Available online at **globets.org/journal**
International Journal of Education, Technology and Science
5(1) (2025) 01–25

IJETS
International Journal of Education Technology and Science

AN OVERVIEW OF THE CONTRIBUTION OF SECONDARY SCHOOL AGRICULTURE CURRICULUM AND THE YFCK ACTIVITIES TOWARDS PROMOTING STUDENTS' PARTICIPATION IN SUSTAINABLE FARMING PRACTICES IN KENYA

(Research article)

Robert Ouko Recha[a 1], Robert Kyalo Ndambuki[b], Jacob J.J.O Konyango[c], Mary M. Waiganjo[d]

[a,b,d] *Egerton University, P.O Box 536, Egerton, 20115, Kenya*
[c] *Machakos University, P.O Box 136, Machakos, 90100, Kenya*

Received: 09.09.2024 Revised version received: 08.12.2024 Accepted: 11.12.2024

Abstract

The need to produce sufficient food to sustain the exponentially growing human population is plunging most nations globally into an inextricable snare of environmental degradation mainly due to the adoption of poor farming techniques coupled with the increasing use of agro-chemicals. One of the general objectives of the secondary school Agriculture curriculum is to promote farming activities which enhance environmental conservation and for this reason, concepts on environmental education have been incorporated in the secondary school Agriculture curriculum. This study aimed at establishing the contribution of school Agriculture curriculum and the Young Farmers Club of Kenya (YFCK) activities towards promoting students' participation in sustainable farming practices (SFP). 150 form three Agriculture students from 15 schools were involved in the study. Descriptive survey research design was employed. Data analysis was done using SPSS version 26. T-test was used to analytically compare the responses from the respondents involved in YFC activities and those not involved. The study established that secondary school agriculture curriculum has a wide coverage of SFP which learners should be engaged in during the learning process. In addition, the study established that there is significant relationship between YFCK activities and learner's involvement in sustainable farming practices (SFP). The study therefore recommended secondary school agriculture teachers to actively engage learners in carrying out agriculture syllabus and YFC activities which enhance learner's involvement in SFP.

Keywords: Young Farmers Club; sustainable farming; Agriculture curriculum; secondary school students

[1]Corresponding author (Robert Ouko Recha). ORCID ID.: https://orcid.org/0009-0007-3652-6804
E-mail: recharobert@gmail.com
DOI: https://doi.org/10.5281/zenodo.14903803

1. Introduction

1.1. Background Information

Data from World Bank (2020) shows that human population has rapidly increased during the last two centuries. To achieve the United Nations Sustainable Development Goal (SDG) number two which aims at ending hunger, achieving food security and improving nutrition global food security, there will be a need to approximately double food production over the coming decades. A report by the Food and Agriculture Organization (FAO, 2018) projects that food production will have to be increased by approximately 70% by the year 2050. The projected increase will not only be in terms of quantity but will also encompass sophistication and diversity to address the anticipated change in the consumer tastes and preferences which Ogemah (2017) predicts that will further complicate the already fragile agriculture sector amidst emerging challenges such as decreasing farmland and the glaring menace of climate change. In the wake of the 21st century, environmental degradation is emerging as one of the most pertinent challenges facing all living things on the planet earth; human beings included (Wang & Dong, 2019). Coupled with shortage of adequate knowledge and awareness pertaining to ecological issues in the midst of the scathing environmental degradation, the agriculture sector has been blamed to be the main catapulting cause.

Loss of biodiversity, deforestation, pollution, climate change, soil erosion and similar problems are some of the escalating environmental challenges directly linked to agriculture (Chandio, Akram, Ozturk, Ahmad & Ahmad, 2021; Hussain et al., 2021). Duval, Cournut and Hostiou (2021) for instance established that despite the livestock industry serving as a source of food and livelihoods for many individuals globally, the sector is responsible for over 30 percent of the total global methane gas emission which Yeni and Teoman (2022) adduce to be a key contributor to global warming. Agriculture cannot be forfeited owing to its immense contribution to economic growth especially in Sub-Saharan Africa (SSA) where according to Van der Merwe (2024), majority of the countries are less technologically advanced and instead depend on the sector for economic growth. On the other hand, a blind eye cannot be cast on the ever rising negative impacts of agriculture on the environment. An ultimate and long-lasting solution is urgently needed.

Sustainable farming has been identified as the ultimate panacea to improving food productivity while at the same time guarding against the negative environmental impacts (Serebrennikov, Thorne, Kallas & McCarthy., 2020; Mutyasira, Hoag, Pendell & Yildiz., 2018). The term sustainable farming which is synonymous with sustainable agriculture has been defined by Ogemah (2017) as the agricultural production which doesn't compromise the ability of future generations to do the same. The United Nations acknowledges the importance of environmental sustainability in the process of achieving socio-economic growth and for this reason, various agenda aimed at promoting environmental conservation practices have been engrained among its 17 SDGs (Vorisek & Yu, 2020). In fact, the SDGs number 12, 13, 14 and 15 directly address environmental conservation. Human beings have the sole responsibility to solve environmental problems through developing the right attitudes partly due to the fact that most of the environmental problems are ethnocentric (Bhujel & Joshi, 2023). Since education is considered a catalyst for socio-economic development, incorporating environmental

conservation practices in the mainstream curricula can go a long way in inculcating a positive attitude towards environmental sustainability among the students who are considered as the **future of the society (Alrawashdeh, Lindgren, Reyes & Pisey., 2023; Eli et al., 2020)**

One of the recommendations of the Rio conference (Agenda 21) was that environment and development concepts be incorporated into the education curriculum as an essential part of learning. In response to this, most world nations included Environmental Education into their School Curricula. Notable examples of countries that have made laudable efforts towards integrating concepts pertaining to environmental sustainability such as biodiversity conservation and ozone layer protection in their national curricula include; England, Turkey, Canada, Australia, Ireland, Singapore, Romania, Japan and South Korea (Imamura, 2017; Lee & Kim, 2017; Glackin & King, 2018; Derman & Gurbuz, 2018; Boca & Saraçlı, 2019). South Africa is one of the notable examples of a country in SSA that has made progress, in both the policy and practice spheres of education, in including environmental issues in formal education curricula. The right to a healthy environment has been enshrined in the South African Constitution through the Bill of Rights, and directives for including environmental issues in formal education have been made in the White Paper on Education and Training (1995) as well as in the various curriculum iterations for schooling that have followed in its footsteps since 1997 (Reddy, 2017; Nkoana, 2020)

Kenya, like majority of the other UN member states espoused to the recommendations of the Rio conference infused concepts related to environmental conservation into various subjects at different levels of education (Magothe, 2016; Republic of Kenya, 2017; Shah & Atisa, 2021). Chikati (2019) points out that at the secondary school level, the concepts relating to sustainable environmental use have been infused into the curricula of various subjects such as Biology, Chemistry, Geography, Agriculture and Physics. In Agriculture, topics such as soil and water conservation as well as agro-forestry are purely environmental conservation concepts. This study therefore sought to establish the contribution of secondary school Agriculture curriculum and the Young Farmers Club of Kenya (YFCK) activities towards promoting sustainable farming practices.

1.2 Statement of the Problem

The agriculture sector is very crucial for propelling economic growth of all nations globally. In fact, the achievement of the United Nations second sustainable goal of ending hunger, achieving food security and improved nutrition is entirely hinged on a strong-investment in agriculture. However, the need to produce sufficient food to sustain the exponentially increasing human population is plunging the agriculture sector into an inextricable snare of environmental degradation through the adoption of poor capitalistic farming practices such as excessive use of agro-chemicals, mono-cropping, continuous cropping and encroachment into reserved land areas such natural forests and wetlands. The aftermath of this has been the aggravation of environmental degradation evident from the rapid increase in global warming, decline in soil productivity, pollution and loss of biodiversity. This looming danger can however be addressed through the adoption of sustainable farming techniques such as organic farming and crop rotation. Teaching of Agriculture subject in schools should prepare the learners for entry into agriculture- related careers and therefore should be tailored towards equipping them with relevant skills. With one of the objectives of the secondary school

Agriculture curriculum in Kenya being to promote agricultural activities which enhance environmental conservation, this study sought to investigate its contribution towards promoting students' participation in sustainable farming practices.

1.3 Objectives of the Study

1. To document the extent to which the secondary school Agriculture curriculum covers content that promotes sustainable farming practices
2. Document the Young Farmers Club of Kenya (YFCK) activities in schools promoting sustainable farming practices

1.4 Research Question

1. To what extent does the secondary school agriculture curriculum cover content that promotes sustainable farming practices

1.5 Hypothesis of the Study

2. H0: There is no statistically significant relationship between Young Farmers' Club activities and students' involvement in sustainable farming practices

2.0 Relevant scholarship

2.1 Agricultural Productivity and the Environment

The total global land mass is approximately 13.2 billion hectares out of which 12 percent (1.6 billion hectares) is currently in use for the cultivation of agricultural crops, 35 percent (4.6 billion hectares) is occupied by grassland and woodland ecosystems and 28 percent (3.7 billion hectares) is under forests (Gomiero, 2016). Over the last 5 decades, it is estimated that the total area under cultivation expanded by 12 percent with the area under irrigation being doubled, leading to encroachment of natural habitats such as wetlands and forests (Alvarado & Toledo, 2017). Gomiero (2016) estimates that about 30% of the current agricultural land was formerly under tropical rain-forests. The study further projected that by the year 2050, the demand for more agricultural land driven by such factors like population pressure, diet change and demand for biofuels is expected to increase by about 50%. It's most likely that tropical rain-forests will account for the anticipated land therefore thus escalating deforestation which will in turn set off a series of negative environmental impacts such as global warming due to excessive accumulation of Carbon (IV) dioxide in the atmosphere. Data from the National Oceanic and Atmospheric Administration (2016), revealed that due to global warming, the average global temperatures are constantly rising with the highest being recorded in 2015; being 0.9 degrees Celsius above the 19th century benchmark.

In the wake of the 21st century, environmental degradation is emerging as one of the pertinent challenges that calls for concerted efforts from all the human race globally as Wang and Dong (2019) point out that these problems are considered ethnocentric as they are directly linked to human activities. Despite its importance to economic development of most nations globally through food provision, creation of employment and poverty alleviation, agriculture has been touted as one of the chief contributors to environmental degradation globally. In china for example, a report by the World Bank (2020) established that the sector is very productive and has been on a steady rise since the 1980s, creating employment to over 35% of the population and accounting for approximately 7.9 % of the country's GDP. The intensive farming

adopted by the Chinese farmers however comes at a cost. Delang (2018) affirmed that Chinese farmers use approximately 305 kilograms of nitrogenous fertilizer per hectare annually which is almost four times the recommended global standard. The aftermath of this has been severe soil degradation evident from water pollution, soil erosion, soil salinization and soil acidification which are real threats to humanity and the entire ecosystem. In the USA, the Dust-Bowl disaster experienced in the mid-1930s that affected about 20 million hectares of land, mainly in states such as Texas, Kansas, Nebraska, New Mexico, Colorado and Oklahoma forcing about 2.5 million people to migrate was a good example of how improper technical know-how relating to nature and functioning of ecosystems, improper use of technology and the blind search for maximum profit can perversely come together, leading to the total devastation of the environment and the disintegration of human society (Gomiero, 2016).

Africa has achieved unprecedented economic growth over the last two decades and currently experiencing its longest period of economic growth since the 1960s (Ninson & Brobbey, 2023; Mukasa, Woldemichael, Salami & Simpasa., 2017; Mulder, 2016). During the 15-year period between the years 2000-2015, a report from the African Development Bank (2016) revealed that five African countries managed to feature among the world's most rapidly growing economies with a real Gross Domestic Product (GDP) growth of 7%. All this is mostly linked to the expansive growth in the agriculture sector which according to the OECD/FAO (2016) employs 65-70% of the African population and accounts for approximately 90% of the continent's GDP. Despite all these prospects, the agriculture sector in Africa is still unable to keep abreast with the exponentially growing population adduced from the fact that the continent has been and is still a net importer of food. Mukasa et al. (2017) revealed that the average expenditure on food importation in the year 2016 was 48.5 billion USD and projected to escalate to 110 billion USD by the year 2025.

In an effort to meet the nutritional needs of this rising population, there has been revitalization in the agriculture sector in the African continent. Mechanization, use of agro-chemicals and expansion into formerly non-agricultural lands such as forested areas and wetlands through use of land reclamation methods such as irrigation and drainage have been on the rise in the wake of the 21st century. The FAO (2019) report envisages that if put into agricultural use, the 200 million hectares of reserved land can produce sufficient food to meet the nutritional needs of the continent as well as ensure surplus reserves. However, as efforts are made to boost on the food security situation, environmental degradation is emerging as a grim matter of concern. Ogemah (2017) established that due the continued drop in soil productivity, farmers across the continent are being pushed into using marginal lands such as wetlands leading to dire consequences such as loss of biodiversity and ecological imbalances. Amidst the need to ensure high productivity amid the declining soil fertility, farmers resolve to using more agro-chemicals whose aftermath is soil degradation leading to the yields diminishing even more. For this reason, the farmers end up using more capital to produce less which further aggravates poverty levels in a continent whereby over 42 % of the populace live on less than one dollar based on the World Bank (2020) report.

In Kenya, the situation looks much grimmer. A report from the Kenya Institute for Public Policy Research and Analysis [KIPPRA] (2020) revealed that with a population of over 50 million, out of which around 80% derive their livelihoods from agriculture, much pressure is on the available arable land to provide food to the exponentially growing population. Boulanger,

Dudu, Ferrari, Mainar-Causapé, Balié and Battaglia. (2018) established that a very large portion of Kenya's landmass (83%) is considered to be arid and semi-arid with a paltry 17% being suitable for intensive crop cultivation. These agriculturally potential lands which are considered as Kenya's food baskets are mainly centered in the central region specifically in Kiambu, Laikipia, Nyeri, Embu, Meru and Murang'a counties, the rift valley region specifically in Kericho, Bomet, Nakuru and Uasin-gishu counties and the western region specifically in Kakamega, Bungoma and Trans-Nzoia counties. These agriculturally potential regions also happen to be the nerve centres of ecological diversity as they are endowed with a diverse array of physical facilities (Areri, 2023). Kakamega County for instance is home to various tropical rain-forests such as the Buyangu, Kakamega and Malava forests. Faced with the need to produce food to meet the nutritional needs of the growing population amidst land scarcity, farmers have no option but to encroach these forests (Akenga, Ali, Anam & Walyambillah., 2014; Kinyangi, 2014). Coupled with the adoption of poor farming practices which are purely capitalistic such as mono-cropping, continuous cropping, excessive use of agro-chemicals and cultivation along water bodies, achievement of the SDG number 15 which aims at protecting, restoring and promoting sustainable use of terrestrial ecosystems, sustainably manage forests, combat desertification, and halt and reverse land degradation and halt biodiversity loss may remain a pipe dream. The ultimate panacea rests on a paradigm shift to sustainable agriculture.

2.2 Role of Education in Promoting Sustainable Farming Practices

The term sustainable farming practices (SFP) stemmed during the conference of the International Federation of Organic Agriculture Movements (IFOAM) in the year 1976. This term is synonymous with the term Sustainable Agriculture which the American Society of Agronomy (ASA) defined as a system that, improves environmental quality and the agricultural resource-base with the aim of ensuring an economically viable agro-ecological environment that is beneficial to the farmers as well as the entire ecosystem over a long period of time. This definition seems to concur with that of the United Nations General Assembly (2019) which defined sustainable development as the development which meets the needs of the current generation without jeopardizing the ability of future generations to meet their needs. Sustainable farming is meant to address an array of issues pertaining to conventional agriculture such as reduction in soil fertility, environmental concerns, socio-economic issues, agricultural energy concerns and climate change (Dessart, Barreiro-Hurlé & Van Bavel., 2019).

Education is considered as a catalyst in enhancing socio-economic changes and for this reason, an effective curriculum should reflect the existing societal needs. According to the renowned environmentalist and Nobel Peace Prize winner; Maathai, (2003) environmental conservation efforts can best be seen when people are educated on the importance of environment as it was the case of the Green Belt Movement. Food insecurity, pollution, decline in soil fertility and climate change are some of the pertinent global issues related to agriculture that need to be solved and for this reason, Ndambuki, Recha and Karani (2024) advocate for constant curriculum review and change. The youth hold the future of the society as they are expected to take up various societal roles in the future. In agriculture, equipping the youth with skills pertaining to sustainable farming is a sure way of ensuring future sustainability in the sector. Developed nations have over time incessantly made laudable efforts in ensuring inclusion of sustainability concepts in their national curricular through informative environmental education programs. In Finland for instance the environmental education

curriculum is expansive and has been divided into five areas which include; nature, the built, aesthetic, social and ethical environment (Jeronen et al., 2009). The common objective of all these areas is to instill sound knowledge and practical skills on the sustainable use of the environment for economic growth and development. In the South Korean education system, the subject 'Environment' has been in existence since the year 1992 at all the basic levels of education with the aim of promoting students' attitude towards sustainable environmental exploitation for economic gains (Lee & Kim, 2017). In the United States of America, the use of learner-centered approaches in High schools has been used to implement a wide array of sustainable farming practices (Sameipour, 2017).

The general outlook with respect to incorporation of environmental conservation practices in the educational curricular of various African countries except for a few cases such as South Africa paints a bleak image. This seems quite surreal especially in a continent where environmental degradation is on the rise. Magagula and Tsvakirai (2020) point out that the formal education systems in most African nations has not strived to empower the upcoming generations with adequate knowledge to enable them apply this concept in future which is a remarkable contrast to the position in the developed countries where the concept has been infused into the education systems. This has consequently resulted to channeling out of agricultural practitioners who are devoid of knowledge pertaining to sustainable farming practices. Ogemah (2017) for instance pointed out that many agricultural extension agents are now graduates who passed through a very comprehensive curriculum that hardly or very scantily mentioned sustainable farming practices thus find it hard to embrace sustainable farming practices out there in the field, and perceive it as an inferior concept. It is obvious that such extension agents can never promote the concept of sustainable Agriculture among farmers. Conclusively, the achievement of sustainable farming practices remains to be a mirage unless proper interventions are made.

In the case of the secondary school agriculture curriculum in Kenya, inclusion of the SFP in syllabus can be traced back to the Chavakali pilot project of 1960. During this era, the 'Principles and Practices' Agriculture curriculum syllabus implemented by Robert Maxwell not only aimed at equipping learners with practical skills but also placed them in a better position to understand the existing relationship between the physical environment and agriculture (Saeteurn, 2017). Kyule (2017) reiterated that this proper mastery of the agro-ecology enabled the learners to initiate and maintain agriculture project sat home without teacher supervision. Following the introduction of the 8-4-4 system of education in 1985, Agriculture was made compulsory at the basic level of education until enforcement of the 2002 educational reforms where the subject was infused into the Science subject at the primary school level while at the secondary school level, it was made optional (Kenya Institute of Education, 2006). All along the secondary school agriculture subject curriculum has included topics that would help in passing SFP to learners. These are such as; soil and water conservation, soil fertility I and II, agroforestry among others (Kahuria, Otieno, Wachira, Muggah, Njagi, et al., 2018). It is upon this background that the study sought to determine the extent to which the secondary school Agriculture curriculum covers content promoting SFP

2.3 The Young Farmers' Club of Kenya (YFCK) Activities Promoting Sustainable Farming Practices

Agriculture is the backbone of many nations globally as it significantly contributes to employment, poverty alleviation and food production. The youth on the other hand serve as a measure of the extent to which a country can reproduce as well as sustain itself as the UNESCO (2016) report indicated that they are full of energy and vigor, enthusiastic, and easy to grasp new concepts. It is therefore imperative to come up with ways of attracting and retaining the youth in agriculture. The Young Farmers Club is one of the few youth organizations aimed at enhancing students' participation in agriculture and changing their perceptions towards agripreneurship (Ouko et al., 2022). In many developed countries globally, YFCs are active and well established. In England and Wales YFC, activities encompass agriculture, athletics, community volunteering, environment, and social activities (National Federation of Young Farmers‟ Clubs [NFYFC], 2011). Canada takes in its own 4-H program, which broadcasts data on new farming methods and maintains experimental farms, research stations, and research institutions throughout the country.

In Africa, Nigeria is one of the countries that has made laudable efforts in establishing and maintaining YFCs. The members are under the guidance of the agriculture teachers, agricultural extension personnel and local volunteer leaders which ensures holistic learning of agriculture (Ikebuaku & Dinbabo, 2023; Iderawumi et al., 2021). In Kenya, YFCK) was formed in 1948 when it was largely sponsored by Sir. Alex Ward with the main objective to prepare young people to be effective future farmers. Activities of the club members then were confined to tree planting, organizing camps and carrying out exchange programs with their counterparts in the United Kingdom. During their heydays in the 1960s, the YFCs maintained good links with other relevant stakeholders in the agriculture sector such as the local farming communities and extension agents (Mugambi, Obara & Kyule., 2022). These links were maintained through field tours and participation in agricultural shows. Their members' involvement in hands-on farming activities reinforced the concepts learnt in class. Currently, the clubs are run by the Agricultural Society of Kenya (ASK) and distributed among the existing ASK branches nationally. Each YFC branch is organized by a branch committee, whose chairman also sits at the nation national committee. The national chairperson is an ex-officio member of the executive committee and the ASK council who represents the movement at the national meetings. The ASK employs an executive national secretary who co-ordinates the clubs and cares for the YFC secretariat with offices located at Jamhuri Park. At the school level, the clubs are patronized by the teachers of Agriculture.

Njoroge (2015) outlines the roles of a functional YFC in a school to include; (i) Participating in exhibitions and competitions at ASK shows, (ii) Involvement in Agriculture projects at the club level (iii) Participation in YFC annual rallies, (iv) Involvement in workshops and seminars related to Agriculture, (v) Participating in national tree planting activities, (vi) Involvement and participation in exchange programs both locally and abroad or to other African countries, (vii) Participation in vocational ploughing contests. A study conducted by Waiganjo (2021) in Nakuru County, Kenya established that projects initiated by the YFC on the school farm are often used as teaching- learning resources by the teachers of Agriculture. Since the roles of the YFC in Kenyan secondary schools is to enhance participation in national tree planting activities as well as involvement in Agriculture projects at the club level, this study

aimed at establishing the contribution of the YFC activities in promoting sustainable farming practices in secondary schools in Kenya.

2.4 Conceptual Framework

The study sought to establish the contribution of secondary school agriculture curriculum and the YFCK activities towards promoting students' participation in sustainable farming practices in Kenya. Therefore, secondary school agriculture curriculum formed the independent variable which included agriculture syllabus topics covering SFP and the YFCK activities promoting SFP. Student's involvement in SFP formed the dependent variables with gender of the students forming the moderator variables. The effect of the moderator variable on the independent and the dependent variable was studied. Figure 1 below presents a summary of the relationship between the variables.

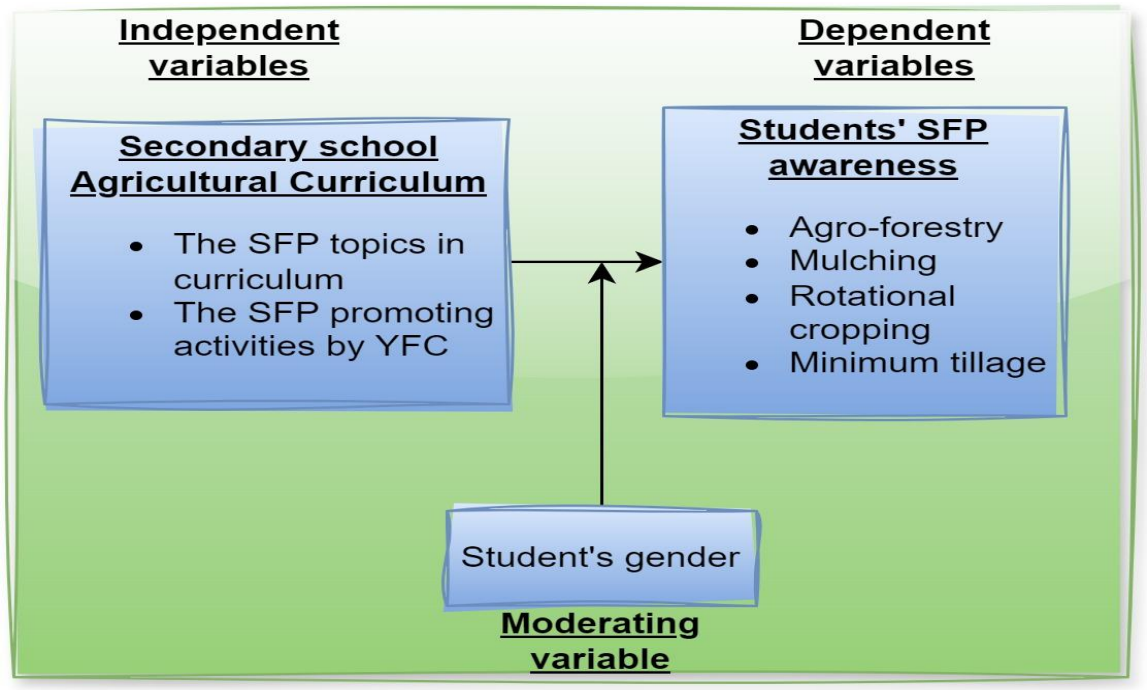

Figure 1: *Relationship between Variables in the Study*

3.0 Methodology

3.1 Research Design

The study adopted descriptive research design as it offers the chance of gathering data from a relatively large number of cases at a particular time in order to make inferences and generalizations from the study of the sample. Cohen, Manion and Morrison (2018) recommend this type of research design for an on-going process. This design enabled the researcher to collect data from Agriculture teachers and form four Agriculture students on the contribution of school Agriculture towards promoting SFP.

3.2 Sampling and Sample Size

There are 50 public secondary schools in Malava Sub-County which offer Agriculture as an examinable subject. In determining the number of schools to participate in this study, the formula recommended by (Nassiuma, 2000) was used. Based on this formula, 15 secondary schools were sampled.

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

Where

n= required sample size (number of schools)

N= total population (50**)**

C= coefficient of variation (0.2)

e= margin error (0.05)

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

n=15

Therefore, a total of 15 out of the 50 public secondary schools were involved in this study. Stratified sampling was used to put the schools into various cadres which included; Pure Boys' schools, Pure Girls' school and Mixed Schools. This categorization of schools was meant to ensure gender parity and determine the effect of the moderating variable (Gender) on the dependent variable (Students' involvement in sustainable farming practices). There are 9 pure girls' schools, 6 pure boys' schools and 35 gender mixed schools. In determining the exact number of schools from each cadre, the proportionate sampling formula by Salkind (2014) was used;

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

Whereby;

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)

Using this formula, 10 gender mixed schools, 3 pure girls' schools and 2 pure boys' schools were sampled. There are approximately 1500 registered form Four Agriculture candidates from the 50 public secondary schools in the Sub-County. In line with the Fraenkel, Wallen and Hyun (2012) recommendation that for a large target population, the minimum sample size should range between 10-30 percent, 150 students (10% of the target population). By use of class-lists, simple random sampling was used to select ten students from each of the schools. This gave a total of 150 respondents for this study. All the student respondents were taking Agriculture subject, however, not all were members of the YFC. This enabled the

researcher to determine the contribution of the YFC towards promoting SFP by separately analyzing the responses from the YFC members and the non-members. Questionnaires and an observation guide were used as the data collection tools.

4.0 Results and Discussions

The study sought to first determine the demographic characteristics of the respondents in terms of gender and school type which they come from. This was to ensure that the respondents who participated in the study were not biased (Ndambuki et al., 2024). Respondents were therefore asked to indicate their gender. The findings were summarized and recorded in Figure 2.

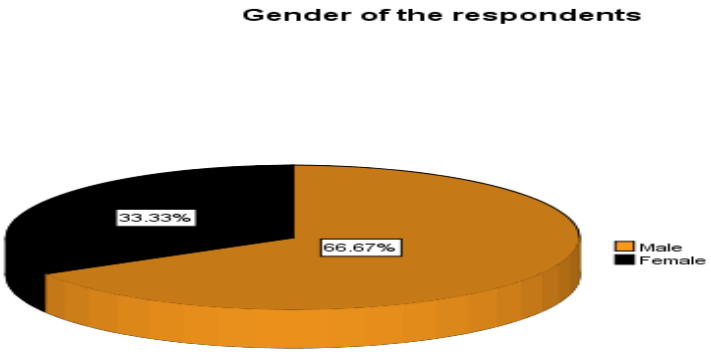

Figure 2: *Distribution of the Agriculture Teachers by Gender*

Based on the findings in Figure 1, majority of the students (66.67%) were males while only 33.33% were females. This seems quite ironical since there are more girl schools in the Sub-County. These findings resonate with those from Recha et al (2024) which attribute the more preference of Agriculture among boys due to its intense physical outdoor activities.

The respodents were also asked to indicate their school category. The results were analysed and summarised in Table 1 below.

Table 1: *Distribution of Schools by Type*

School category	**Frequency**	**Percent**
Boys' Schools	20	13.33
Girls' Schools	30	20
Mixed Schools	100	66.67
Total	**150**	**100**

From the findings in Table 1, it is evident that the highest number of schools where the research was conducted were the mixed schools which formed over 66% of the total targeted schools. The above findings were in line with findings by Njoroge (2015) who also recorded a higher number of mixed schools than any other school type. Similarly in the Ministry of Education (2022) documentation there are more mixed schools than pure one gender schools.

To determine if active YFCK existed in the sampled schools, the respondents were requested to indicate whether an active YFCK existed in their schools. The results were as shown in Figure 3.

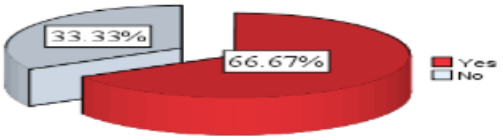

Figure 3: *Presence of an Active YFC*

One of the main objectives of the YFCs is to equip learners with hands-on skills in preparation for agriculture related jobs. This is unlikely to be achieved with majority of the respondents reporting that their schools lack an active YFC. The respondents who had reported having YFC in their schools were requested to indicate whether they were active members of the clubs. Based on the findings, 50 percent reported being active members with another equal percentage reporting that they are not members. Being vocational in nature, Agriculture aims at instilling learners with hands-on skills. On the other hand, the YFCK involves a lot of outdoor activities. Early exposure of students to these activities equips them with life-long agricultural skills at a very tender age (Njoroge, 2015)

The respondents who had reported of having active YFCK were further requested to indicate at which level of their secondary school level they joined the YFC. Their responses were summarized in Figure 4.

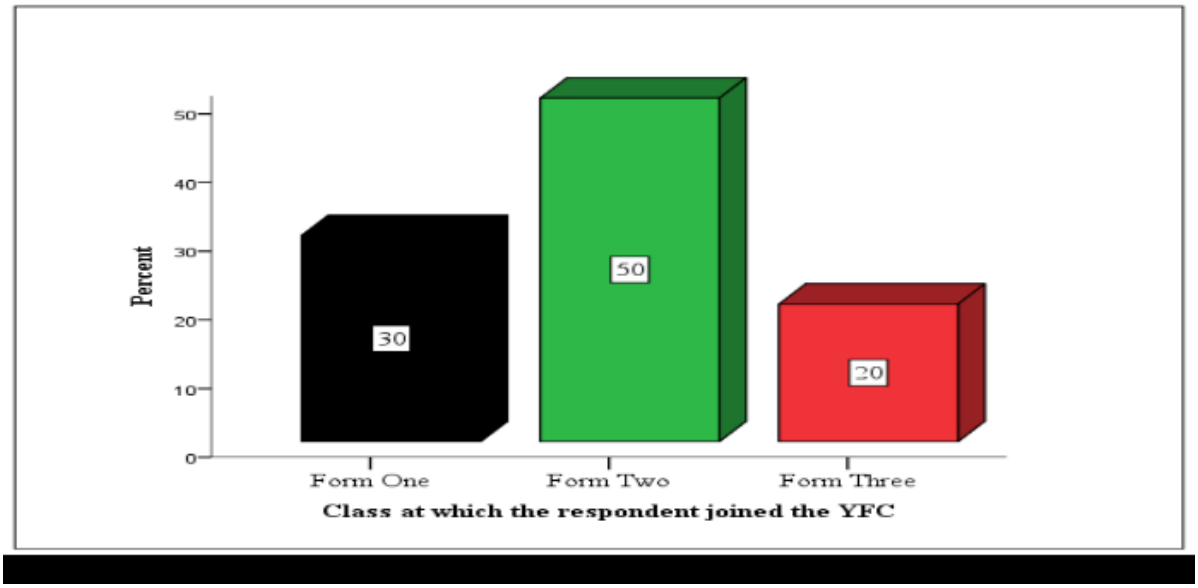

Figure 4: *Class at which the Respondent joined YFC*

Based on the findings, majority of the respondents (50%) reported having joined at form two while 20 percent reported having joined at form three level. These group of respondents likely missed in engaging in YFC SFP offered at the form one level such as preparation of organic manures and control of water pollution.

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 Table 2.

Table 2: *Allocation of YFC Plots in the School Farm*

Allocation of a section of the school farm to the YFC members	**Response in frequencies and percentages**		
	Yes	**No**	**Total**
Frequency	50	100	150
Percentage	33.33	66.67	100

From the findings, it was contrary to the expectation as majority of the respondents (66.67%) 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 though active, the YFC members in these schools hardly participated in project activities for skill acquisition. With such low exposure to project activities, the objective of the YFCK of moulding the youth into productive future farmers by equipping them with relevant SFP still remains a mirage among secondary schools in Malava Sub-County.

The study first sought to carry out a qualitative analysis of the agriculture syllabus and other relevant documents to find out extent to which the secondary school agriculture curriculum covers SFP. Upon the analysis the following findings were made; That the secondary school Agriculture syllabus has twelve general objectives with promotion of agricultural activities which enhance environmental conservation being one the objectives.

Analytically, the secondary school Agriculture syllabus comprises of 33 topics which Waiganjo (2021) broadly categorizes into Farm Machinery, Agricultural Economics, Crop Production and Livestock Production. Form one Agriculture syllabus consists of eight topics which according to Kahuria et al. (2018) include; Introduction to Agriculture, Factors Influencing Agriculture, Farm Tools and Equipment, Crop Production I, Water Supply, Irrigation and Drainage, Soil Fertility I (Organic Manures), Livestock Production I and Introduction to Agricultural Economics. The topic on Crop Production I is expected to expose the learners to minimum tillage which is a crucial component of sustainable farming as it aims at least disturbance of the soil. The topic on Water Supply, Irrigation and Drainage exposes students to various methods of irrigation and water conservation. The topic on Soil Fertility I exposes the learners to the various types of organic manures and the procedures involved in their preparation. Reeve et al. (2016) deem organic farming as the ultimate panacea to the over-reliance on agro-chemicals which is consequently leading to soil and water pollution.

The form two Agriculture students' book authored by Kahuria, Otieno, Wachira, Muggah, and Njagi (2018) comprises of eight topics which include; Soil Fertility II (Inorganic Fertilizers), Crop Production II (Planting), Crop Production III (Nursery Practices), Crop Production III (Field Practices), Crop Production IV (Vegetable Production), Livestock Health I (Introduction to livestock health), Livestock Health II (Parasites) and Livestock Health III (Nutrition). Only two topics cover content relating to sustainable farming. The topic on Soil II (Inorganic fertilizers) exposes the students to soil sampling and soil testing methods as well as computation of fertilizer ratios which is aimed at enhancing students' accuracy during fertilizer application so as to avoid excessive application. Gomiero (2016) established that the excessive use of inorganic fertilizers is a key contributor to soil acidification. The topic on Field Practices introduces the learners to some environmentally farming practices such as mulching, crop rotation and mixed cropping. The topic also discusses the negative impacts of some farming practices such as mono-cropping. The form three Agriculture students' book authored by Kahuria et al (2018) comprises of ten topics which include; Livestock Production III (Selection and Breeding), Livestock Production IV (Livestock Rearing Practices), Farm Structures, Agricultural Economics II (Land Tenure and Land Reform), Soil and Water Conservation, Weeds and Weed Control, Crop Pests and Diseases, Crop Production VI (Field Practices), Forage Crops, and Livestock Health III (Livestock Diseases). The topic on Soil and Water Conservation is expected to expose the students to the various soil conservation approaches aimed at curbing soil erosion which according to Srinivasarao et al (2021) contributes to the gradual loss of soil fertility thus hindering sustainable farming.

The form four students' book authored by Otieno et al. (2019) comprises of seven topics which include; Livestock Production V (Cattle), Livestock Production VI (Cattle), Farm Power and Machinery, Agricultural Economics III (Production Economics), Agricultural Economics IV (Farm Accounts), Agricultural Economics V (Agricultural Marketing and Organization) and Agro-forestry. The topic on Agro-forestry is expected to expose the students to establishment and management of Agro-forestry trees and discusses its importance to

farming. The study aimed at establishing the extent to which the secondary school Agriculture curriculum covers content related to sustainable farming practices.

Table 3: *Secondary School Agriculture Topics that Cover Content Promoting Sustainable Farming Practices*

Form	Topic	Suggested learning activities
One	Water Supply, Irrigation and Drainage	(i)Identification of polluted water bodies (ii) Participation in a water pollution control exercise
	Soil Fertility I (Organic Manures)	(i) Identification of farm yard manure or compost pits (ii) Participation in preparing compost manure (iii) Organic farming
Two	Soil Fertility II,	(i) Soil sampling (ii) Soil testing (iii) Top dressing
	Crop Production IV (Field Practices)	(i) Crop rotation activities (ii) Mulching activities
Three	Soil and water conservation	(i) Designing various models of soil erosion (ii) Construction of various designs which conserve soil such as bench terraces (iii) Survey and identification of various water harvesting methods used in the local environment (iv) Carrying out soil and water conservation work in and out of the school
Four	Agro-forestry	(i) Collection and preparation of tree seeds for planting (ii) Transplanting tree seedlings (iii) Selecting an appropriate site for a tree nursery (iv) Pruning, thinning and harvesting trees

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 mound the youth into productive future farmers through active involvement in farming projects. Mugambi (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 et al. (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. Therefore, the study first sought to determine learner's frequency of access to the school farm to conduct SFP learning activities.

Frequency at which learners access facilities determines the level of skills they acquire (Iyer & Rao, 2024). In order to determine how frequently the YFCK members access the school farm, the respondents were requested to indicate how frequently they access the school farm in a term. The responses are summarized in Figure 5

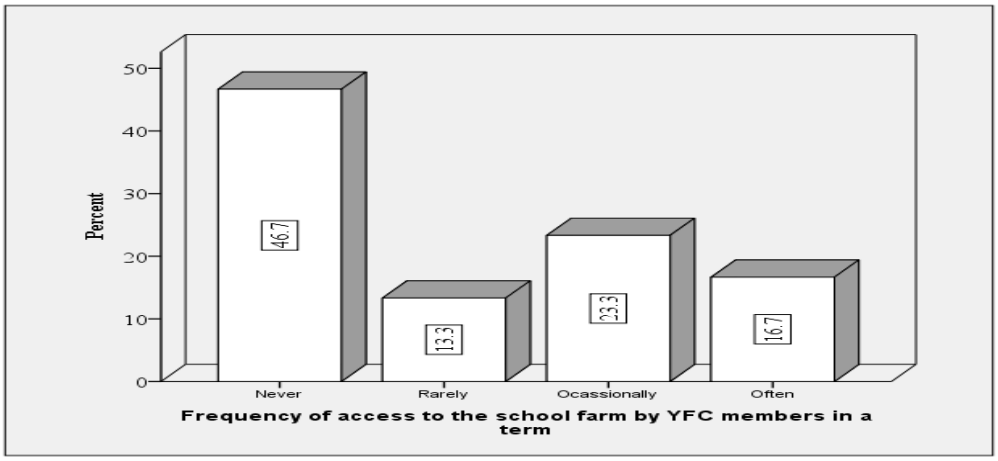

Figure 5: *Frequency of Access to the School farm*

Based on the findings in Figure 5, majority of the respondents 46.7 % never access the school farm in a term. It was quite surreal that no respondents reported accessing the school farm on very oftenly. Sustainable farming practices recommended in the Agriculture syllabus such as mulching and preparation of organic manures require constant monitoring which cannot be done once in a term.

Sustainable Farming practices are applicable to both crop and livestock production. Furthermore, the secondary school Agriculture curriculum recommends practical activities in both the two types of enterprises. The respondents who had indicated the YFC members having been allocated a portion of the school farm were asked to indicate the types of projects initiated and maintained by the YFC members. Their responses were summarized in Figure 6.

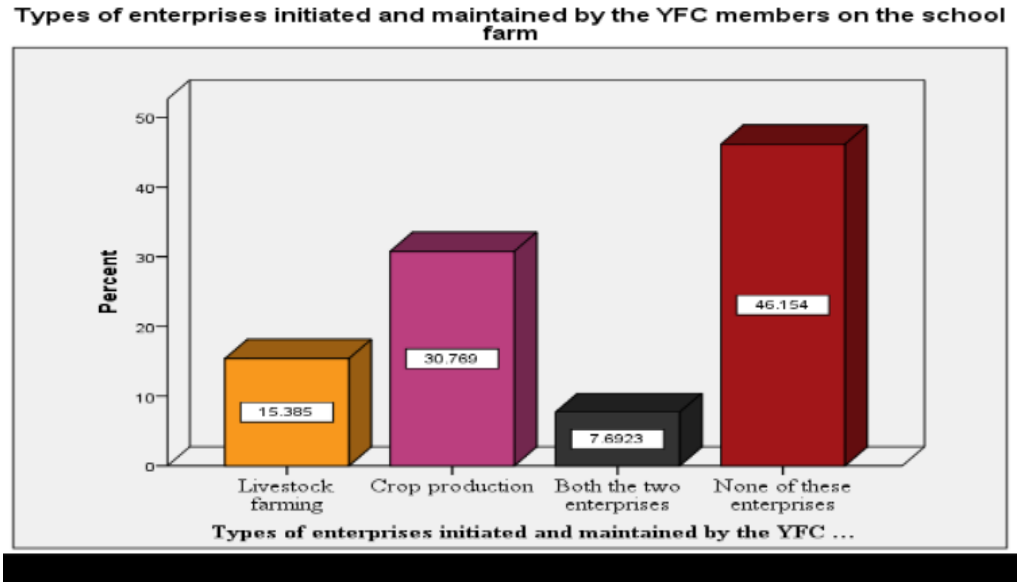

Figure 6: *Types of Enterprises Initiated and Maintained by the YFC*

Based on the findings in Figure 6, only a paltry 7.69 percent of the YFC members reported having both crop and livestock enterprises. It was however quite surprising that

majority of the respondents (46.15%) had neither crop nor livestock enterprises. This can be blamed on the much focus on theoretical aspects of the subject which according to Kyule (2017) denies students the opportunity to acquire practical skills in farming; inclusive of sustainable farming practices.

In order to determine the specific types of sustainable farming practices evident on the school farm projects, the respondents were requested to indicate the types of practices promoting SFP on their school farm projects. The summary of the responses was presented in Table 4.

Table 4: *Sustainable Farming Practices on the school farm*

Sustainable Farming Practices on the school farm		**Responses in frequency and percentage**		
		Yes	**No**	**Total**
Mulching	Freq	20	55	75
	%	26.67	73.33	100
Organic farming	Freq	22	53	75
	%	30	70	100
Agro-forestry	Freq	55	95	150
	%	36.67	63.33	100
Minimum tillage	Freq	15	135	150
	%	10	90	100
Bio-control of pests, parasites and weeds	Freq	12	138	150
	%	8	92	100
Rotational cropping	Freq	75	75	150
	%	50	50	100
Mixed cropping	Freq	80	70	150
	%	53.33	46.67	100
Establishing cover crops	Freq	71	79	150
	%	47.33	52.67	100

Among the Sustainable Farming Practices, minimum tillage and biological control of pests, parasites and weeds were the least practiced among the YFC members. Based on the researchers' observation guide, mixed cropping was hardly evident as mono-cropping was the most common practice. Generally, sugarcane (*Saccharum officinarum*) is the main cash-crop in Malava Sub-County although maize (*Zea mays*) and livestock farming are also practiced but on a minor scale. The desire to earn more income among the farmers has led to expansion of the area under sugarcane over time, whose main aftermath has been the decline in soil fertility based on a study by Akenga (2014).

T-test was used to determine whether there was a significant difference in involvement in Sustainable Farming Practices among students who were members of the Young Farmers Club and those who were not members. Table 5 gives a summary of the findings.

Table 5: *T-test on level of involvement in SFP among the YFC members and the non-YFC members*

Young Farmers Club Membership	N	Mean	Std. Dev.	t-value	Df	P-value
No	100	3.71	0.63	4.93	111	0.03
Yes	50	4.23	0.45			

Based on these findings, the significance level of 0.03 is lower than the recommended α level of 0.05. The null hypothesis was therefore rejected in favor of the alternative hypothesis which stated that there is a statistically significant relationship between Young Farmers' Club activities and students' involvement in sustainable farming practices. These findings suggest that secondary school students who are active members of the YFC are more likely to be better exposed to SFP than the non-members. The respondents were further categorized into their respective genders in order to determine the effect of the moderator variable (Gender) on the dependent variable (Involvement in SFP. The summary findings of the results were presented in Table 6.

Table 6: *T-test on level of involvement in SFP based on gender among the YFC members*

Gender	N	Mean	Std. Dev.	t-value	Df	P-value
Male	32	4.32	0.43	1.84	103	0.06
Female	18	5.23	0.65			

Based on these findings, the significance level of 0.06 is higher than the recommended α level of 0.05 and thus it was evident that gender does not significantly contribute to students' involvement in SFP. This could be attributed to the fact that all the respondents who were YFC members were indiscriminately exposed to SFP irrespective of their gender.

To measure, the dependent variable (Students' involvement in Sustainable Farming Practices), students' mean knowledge level in selected SFP was measured. For convenience of analysis, the SFP were categorized into two groups; those tailored towards enhancing soil and water conservation (Mulching, cover cropping, agro-forestry, biological control of pests, weeds and parasites and minimum tillage) and those tailored towards replenishing soil nutrients (Crop rotation, mixed farming, inter-cropping and organic farming). The findings are summarized in Table 7.

Table 7: Level of knowledge in Sustainable Farming Practices

Level of skills in	N	Minimum	Maximum	Mean	Std. Deviation
Mulching	150	1.00	3.00	1.7667	.72793
Organic farming	150	1.00	3.00	1.6000	.72397
Agro-forestry	150	1.00	3.00	1.5667	.77385
Minimum tillage	150	1.00	3.00	1.5333	.73030
Biological control of pests, parasites, weeds and diseases	150	1.00	2.00	1.1667	.37905
Rotational cropping	150	1.00	2.00	1.2667	.44978
Mixed farming	150	1.00	2.00	1.4667	.50742
Intercropping	150	1.00	2.00	1.3333	.47946

Analytically, those SFP tailored towards enhancing soil and water conservation (Mulching, cover cropping, agro-forestry, biological control of pests, weeds and parasites and minimum tillage) had a mean of 1.50835. The regenerative practices aimed at replenishing soil nutrients (crop rotation, mixed farming, inter-cropping and organic farming) had a mean of 1.4166. The researcher developed a rating scale for the level of knowledge in SFP. Based on this rating scale, any score between 1-1.5 was categorized as below average, 1.6-2.4 as average, 2.5-3.0 as above average. The level of student's mean knowledge in SFP tailored towards soil and water conservation was 1.50835 which was generally rated as below average. Likewise, the mean score for regenerative practices aimed at replenishing soil nutrients was 1.4166 which was generally considered to be below average. This seems to be quite ironical and negates the objective of secondary school Agriculture of promoting farming activities which enhance environmental conservation. These findings aptly back those from Ogemah (2017) which established that agricultural education systems in Africa have failed to adequately incorporate concepts related to sustainable agriculture leading to churning out of agricultural practitioners such as extension agents who are completely devoid of knowledge and skills in SFP.

Agriculture being a vocational subject aims at instilling learners with practical skills in preparation for entry into various careers in the agriculture sector (Recha et al. 2024). With SFP becoming an area of concern in agriculture, the respondents were requested to indicate their level of willingness to practice and advocate for SFP upon graduating from secondary school. Their responses were summarized in Figure 7.

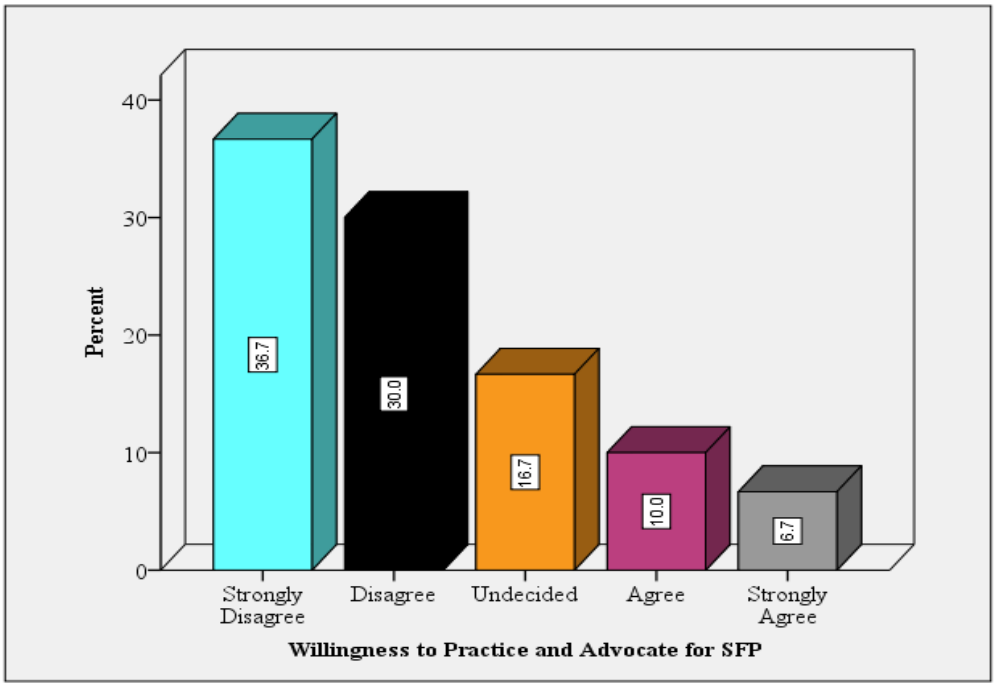

Figure 7: *Willingness to Practice and Advocate for SFP*

It was quite ironical that majority of the respondents 66.67% were unwilling to venture into or promote SFP with only a paltry of 16.67% willing to do the same. With the youth being expected to take up opportunities in the agriculture sector such as extension agents, these findings spell a doom for the agriculture sector not only in the Sub-County but also nationally as Kenya's economy is exclusively hinged on agriculture.

5.0 Conclusions

In conclusion, the study established that the secondary school agriculture syllabus has a variety of topics that covers SFP that would enhance learner's participation in such activities during the learning process. These syllabus-based topics that cover SFP are such as soil fertility topics, soil and water conservation, water supply, irrigation and drainage, crop production among others. These topics are distributed across all the classes in secondary school. On the YFCK activities that promote SFP, the study established that there is statistically significant relationship between YFCK activities and learner's involvement in sustainable farming

practices. This is because the YFCK include a variety of activities which are crop, soil and livestock based that enhance sustainable farming.

6.0 Recommendations

Based on the conclusions, this study recommended that;

i. Teachers of agriculture at secondary school to teach agriculture subject practically to enable learners practice the SFP when learning syllabus topics that cover such activities.
ii. Schools to keep YFCs vibrant for use in enhancing SFP to learners.

Acknowledgements

This study acknowledges Dr. Collins Musafiri, PhD for conducting a plagiarism check on this paper to ensure originality of the information contained.

Declaration of Conflicting Interests and Ethics

Authors declare no conflict of interests

References

African Development Bank. (2016). *Feed Africa: Strategy for Agricultural transformation in Africa 2016-2025*. AfDB, Abidjan.

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.

Alrawashdeh, G. S., Lindgren, S., Reyes, M., & Pisey, S. (2023). Engaging youth at school to advance sustainable agriculture and inspire future farming: Evidence from Cambodia. *The Journal of Agricultural Education and Extension*, *29*(5), 539–556. https://doi.org/10.1080/1389224X.2022.2117213

Alvarado, R., & Toledo, E. (2017). Environmental degradation and economic growth: Evidence for a developing country. *Environment, Development and Sustainability*, *19*(4), 1205–1218. https://doi.org/10.1080/01436597.2022.2132927

Areri, V. (2023). *Smallholder farmers' perceptions on adoption of organic farming practices in Kisii Central Sub-County, Kisii County, Kenya* [PhD Thesis, Egerton University]. http://ir-library.egerton.ac.ke/handle/123456789/3096

Bhujel, R. R., & Joshi, H. G. (2023). Understanding farmers' intention to adopt sustainable agriculture in Sikkim: The role of environmental consciousness and attitude. *Cogent Food & Agriculture*, *9*(1), 2261212. https://doi.org/10.1080/23311932.2023.2261212

Boca, G. D., & Saraçlı, S. (2019). Environmental education and student's perception, for sustainability. *Sustainability*, *11*(6), 1553. https://doi.org/10.3390/su11061553

Boulanger, P., Dudu, H., Ferrari, E., Mainar-Causapé, A., Balié, J., & Battaglia, L. (2018). Policy options to support the agriculture sector growth and transformation strategy in Kenya. *A CGE Analysis, EUR*, *4*(1), 4–91. https://doi.org/10.2760/091326

Chandio, A. A., Akram, W., Ozturk, I., Ahmad, M., & Ahmad, F. (2021). Towards long-term sustainable environment: Does agriculture and renewable energy consumption matter? *Environmental Science and Pollution Research*, *28*(38), 53141–53160. https://doi.org/10.1007/s11356-021-14540-y

Chikati, T. (2019). *Implementation of Integrated Environmental Education in the Secondary School Curriculum for Managing Environmental Degradation in Machakos Sub-County, Kenya* [PhD Thesis]. Catholic University of East Africa.

Cohen, L., Manion, L., & Morrison, K. (2018). *Research Methods in Education* (8th ed.). Routledge.

Delang, C. O. (2018). The consequences of soil degradation in China: A review. *GeoScape*, *12*(2), 92–103. https://doi.org/10.2478/geosc-2018-0010

Derman, M., & Gurbuz, H. (2018). Environmental education in the science curriculum in different countries: Turkey, Australia, Singapore, Ireland, and Canada. *Journal of Education in Science Environment and Health*, *4*(2), 129–141. https://doi.org/10.21891/jeseh.409495

Dessart, F. J., Barreiro-Hurlé, J., & Van Bavel, R. (2019). Behavioural factors affecting the adoption of sustainable farming practices: A policy-oriented review. *European Review of Agricultural Economics*, *46*(3), 417–471. https://doi.org/10.1093/erae/jbz019

Duval, J., Cournut, S., & Hostiou, N. (2021). Livestock farmers' working conditions in agroecological farming systems. A review. *Agronomy for Sustainable Development*, *41*(2), 22. https://doi.org/10.1007/s13593-021-00679-y

Eli, M., Scheie, E., Gabrielsen, A., Jordet, A., Misund, S., Nergård, T., & Øyehaug, A. B. (2020). Interdisciplinary primary school curriculum units for sustainable development. *Environmental Education Research*, *26*(6), 795–811. https://doi.org/10.1080/13504622.2020.1750568

FAO. (2018). *Report on the State of Food Security and Nutrition*. Accessed on 4-10-2022 from www.fao.org

FAO. (2019). *The state of food security and nutrition in the world 2019*. LWW. Retrieved on 13-6-2021 from http://www.fao.org/3/19553EN/19553/en.pdf

Fraenkel, J. R., Wallen, N. E., & Hyun, H. H. (2012). *How to design and evaluate research in education* (8th ed.). McGraw-hill New York.

Glackin, M. A., & King, H. (2018). *Understanding Environmental Education in Secondary Schools in England: Report 1: Perspectives from Policy*. King's College London.

Gomiero, T. (2016). Soil degradation, land scarcity and food security: Reviewing a complex challenge. *Sustainability*, *8*(3), 281. https://doi.org/10.3390/su8030281

Hussain, S., Hussain, S., Guo, R., Sarwar, M., Ren, X., Krstic, D., Aslam, Z., Zulifqar, U., Rauf, A., & Hano, C. (2021). Carbon sequestration to avoid soil degradation: A review on the role of conservation tillage. *Plants*, *10*(10), 2001. https://doi.org/10.3390/plants10102001

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

Ikebuaku, K., & Dinbabo, M. (2023). Exploring the Dynamics of Agripreneurship Perception and Intention among the Nigerian Youth. *International Journal of Management, Entrepreneurship, Social Science and Humanities*, *6*(2), 94–115. https://doi.org/10.31098/ijmesh.v6i2.1222

Imamura, M. (2017). Beyond the limitations of environmental education in Japan. *Educational Studies in Japan*, *11*(11), 3–14.

Iyer, S., & Rao, N. (2024). Skills to stay: Social processes in agricultural skill acquisition in rural Karnataka. *Third World Quarterly*, *45*(4), 677–697. https://doi.org/10.1080/01436597.2022.2132929

Jeronen, E., Jeronen, J., & Raustia, H. (2009). Environmental Education in Finland–A Case Study of Environmental Education in Nature Schools. *International Journal of Environmental and Science Education*, *4*(1), 1–23.

Kahuria, R., Otieno, M., Wachira, A., Muggah, C., & Njagi, D. G. (2018). *Secondary Agriculture Form Two Students' Book* (4th ed.). Kenya Literature Bureau.

Kahuria, R., Otieno, M., Wachira, A., Muggah, C., Njagi, D. G., & Imonye, J. (2018). *Secondary Agriculture Form Three Students' Book* (4th ed.). Kenya Literature Bureau.

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*.

Kenya Institute of Education. (2006). *Revised secondary school Agriculture syllabus*. Kenya Literature Bureau, Nairobi.

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.

Kyule, M. N. (2017). *Influence of school factors on the implementation of secondary school agriculture curriculum in arid and semi-arid lands of Kenya Case of Baringo, Makueni and Narok Counties* [PhD Thesis]. Egerton University.

Lee, S.-K., & Kim, N. (2017). Environmental education in schools of Korea: Context, development and challenges. *Japanese Journal of Environmental Education*, *26*(4), 4_7-14.

Maathai, W. (2003). *The Green Belt Movement: Sharing the approach and the experience*. Lantern Books.

Magagula, B., & Tsvakirai, C. Z. (2020). Youth perceptions of agriculture: Influence of cognitive processes on participation in agripreneurship. *Development in Practice*, *30*(2), 234–243.

Magothe, S. N. (2016). Do Kenyan Set Book Novel Kidagaa Kimemwozea Advance Environmental Education?. *Journal of Education and Practice*, *7*(30), 24–26.

Ministry of Education. (2022). *Guidelines on implementation of free day secondary school education capitation to schools*. Nairobi: Government Printer.

Mugambi, D. K., Obara, J., & Miriam, K. N. (2022). An investigation of the relationship between students' enrolment in Young Farmers Club of Kenya (YFCK) and establishment of individual farm projects at home: A Case of Public Secondary Schools in Njoro Sub-County, Kenya. *International Journal of Education, Technology and Science*, *2*(2), 213–228.

Mukasa, A. N., Woldemichael, A. D., Salami, A. O., & Simpasa, A. M. (2017). Africa's agricultural transformation: Identifying priority areas and overcoming challenges. *Africa Economic Brief*, *8*(3), 1–16.

Mulder, M. (2016). Editorial – The latest from international agricultural and extension education. *The Journal of Agricultural Education and Extension*, *22*(3), 217–222. https://doi.org/10.1080/1389224X.2016.1178473

Mutyasira, V., Hoag, D., & Pendell, D. (2018). The adoption of sustainable agricultural practices by smallholder farmers in Ethiopian highlands: An integrative approach. *Cogent Food & Agriculture*, *4*(1), 1552439. https://doi.org/10.1080/23311932.2018.1552439

Nassiuma, D. K. (2000). *Survey sampling: Theory and methods*. Nairobi University Press.

Ndambuki, R. K., Kyule, M. N., & Konyango, J. J. (2024). The teacher guided 4-k club activities undertaken within the school farm for the acquisition of the core competencies in Agriculture subject at Upper Primary School in Kenya. *International Journal of Education, Technology and Science*, *4*(1), 1619–1638. https://globets.org/journal/index.php/IJETS/article/view/231

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. https://globets.org/journal/index.php/IJETS/article/view/269

Ninson, J., & Brobbey, M. K. (2023). "Review on engaging the youth in agribusiness". *Cogent Social Sciences*, *9*(1), 2193480. https://doi.org/10.1080/23311886.2023.2193480

Njoroge, D. (2015). *Influence of young farmers' club of Kenya activities on students' performance in Kenya certificate of secondary education agriculture in Rongai Sub-County of Nakuru, Kenya* [Masters' Thesis]. Egerton University.

Nkoana, E. M. (2020). Exploring the effects of an environmental education course on the awareness and perceptions of climate change risks among seventh and eighth grade learners in South Africa. *International Research in Geographical and Environmental Education*, *29*(1), 7–22. https://doi.org/10.1080/10382046.2019.1661126

OECD/FAO. (2016). *OECD-FAO Agricultural outlook 2016-2025*. Retrieved from http://dx.doi.org/10.1787/agr_outlook-2016-en

Ogemah, V. K. (2017). Sustainable agriculture: Developing a common understanding for modernization of agriculture in Africa. *African Journal of Food, Agriculture, Nutrition and Development*, *17*(1), 11673–11690. https://doi.org/10.18697/ajfand.77.16560

Ouko, K. O., Ogola, J. R. O., Ng'on'ga, C. A., & Wairimu, J. R. (2022). Youth involvement in agripreneurship as Nexus for poverty reduction and rural employment in Kenya. *Cogent Social Sciences*, *8*(1), 2078527. https://doi.org/10.1080/23311886.2022.2078527

Recha, R., Kyule, M., & Nkatha, L. (2024). Relationship between selected School Farm Factors and the Acquisition of Agricultural Skills among Secondary School Students in Malava Sub-County, Kakamega County, Kenya. *International Journal of Education, Technology and Science*, *4*(1), 1718–1735. https://globets.org/journal/index.php/IJETS/article/view/235

Reddy, C. (2017). Environmental education in teacher education: A viewpoint exploring options in South Africa. *Southern African Journal of Environmental Education*, *33*, 117–126. https://doi.org/10.4314/sajee.v.33i1.9

Reeve, J. R., Hoagland, L. A., Villalba, J. J., Carr, P. M., Atucha, A., Cambardella, C., Davis, D. R., & Delate, K. (2016). Organic farming, soil health, and food quality: Considering possible links. *Advances in Agronomy*, *137*(1), 319–369. https://doi.org/10.1016/bs.agron.2015.12.003

Republic of Kenya. (2017). *Basic Education Curriculum Framework*. Nairobi: Kenya Institute of Curriculum Development.

Saeteurn, M. C. (2017). 'A Beacon of Hope for the Community': The Role of Chavakali Secondary School in Late Colonial and Early Independent Kenya. *The Journal of African History*, *58*(2), 311–329. https://doi.org/10.1017/S0021853716000682

Salkind, N. J. (2014). *100 questions (and answers) about statistics*. SAGE Publications.

Sameipour, S. F. (2017). *Teachers' Perceptions toward Sustainable Agriculture in an Ohio Science High School* [PhD Thesis]. The Ohio State University.

Serebrennikov, D., Thorne, F., Kallas, Z., & McCarthy, S. N. (2020). Factors influencing adoption of sustainable farming practices in Europe: A systemic review of empirical literature. *Sustainability*, *12*(22), 9719. https://www.mdpi.com/2071-1050/12/22/9719

Shah, P., & Atisa, G. (2021). Environmental education and awareness: The present and future key to the sustainable management of Ramsar convention sites in Kenya. *International Environmental Agreements: Politics, Law and Economics*, *21*(4), 611–630. https://doi.org/10.1007/s10784-021-09534-7

The National Oceanic and Atmospheric Administration. (2016). *Trends in Global Temperatures* (pp. 1–32). Washington, DC, USA. Available online: http://www.photolib.noaa.gov/bigs/theb1365.jpg

UNESCO. (2016). *Youth and Skills: Putting education to work.*

United Nations General Assembly. (2019). *Sustainable Development: Implementation of Agenda 21, the Programme for the Further Implementation of Agenda 21 and the outcomes of the World Summit on Sustainable Development and of the United Nations Conference on Sustainable Development: report of the 2nd Committee: General Assembly, 74th session*. UNGA Publishing. https://policycommons.net/artifacts/5708/sustainable-development/1241/

Van der Merwe, M. (2024). How do we secure a future for the youth in South African agriculture? *Agrekon*, *63*(1–2), 1–15. https://doi.org/10.1080/03031853.2024.2341511

Vorisek, D. L., & Yu, S. (2020). Understanding the cost of achieving the Sustainable Development Goals. *World Bank Policy Research Working Paper*.

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.

Wang, J., & Dong, K. (2019). What drives environmental degradation? Evidence from 14 Sub-Saharan African countries. *Science of the Total Environment*, *656*, 165–173.

World Bank. (2020). *World Development Report 2019: The Changing Nature of Work*. The World Bank.

Yeni, O., & Teoman, Ö. (2022). The agriculture–environment relationship and environment-based agricultural support instruments in Turkey. *European Review*, *30*(2), 194–218.