ORIGINAL RESEARCH ARTICLE

Influence of school agricultural farms on academic performance in agriculture in secondary schools

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ABSTRACT
Performance in agriculture in secondary schools countrywide has remained dismal since the year 2016 and it is mainly attributed to poor pedagogical skills and a lack of proper teaching materials and infrastructure. This study, therefore, sought to assess the influence of school agricultural farms on academic performance in agriculture in secondary schools in Hamisi Sub-County, Kenya. The study employed a descriptive survey research design involving census sampling. Data was collected using questionnaires. Quantitative data were analyzed using the Statistical Package for Social Sciences (SPSS) Version 25.0, with Spearman's rank-order correlation being employed to check for multicollinearity among study variables. The study established that, to a large extent, school agricultural farms influence academic performance in agriculture. The study recommends that efforts be made by all relevant players to ensure that secondary schools offering agriculture have access to functional farms for effective instruction. For their part, teacher training institutions should improve their ability to provide teachers with relevant knowledge, skills, and strategies for teaching agriculture, and the Ministry of Education should ensure that schools offering the subject have adequate resources for running their demonstration farms.

Key Words: Agricultural farms, academic performance, agriculture

1.0 Introduction

Agriculture is the main economic activity in many parts of Kenya, being the backbone of the country's economy. According to the Food and Agricultural Organisation of the United Nations, agriculture and related activities contribute 53% of Kenya's Gross Domestic Product (GDP) and 40% of the country's export earnings (FAO, 2021). School farms provide a learning laboratory that enhances the quality of secondary agriculture education (Lekies & Sheavly, 2007). The concept of school agricultural farming began in the developed world in the 19th century.

URL: https://ojs.jkuat.ac.ke/index.php/JAGST
ISSN 1561-7645 (online)
doi: 10.4314/jagst.v21i3.5

During this period, school farms were established across Europe, Australia, and the United States to improve the quality of education by involving children in the learning process, promoting engagement, and changing attitudes towards practical experience (Dillon et al., 2003; Christie, 2016). The public-school farm then emphasized that agricultural sciences should be learned with the backing of agricultural farms (Desmond, Grieshop & Subramaniam, 2004). School farms were intended both for teaching farming and as experiential learning tools that would help children connect with real-life experiences (Dillon et al., 2003). School agricultural farms have now become regular features in African countries and are included in national education policies and wide-scale school garden classes (Dillon et al., 2003). The Food and Agriculture Organization promotes the use of school farms for experiential learning, through which education and nutrition can be improved. This learning provides a form of non-formal education that prepares future farmers beyond the classroom (Snodgrass, 2012). School farms are a component of school activities and help students acquire knowledge and practical skills in agriculture and agricultural-related opportunities. They also create circumstances for students to market agricultural products, providing them with supervised occupational experience in agricultural productivity and encouraging the use of records and reports. The school farm has become an essential part of agricultural education and student experience (Rubenstein & Thoron, 2014), especially for students who do not have an agricultural background. The farms improve the quality of education by adding relevant content and, according to Snodgrass (2012), create opportunities for hands-on learning when students interact with farm activities. They also act as platforms for extracurricular learning while offering great educational potential (Kolb, 1984). For those who do have agricultural backgrounds, the farms are platforms for gaining in-depth knowledge about agricultural production. School farming is designed to increase active learning because the principles taught in the classroom are applied on the farms for practical experience (Njura et al., 2019).

Agricultural education in Kenya currently runs from Form 1 to Form 4 and entails crop and livestock production; farm power and equipment; farm structures; and agricultural economics and agroforestry (The Elimu Network, 2021). The course is tailored with the primary goal of inculcating a sound understanding of the subject among learners and an appreciation of its importance to society and the nation at large. It is also intended to inform learners about the numerous opportunities available in the sector and other sectors of the economy that are related to it, as well as to provide the skills needed to carry out agricultural activities and to open doors to higher education. According to a study conducted by Chemjor (2016), the majority of agriculture teachers feel that students choose the subject at Form 3 and 4 levels mainly due to peer pressure. The survey also established that parental pressure influenced students' choice of the subject, with up to a quarter of the parents feeling that the subject was not suitable for girls. The study, in addition, found that about a third of the boys and the same proportion of girls chose the subject due to a positive attitude towards it and a liking for agricultural activities. Another study by Njoroge & Orodho (2014) found that enrolment in the subject by students in public secondary schools in Nairobi County was declining, although attitudes towards the subject remained largely positive. The study also established that the development of the subject in schools was hampered by inadequate teaching resources,

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ISSN 1561-7645 (online)
doi: 10.4314/jagst.v21i3.5

especially tools for farming, and a shortage of land.

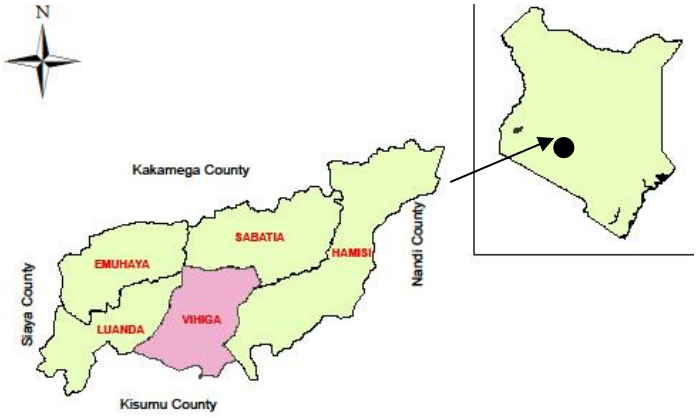

Figure 1: Location of Hamisi Sub-County

Source: Researchgate.net, 2021

Despite the Government's efforts to enhance the teaching of agriculture in secondary schools around the country, performance in the subject remains generally below par, with most schools recording a low average score (Andanje, 2020). Among the key reasons attributed to this trend are poor pedagogical skills among the majority of teachers of the subject and the existence of conflicting syllabi from the Kenya National Examinations Council (KNEC) and the Kenya Institute of Curriculum Development (KICD), a fact many teachers aren't aware of. The Kenya Certificate of Secondary Education Agriculture examination comprises three papers, namely, Paper 1 (443/1), a theory paper with a maximum of 90 marks; Paper 2 (443/2), also a theory paper with up to 90 marks, and Paper 3 (443/3), which is a project examination, giving a maximum of 100 marks (Teacher.co.ke, 2021). Paper 1 features general agriculture, crop production, agricultural economics, and soil and water conservation. Paper 2 focuses on Livestock production, farm machinery, farm structures, and farm tools and equipment. In the year 2019, Paper 3 involved candidates growing finger millet on the one hand (Section A), and rearing chicken on the other (Section B). In the same year, there were 289,315 candidates in the subject countrywide, and their mean score was 64.82%, a steady improvement from the mean of 60.57% attained by 278,658 candidates in 2018, and 54.75% from the 247,265 candidates in 2017. Over the years, Hamisi sub-county has, like the rest of the country, recorded generally unimpressive secondary school Agriculture results. Between 2013 and 2019, the highest mean score attained by an individual school in the subject was 10.67, by Kitagawa Secondary School, in the year 2013. The highest average mean over the period was 8.00, which was attained by Nyang'ori High School, with only five schools managing a mean grade of C+. The average mean for the sub-county has seen a steady decline over the period, with the highest, 5.7, being attained in 2014.

1.1 Impact of school agricultural farms on academic performance in agriculture

Studies have shown that the extent and scope of farm education strongly correlate with the appreciation of nature that influences environmental action(Beni & Adu, 2017; Williams &

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ISSN 1561-7645 (online)
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Dixon, 2013). According to Ratcliff et al. (2009), students engaged in farm education gain exposure to direct learning experiences that equip them with farming practices on crops and livestock. Desmond, Grieshop & Subramaniam (2004) established that utilization of the school farm impacts skills like teamwork, communication, and cooperation among learners, and in turn enhances academic achievements. The study found that experimental learning can improve learners' quality of education through involvement in the learning process, as a result generating a positive attitude towards that subject. Radcliffe et al. (2009) argued that students participating in garden group projects gained enhanced ability to correctly identify vegetables. Studies indicate that teacher evaluation and students' self-assessments agree with the notion that gardening and farming experiences have a positive impact on science achievement in school (Abdullah et al., 2015; Lekies & Sheavly, 2007). A study by Onwumere, Modebelu & Chukwuka (2017) on the impact of school farms on the teaching of agricultural sciences in senior secondary schools in Abia State, Nigeria, established that the farms have a positive influence on the teaching of the subject since Agriculture teachers have high regard for the farms in the first place. Njura et al. (2019) investigated the importance of hands-on activities in farm education of adolescents aged 13-16. In the study, students' self-reports showed an increased level of cognitive and affective components of learning through the inclusion of instructional hands-on activities on farms in comparison to control group participants without hands-on experience. Krogh et al. (2014) conducted a study on the benefits of learning on farms. The study established that students who regularly and actively participated in local farming had long-term connections to the farm activities.

2.0 Materials and methods

2.1 Research design

The study employed a descriptive survey approach, as espoused by Njura et al. (2019) and Onwumere et al. (2019), with both qualitative and quantitative data used. Data was collected using a questionnaire, an interview, and a focus group discussion.

2.2 Study area

Hamisi Sub-County is one of the four sub-counties of Vihiga County, in western Kenya. It is situated in the eastern part of Vihiga County, whose other sub-counties are Emuhaya, Luanda, Sabatia, and Vihiga. The sub-county borders Nandi County to the East, Sabatia and Vihiga sub-counties to the West, Kisumu County to the South, and Kakamega County to the North, as depicted in Figure 1.1. The sub-county straddles the equator and has an equatorial climate with an annual rainfall of 1000–2700 mm.

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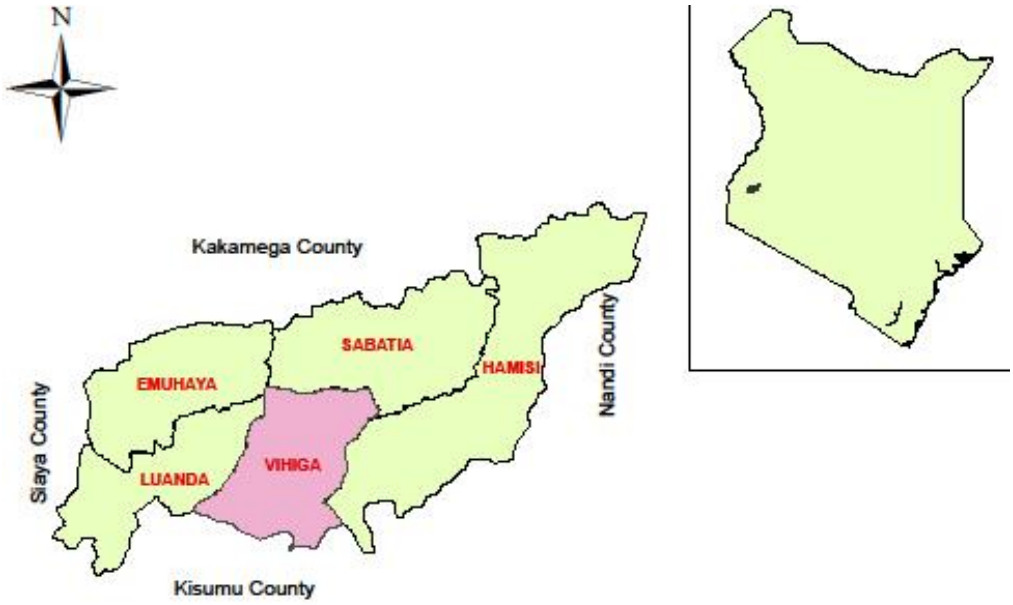

Location of Hamisi Sub-County in Vihiga County, Kenya
Source.researchgate.ne,2021

2.3 Population and sample of the study

As of the year 2019, Hamisi Sub-County had 50 secondary schools offering agriculture as a subject, three of them being boys' boarding schools; three girls' boarding schools; two day/boarding schools; and 42 mixed-day secondary schools (MoE, 2019). The target population of the study was 1600 Form Four agriculture students in the schools, 49 school principals, and 49 agriculture teachers. The entire sub-county was studied because the population of interest was small. The Taro Yamane formula was used for determining the sample size, as expressed below;

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

where, n represents the sample size, N the population under study and e the margin error.

Since the sub-county had 1600 Form Four Agriculture students, the sample size was:

$$n = \frac{1600}{(1 + 1600(0.05)^2)}$$
$$n = \frac{1600}{(1 + 1600(0.0025)^2)}$$
$$n = \frac{1600}{(1 + 4)}$$

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$$n = \frac{1600}{5}$$
$$n = 320\ students$$

2.4 Data collection

As indicated, the study utilized structured questionnaires, focus group discussions, and interviews as tools for primary data collection. Data on the impact of school agricultural farms on academic performance in the schools under study was collected from teachers and students using the questionnaire. The questionnaires were validated by two experts from the Department of Agricultural Education and Extension, Jaramogi Oginga Odinga University of Science and Technology. The reliability of the instruments was estimated through a pilot test using the test-retest method. The questionnaire was administered twice within an interval of two weeks and modified to determine reliability. Results obtained after the re-test were reserved for comparison with the final study.

2.5 Pilot study

Pre-testing of the research instruments was conducted by administering them to a selected sample similar to the actual sample that the research used in the study. A pilot study was carried out on members identical to the sample, but not on those who would form part of the final sample. The pilot study helped in developing and testing the adequacy of the research instrument; assessing the feasibility of the study; designing a study protocol; assessing whether the research protocol was realistic and workable; establishing whether the sampling frame and techniques were effective; identifying possible problems that may occur using the study methods; collecting preliminary data, determining financial and human resources needed in the study for data analysis techniques to uncover potential problems, and developing research questions and research plan. The pilot study was carried out in three of the 50 secondary schools in the sub-county and involved a total of 50 Agriculture students responding to questionnaires and interviews. Given the findings of the study, necessary adjustments were made to the research tools.

2.6 Data analysis and presentation

The study used both quantitative and qualitative analysis methods. The collected data were checked for consistency, accuracy, and level of completeness, and the information was then coded. Analysis of the coded data was done through descriptive statistics of frequency and percentages. The statistical software for social sciences (SPSS) version 25.0 was used to analyze the collected data.

3.0 Results

3.1 Students' response on influence of farms on academic performance

The student's response on the impact of school farms on academic performance in agriculture was presented on a Likert scale of 1-5, ranging from the very low extent to a very large extent. On the feeling that engaging in practical lessons helps improve academic performance, 62.4% of the total agreed that it does to a very large extent, 19% and 15.8% for to a large extent and a moderate extent respectively. On having an agricultural farm helping improve school

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performance in the KCSE exam, 47.1% of the respondents agreed that it does to a very large extent, 25.8% and 20.4% to a large extent and a moderate extent respectively, see Table 3.2. Overall, the findings indicated that school agricultural farms impacted academic performance in Agriculture in secondary schools to a large extent. This is as shown by the average of the cumulative average of the total responses on agricultural farms and academic performance, given by the variable farm performance (the mean is approximately 4, which is a large extent on the Likert scale).

Table 1: How agricultural farms impact academic performance in Agriculture

	Very low extent		Low extent		Moderate extent		Large extent		Very large extent		Total	
	Count	N%	Count	N%	Count	N%	Count	N%	Count	N%	Count	N%
Engaging in practical lessons helps as improve our academic performance	4	1.8%	2	0.9%	35	15.8%	42	19.0%	138	62.4%	221	100.0%
Having an agricultural farm has helped our school perform better in KCSE exam	9	4.1%	6	2.7%	45	20.4%	57	25.8%	104	47.1%	221	100.0%
The school farm has helped us develop better understanding of Agricultural concepts	10	4.5%	14	6.3%	28	12.7%	64	29.0%	105	47.5%	221	100.0%
Practical lessons on the school farm has enabled us develop cohesion and integration	15	6.8%	17	7.7%	44	20.0%	61	27.7%	83	37.7%	220	100.0%

3.2 Teachers' response on influence of school farms on academic performance

The teachers' response to how agricultural farms impact the academic performance of students in agriculture showed a marked difference from that of the students. On the question of whether practical experience in school improved understanding of agricultural concepts, 39.1%, 34.8%, and 21.7% of teachers agreed that it did to a large, very large, and moderate extent, respectively. At schools with active agricultural farms performing better in the Agriculture KCSE examination, 52.2%, 30.4%, and 8.7% of the teachers agreed that it did to a large extent, moderate extent, and very large extent, respectively, see Table 3.2.

Table 2: Teachers' response on how agricultural farms impact academic performance in agriculture.

	Very low extent		Low extent		Moderate extent		Large extent		Very large extent		Total	
	Count	N%	Count	N%	Count	N%	Count	N%	Count	N%	Count	N%
Practical on school farm improve understanding of agriculture concepts in secondary school?	1	4.3%	0	0.0%	5	21.7%	9	39.1%	8	34.8%	23	100.0%
Schools with active agricultural farms perform better in agriculture KCSE examination?	2	8.7%	0	0.0%	7	30.4%	12	52.2%	2	8.7%	23	100.0%
Teaching and Learning agriculture in school	1	4.3%	0	0.0%	0	0.0%	12	52.2%	10	43.5%	23	100.0%

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farms make learning interesting and real?												
Lack of functional school farms makes it difficult to understand some agriculture concepts?	2	8.7%	2	8.7%	4	17.4%	9	39.1%	6	26.1%	23	100.0%
Participation of school farm activities encourages sharing of knowledge among agriculture students?	0	0.0%	0	0.0%	3	13.0%	14	60.9%	6	26.1%	23	100.0%
A farming activity in school farm encourages collaboration and discussion among learners?	1	4.3%	0	0.0%	5	21.7%	11	47.8%	6	26.1%	23	100.0%

In general, therefore, school agricultural farms impact the academic performance of agriculture in secondary schools to a large extent. This is shown by the average of the cumulative average of the total responses on how agricultural farms influence academic performance, given by the variable farm influence (mean is approximately 4, which is a large extent on the Likert scale). There is a strong relationship between the responses of teachers and those of students since both responses are in agreement that farms influence performance in agriculture to a large extent. These results agree with studies that show teacher evaluation and students' self-assessments have a positive impact on science achievement in school (Abdullah et al., 2015; Lekies & Sheavly, 2007). This is explained by qualitative findings indicating that farm experiences promote social learning and strengthen the sense of self-efficacy (Woody et al., 2015; Lachowski, 2009), which in turn can have a positive effect on learning and achievement in school. A study by Njura et al. (2019) investigated the importance of hands-on activities in farm education for adolescents aged 13–16 years old. The findings indicated an increased level of cognitive and affective components of learning through the inclusion of instructional hands-on activities on farms in comparison to control group participants without hands-on experience. Another study by Krogh et al. (2014) showed that learning in school gardens and neighboring farms, whose core idea is that students who regularly and actively participate on local farms have long-term connections to the farm's activities.

3.3 Principals' responses on influence of school farms on academic performance

From the responses of the principals, the impact of school farms on academic performance in agriculture was observed to be of great significance, as 66.1% of them recorded close supervision of students' performance through practical session interactions with their respective subject teachers. Of the sampled population, 22.0% viewed school agricultural practicals as tools for positively shaping students' attitudes towards agriculture as a subject and hence generating better performance. Saving time to be focused on learning was also another factor of consideration, according to 6.8% of them, while the least suggested was the enhancement of students' creativity by exposing them to field problems and allowing them to come up with viable solutions during practical sessions. This is an indicator that agriculture

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practicals are highly valuable in determining the academic performance of students in agriculture; see Table 3.

Table 3: How school agricultural practical are valuable in the teaching of agriculture in schools

		Frequency	Percent	Valid Percent	Cumulative Percent
Valid	Students save on time spent on travelling to far away farms	4	4.2	6.8	6.8
	Close supervision of students' performance	39	41.1	66.1	72.9
	Students' attitudes towards agriculture can be shaped positively	13	13.7	22.0	94.9
	Students enhance problem identification and solving skills	3	3.2	5.1	100.0
	Total	59	62.1	100.0	
Missing	System	36	37.9		

A Pearson's chi-square was run to establish the relationship between school agricultural farms on students' academic performance agriculture, see Table 4

Table 4: Chi-Square Test for relationship between School agricultural farms and Students' academic performance agriculture

	Value	df	Sig. (2-sided)
Pearson Chi-Square	6.846[a]	4	.004
Likelihood Ratio	7.497	4	.002
Linear-by-Linear Association	.331	1	.005

From the results, Chi-square values $\chi 2 = 6.846$, at $p < 0.004$ was between school agricultural farms and students' academic performance agriculture, which is statistically significant, given that the p value 0.004 is less than 0.05. The study thus concluded that there was statistically significant relationship between school agricultural farms and students' academic performance agriculture.

4.0 Conclusion and recommedations

This study has demonstrated that performance in agriculture by secondary school students in Hamisi Sub-County is greatly impacted by the existence of school agricultural farms. The impact of school farms on academic performance in agriculture was felt immensely, as agreed upon by a cumulative of 97.2% of the sampled students, 95.6% of the teachers, and 100.0% of the principals.

According to the findings, several recommendations are hereby made. First, government education stakeholders should ensure that every secondary school offering agriculture as an examinable subject has access to a functional agricultural farm for effective instruction of agriculture. On the other hand, training institutions for agriculture teachers should equip teachers with adequate relevant knowledge, skills, and strategies on the utilization of farms in teaching agriculture. The Ministries of Education and school boards of management should

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ensure that schools have adequate resources for the functioning of their farms. This will ensure effective instruction of agriculture on farms. Also important, agriculture teachers should ensure maximum utilization of school agricultural farms in the teaching of the subject. They should also strive to instill positive attitudes toward agricultural farms in students and involve them in the design and implementation of various farm crop and livestock practices. This will improve their experience in agricultural practices. Finally, curriculum planners should include farming in the agricultural syllabus content for effective farm utilization.

5.0 Acknowledgement

5.1 Funding of the study

None

5.2 Presentation of the study finding and a section of the study mark

The preliminary findings were presented in an abstract communicated in the preliminary thesis defense also school level held at JOOUST university on 12th July 2020 masters defence at the School of Agricultural and Food-science

5.3 General acknowledgment

The research is grateful and thankful to the Ministry of Education through Sub-County Education Hamisi Sub-County for granting permission to undertake research in the Sub-County on 9th February 2020, Ref/HAM/ADM/98/41. This includes the 50 secondary school principals, 50 agriculture teachers and the 350 form four agriculture students in Hamisi sub-county for input and positive participation in the study.

5.4 Declaration of interest

The present mark fulfil the basic requiment for obtaining MSC. Degree in agricultural and extension education. The researcher opinions, assessment, knowledge and study recommendation and conclusion in this paper exclusively the authors.

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ISSN 1561-7645 (online)
doi: 10.4314/jagst.v21i3.5