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Original Article

A COMPARATIVE STUDY OF THE HOUSEHOLD FOOD ACCESS BY FARMERS IN FARMER FIELD AND LIFE SCHOOLS IN GATANGA CONSTITUENCY, MURANG'A COUNTY, KENYA

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ABSTRACT

Many programs have been initiated to assist farmers diversify food production. The Farmer Field and Life Schools (FFLS), an agricultural extension methodology, is an example. Dietary assessment methods are used for nutrition assessments. This study compared household food consumption patterns, by using the Household Dietary Diversity Score (HDDS) of households who participated in the FFLS at baseline and after intervention and Non-FFLS households in the Gatanga Constituency in Murang'a County. The study was based on a United Nations Joint Program implemented from 2009 to 2013. A comparative cross-sectional design was used in this study to compare FFLS at baseline, after intervention and Non-FFLS households. 112 households (56 for cases and 56 for comparative group) participated in this study. The baseline survey with 390 households was in 2009. Data was analysed using the Statistical Package for Social Science (SPSS) version 21. Paired and independent T-Tests were used to determine the difference in the household dietary diversity score between FFLS at baseline and after intervention, and post intervention FFLS and Non-FFLS, respectively. Results show that 42.8% (n=56) of the FFLS households and 28.5% of non-FFLS household respondents were over 50 years of age. 49% of FLS and 11% non FFLS households have incomes ranging from 0-5,000 Ksh. per month, with 41% of FFLS and 32% non FFLS having incomes ranging from Ksh. 5,001- 10,000[1]. Mean for Household Dietary Diversity Score (HDDS) at baseline was 8.16 and Non-FFLS was 8.45. Minimum food groups consumed across all groups were cereals, milk and milk products, oils and fats. Comparing FFLS at baseline and post intervention, the percentage of households consuming all food groups increased with exception of fruits and meat. There was a significant difference (p=0.007 against p<0.0005) in the HDDS when FFLS groups post intervention were compared with their baseline. There was no significant difference (p=0.176, against p<0.0005) in the HDDS between FFLS post intervention and non-FFLS households. Compared with the baseline information, FFLS participants who were of low economic status improved their HDDS. Targeting of vulnerable households to participate in such programs has the potential of improving their HDDS compared with the regular HDDS population. Integration of nutrition in agricultural programs with strong extension systems like the - has great potential to improve access and consumption of diversified foods for vulnerable households.

Key words: Agriculture, Nutrition, Farmer Field and Life Schools (FFLS), Household Dietary Diversity Score (HDDS)

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[1] Ksh 0-5000 is equivalent to USD 0-50; Ksh 5001-10,000 is equivalent to USD 50-100

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INTRODUCTION

The second Sustainable Development Goal (SDG) [1] aims to end hunger, achieve food security, improve nutrition and promote sustainable agriculture. The first and second targets of this goal, aim to end hunger by 2030 to ensure access to safe, nutritious and sufficient food all year round; and end all forms of malnutrition by all people, particularly the poor and people in vulnerable situations including infants. By 2025, the internationally agreed targets on stunting and wasting in children under 5 years of age and address the nutritional needs of adolescent girls, pregnant and lactating women and older persons. Though these goals are within reach by 2030, in 2015, there were 870 million people estimated to be undernourished globally, and more than 100 million children under the age of 5 still undernourished and underweight [1] Therefore, the international community has focused its attention on the development of the three inter-twined sectors of agriculture, nutrition and health to enhance human livelihoods and well-being.

The Global Nutrition Report 2015 under the Nutrition profile for Eastern Africa shows that 38% of children under 5 years are stunted, and 7% are wasted [2]. The prevalence of stunting of children under 5 years in the Central Province, where Gatanga constituency is located, was 32.4% in 2008/09 [3] and 18.4% in 2014 [4] and the percentage of underweight children was 12.1% in 2008/09 and 5.3% in 2014. Comparing to the most recent national figures [4], stunting of children is at 26% while underweight is at 11%.
The Lancet Series on Maternal and Child Nutrition 2013 [5] defines nutrition-sensitive interventions and programs as those that address the underlying determinants of nutrition and development. Examples include agriculture and food security, social safety nets, early child development, maternal mental health, women’s empowerment, child protection, schooling, water, sanitation, and hygiene, health and family planning services. Further, it has been shown that nutrition-sensitive programs can have a pivotal role in the prevention of excess stunting, wasting, and impaired child development that the scale up of nutrition-specific interventions cannot resolve on its own [5].

Agricultural interventions to improve household food availability and dietary diversity are considered as one of the most sustainable solutions to the problems of high household food insecurity and malnutrition by increasing households’ access to diverse foods and consumption of micronutrient rich food. Such interventions can also lead to reduced household poverty, improved nutritional status of household members and potentially empower women beneficiaries [6]. At the household level, food security refers to the ability of the household to secure, either from its own production or through purchases, adequate food for meeting the dietary needs of all members of the household [7]. Agriculture can positively affect food security and nutrition through several pathways like food production, increased access to quality foods in markets, increased incomes, and gender empowerment [5, 8, 9].

Farmer Field and Life School (FFLS) is a community-based, practically oriented field study programme involving a group of farmers who meet regularly to critically study and analyze their farming systems, under the guidance of a trained facilitator [10]. This programme assists farmers to improve food production. Through the FFLS programme, households consume part of the food they produce sell for cash income. FFLS addresses issues on plant and animal health, natural resource management, cross cutting issues and life skills like Gender empowerment, Human nutrition and HIV intervention programmes. There is limited quantitative evidence that FFLS activities in relation to food production and practical nutrition education, have had an impact on improved household food consumption patterns, which have a vital role in improving nutrition. By using the UN Joint Program as an example, the goal of this study is to determine if participation of farmers in the FFLS has any effect on their food consumption patterns by comparing their baseline and after intervention indicators to farmers who do not participate in the FFLS.

Several UN agencies in Kenya, implemented the UN Joint Program [11], based on the aim of the UN Reform to deliver as one, the program's primary purpose; which was to support the development of an effective, evidence-based and nationally led multi-sectoral response in Kenya, by supporting the Kenya National AIDS Strategic Plans. The program implementation was from 2009 to March 2013. The key objective was to improve food security, nutrition and livelihood of vulnerable populations and the Gatanga constituency was one of the project sites. The program's specific objectives were to; establish and functionalize farmers field and life schools, strengthen adoption of improved nutritional and care practices at household. It was implemented through the Farmer Field and Life School (FFLS) approach. Vulnerability in this case was based on the presence of an HIV infected or affected adult member in a household, that is, presence of a chronically sick adult member; death of a productive adult house-member; single-headed households as well as economic vulnerability affecting agricultural to productivity.

The researcher reviewed relevant baseline data on household dietary diversity and meal frequency and compared the current research quantitative findings to the qualitative data in the project research report. The FFLS program in Thika was implemented by YARD, (Youth Action for Rural Development), an NGO that works in the larger Gatanga region through agriculture and income generating activities for community economic empowerment.

Studies have shown that an increase in dietary diversity is associated with improved economic access and household food security [6, 12]. The Household Dietary Diversity Score (HDDS) can be used for various reasons, including monitoring food security/nutrition programmes, or agricultural interventions, to measure the impact of the intervention on the quality of the diet. Researchers also use information on consumption of individual food groups to investigate dietary patterns. Besides, Dietary Diversity Scores are used to assess changes in diet before and after an intervention [12]. The purpose of this study was to examine the practices in food consumption among FFLS and compare their baseline and other non FFLS farmers who have not been involved in this kind of participatory learning and capacity building process.

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MATERIALS AND METHODS

Study area and Population

This study was conducted in the Gatanga Constituency of the larger Murang'a County, Kenya. The Gatanga constituency has six county assembly wards (Ithanga, Kakuzi/Mitubiri, Mugumo-ini, Kihumbu-ini, Gatanga, Kariara). The study area population are farmers in Gatanga constituency and the target population groups were vulnerable farmers who had participated in the Farmer Field and Life Schools (390 farming households) and farmers in the same region who had not participated in Farmer Field and Life Schools. Vulnerability of farmers was based on socio-economic effects of HIV and AIDS to productivity. This was assessed at baseline by identifying the key assets owned by farming households.

There was a total of 14 FFLS (with an average of 15-20 persons in each field school) spread across five of the six wards. A baseline was established with 390 households in the Gatanga constituency. In the comparative groups, only households with at least one woman were included in the research. The mother of a household was the target during the research. The control (non-FFLS) group consisted of households without any representatives who participated in any FFS or FFLS program.

Study Design

A comparative cross-sectional design was used in this study. This is a one-point in time comparison of households who had participated in FFLS (using their baseline data and after intervention) and non-FFLS. The baseline data had a sample size of 390.

Sampling: The sample size for the two comparative groups for the study (FFLS after intervention and Non-FFLS) was calculated using the online sample size estimation calculator this gave 56 households for the FFLS after intervention and 56 households for Non-FFLS group.

Data collection tools and procedures

Data for the study was collected in August 2014 using quantitative methods to assess the differences in dietary diversity. The quantitative methods included structured and semi-structured questionnaires. The questionnaires comprised of two sections: Socio-economic data, Household dietary diversity score. The Household Dietary Diversity Score (HDDS) made up of 12 food groups was administered to the person responsible for food preparation at the household level. The HDDS was based on FAO guidelines [12]. Household Dietary Diversity was measured by using the Household Dietary Diversity Index, which includes diversity of foods consumed in the household, economically important food categories that correlate with household purchasing power/access to that food, and specific nutrient rich foods consumed. This tool is an indicator of food access and it can be used to assess the adequacy of intake of essential nutrients. Household food groups reflect economically important food categories and correlate with household purchasing power [13] This was assessed with the household questionnaire and it is an element to show high quality diet.

The researcher trained four enumerators during a one-day training exercise. The enumerators were people from the locality (live in Gatanga constituency and had attained a minimum of college education (diploma level) and were able to speak the local language.

Trained enumerators pre-tested the questionnaire in one ward in Gatanga constituency. The UNJO Farmer Field and Life schools program did not cover this constituency and only involved 10% of the sample size (12 households). Pretesting of the questionnaire with minor changes ensured that the tools addressed the objectives of the study.

Quantitative data was analysed by using the Statistical Package for Social Sciences (SPSS) version 21, 2012 software. Data processing and analysis was done for the three groups of data: FFLS baseline, FFLS after intervention and Non-FFLS.

Analysis and processing included comparison of the research data with the qualitative data collected during the end of project in March 2013 (YARD, 2013).

Categorized data as either continuous or discrete, were summarized as measures of central tendency like the mean, median and as measures of dispersions like the standard deviation, variance, and the range. The researcher carried out t-tests comparing the variables, between the FFLS after intervention and non-FFLS as well as FFLS baseline and FFLS after intervention. The two hypotheses were tested at CI 95% and P value of 0.05 was considered adequate.

Ethical considerations

The Moi University Institutional Research and Ethics Committee (IREC) approved the ethical standards for this study that focused on interviewing of subjects. Permission to use the UNJP program for research was sought from the program manager in UNFAO Kenya and approved. Further, the Director for YARD allowed the researcher to undertake the study with the program beneficiaries and with access to the FFLS baseline in Gatanga constituency. This research aimed to respect participants' right to privacy, thus, participation was strictly voluntary. The researcher kept all information collected during the study within the scope of this study, and all completed questionnaires were stored under lock by the researcher.

RESULTS AND DISCUSSIONS

One hundred and twelve (112) households participated in this study. Fifty six (56) households had farmers who had participated in the FFLS program (FFLS after intervention), while 56 households had farmers without any experience in the FFLS program (non-FFLS).

The socio-demographic information gathered during the study for the FFLS after intervention and Non-FFLS households include age, sex, education level, and number of children in the households. In the FFLS and non-FFLS households, 42.8% (n=56) and 28.5% (n=56) of respondents were over 50 years of age, respectively. The mean ages of the FFLS and non-FFLS household respondents was 49 years and 43 years, respectively (Table 1.1).

Regarding monthly incomes, 49% (n=56) of the FFLS and 11% (n=56) non-FFLS households had incomes ranging from 0-5,000 Ksh. per month. The same trend was noted across the second income group, where 41% (n=56) of FFLS and 32% (n=56) non-FFLS households had monthly incomes in the range of Ksh. 5,001- 10,000. In the third income group, there were less FFLS (9%, n=56) than non-FFLS (37%, n=56) households with monthly incomes ranging from Ksh. 10,000-20,000. The distribution of the highest income group with monthly incomes over Ksh. 20,001 was only 1.7% (n=56) of FFLS and 19% (n=56) of non-FFLS (Figure 1.1).

During the FFLS baseline survey[34], although the household income of the respondents was not quantified, information about ownership of the following assets: size of land, radio, bicycle, livestock numbers, other farm and household assets was sought from the 390 households involved in the study.

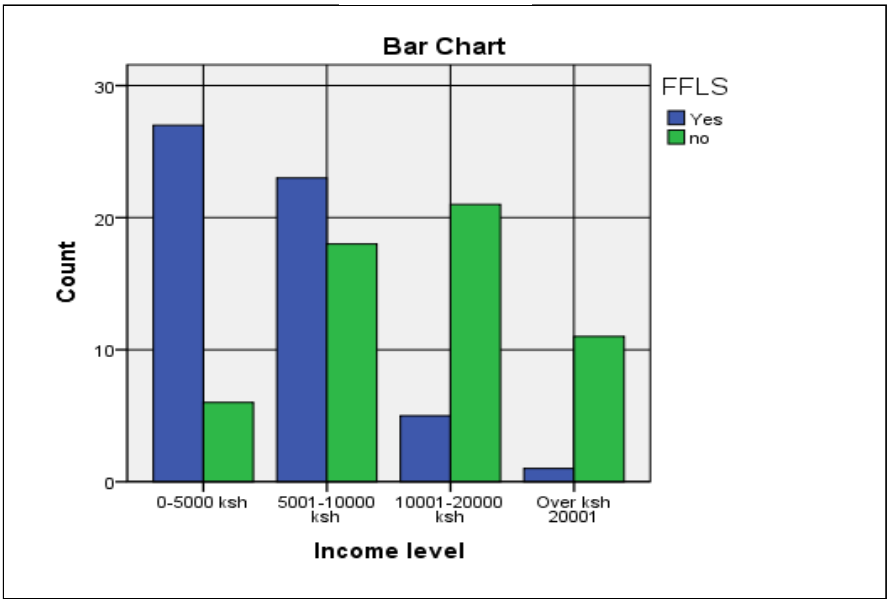

Figure 1.1: Income levels for FFLS after intervention and Non FFLS households

An independent t-test showed that there was a significant difference ($p<0.0005$) between the incomes of FFLS and Non-FFLS households. The non-FFLS households were much more economically empowered than the FFLS households.

Household food access by use of HDDS

For the Household Dietary Diversity Scores (HDDS), the global acceptable minimum number of food groups is four (FAO, 2011).

Comparison of HDDS between FFLS and Non FFLS households

The HDDS mean for the FFLS was 7.26, with the minimum HDDS/number of food groups being three and the maximum was 11.

Out of the 112 households, 33% of the respondents had a HDDS of eight (8), while 31.3% had a HDDS of nine (9). The HDDS mean at baseline for FFLS was 7.26, compared with 8.16 for the after intervention and 8.45 for the non-FFLS group.

The cumulative HDDS mean of the FFLS after intervention and non-FFLS was 8.3 (n=112, ±1.11), while the minimum HDDS/number of food groups was 5 and maximum 11, with FFLS having a minimum of 5 and maximum of 10 after intervention. Non-FFLS had a minimum of 6 and maximum of 11 food groups.

Table 1.2 shows a comparison of the HDD Scores of the FFLS baseline, FFLS after intervention and non-FLS households. On average, most FFLS households at the baseline, consumed between five (5) and nine (9) food groups, while with the after-intervention group, the consumption increased from seven (7) to nine (9) of the food groups. This was similar to the non-FFLS groups (consumption range between 7 and 9 food groups) (Table 1.2).

The cumulative percentage of higher HDDS (7, 8, 9), for FFLS baseline was 53.4%, while FFLS after intervention was 85.7% and the non-FFLS households was 76.7%. It was observed that some of the FFLS households consumed 3-4 food groups at the baseline. This observation at the baseline was not with the FFLS households after intervention and the non-FFLS groups. On the other hand, there were more households consuming nine (9) or more food groups in the non-FFLS (49.9%) than during the FFLS baseline (29.1%) and FFLS after intervention (39.4%).

Household Dietary Diversity Score (HDDS) data was analyzed based on the individual food groups in order to find out the food groups that were highly consumed. Table 1.3 compares the percentage and frequency of the 12 food groups, as consumed by the FFLS group at the baseline and after intervention, and non FFLS Households.

Based on the acceptable minimum food groups, the top four foods frequently consumed by all the three groups, were cereals, milk and milk products, oil and fat, and vegetables. The percentage difference in number of households consuming these foods is the table. Figure 1.2 graphically compares the consumption of the different food groups between FFLS baseline and FFLS after intervention. The percentage of households consuming all the food groups increased, with the exception of fruits and meat.

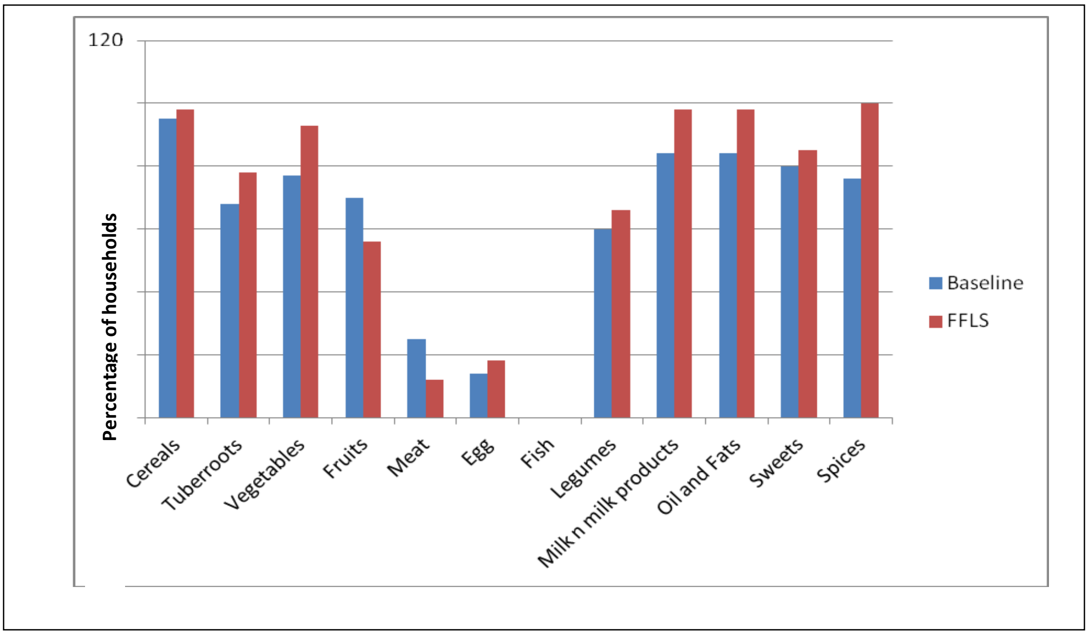

Figure 1.2: **Percentage of households from baseline and FFLS consuming different food groups**

Figure 1.3 compares the consumption of the different food groups between FFLS after intervention and non-FFLS. In both types of households, cereals, vegetables, oils and fats, milk and milk products were highly consumed while meats had a very low level of consumption. None of the households consumed fish.

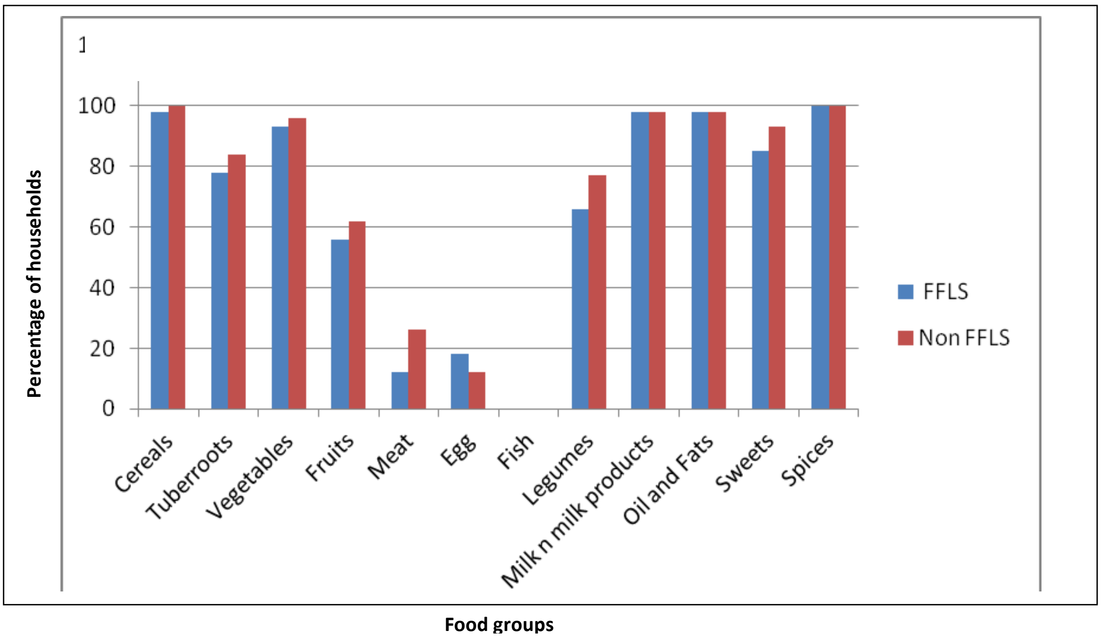

Figure 1.3: **Percentage of each food group as consumed by FFLS after intervention and Non-FFLS Households**

Relationships between the Dietary Diversity Scores between FFLS and Non-FFLS Households

a) Household Dietary Diversity Score (HDDS) between FFLS baseline and FFLS after intervention.

The FFLS baseline for the UNJP project in Gatanga was done on 390 households. Since this figure was much higher than the number of Households that took part in the current study, 56 households' data was randomly selected by using the SPSS version 21. This approach enabled the comparison of the FFLS households after intervention. In order to ensure that the key factors were not affected, the mean and standard deviation of the data for the 56-selected households did not deviate from the mean and standard deviation of the total number of 390.

A paired-sample T-test was performed to determine whether HDDS of the FFLS baseline and FFLS after intervention were statistically different. The test results showed that there was a significant difference (p=0.007) between HDDS of FFLS at the baseline and after the intervention. This implied a statistically significant difference in the HDDS (higher, in this case), means of the vulnerable households during the baseline and after participating in the FFLS program.

b) Household Dietary Diversity Score (HDDS) between FFLS after intervention and Non-FFLS households

The independent T-test revealed that there was no significant difference (p=0.176) between HDDS of FFLS after the intervention and Non-FFLS.

This study revealed that a large number of the respondents were 50 years of age and older. Gatanga is an agricultural area and these figures are representative of farming households. The average age of the Gatanga agricultural area was slightly younger than the average age of 60 years of a Kenyan farmer [14].

The income data showed that on average, most of the FFLS households were within group one (earning between Ksh 0-5,000), while Non-FFLS households were within group two (earning between Ksh 5,001 and 10,000). This implied that the Non-FFLS households with higher levels of education compared with the FFLS households earned more income.

The T-test analysis to compare the incomes of the two groups showed a statistically significant difference in the incomes of the two households. The non-FFLS households were classified as the wealthier group because of their higher economic power and were used in this study as the target group for the relevant indicators of concern against the more vulnerable FFLS households.

Comparison of HDDS among FFLS baseline, FFLS after intervention and Non-FFLS households

The results of the HDDS showed that there is a larger difference between the FFLS baseline and FFLS after intervention means (7.26 and 8.16 respectively), compared with the difference in means between FFLS after intervention and Non-FFLS (8.16 and 8.45 respectively). This finding indicates dietary diversity of the FFLS improved through their participation in the program. This finding is similar to other studies, which showed that an increase in dietary diversity is associated with improved economic access and household food security [15], and higher diversity of food are eaten by FFLS members in the Eastern Africa countries of Rwanda and Uganda [16]. The study further shows that families that participated in the FFLS ate crops promoted through the FFLS to improve their nutrition and overall health and that contributes to increased household dietary diversity [16].

On the contrary, the FFLS study in Rwanda and Uganda also showed that the HDDS of FFLS members were 5.2 and 7.5, respectively. This is marginally lower than the average HDDS results of this research study [16].

While comparing the consumption of the different food groups between the baseline and FFLS, it was clear that the percentage of households consuming all the food groups had increased, with the exception of fruits and meat. The groups studied did not consume fish. The reason for non-consumption of fish was not sought. The reason for the reduction in fruit consumption during the study was the season in which data was collected. There was a lower diversity of available fruits during that season, when the study was conducted. The reduction in meat (beef, mutton) consumption was attributed to the higher cost of meat and meat products compared to plant source foods. This finding agrees with the report that many households in Kenya depended on proteins from plant-based food (especially cereals) other than meats due to higher price of meat compared to cereals [17]. Contrary to this, a program implemented in Bangladesh using Farmer Nutrition Schools (a modification of Farmer Field Schools), led to an increase in consumption of fish and increased dietary diversity by supporting fish farming coupled with nutrition education on the importance of including fish in family diets [18].

Comparison on the consumption of the different food groups between FFLS (at baseline and after intervention) and non-FFLS showed that most of the foods consumed were cereals, vegetables, oils and fats, and milk and milk products. These findings are similar to research that showed that the average rural smallholder obtained a large share of the daily calorie intake from only a limited range of foods: cereals- maize, millet and sorghum (61%), starchy roots (12%), beans 5% (plant protein), sugar 5% and milk 4% (protein). These foods represent 87% of total daily calorie intake [19].

The significant increase in the HDD Score in the FFLS household when the baseline and FFLS scores were compared, and the non-significant difference in the HDD Scores when the FFLS were compared to the non-FFLS show that the FFLS program has significantly improved household economic access to food and the household food security. This indicates that though the FFLS households at the beginning of the program were more vulnerable with a lower HDDS and their access to food significantly improved during the program, which reached the level of the wealthier farming population, who are the non-FFLS.

This finding is similar to another study on FFLS and nutrition carried out in the region, which showed that there was a highly promising scope for linking agricultural development and education with nutrition through the FFS and FFLS approach [16]. Furthermore, increased and diversified food production had been observed from FFLS members and found to contribute to better nutrition, which could be enriched if nutrition were more mainstreamed and better integrated in the FFS approach [16].

According to FAO, one of the principles of making agriculture work for nutrition is to target the most vulnerable groups, including smallholder farmers, women, and poor/food insecure households [20]. The results of this study showed that the program targeting was well done, as it was accessible to the most vulnerable farming household in the community with demonstrable impact observed from the results of the study.

CONCLUSION

The following are the conclusions drawn from this study.

1. There was a notable difference in the Household Dietary Diversity Scores among FFLS groups between baseline and the intervention
2. There was no difference in the Household Dietary Diversity Scores between FFLS after intervention and non-FFLS households.
3. FFLS participants had a low economic status whose HDDS improved from the baseline.
4. Agriculture-based programs implemented through extension methodologies, like the FFLS, have a great potential to improve access and consumption of diversified foods for vulnerable households.

The following recommendations are based on the conclusions drawn from this research.

1. The researcher(s) recommend the mainstreaming of nutrition in agricultural programs and the monitoring of food consumption indicators like HDDS, meal frequency among others, to strengthen the evidence of agricultural programmes' contribution to improved nutrition outcomes.
2. The researcher(s) recommend, that FFLS programmes should target the most vulnerable households in nutrition sensitive agricultural programs as that has great potential in improving and diversifying food consumption of specific needy households.

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Table 1.1: Ages and education level of respondents from FFLS and Non-FFLS households

Age group	Household type		Total
	FFLS hh (n=56)	**Non-FFLS hh (n=56)**	
18-49	32 (51.8%)	40 (71.5%)	72 (64.2%)
50 and above	24 (48.2%)	16 (28.5%)	40 (35.8%)
Total	56	56	112
Other statistics for age			
Mean	49 yrs	43 yrs	
Mode	50 yrs	49 yrs	
Minimum age	30 yrs	24 yrs	
Maximum age	85 yrs	80 yrs	
Education level			
No Education	4 (7%)	3 (5.5%)	7 (6%)
Primary Education	35 (62.5%)	23 (41%)	58 (52%)
Secondary educatio	14 (25%)	19 (34%)	33 (29.5%)
Tertiary education	3 (5.5%)	11 (19.5%)	14 (12.5%)
Total	56	56	112

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Table 1.2: Summary of HDDS for FFLS Baseline, FFLS after intervention and Non-FFLS Households

		Households type		
		FFLS (baseline) (n=390)	FFLS (after intervention) (n=56)	Non FFLS (n=56)
Total score of HDDS per HH	0	0 (0%)	0 (0%)	0 (0%)
	1	0 (0%)	0 (0%)	0 (0%)
	2	0 (0%)	0 (0%)	0 (0%)
	3	14 (3.5%)	0 (0%)	0 (0%)
	4	29 (7.4%)	0 (0%)	0 (0%)
	5	44 (11.2%)	1 (1.7%)	0 (0%)
	6	48 (12.3%)	2 (3.5%)	3 (5.3%)
	7	76 (19.4%)	11 (20%)	8 (14.3%)
	8	67 (17.1%)	20 (35.7%)	17 (30.5%)
	9	66 (16.9%)	17 (30.5%)	18 (32.2%)
	10	31 (8.4%)	5 (8.9%)	9 (16%)
	11	15 (3.8%)	0 (0%)	1 (1.7%)
Total		390	56	56

Table 1.3: Percentage and frequency of food group consumed at FFLS at baseline, after intervention and Non-FFLS Households

Food group	**FFLS Baseline** (n=390)	**FFLS after intervention** (n=56)	**Non FFLS** (n=56)
	Frequency	**Frequency**	**Frequency**
Cereals	371 (95%)	55 (98%)	56 (100%)
Tuber roots	266 (68%)	44 (78%)	47 (84%)
Vegetables	299 (77%)	52 (93%)	54 (96%)
Fruits	277 (70%)	37 (56%)	35 (62%)
Meat	98 (25%)	7 (12%)	15 (26%)
Egg	55 (14%)	10 (18%)	7 (12%)
Fish	0 (0%)	0 (0%)	0 (0%)
Legumes	245 (60%)	37 (66%)	43 (77%)
Milk n products	328 (84%)	55 (98%)	55 (98%)
Oil and Fats	326 (84%)	55 (98%)	55 (98%)
Sweets	297 (76%)	48 (85%)	50 (93%)
Spices	296 (76%)	56 (100%)	56 (100%)

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