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The Contribution of Agricultural Education in Secondary Schools to Rural Agricultural Productivity: The Case of Small Scale Farmers in Uasin Gishu County, Kenya

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Abstract

Many developing countries today are facing major challenges with regard to food security due to changes in rural land use, coupled with population pressure. One of the ways countries like Kenya has responded to this is by teaching agriculture at various levels of education especially secondary school level. Little has been done however; to establish whether there is any significant difference in agricultural productivity between farmers who graduate with secondary school agriculture knowledge and those without as a way of building farm capability hence the study. The sampling procedure adopted by this study was proportionate sampling technique, where a sub-sample of farmers from a target population of those farmers with secondary school agriculture knowledge and those without this knowledge and a total of 200 farmers where interviewed. Results show that farmers with secondary school agriculture knowledge perform significantly better than those without the secondary school agriculture knowledge and thus have higher levels of food security indicators in crop productivity, and level of household food security. It is concluded that farmers with secondary school agriculture knowledge perform significantly better in all farming aspects as compared to farmers without. The secondary school agriculture knowledge not only broadens farmers' capacity, but also makes them more effective, self reliant, resourceful and capable

of solving farming problems and as a result, significantly improves their crop productivity and hence guarantee food security for the family. The challenge for the teaching profession is finding out the best teaching methods as approaches both in and out of class.

Introduction

Despite enormous efforts to industrialize, Kenya still remains an agricultural nation with the majority of its people (90%) living in the rural areas and depending on agriculture, either directly or indirectly for their income. It has also been noted that small-scale farmers who constitute majority of the rural crop producers have great potential in increasing agricultural production the Least Developed Countries (LDCs), Kenya included. Chitere and Doorne (1985) also noted that 85% of the Kenyan people live in the rural areas, most of them in small holding areas where farm units are only approximately two hectares. This study focuses on the contribution of secondary school agricultural knowledge to rural agricultural productivity.

The rapidly growing population and steady expansion of the education system has resulted in the unemployment of those who complete school and cannot find access to further education. Students who cannot get into high paying jobs can engage themselves in agriculture, hence, the need for initiating agriculture in secondary schools in Kenya (Ominde, 1964).

One of the general objectives of teaching agriculture in the 8-4-4 secondary school curriculum (K.I.E, 1992), is to ensure that schools take an active part in rural development by integrating agricultural activities in the curriculum. This has been done through provision of technical knowledge, reinforcing interest in and awareness of opportunities existing in agriculture among the secondary school graduates (Gachathi, 1976). However, little has been done to establish whether there is any significant difference in agricultural productivity between farmers who graduate with secondary school agriculture knowledge and those without. The main question was, does agriculture knowledge at secondary school level make any difference in agricultural productivity?

The purpose of this paper is to examine and determine the contribution of secondary school agricultural knowledge to rural agricultural productivity. Specifically, the paper seeks to determine the difference in crop productivity per unit area and the role of secondary school agriculture knowledge on the level of rural household food security.

Literature Review

Agriculture and National Development

In recent years, agriculture production has not kept pace with population growth rate and the country has become a net importer of its two major staple foods, maize and wheat (Kliest, 1985). There is now an urgent need for agriculture expansion and development in order to reverse the current trend in agricultural productivity in the country.

Mosher, (1971) described various ways in which agricultural expansion and development can be purposefully accelerated. One of the ways was provision of agricultural education and training through schools, colleges and extension education, including youth clubs. According to a World Bank report (1988), "without education, development will not occur. Only an educated person can command the skills necessary for sustainable economic growth". The reduction in farm size due to increase in human population has led to reduction in farm output. There is, therefore, need to get more and more technical knowledge to maintain a viable and sustainable agricultural production through intensive farming. This needs a level of education that can assist the trainee to make certain critical decisions related to farming. This is because the education system of a country plays a major role in the development of human and natural resources, as well as crating attitudes which, inspire and dispose individuals towards change. Education provides participatory skills in people. Subsequently, this will enhance economic, political and social development (Mwangi, 1998).

Economic growth in Kenya is related to development within agriculture, consequently, if agricultural development is stagnant, it offers only a stagnant market and inhibits the growth of the rest of the economy (Sheffield, 1971). Over 70% of those who live in rural areas derive their livelihood from farming (Bessey, 1972). The implication of this heavy dependence on agriculture is that any considerations about national development are likely to lean heavily on agricultural development, hence rural development. When knowledge, skills and attitudes are rationally utilized, they contribute greatly to social and economic development (Kathuri, 1990).

Building Future Farmers' Capacity through Practical Agriculture Skills in Secondary Schools

Recommendations on the development and building of rural farmers' capacity in Kenya has come from varied sources, most of which saw the rural agricultural sector as holding the key to the present and future development of the country. Bessey (1972) advised the Government of

Kenya that methods suited to the needs of small-scale intensive crop production be incorporated into agriculture education programme. The committee also suggested that school teaching facilities should include school crop and livestock enterprises to assist the learners gain the practical skills.

Gachathi (1976), also suggested that the curriculum for both primary and secondary schools should prepare learners for agriculture budgeting, the family welfare and community development. These suggestions particularly those regarding the teaching of agricultural sciences, including the economics of production, have over the years been incorporated into the syllabus. The same report recommended that secondary education be geared towards the rural and informal sector by diversifying the curriculum and giving priority to teaching agricultural sciences. This is a further emphasis on practical agriculture. It is from the above reports from the committees set by the government, that the general objectives of teaching agriculture were developed and adopted. Although agriculture was taught before 1976, it was not as elaborate as it is currently. Education experts have argued that, teaching of skills necessary for self-employment and self reliance is only possible where there are adequate and proper material and human resources (K.I.E, 1992). The resources included a viable school farm among other equipment and facilities. It is gratifying to note however that the teaching of agriculture has improved over the years to reflect the practical oriented approach.

Among the steps undertaken by the Kenya Government through the Ministry of Education, included ensuring that every school offering agriculture as an elective subject either own or here a farm for practical purposes as well as including project work (Agriculture practical paper 3) in the Kenya National Examinations where students fully participate in developing their psychomotor skills through carrying out of project work in their individual allocated plots. The major aim is to reinforce the students interest in agriculture and development of the psychomotor skills so that they have positive attitudes towards the subject as well as developing their agricultural skills hence become better farmers after completing their formal education (K.I.E, 1992). Little is however known about the impact of building this capacity among secondary school graduates in rural areas where crop production is carried in Kenya. The objectives of the study were to examine and determine the contribution of secondary school agricultural knowledge to rural agricultural productivity. Specifically, the study sought to determine the differences in crop productivity per unit area and the role of secondary school agriculture knowledge on the level of rural household food security.

The contribution of Farmer's Education to Agricultural Productivity

Education is cherished in all societies. Schooling is important where there is a rapid rate of technological change. Against this background, several countries and international agencies have supported farmer's formal and non-formal education. In Africa, several studies have shown a positive relationship between education and agricultural productivity (Mwangi, 1998; World Bank, 1980). These works elaborate on the positive contributions education makes to agricultural productivity. No significant growth is possible in Kenya without substantial growth in agricultural productivity (Nyoro, 1994).

Food security

Food security can be defined as the ability of countries, regions or individuals to meet their year round target calorie food requirements through domestic production, storage and international trade (Dellere, 1988). Mwangi (1999) on the other hand, defines food security as the access to enough food by the people for active and healthy living. It is achieved when households produce enough staple crops for their own consumption or when they have enough disposable income to meet their food needs for the market. In general, a family has food security if it can consistently satisfy 80% or more of its nutritional requirements. Maize is the staple food for the majority of Kenyans; it is therefore, the chief source of energy and protein for both the rural and the urban populations. Poor households especially those with smaller land holdings, and a weaker resource base are more vulnerable to food stress than wealthier households. Such households begin to suffer earlier than the rest, when food shortages occur, Kagutha (1995).

Poverty is a major cause of the inability of many individuals to acquire a calories adequate diet throughout the year. To be food secure, one needs a level of education that can enable him or her to be innovative and hence plant more, store more or purchase food for utilization (Dellere, 1988).

Materials and Methods

The research design chosen for the study was the *Ex-post facto* research design. This design allowed the researcher to examine the effects of the natural occurring influence of the independent variable (secondary school agriculture education) on the dependent variable (farmers' agricultural productivity). In addition, the design allowed the researcher to apply aspects of survey research to track agricultural productivity and thus relate secondary school agricultural knowledge to agricultural productivity. Each farmer was visited once to observe farm activities. An interview was conducted during the visit.

Sample Size and Sampling Procedures

The minimum recommended sample size for survey studies is 100 (Kathuri & Pals, 1993; Borg, 1987), but the study took a sample of 200 for the two divisions to ensure that the main characteristics of the farmers were captured. The sample size was also large enough to allow reasonably accurate interpretation of the results. First, the target population was identified and stratified according to the farmers' secondary school agriculture knowledge. Secondly, the sample size was determined by using proportionate sampling technique and thirdly, simple random sampling technique was applied for each stratum.

Measures and Data Analysis

The responses from the respondents were coded and entered into a data sheet. The final data were then keyed into the computer for analysis. The Statistical Package for Social Sciences (SPSS) programme was used to analyse the data. The t-test and chi-square statistics were used to test the stated hypotheses.

Quantitative method of data analysis was mainly used with both descriptive and inferential statistics being employed to explain the results of the study. The dependent variables that were analysed as follows:-

Crop Productivity

This variable was measured by determining the percentage of crop output per unit areas based on estimated agro-ecological zone potential productivity.

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Food Security – This was measured by dividing the variable into three categories indicating the level of household food security as follows: a) Adequate food security b) fair food security

Results and Discussion

The purpose of this study was to determine the contribution of secondary school agricultural knowledge on rural agricultural productivity of small-scale farmers in Turbo and Kapseret division of Uasin Gishu District. The finds of the study are presented and discussed as follows:

Farmers' Crop Production and Percentage Performance

The crops mainly considered to compute the percentage crop production performance were maize and beans. Their productivity was measured by computing the output level of each crop per hectare compared with the average expected zone production and their percentage production performance determined. The results in **Table 1**, indicate that farmers with secondary school agriculture knowledge with a mean percentage performance of 97.66 perform better as compared to the farmers without secondary school agriculture knowledge whose crop percentage performance 92.16. The general observation and results from crop productivity as shown in **Table 1** indicates that farmers with secondary school agriculture knowledge have a higher productivity in both crops.

Table 1 Distribution of Farmers by Overall Percentage Crop Performance

Farmers with Sec. Scho. Agric. Knowledge				Farmers Without Sec. Sch. Agric. Knowledge		
Percentage Performance	Frequency	Percentage	Cumulative Percent	Frequency	Percent	Cumulative Percent
<50	5	5.0	5.0	8	8.0	8.0
50-100	51	51.7	56.7	58	56.7	64.7
>100	42	43.3	100.0	36	35.3	100.0
Missing System	0					
	98	100.0		102	100.0	

Mean = 97.66 Mean 92.16

First, this could be as result of specialization by this group of manners as compared to the farmers without secondary school agriculture knowledge. Secondly, better crop performance in crop productivity among the farmers with secondary school agriculture knowledge could be attributed to the knowledge gained in school in crop production to higher productivity.

Farmers Percentage Level of Food Security

The percentage level of food security per farmer was determined by noting down the amount of maize (as the main food crop) consumed per day for each of the farmers and also the amount of maize (in kgs) that the farmer kept for the family for the whole year.

Table 2: Farmers' percentage level and food security

Farmers with Sec. Sch. Agri. Knowledge				Farmers without sec. school, knowledge		
	Frequency	Percent	Cumulative Percent	Frequency	Percent	Cumulative Percent
<49 (Lack Food Security)	1	1.0	1.0	4	3.9	3.9
50 – 79 (fairly Food secure)	14	14.3	15.3	16	15.7	19.6
> 80 (Adequate Food security)	83	84.7	100.0	82	80.4	100.0
Total	**98**	**100.0**		**102**	**100.0**	

Mean = 140.57 Mean = 124.39

The amount of food consumed per day per family is multiplied by 365 (days in a year). This gives the value of the amount of food required by a family for the whole year is kilogrammes. The amount of food stored was compared to the amount consumed in a year and computed in percentages to determine the percentage level of food security per family. Their frequencies were determined and the summary was as shown on Table 2.

The results Table 2 shows that only 1% of the farmers with secondary school agriculture knowledge lacked food security; whereas there was 3.9% of the farmers without secondary school agriculture knowledge who lacked food security. Farmers with secondary school agriculture knowledge had 14.3% of them who were fairly food secure whereas their counterparts had 15.7%. Farmers with secondary school agriculture knowledge had 84.4% of the members with adequate food security. The percentage mean level of food security was 140.57% for farmers with secondary school agriculture knowledge whereas those farmers without this knowledge had a percentage mean level of food security of 124.39

Impact of Secondary School Agriculture Knowledge on Crop Productivity

It was postulated that there is no significant difference in crop productivity between farmers with secondary school agriculture knowledge and those without this knowledge. The inferential statistical analysis of the results yielded the t-test values presented on

Table 3: Paired t-test values on difference in crop productivity between farmers with secondary school agriculture knowledge and those without this knowledge

Variable	Calculate t-value	Mean differences	df	Significant t
Percentages Crop yield (with agric)				
Percentage Crop yield (without agric)	20.078	97.65	97	0.05

This was done to test the validity of the hypothesis that there is no significant difference in crop productivity between farmers with secondary school agriculture knowledge and those without.

The results of the analysis on Table 3 show that there was statistically significant difference in crop productivity between farmers with secondary school agriculture knowledge and those without this knowledge. Table 3 indicate that the t-calculated value of 20.078 for farmers with secondary school agriculture knowledge and those without it, with 97 degrees of freedom, was statistically different. This difference is significant at 0.05 level of confidence. Therefore, the null hypothesis is rejected.

These findings imply that secondary school agriculture knowledge prepares the student to be better in agriculture productivity after going through the secondary school agricultural curriculum. It can be concluded that the original objective of introducing agriculture in secondary schools in Kenya is being met.

Impact of Secondary School Agricultural Education of Household Food Security

It was hypothesized that there is no significant differences in level of household food security between farmers with secondary agriculture knowledge and those without this knowledge. This hypothesis was tested by use of *t*-test statistics. The frequencies showing the percentage household-food security were also used to determine the relationship between the two variables as shown in the results yield by the *t*-test values presented on **Table 4**. This was done to test the validity of the hypothesis that there is no significant difference in level of household food security between farmers with secondary school agriculture knowledge and those without it. The results of the analysis in **Table 4** show that there were statistically significant differences in the percentage level of food security between farmers with secondary school agriculture knowledge and farmers without this knowledge. **Table 4** indicate that the *t*-calculated values of 19.15 for farmers with secondary school agriculture knowledge and those without it. The results of the analysis on Table 6 show that there was statistically significant difference in the percentage level of food security between farmers with secondary school agriculture knowledge and farmers without this knowledge. Table 6 indicate that the t-calculated values of 19.15 for farmers with secondary school agriculture knowledge and those without it, with 97 degrees of freedom show that the food security for the two groups of farmers were statistically different. This difference was significant at 0.05 level. Therefore, the null hypothesis that stated that there is no significant difference in the level of household food security between farmers with secondary school agriculture knowledge and those without this knowledge was rejected.

Table 4: Paired t-test values on difference in levels of household food security between farmers with secondary school agriculture knowledge and those without this knowledge

Variable	Calculate *t*-value	Mean differences	df	Significant *t*
Percentages				
Level of Household				
Food security				
Percentage	**19.15**	**2.172**	**97**	**0.05**
Level of household				
Food security				

These findings are consistent with the objectives of the secondary school agriculture syllabus (K.I.E, 1985). It is expected that as a result of completing the four-year agriculture course, the learners are expected to

develop self-reliance, resourcefulness and problem solving abilities, such as ensuring that there have enough food for the family throughout the year by planting enough and storing enough for the family.

Conclusion

Introductions

The major purpose of this study was to determine the contribution of secondary school agriculture knowledge on rural agricultural productivity. In all the test, farmers' secondary school agricultural knowledge was the independent variable. The crop Productivity, level of crop management and the level of household food security were the dependent variables.

Secondary School Agriculture Knowledge and Crop Productivity

It was concluded that the farmers' secondary school agriculture knowledge positively contribute to the farmer's crop percentage performance. In that, those farmers with secondary school agriculture knowledge perform significantly better than those without the secondary school agriculture knowledge. This implies that agriculture should be made more practical than before by emphasizing practical aspects in instil more knowledge in productivity among the learners, especially the development of the psychomotor skills.

Household Food Security

It was concluded that farmers with secondary school agricultural knowledge perform significantly better as compared to farmers without the secondary school agricultural knowledge as far as food security was concerned. This implies that farmers with secondary school agricultural knowledge have developed the ability to be self-reliant, resourceful and problem solvers, such that they ensure they have enough food for the family throughout the year.

In general, agriculture knowledge at secondary school level, indeed contribute positively and significantly to rural agricultural productivity in Uasin Gishu District.

Policy Recommendations

On the basis of the results obtained, conclusions and implications of the study discussed above, the following recommendations are made:

Since farmers with secondary school agricultural knowledge perform

significantly better in most of the aspects looked into in crop production, it would be more appropriate to make agriculture subject compulsory for all the students in this country as a way of diversifying ways of rural poverty alleviation. It is therefore instructive to teachers, planners and even policy makers that teaching of agriculture in secondary schools develops self-reliance, resourcefulness, problems – solving abilities and occupies the learners in agricultural enterprises which may not necessarily require a lot of capital to start, but significantly improve the economy of this country.

The Ministry of Education, Science and Technology should also ensure that schools offering agriculture own or hire land to enhance the crop management practical skills. This will ensure that those students completing the fourth form, having done agriculture in secondary school, become better farmers and hence agents of change in rural areas who can significantly contribute to poverty alleviation as it is a common knowledge in our country that agriculture is the backbone of Kenya's economy.

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