International Journal of Sciences: Basic and Applied Research (IJSBAR)

ISSN 2307-4531
(Print & Online)

http://gssrr.org/index.php?journal=JournalOfBasicAndApplied

Influence of Farmer FFS Approach on the Acquisition of Knowledge, Skills for Agricultural Productivity in the Lake Victoria Region, Kenya

Akuno W.[a*], Onyango C.[b], Obara J.[c]

[a]*Registrar Academic Affairs / Jaramogi Oginga Odinga University of Science and Technology, P.O Box 210-40601 , Bondo, Kenya*

[b,c] *Department of Agricultural Education and Extension / Egerton University, P.O Box 536 Egerton, Kenya*

Abstract

The role of agricultural extension is vital to the diffusion of new technologies, but extension is currently not very effective in many African nations, with traditional extension approaches having minimal impact. In Kenya, there have been gaps on the availability of studies and documentation of the specific extension approaches and their influence on the acquisition of knowledge, skills and productivity for household food security despite the various extension efforts and resources put in place in many parts of the country. This study therefore investigated the influence of Farmer Field Schools extension approaches on the acquisition of knowledge, skills and productivity for household food security in the Lake Victoria region, Kenya. The main objective of the study was to compare the influence of Farmer Field Schools and Conventional extension on the acquisition of knowledge, skills and farm productivity for enhanced household security in the Lake Victoria region of Kenya. A cross sectional survey design was adopted in order to develop a detailed account of the effect of the three approaches. The total population of the study area was 188,661 households from which a random sample of 236 was selected comprising of small-scale farmers from three sub counties: Bondo, Rachuonyo and Nyamira.

---

* Corresponding author.

E-mail address: wakuno@jooust.ac.ke.

Data was analyzed using both descriptive and inferential statistics with the aid of Statistical Package for Social Sciences (SPSS 18.0) at 5 percent level of significance.

Findings revealed that Farmer Field School contributed to the acquisition of knowledge and skills in various agricultural production activities and an increase in farm productivity. Results on On-Farm Research revealed that it contributed more in the acquisition of knowledge and skills as well as improvement of farm productivity as compared to Conventional Extension. Furthermore a hypothesis test showed a significant difference between the two approaches. It is hoped that the findings of this study will contribute to greater understanding of agricultural extension approaches especially in policy formulation and design of the provision of extension services to communities in Kenya.

Key Words: Extension approach; Farmer Field Schools; knowledge and skills.

1. Introduction

1.1 Background Information

Agricultural extension is considered to be an important service in increasing agricultural productivity and attaining sustainable development [1]. Its role is to help people identify and address their needs and problems. There is a general consensus that extension services if successfully applied, should result in outcomes which include observable changes in attitudes and adoption of new technologies, and improved quality of life based on indicators such as health, education and housing. It has been recognized that agricultural extension accelerates development in the presence of other factors such as markets, agricultural technology, availability of supplies, production incentives and transport.

Eradication of extreme poverty and hunger is given top priority by the United Nations and is listed as Millennium Development Goal Number One [2] The New Partnership for Africa's Development (NEPAD) is equally concerned about poverty, the cause of chronic food insecurity in Africa. Top of the primary objectives of NEPAD is to eradicate poverty, and facilitate implementation of the household food production and agricultural development programmes in all sub-regions in Africa.

The role of agricultural productivity in alleviating poverty in developing countries as presented in some empirical results suggest that there are significant relationships between productivity growth and both poverty and nutrition [3] These studies have shown that the empirical estimates of this relationship appear to be robust and that regardless of the differences in data and formulation, the results showed that a 1 percent increase in yields leads to a reduction in the percentage of people living on less than $1 per day of between 0.6 percent and 1.2 percent. There is wide geographic variation in crop and livestock productivity, even across regions that experience similar climates.

Farmer education and extension are important components in improving people's lives. However, traditional educational approaches and methods have proved unsuccessful [4] and efforts to provide farmers with a voice seldom form an integrated part of agricultural programmes [5]. In response to this concern, elements of

participation and downward accountability have gradually reformed advisory services in agriculture and approaches to participatory extension [6]. Alternative approaches have emerged that place the emphasis on farmer groups that provide a 'voice' for the poor [7] However, there is still a great need for mechanisms that can ensure the genuine participation of citizens and improve understanding of how participation can encourage more equal gender relations, since current research indicates that most participatory projects do not lead to significant changes in gender inequalities.

One of the alternative participatory extension approaches that seems to address some of these needs is Farmer Field Schools (FFS), which provides a platform for farmers to meet regularly in groups to study the 'how and why' of farming [8]. There is currently a multitude of FFS initiatives in more than 27 countries in Africa funded by various development agencies. Published research indicates that FFS is having a substantial impact in terms of increases in farm productivity, reductions in farmers' use of pesticides and improved farming knowledge [9]. Developmental benefits reported include poverty reduction, greater empowerment and collective action [10].

In Kenya, agriculture is the leading economic sector, accounting for 25 percent of the gross domestic product (GDP) and employing 61 percent of Kenyans. Kenya's Agriculture is predominantly small scale mainly in the high potential areas, accounting for 75 percent of the total agricultural output and 70 percent of agricultural produce [11]. According to the [12] more than half of Kenya's population is poor with 7.5 million people living in extreme poverty and over 10 million people suffering from chronic food insecurity. There are about two million people who are permanently on food relief; the number of people on food relief increases rapidly to over five million during drought years and over four million live below the absolute poverty line [13] It has been documented that the low level use of farm inputs amongst the small scale farmers has often resulted in sub-optimal levels of production [14].

Despite Kenya's diversity, the agricultural sector has experienced mediocre growth over the last two decades, thus mirroring the weak overall performance of the economy. Agricultural production grew at 1 percent annually during the 1990s, driven by marginal improvements in crop yields or productivity [15]. However, this growth was well below the population growth rate of 2.5 percent. Although agricultural growth has doubled since 2000, this more recent period has been characterized by rapid area expansion and stagnant yields. There is also variation in the performance of individual sectors. On the one hand, horticulture and export crops have grown rapidly over the last decade, with the exception of coffee due to a collapse in international prices. On the other hand, cereals and root crops performed poorly during the 1990s, and while these sectors have subsequently expanded production, they have continued to experience pronounced declines in yields. Given Kenya's growing population and land constraints, the key challenge for accelerating agricultural growth is overcoming the long-standing and widespread deterioration of farm productivity. Kenya was a food surplus country until 1998 but has now developed a structural deficit and is a net importer of all the staple cereals, pulses and livestock products [16] The decline of the agricultural sector underscores the precarious food security status of the estimated 75 percent of the Kenyan population that derives its livelihood from a declining agricultural sector . In Kenya, nearly half of the population lives below one dollar a day, characterized by landless populations, subsistence farmers, peasant farmers, pastoralists, unemployed, refugees, squatters, ill health, a inadequate food and poor nutrition among others [17] .

Agricultural extension serves as a means of appropriate technology generation and dissemination and it has been demonstrated that it has the potential to improve yields in Kenya [18]. The National Development Plan, 2002-2008 and Kenya Vision 2030 document that the realization of Kenya's agricultural full potential has been hampered by the ineffective system under which extension services are provided by the government. Although many institutions offering extension services have emerged, there is limited study of the extent to which these agencies are strengthening and influencing change in farmer ability to increase agricultural productivity [19]. It has been demonstrated that sustained high levels of agricultural production is not possible without an effective agricultural extension supported by agricultural research that is relevant to farmers' needs [20].

Conventional extension also referred to as general extension approach or public extension in contrast to several other approaches is also called Ministry-Based General Extension [21]. It has been noted that Face-to-face extension, where the extension agent visits farmers in their fields according to a fixed schedule, is practiced in all the SSA countries. Face-to-face extension would support the emphasis on farmer participation in technology generation implicit in the "farmer- first" paradigm and that the phrase "top-down" is often used in this context [22].

Conventional Extension approach to extension or public agricultural extension service in Kenya has been practiced by many countries but its performance not been satisfactory [23]. The National Development Plan, 2002-2008 and Kenya Vision 2030 document that the realization of Kenya's agricultural full potential has been hampered by the ineffective system under which extension services are provided by the government [24]. The extension system was perceived as top-down, uniform and inflexible and considered a major contributor of the poor performance in the agricultural sector [25]. It has been demonstrated that extension workers must learn the principles of community-organizing and group management skills in order to help the community, especially the poor or weaker sections, to organize themselves for development [26]. Agricultural extension as a public sector institution has an obligation to serve the needs of all agricultural producers, either directly or indirectly [27]. A consensus exists that extension services, if properly designed and implemented, improve agricultural productivity [28]. This study involved three selected alternative extension approaches namely: On- Farm research, Farmer Field Schools and Focal Area.

One of the pluralistic education and extension programme practiced worldwide is the Farmer Field Schools (FFS) approach, being implemented in at least 78 countries [29]. FFS is a participatory method of learning, technology adaptation, and dissemination based on adult learning principles such as experiential learning [30]. This approach provides farmers with an opportunity to make a choice in the methods of production through a discovery-based approach. It is a group extension method based on adult education principle. It is a `school without walls' that teaches basic agro-ecology and management skills that make farmers experts in their own farms. After the training period, farmers continue to meet and share information with less contact with extension officers [31]. It involves a group of 25 – 30 farmers in a given locality facilitated to find solutions to their problems.

The main objective of a Farmer Field School is to bring farmers together in a learning situation to undergo a participatory and a practical season-long training in a particular topic/technology. The focus is field observation,

hands-on activity and season long evaluation of technologies demonstrated for scaling-up [32] Farmers are facilitated to conduct their own research, diagnose and test problems, and come up with solutions. FFS training programmes help farmers develop analytical skills, critical thinking, and creativity, and learn to make better decisions [33]. Such an approach, in which the trainer is a facilitator rather than an instructor, reflects a paradigm shift in extension [34]. Through group interactions, attendees sharpen their decision making abilities and their leadership, communication, and management skills. Three major learning tools of FFS include discovery-based learning exercises, group experiments, and agro-ecosystem analysis. These processes help participants to experience, reflect, and make decisions. FFS is also described as a group extension method based on adult education methods and a `school without walls' that teaches basic agro-ecology and management skills that make farmers experts in their own farms. After the training period, farmers continue to meet and share information with less contact with extensionists.

As an extension approach, the FFS concept does not require that all farmers attend FFS training. Rather, only a selected number of farmers within a village or local farmers' group are trained in these informal schools, which entails weekly meetings in a season long training course. However, in order to disseminate new knowledge more rapidly within the community, selected farmers receive additional training to become farmer-trainers, and are expected to organize field-school replications within the community, with some support from public sources. Furthermore, all FFS graduates are encouraged to share their knowledge and experiences with other farmers within the village and community organizations. These farmer-to-farmer diffusion effects are expected to bring about cost effective knowledge diffusion and financial sustainability [35].

1.2 Objective of the Study

The objective of the study was to:

i) To determine the influence of Farmer Field Schools approach on the acquisition of knowledge, skills and productivity for household food security in the Lake Victoria region of Kenya.

1.3 Hypothesis of the Study

The following was the null hypothesis of the study:

$Ho_{(1)}$ There is no statistically significant influence of Farmer Field Schools extension approach on the acquisition of knowledge, skills and productivity for household food security in the Lake Victoria region of Kenya

2. Study Methodology

2.1 Research Design

The research adopted a cross sectional design. This design involves collecting data from a predetermined and specific population [36]. It allows the researcher to collect data at one point in time, thus enabling the respondents to describe a phenomenon, in this case selected extension approaches and their effect on agricultural knowledge, skills and household food production. This design allows for comparison of groups without manipulating the independent variable [37]. In this study, knowledge, skills and productivity for household food security in the study districts were determined in relation to the extension approaches used to provide services. Chance differences were however minimized by using a large sample and randomization [38].

2.2 Study Location

The study was carried out in three districts in the Lake Victoria region basin of Kenya. Lake Victoria basin is located in the upper reaches of the Nile River basin and occupies an area of about 251,000 km^2 of which 69,000 km^2 is the lake area [39] and is shared by Kenya, Uganda, Tanzania, Rwanda and Burundi. The study was carried out in three sub counties in the Lake Victoria region namely: Bondo, Nyamira and Rachuonyo. The following criteria formed the basis for sampling the 3 sub counties:

a) The sub counties portrayed a national or regional extension delivery system
b) They were fairly accessible based on available funds and time
c) They had representation in terms of diverse climatic conditions, agro-ecological zones, agricultural practices and communities.

The sub counties were purposively selected since they were representative of the larger Lake Victoria Region of Kenya. Nyamira, located in the Kisii highlands represent a high potential region for agricultural production, receiving rains most of the year, with rich arable soils. Rachuonyo on the other hand represent a medium potential region especially the Southern part with moderate rains, with fairly rich soils. Bondo Sub County is typically low potential with low rains and poor soils, with the main economic activity being fishing in Lake Victoria.

2.3 Population of the Study

The target population for this study consisted of small-scale farmers drawn from the three districts: There are approximately 865,923 persons in the three study districts represented by 188,661 households [40]. The small-scale farmers in the study sub county practice subsistence agriculture, involving cultivation of food crops and keeping few heads of cattle mainly for household consumption with little surplus for sale. In Nyamira sub county the small scale farmers grow bananas, small acreages of tea and coffee. In Bondo Sub County, the farmers are involved in fishing, growing of maize and sorghums for subsistence and keeping of local cattle. In Rachuonyo Sub- County the farmers grow bananas, maize, sweet potatoes and keep grade cattle. The demographic characteristics of these Sub- Counties are as shown in Table 1

Table 1: Population distribution of the study Sub- Counties

S/N	Sub- County	Male	Female	Total	Households	Area (Km^2)	Density
1	Bondo	76468	81054	157522	37296	593.0	266
2	Rachuonyo	182,967	199744	382711	81426	950.7	403
3	Nyamira	155808	169882	325690	69,939	398.3	818
	Total	415243	450680	865923	188661	1942	

Source: GoK (2009)

2.4 Sampling Procedure and Sample Size

The study adopted multi stage sampling technique, first of the Sub- Counties and secondly of the households.

2.4.1 Sampling of the Sub- Counties

For the selection of sample Sub- Counties, purposive sampling technique was used. This technique allows the researcher to use cases that have the required information with respect to the objectives of the study, cases of subjects are therefore handpicked because they are informative or they possess the required characteristics [37] Then within the selected Sub- County, proportionate random sampling was applied to obtain the desired cases [38] The sample frame for this study comprised of small-scale farmers who had practiced agriculture over the years. The sampling unit was the household. In order to sample the households, proportional stratified random sampling technique was used. This technique ensures that all subgroups in the population are represented. Equal allocation was then used to sample the households.

2.4.2 Sample Size

The probability formula was adopted to determine the sample size [37] as follows, whereby a sample size was selected as shown in Table 2.

Table 2: Study Sample

Extension Approach	Sample	
	F	%
Farmer Field Schools	46	19.49
Conventional Extension	190	80.51
Total	236	100
N=236		

2.5 Instrumentation and Data Collection

An interview schedule was used to collect data from the sampled farmers in the study area. Validity of the instrument was done to test if results obtained from the analysis of the data actually represent the phenomenon

under study. Based on the comments offered by the experts, appropriate adjustments were made on the instrument before it was taken to the field for data collection. Reliability of the instrument was computed using Cronbach alpha [36]. A reliability coefficient threshold of 0.7 is recommended for survey research to be adopted. For this study the final reliability was 0.72, which was above the recommended threshold. Face-to-face administration of the interview schedule was done. Focus group discussions were held to further verify the information gathered from individual respondents, and to be able to triangulate it within the themes of the study.

Qualitative or non-numerical data was used in describing the various aspects of the study. Quantitative data was however analyzed using inferential statistics as shown in Table 5. Descriptive statistics involved computing frequencies, percentages, means and standard deviations to summarize data from the objectives. The purpose was to enable the researcher to meaningfully describe a distribution of scores of measurements using a few indices or statistics. The inferential statistics used in the study were F test using ANOVA and independent t-test.

3. Results and Discussions

3.1 Education level of respondents

Results in Table 3 show the level of education for participants of the extension approaches.

Table 3: Extension approaches by level of education

	None		Primary		Secondary		Post Sec.		Total	
	F	%	F	%	F	%	F	%	F	%
Farmer Field Schools	1	2.2	19	41.3	20	43.5	6	13.0	46	100
Conventional Extension	18	9.3	67	34.7	100	51.8	8	4.1	193	100
Total	19	8.1	86	36.4	120	50.8	14	5.9	236	100

Most of the study farmers had some level of education except 30(7.6%) who had no education at all. The majority of farmers had primary and secondary levels of education (37.6%) and (48.2%) respectively. About 26(6.6%) had post secondary education level of education. In terms of extension approaches, the results show that both FFS and Focal Area had most of the participants having primary and secondary levels of education. Studies have shown that some farmers with high levels of education tend to rely more on outside sources of information other than on their own experience [40]. Such farmers more often rely on print as an information source and therefore may get more knowledge through reading than from other sources. Furthermore, educated farmers are more flexible in acquisition of information sources and often consult depending on the prevailing circumstances to meet their information needs. In such cases they may be more associated with more sophisticated sources such as print than would be their less educated counterparts.

Family income is an important factor in determining the livelihoods of the family. According to the 1997 WMS, the poverty line per person per year was defined as Kenyan shillings (Ksh) 21,848 (US$288) in rural areas and Ksh46, 693 (US$615) in urban areas, both expressed in 2003 prices and unadjusted in US dollars [41].

Table 4 shows the family farm incomes of the respondents. On average, a majority of families (47.9%) earn incomes of over Ksh. 10,000 followed by incomes of between Ksh. 5000-10000 represented by 31.5 percent; while less than 16.5 percent earn below Ksh. 5,000.00.

Table 4: Extension approaches by family farm incomes

	Less than Ksh.5000		Ksh.5000-10,000		Over Ksh.10,000		Total	
	F	%	F	%	F	%	F	%
FFS	10	21.7	25	54.3	11	23.9	46	100
CE	29	15.3	59	31.0	102	53.7	190	100
Total	39	16.5	74	31.5	113	47.9	236	100

N=236

The results show that most of the respondents (48%) have an income of below Kenya Shillings 10,000. This implies that they live below the poverty line. Farmers exposed to FFS had slightly higher number of farmers (54.3%) with an income of between 5000-10000.The results concur with studies by [42], which documented that Farmer- to -Farmer diffusion effects of FFS are expected to bring about cost effectiveness in knowledge diffusion and financial sustainability.

3.4 Analysis of Objectives and Testing of Hypothesis

Objective 1: To determine the status of changes in food production under the influence of Farmer Field Schools extension approach in the Lake Victoria region of Kenya.

This section provides a description of the status of changes in food production in the study area under the influence of the selected alternative extension approaches, including: the period of participation in the extension approach and activities undertaken; causes of persistent food shortages; amount of food consumed and stored; approaches and their contribution to food productivity.

A pair-wise comparison was made between each extension approach and the conventional extension approach using an independent t-Test to test the significant differences between the means.

3.5 Trends in farm productivity for the last 10 years per extension approach

Table 5 gives the trend of farm productivity over the last ten years per extension approach.

Table 5: Trends in farm productivity for the last 10 years per approach

Extension Approach	Increased		Remained constant		Decreased		Total	
	F	%	F	%	F	%	F	%
FFS	29	63.04	14	30.4	6	13.04	46	100
CE	51	26.8	29	15.3	110	57.95	190	100
Total	80	33.9	43	18.2	116	49.2	236	100
N=236								

When asked the extent to which extension approaches had contributed to improvement in their farm productivity over a period of ten years, findings were as shown in Table 5. Results show that 63.04 percent of the FFS had their yields increased as compared to Conventional Extension (33.9%). Most of the Conventional Extension participants (49.2%) had their yields decreased. The results revealed that there was an upward trend in farm productivity with FFS confirming studies evaluating the impact of FFS at the farm level which reported significance increase rice yields by more than 25 percent in farm level yield and profits and a decline in pesticide use in Thailand [43].

3.6 Knowledge and skills on the use of fertilizers and manures

Table 6 presents the results on the knowledge and skills on the use of fertilizers and manures. The results show that 53.3% of the farmers have some knowledge and skills on the fertilizers ad manures. The fertilizers and manures in the study were: inorganic fertilizers, green manures, compost and farmyard manure. FFS participants had higher (69.6%) knowledge and skills on the use of fertilizers and manures as compared to participants of Conventional Extension approach (50.5%).

Table 6: Extension approaches by knowledge and skills on fertilizers and Manures

Exten App	Very know		Somewhat Know		Not sure		Very little Know		No Know		Total	
	F	%	F	%	F	%	F	%	F	%	F	%
FFS	2	4.3	32	69.6	5	10.9	6	13.0	1	2.2	46	100
CE	1	0.5	96	50.5	19	10.0	18	9.5	56	29.5	190	100
Total	3	1.3	128	54.2	24	10.2	60	25.4	57	24.2	236	100
N=236												

3.7 Knowledge and skills on crop husbandry practices

Successful crop production depends on the amount of skills and knowledge posses by the farmers on the crop husbandry. The operations include: the choice of crops and varieties of seeds to grow, which is a critical

ingredient for successful crop production; this is because different crops are suited to different agro-ecological zones; weed control since there is a direct competition between crops and weeds against soil nutrients; crop spacing to ensure the optimal plant populations per unit area of land; and crop post harvest handling to reduce losses due after harvesting especially due to pest attacks including weevils and Greater Grain Borer.

3.8 Extension approaches and knowledge and skills on seed variety selection

Table 7 shows the knowledge and skills on seed variety selection by farmers.

Table 7: Knowledge and skills on seed variety selection by Extension approach

Exten App	Very know		Somewhat Know		Not sure		Very little Know		No Know		Total	
	F	%	F	%	F	%	F	%	F	%	F	%
FFS	1	2.2	27	58.7	13	28.3	5	10.9	0	0	46	100
CE	2	1.1	81	42.6	26	13.9	29	15.3	52	27.4	190	100
Total	3	1.3	108	45.7	39	16.5	34	14.4	52	22.0	236	100

N=396

Results show that 45.7 percent of the farmers had knowledge and skills on seed variety selection, while over 54.3 percent had little or no knowledge and skills on seed variety selection. FFS participants had higher (58.7%); Knowledge and skills than Conventional Extension (42.6%).

3.9 Knowledge and Skills on crop spacing

Table 8 gives the knowledge and skills on crop spacing.

Table 8: Extension approaches by knowledge and skills on crop spacing

Extension Approach	Very know		Somewhat Know		Not sure		Very little Know		No Know		Total	
	F	%	F	%	F	%	F	%	F	%	F	%
FFS	3	6.5	27	58.7	13	28.3	3	6.5	0		46	100
CE	1	0.7	78	41.1	31	21.7	80	23.1	0		190	100
Total	4	7.2	105	99.8	44	59.0	113	29.6	0		236	100

N=236

The results show that for somewhat and very knowledgeable combined, had 54.4 percent of the participants, while about 45.6 percent had little or no knowledge on crop spacing. Based on the approaches, findings show that Farmer Field Schools was higher with 58.7 percent than Conventional extension was 51.1 percent.

3.10 Knowledge and skills on the use of commercial chemicals for storage of crops

Table 9 presents the findings on the knowledge and skills on the use of commercial chemicals in the storage of crops.

Table 9: Knowledge and skills on the use of commercial chemicals for storage of crops

Exten App.	Very know		Somewhat Know		Not sure		Very little Know		No Know		Total	
	F	%	F	%	F	%	F	%	F	%	F	%
FFS	0	0	22	47.8	12	26.1	11	23.1	1	2.2	46	100
CE	1	0.5	82	43.2	26	28.9	28	19.6	53	27.9	190	100
Total	1	0.4	104	44.1	38	16.1	39	16.5	54	22.9	236	100

N=236

When asked about their Knowledge and skills on the use of commercial chemicals to store their crops, results in Table 9 show that 44.1 percent of the participants had some knowledge and skills, while about 56.4 percent have little or no knowledge and skills. FFS participants however had higher knowledge and skills (47.8%) than Conventional Extension had (43.2%).

3.11 Knowledge and skills on Livestock Production

Livestock production is useful in the provision of meat, milk and hides and skins among other products. Appropriate technologies to improve dairy production and household food security are crucially needed and that smallholder dairying is clearly a positive activity in a food security [44]. Knowledge and skills on various aspects helps to boost livestock productivity among farmers. The following tables provide information on the knowledge and skills on these aspects. Table 10: Knowledge and skills on livestock feeding.

Results indicate that 32.6 percent of the farmers are knowledgeable (very knowledgeable and knowledgeable) in livestock feeding techniques, while about 46.6% percent have little or no knowledge. FFS participants however had lower knowledge and skills (36.9%) than Conventional Extension approach (42%).

Table 10: Knowledge and skills on livestock feeding

Knowledge level										
Exten App	Very know		Somewhat Know		Not sure		Very little Know		No Know	Total
	F	%	F	%	F	%	F	%	F %	F %
FFS	2	4.3	15	32.6	19	41.3	9	19.6	1 2.2	46 100
CE	4	2.8	56	39.2	30	21.0	52	36.4	48 0.7	190 100
Total	6	2.5	71	30.1	49	20.8	61	25.8	49 20.8	236 100
N=236										

3.12 Knowledge and skills on Experiments involving new crop/livestock varieties

Table 11 shows the results of knowledge and skills on experiments involving crop/livestock varieties.

Table 11: Knowledge and skills on experiments involving crop/livestock varieties by Extension approach

Exten App	Very know		Somewhat Know		Not sure		Very little Know		No Know	Total
	F	%	F	%	F	%	F	%	F %	F %
FFS	1	2.2	15	32.6	17	37	10	21.7	3 6.5	46 100
CE	0	0	24	12.6	47	24.7	62	32.6	57 30.0	190 100
Total	3	1.3	39	16.5	64	27.1	82	34.7	59 25.0	236 100
N=236										

Finding show that about 20 percent of the farmers had knowledge and skills on experiments, while over 80 percent had little or none. When looking at the Knowledge and skills on experiments involving new crop/ livestock varieties, per extension approach, the results indicate that Farmer Field Schools was higher (32.6%) than Conventional Extension (12.6%).

3.13 Knowledge and skills on experiments involving Indigenous Technical Knowledge (ITK)

Results in Table 12 show the Knowledge and skills on carrying out experiments involving Indigenous Technical Knowledge (ITK) by extension approach.

Table 12: Knowledge and skills on experiments about ITK by Extension approach

Exten App	Very know		Somewhat Know		Not sure		Very little Know		No Knowledge		Total	
	F	%	F	%	F	%	F	%	F	%	F	%
FFS	1	2.2	26	56.5	7	15.2	8	17.4	4	8.7	46	100
CE	6	3.2	18	9.4	48	25.3	53	27.9	65	34.2	190	100
Total	7	3.0	44	18.6	55	23.3	61	25.8	69	29.2	236	100

N=236

They indicate that Farmer Field Schools had a higher (56.5%) knowledge and skills than Conventional Extension (9.4%).

3.14 Influence of own experiments on farm productivity

Table 13 shows the results of knowledge and skills of respondents on the influence of experiments on farm productivity.

Table 13: Influence of own experiments on farm productivity

Extension Approach	Increased		Remained Constant		Decreased		Total	
	F	%	F	%	F	%	F	%
FFS	8	76.1	4	8.7	7	15.2	46	100
CE	51	26.8	24	12.6	111	58.4	190	100
Total	59	25.0	28	11.9	118	50.0	236	100

N=236

When farmers were asked how their ability to conduct own experiment had affected their crop production, the results in Table 33 show that 28.2 percent of the farmers had their farm productivity increased as a result of conducing experiment; 14.9 percent remained constant while 48percent had a decrease. On the farmer categories, Farmer Field Schools was higher (76.7%) as having had an increase compared to Conventional Extension approach (26.8%).

3.15 Test of Hypothesis

In comparing the influence of the two extension approaches, a null hypothesis was derived from the objective:

Hypothesis one stated as follows:

$Ho_{(1)}$ There is no statistically significant influence of Farmer Field Schools extension approach on the acquisition of knowledge, skills and productivity for household food security in the Lake Victoria region of Kenya.

Table 14 presents the results of a comparison between Farmer Field Schools and conventional extension regarding the influence on acquisition of knowledge, skills and productivity for household food security.

Table 14: Independent t-test results for the comparison of Farmer Field School and Conventional Extension

Source	Means	N (236)	df	Std. Error Difference	T	Sig. (2-tailed)
FFS	2.7823	46	2	.06951	-1.587	0.014
Conventional Extension	2.9053	190		.03788		

From the Results (Table 14) it can be seen that $p = 0.014$ is less than alpha 0.05. This indicates therefore that, there is a significant difference between FFS and the Conventional Extension approaches. We therefore reject the null hypothesis. This implies that Farmer Field Schools extension approach may significantly influence the acquisition of knowledge, skills and productivity for household food security in the Lake Victoria region of Kenya.

4. Conclusion

The following conclusion may be drawn from the study:

i- That Farmer Field Schools approach is useful as revealed in the study. From the results it is evident that it contributes to the acquisition of knowledge and skills in various agricultural production activities but more significantly to an increase in farm productivity. The study concludes that Farmer Field Schools approach influences agricultural knowledge, skills for household food production in the Lake Victoria region of Kenya. The findings showed that the approach contributed to more knowledge and skills on agricultural technologies as compared to Conventional extension approach.

5. Recommendation

The following recommendations may be drawn from the study:

1. That Farmer Field Schools approach is a useful tool that should only be used for technology generation, validation, verification and disseminating for wider adoption of agricultural technologies.

6. Acknowledgements

I am heavily indebted to the many individuals and institutions that collectively or individually contributed to the successful completion of this study. First and foremost I acknowledge my Supervisors, Prof. Christopher Onyango and Dr. James Obara for their able guidance that enabled me to conduct the research and write this thesis. Secondly I sincerely thank the National Commission for Science, Technology and Innovation (NACOSTI) for funding the study. Thirdly, my employer, Jaramogi Oginga Odinga University of Science and Technology for the timely processing of research funds. My Vice Chancellor, Prof Stephen Gaya Agong' gave me adequate time out to conduct the research and I thank him so much. Fourthly, the extension workers in the three sub counties for their support during field data collection. Lastly, my entire family and all other people who helped me in one way or the other during this research. Despite the assistance and guidance from all the above, I am, however, fully responsible for the facts presented in this thesis including any unforeseen omissions and errors.

References

[1] J.K. Kibet, M.E. Omunyinyi, M. E. & J. Muchiri . Elements of Agricultural Extension Policy in

Kenya. Challenges and Opportunities. African Crop Science Conference Proceedings. 7: 1491 - 1494.2005.

[2] A.Haines & A.Cassels. Can The Millennium Development Goals Be Attained? BMJ: British Medical Journal, Vol. 329, No. 7462 (Aug. 14, 2004), pp. 394-397.2004.

[3] C.Thirtle . Producer Funding of R&D: Productivity and the Returns to R&D in British Sugar, 1954-93, *Journal of Agricultural Economics*, Vol.50, No.3.2001.

[4] D.L.Purcell & J.R. Anderson. *Agricultural Extension and Research: Achievements and Problems in National Systems*, The World Bank, Washington, D.C.1997.

[5] D.Duveskog . Theoretical perspectives of the learning process in farmer field schools. Nairobi: FAO Working Paper .2006.

[6] World Bank. *World Development Report: Agriculture for Development* (World Bank, Washington, DC,). 2008.

[7] C. Leeuwis . Communication for Rural Innovation: Rethinking agricultural extension. Blackwell.2004.

[8] A.Braun, J.Jiggins, N. Ro¨ ling, H.Van den Berg, & P.Snijders . A global survey and review of Farmer Field School experiences. Nairobi: International Livestock Research Institute .2006

[9] A.C. Rola, J.B. Quizon, & S.B. Jamias. Do farmer field school graduates retain what they learn? An investigation in Iloilo, Philippines. Journal of International Agricultural and Extension Education, 9(1), 65–76.2002.

[10] K.Davis, E. Nkonya, E.Kato, D.A. Mekonnen, M. Odendo, R. Miiro. Impact of farmer field schools on agricultural productivity and poverty in East Africa. World Development, 40(2), 402–413.2012.

[11] Ministry of Agriculture. *Supplement on Managing Food and Nutrition Security.* Kilimo House Nairobi Kenya .2009.

[12] Central Bureau of Statistics . *Statistical Abstract 2004*. *Ministry of Finance and Planning.* Government Printers, Nairobi.2004.

[13] GoK . Ministry of Agriculture. *Agricultural Sector Development Strategy 2010-2020*. Government Printers, Nairobi, Kenya.2010.

[14] R. Joetzold, H. Schmidt, H. Brethold, & C. Shisanya, C. (2006). Farm Management hand Book of Kenya, Vol II: Part B. Rassdorf, Nairobi.

[15] FAO . Food and Agriculture Organization Statistical Database (FAOSTAT). www.fao.org.2006

[16] Ministry of Agriculture, Livestock & Fisheries Development. NALEP Operational Manual, Kilimo House Nairobi.2004.

[17] GoK. (1998). *Situation Analysis of children and women in Kenya. Ministry of Planning and National development.* Nairobi, Kenya.1998.

[18] R.E. Evenson & G. Mwabu G. The effects of agricultural extension on farm yields in Kenya. Discussion Paper No. 708. Yale University, Economic Growth Center, New Haven, Connecticut.1998

[19] World Bank. Agriculture development source book: Agriculture and rural development. Washington DC: World Bank publication.2004.

[20] D. Benor, & Baxter, M. *Training and visit extension.* The World Bank, Washington DC: USA.1984.

[21] J. Morris. *Extension Alternatives in Tropical Africa*. Overseas Development Institute: London.1991.

[22] V. Venkatesan. Knowledge and Policy: The International Journal of Knowledge Transfer and Utilization, Winter, Vol. 9, Number 4.1997.

[23] M. Gautam & J.R. Anderson . Reconsidering the evidence on returns to T&V extension in Kenya. Policy Research Working Paper 1098, the World Bank, Washington D.C. 1999.

[24] GoK. National Development Plan1994- Ministry of Finance and Planning,

Government Printer, Nairobi. Kenya.2004a.

[25] GoK. . Review of the National Agricultural Extension Policy (NEAP) and its Implementation. Volume II – Main Report and Annexes. Ministry of Agriculture and Ministry of Livestock and Fisheries Development. Nairobi.2005.

[26] S. Chamala & P.D. Mortiss, P. D. *Working together for Landcare: Group management skills and strategies*, p. 368. Brisbane: Australian Academic Press.1990.

[27] J. R. Anderson . Agricultural Advisory Services. Background Paper for the World Development Report, 2007.

[28] M. Romani. *The impact of extension services in times of crisis*: Côte d.Ivoire 1997-2000. Centre for the Study of African Economies, University of Oxford. CSAE WPS/2003-07.2003.

[29] A.Braun, J. Jiggins, , N. Ro¨ ling, H. Van den Berg & P. Snijders, P. A global survey and review of farmer field school experiences. Nairobi: International Livestock Research Institute.2006.

[30] K. Davis, & N. Place. Non-governmental organizations as an Important Actor in Agricultural Extension in Semiarid East Africa. Journal of International Agricultural and Extension Education, 10(1),31–36.2003.

[31] B.A.M Mweri & S.G. Khisa, S.G. *Report of the training of trainers course On- Farmer Field School methodology for soil management and legume research Network Project* held at Egerton University, March 12-17, 2001. Published by, *Kenya Agricultural Research Institute Nairobi*, Kenya. Pp 13.2001.

[32] A.Abate &, D. Duveskog *Applications of the Farmer Field School Approach in Kenya*, A Report of The Farmer Field School Stakeholders forum Held on 27th March 2003 At ILRI, Nairobi, Kenya, 2003. Pp. 11-15.

[33] P. Kenmore. Integrated pest management in rice. In: Persley, G.(Ed.), Biotechnology and Integrated Pest Management. CAB International,Wallingford, pp. 76–97.1996.

[34] Van de Fliert, E. (1993). Integrated pest management: Farmer field schools generate sustainable practices. A case study in central Java evaluating IPM training. Published Doctoral Dissertation, Wageningen University, Wageningingen.

[35] Feder, G., Murgai, R., & Quizon, J. (2004a). Sending farmers back to school: The impact of farmer field schools in Indonesia. Review of Agricultural Economics, 26(1), 45–62.

[36] J.R. Fraenkel, J.R. & N.E. Wallen, N.E. How to Design and Evaluate Research in Education: New York, NY: Mcgraw-Hill Publishers Co. Pp 2-483.2000.

[37] O. Mugenda & A.G. Mugenda, A.G. *Research Methods*: *Quantitative and Qualitative Approach*, African Centre for Technology Studies, Nairobi, Kenya.1999.

[38] V. H.Borg & Gall, M.E. . *Education Research: An Introduction*, Pp 257-265). New York, NY:Longman. Inc. 2003.

[39] UNEP (2006a). Lake Victoria Environment Outlook: Environment and Development. UNEP,Nairobi, Kenya.

[40] GoK . Demographic and Health Survey (KDHS, 2008/2009). Ministry of Health, Nairobi: Government Printer.2009.

[41] I.N. Ngathou,J.O. Bukenya, D.M. Chembezi. Information sources preferred by limited resource farmers in using agricultural risk tools. Southern Agricultural Economics Association's annual meetings in Little Rock, Arkansas. (February 5–9).2005.

[42] G. Feder, R. Murgai, & J. Quizon . Sending farmers back to school: The impact of farmer field schools in Indonesia. Review of Agricultural Economics, 2004a .26(1), 45–62.

[43] F. Mancini.Impact of IPM farmer field schools on the environment, health and livelihood of cot-ton growers in southern India.Doctoral thesis, Biological Farming Systems Group, Wageningen University, The Netherland.2006.

[44] G. Mbagaya, M. Odhiambo & R. Oniango. .*Dairy production: A nutrition intervention in a sugarcane growing are in Western Kenya.* African Journal of Food Agriculture, Nutrition and Development. Volume 4 No1 2004.