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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 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 descriptive survey research design involving census sampling. Data was collected using questionnaires. Quantitative data was analyzed using 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 have influence on 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. Teacher training institutions on their part should upscale their equipping of teachers with adequate relevant knowledge, skills and strategies on teaching of 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*

I. 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 Products (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. During this period, school farms were established across Europe, Australia and the United States, with a goal of improving the quality of education through involving children in the learning process, promoting engagement and changing the attitude towards practical experience (Dillon et al., 2003; Christie, 2016). The public-school farm then emphasized that agricultural sciences should be learnt with the backing of agricultural farms (Desmond, Grieshop & Subramaniam, 2004). School farms were intended for teaching farming and also 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 to 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 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 the 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 appreciation of its importance to the society and the nation at large. It is also aimed at enlightening learners on the vast opportunities existing in the sector and other arms of the economy related to it, while also providing the skills necessary for carrying out agricultural activities, in addition to opening path for higher learning. According to a study conducted by Chemjor (2016), majority of Agriculture teachers feel that students choose the subject at Form 3 and 4 level mainly due to peer pressure. The survey also established that parental pressure had an influence on 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 positive attitude in it, and a liking for agricultural activities. Another study by Njoroge & Orodho (2014) found that enrolment for the subject by students in public secondary schools in Nairobi County was declining, although attitude towards the subject remained largely positive. The study also established that development of the subject in schools was hampered by inadequate teaching resources, especially tools for farming, and shortage of land.

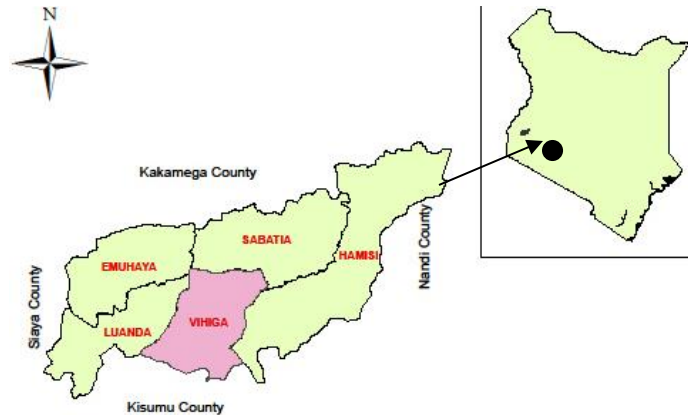


Figure 1: Location of Hamisi Sub-County
 Source: Researchgate.net, 2021

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 majority of teachers of the subject and 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 the 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 Kitagwa 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.

1.2 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 & Dixon, 2013). According to Ratcliff et al. (2009), students engaged in farm education gain exposure to direct learning experience that equips them with farming practices pertaining to crops and livestock. Desmond, Grieshop & Subramaniam (2004) established that utilization of the school farm impacts skills like teamwork, communication, 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 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 evaluations 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 positive influence on 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 farms 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 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.

II. MATERIALS AND METHODS

2.1 Research Design

The study employed descriptive survey approach, as espoused by Njura et al. (2019) and Onwumere et al. (2019), with both qualitative and quantitative data were used. Data was collected using questionnaire, interview and 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 on 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 annual rainfall of 1000-2700mm.



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 school, and 42 mixed day secondary schools (MoE, 2019). The target population of 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. Taro Yamane formula was used for determining the sample size, as expressed as 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:

$$\begin{aligned} n &= \frac{1600}{(1 + 1600(0.05)^2)} \\ n &= \frac{1600}{(1 + 1600(0.0025)^2)} \\ n &= \frac{1600}{(1 + 4)} \\ n &= \frac{1600}{5} \end{aligned}$$

$n = 320$ students

Stratified sampling technique, which involves splitting the sample into subgroups (strata), then taking a random sample from each (Taherdoost, 2016), was employed to select 7 respondents from each of the seven wards in the sub-county, namely, Shiru, Gisambai, Jepkoyai, Banja, Muhudu, Tambua and Shamakhokho. This approach was chosen because it ensures that each sub-group within a given population receives good representation (Troost, 1986).

2.4 Data Collection

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

2.5 Pilot Study

Pre-testing of the research instruments was conducted by administering them to selected sample similar to actual sample that the research used in the study. 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 adequacy of the research instrument; assessing feasibility of the study; designing a study protocol; assessing whether the research protocol was realistic and workable; establishing whether 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. In view of the findings of the study, necessary adjustments were made on the research tools.

2.6 Data Analysis and Presentation

The study used both quantitative and qualitative analysis methods. The collected data was checked for consistency, accuracy and level of completeness, and the information then coded. Analysis of the coded data was done through descriptive statistics of frequency, cross tabulation, chi-square and standard deviations and percentages. In addition, content analysis was also used for qualitative data. The data was analyzed and presented thematically as discussed below. The statistical software for social sciences (SPSS) version 25.0 was used to analyze the collected data.

III. RESULTS AND DISCUSSION

3.1 Students' Response on Influence of Farms on Academic Performance

The students' response on impact of school farms on academic performance in agriculture was presented on a Likert scale of 1-5, ranging from **very low extent** to **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 to a moderate extent respectively. On having an agricultural farm being helpful in improving school performance in 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 to 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 **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	
	Coun t	N% %	Coun t	N% %	Coun t	N% %	Coun t	N% %	Coun t	N% %	Coun t	N% %
Engaging in practical lessons	4	1.8%	2	0.9%	35	15.8%	42	19.0%	138	62.4%	221	100.0%

helps as improve our academic performance												
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 on how agricultural farms impact academic performance of students in Agriculture showed a marked difference from that of the students. On the question of practical experience in the school improving understanding of agriculture concepts, 39.1%, 34.8% and 21.7% of the teachers' agreed that it did to a large extent, very large extent and moderate extent respectively. On schools with active agricultural farms performing better in 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	
	Coun t	N%	Coun t	N%	Coun t	N%	Coun t	N%	Coun t	N%	Coun t	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	2	8.7	0	0.0	7	30.4	12	52.2	2	8.7%	23	100.0

active agricultural farms perform better in agriculture KCSE examination ?		%		%		%		%			%	
Teaching and Learning agriculture in school farms make learning interesting and real?	1	4.3 %	0	0.0 %	0	0.0%	12	52.2 %	10	43.5 %	23	100.0 %
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 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 **large extent** on the Likert scale). There is a strong relationship in the responses of teachers and that 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) that 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 farms 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, 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 on 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 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		
Total		95	100.0		

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.

IV. CONCLUSIONS AND RECOMMENDATIONS

This study has demonstrated that performance in Agriculture by secondary school students in Hamisi Sub-County is greatly impacted by 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.

Pursuant to the findings, a number of recommendations are hereby made. First, Government education stakeholders should ensure that every secondary school offering Agriculture as an examinable subject has access to functional agricultural farm for effective instruction of agriculture. Training institutions for Agriculture teachers on the other hand should equip teachers with adequate relevant knowledge, skills and strategies on utilization of farms in teaching agriculture. The Ministries of Education and school boards of managements should 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 teaching of the subject. They should also strive to instill positive attitudes towards agricultural farms in students, and involve them in designing, carrying out various practices on the farm crops and livestock. This will improve their experience in Agriculture practices. Finally, curriculum planners should include farming in the agricultural syllabus contents for effective farm utilization.

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