy of the vital section of the school farm negates the aim of the form three students' book authored by Kahuria et al (2018) of exposing students to the basic principles of agriculture that can be put into practice for the benefit of the individual and the community in general.

Kenya is gradually changing her education system from 8-4-4 to the Competence-Based system. One of the main distinguishing features of the CBE is that it embraces a criterion referenced approach whereby emphasis is placed on students' ability to perform tasks for acquisition of core-competencies and for this reason, Ndambuki et al. (2024) observed that Competence- Based-Agriculture (CBA) implementation demands incorporation of a wide range of facilities and resources. The first cohort of students from the Junior Secondary Schools are expected to join Senior Secondary Schools in early 2025. However, with majority

of schools lacking vital sections of the school farm that are vital for implementation of practical agriculture, it is unlikely that secondary schools in Malava Sub-County are adequately prepared for implementation of CBA.

It is a mandatory requirement by the KNEC for any Agriculture student to sit for three papers during KCSE. Paper 1 and 2 cover the theoretical aspects while paper three is project work. The project work always comes in two options; crop growing or livestock rearing from which the school can choose only one of the options. For schools that opt for a crop growing project, the KNEC guidelines require each candidate to be allocated a plot of land measuring 12 square metres. It was therefore imperative to establish if there was adequate land in the sampled schools to enable the form fours carry out their KNEC projects as well as allow for the other students in the lower classes to carry out their project work as recommended by the KIE. The teachers of Agriculture were therefore asked to indicate whether the school farms in their schools was adequate to allow the candidates conduct their KNEC projects as well as the other Agriculture students in the lower forms. The figure 7 presents a summary of the results.

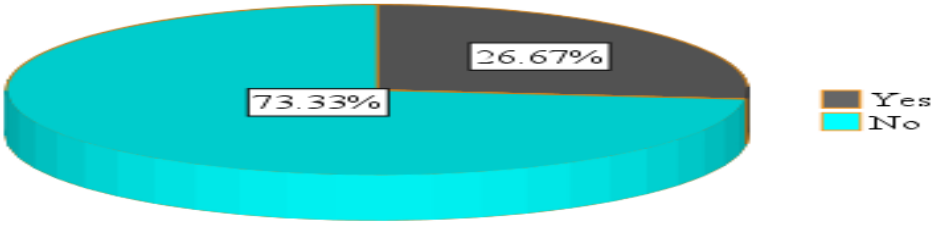

Figure 7: Adequacy of Project Plots For Both KNEC Activities and the Lower Classes

Based on the findings, majority of the teachers (73.33%) indicated that the school farm is not adequate to allow for the form four students to partake their KNEC projects and still remain for the lower forms to use for project work. The KNEC projects commence in January and end in September, this means that majority of students in Malava Sub-County are never exposed to hands-on activities on the school farm for eight months. It should be noted that the eight months cover the entire term one, two and half of term three. The school farm is therefore left vacant in September, a period during which the students in the lower forms are always preparing for the end of year exams. This implies that they hardly have any time for putting the theoretical aspects learnt in the classroom into practical use on the school farm. This violates the vision of school Agriculture which envisages to equip students with practical agricultural skills so as to steer Kenya into a middle economy by 2030.

This is however expected to be sorted out in the CBA with the introduction of innovative gardening techniques such as square foot gardening. According to the grade eight course book authored by Ngunyu (2023), the learners are introduced to this farming technique whereby gardens are divided into blocks measuring four feet by four feet. Each block is further divided into smaller blocks measuring 1 foot by one foot (30 cm by 30 cm) which are allocated to individual learners. Such innovative techniques will ensure sustainability in the implementation of practical Agriculture with the continued rise in student enrolment since technically, one acre ($4000M^2$) will accommodate 44,444 blocks.

The 73.33% teachers who had reported having inadequate school farms to accommodate project plots for both the candidates and the lower forms were asked to indicate

the level of exposure of the different forms to the school farm. Table 5 presents a summary of the results.

Table 5: Level of Exposure of Different Forms to the School Farm

n= 15

Form		**Level of exposure**				
		Highly exposed	**Moderately exposed**	**Lowly exposed**	**Least exposed**	**Total**
One	Freq	0	1	1	9	11
	%	0	9.1	9.1	81.8	100
Two	Freq	0	2	5	4	11
	%	0	18.2	48.5	36.4	100
Three	Freq	0	2	1	8	11
	%	0	18.2	9.1	72.7	100
Four	Freq	2	9	0	0	11
	%	18.2	81.8	0	0	100

From the analyzed results in table 20, form ones and threes were the least exposed students to the school farm while form fours were the most exposed. High exposure of the form fours can be attributed to the fact that they have to regularly access the school farm to monitor their KNEC projects. The least exposure among the form threes can partly be attributed to the fact that the form three Agriculture syllabus is very wide as it comprises of ten topics. By virtue of being pre-candidates, the teachers focus more on early syllabus completion at the expense of experiential learning hence the low exposure to the school farm. At form one, the class size always happens to be very large since subject selection has not yet been done which according to Waiganjo (2021) makes it difficult for them to access the school farm for instructional purposes. This is however expected to reduce at form two after subject selection among the technical options has been done. The least exposure to the school farm among the form one and three students denies them the opportunity to acquire agricultural skills which are necessary in the world of work.

The dependent variable under this study was level of acquisition of agricultural skills among secondary school students in Malava Sub-County. 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 6.

Table 6: 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.

In order to determine the relationship between the independent variable (level of adequacy of the school farm) and the dependent variable (level of acquisition of agricultural skills), chi-square test of relationship was used. The table 7 gives a summary of the findings

Table 7: Level of Adequacy of the School Farm and Level of Acquisition of Agricultural Skills Chi-Square Test

Scale	**Value**	**Df**	**p-value**
Pearson Chi-Square	17.232	12	.025
N	165		

The p value of the test was .025 which is less than .05, for this reason, the null hypothesis which stated that there is no statistically significant relationship between the level of adequacy of the school farm and the acquisition of agricultural skills among secondary school Agriculture students in Malava Sub-County was rejected in favor of the alternative hypothesis. Having established that there is a significant relationship between the two variables, the Cramer's V test was used to determine the strength of the relationship. Cramer's V was .34 which denotes a strong relationship. Similar findings from Waiganjo (2019) established that in the teaching and learning of practical Agriculture, smaller class sizes not only allow for better classroom management but also make it possible for the teacher to employ learner-centered approaches which enhance skill acquisition. Kyule (2016) points out that skills can only be acquired by active participation and therefore, with low student-facility ratio, each learner gets an opportunity to be actively engaged in the practical activities within the school farm which enhances skill acquisition.

4. Conclusions and Recommendations

This study concluded that:

a) All the schools in the Sub-County had school farms although these farms had inadequate vital facilities necessary for practical implementation of the Agriculture curriculum such as project plots, museum plots and demonstration plots.
b) Most schools have high student enrolments in Agriculture thus project plots are mostly allocated to the form four candidates for their KCSE projects. This denies the students in the lower classes an opportunity to engage in project work within the school farm.
c) Commercialization of the school farms has led to the in-availability and inadequacy of the other facilities such as crop museums which are fundamental for the practical teaching of agriculture for skill acquisition
d) Despite the importance of the YFCK in the implementation of practical Agriculture in schools through project activities, most schools in Malava Sub-County have not allocated a section of the school farm to the YFCK members.
e) The few existing projects on the school farms were completely neglected thus were in a poor state.

The study therefore recommends;

a) Teachers of Agriculture as the curriculum implementers should come up with innovative farm planning techniques to ensure proper sub-division of the school farm to ensure adequacy of vital facilities such as museum plots, demonstration plots and project plots
b) To ensure practical implementation of Agriculture amidst the rising enrolment, school managements through the principals and Boards of management should strive to acquire extra land through such means as purchasing or leasing from the neighbouring community.
c) The Ministry of Education through the County directors and Sub-County directors should enforce policies that regulate the commercialization of school farms by school principals.
d) Young Farmers Clubs should be activated and allocated a section of the school farm to facilitate practical implementation of the Agriculture curriculum through project activities on the school farm.

e) Having been vouchsafed with the responsibility of curriculum implementation, teachers of Agriculture need to ensure a balance trade-off between the theoretical and practical aspects of the subject for purposes of skill acquisition among the learners.

Acknowledgements

First and foremost, thanks and glory to the Almighty God. I would also like to thank Professor Ismail Hakki Mirici and the entire IJETS editorial board for making this work a success. God bless you abundantly.

Declaration of Conflicting Interests and Ethics

The authors of this article do hereby declare to have no conflict of interest.

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