



# Integration of Natural Resource Management in the Primary Education Curriculum in Kenya

Michael G. Kanyi<sup>1\*</sup>, Tom Vandenbosch<sup>2</sup>, Fredrick U. Ngesa<sup>3</sup>, Joash K. Kibett<sup>4</sup> and George Muthaa<sup>5</sup>

Received: 14 July 2011,

Accepted: 4 September 2011

## Abstract

The Farmers of the Future (FoF) initiative implemented a programme of integrating natural resources management in the basic education curriculum. The purpose of the study was to document activities and determine the effects of FoF programme on primary school learners' perceptions towards natural resources management by comparing learners involved in the FoF programme and those not involved. Further, comparison of perceptions by gender among learners involved in the FoF was done. The study employed an ex-post-facto design. The location of the study was the western region of Kenya. The sample was composed of 120 learners and 6 teachers, making a total of 126 respondents. This was in accordance with recommendations by Kathuri and Pals (1993). The data were collected using questionnaires and analysed using t-test at  $\alpha = 0.05$ . The instruments were validated by two experts in the Department of Agricultural Education and Extension at Egerton University and one expert from ICRAF. Reliability was tested through pilot testing and indicated a reliability coefficient of 0.72. The findings indicated that the FoF programme had a significant influence on learners' positive perceptions towards natural resources management thus the programme forms an integral part in sustainable agriculture.

### Keywords:

*Agricultural education, Agroforestry, Basic education, Natural resources, Perceptions.*

\* <sup>1</sup> Lecturer, Chuka University College, Chuka Kenya.

<sup>2</sup> Global Coordinator, Farmers of the Future Initiative, World Agroforestry Centre (ICRAF), Nairobi, Kenya.

<sup>3</sup> Senior lecturer, Department of Agricultural Education & Extension, Egerton University, Egerton, Kenya.

<sup>4</sup> Senior lecturer, Department of Agricultural Education & Extension, Egerton University, Egerton, Kenya.

<sup>5</sup> Lecturer, Department of Education, Chuka University College, Chuka, Kenya.

\* Corresponding author's email: [michaelgachaga@yahoo.com](mailto:michaelgachaga@yahoo.com) Tel: +254 0722 282830

## INTRODUCTION

This study was aimed at providing empirical information on the activities of the Farmers of the Future (FoF) initiative in Kenya primary schools and the effects of the initiative on pupils' perceptions towards natural resources management. FoF works with the existing agricultural clubs in the schools such as 4K-clubs, Young Farmers Clubs in secondary schools, wildlife clubs, environmental clubs, Agroforestry clubs, and Science clubs among others. The programme also uses notice boards to pin articles. Farmers of the Future initiative use several methods during teaching and learning process. Common methods include essay writing, debates and drama. These methods are structured in a way that they offer motivation to learners. Motivation is crucial to the achievement of learning goals (Ndirangu, 2003). All of these methods have a common theme of environmental management for sustainable development.

The use of agricultural plots in schools to demonstrate tree nursery management is a common activity among learners. Activities similar to those of Farmers of the Future are evident in countries like Philippines, Panama, India, Cuba, Vietnam, Zambia, Tanzania, Mali and South Africa. Farmers of the Future initiative is involved in capacity building of learners and the teachers in agroforestry and sustainable agriculture as well as linking research and development organisations with the rural communities.

Many agricultural programmes have been practiced in Kenyan schools for a long time with the aim of developing technical skills in learners as well as teachers. Educators need to develop abilities necessary in empowering learners in vocational education such as agriculture (United States Office of Education, 1976). In some developed countries such as the United States of America, agricultural institutions have taken charge of providing leadership and human resource development among the learners of agriculture even at post-secondary level (Foster and Dodge, 1991). Empowered human resource has a great potential to manage natural resources more sustainably. School curriculum should empower human resource with the vocational skills to manage natural resources in sustainable manner.

FoF is a recent initiative that was conceptualised in 2000 by the World Agroforestry Centre (ICRAF) in order to facilitate and contribute to integration of agroforestry and natural resources management into the school curriculum, mainly in basic education.

Basic education is now seen as a crucial aspect of rural development, food security and wealth creation (Vandenbosch, *et al.*, 2002). During the 1990s, International Centre for Research in Agroforestry (ICRAF) evolved into the World Agroforestry Centre with a vision that by the year 2010, 80 million peasant farmers would get access to agroforestry research innovations that will improve their livelihoods and help to sustain the global environment (Maundu and Tengnas, 2005). Many development and research organisations are now using schools to create awareness and positive perceptions towards sustainable agriculture. It is on this premise that the World Agroforestry Centre (ICRAF) initiated the Farmers of the Future programme in western region of Kenya to enhance natural resources management among school going learners who are actually the future farmers.

Despite its effort in education for sustainable agriculture, the activities FoF programme and their effect on learners' perceptions towards natural resource management are not well understood. Literature concerning practical activities and potentials of FoF initiative in Kenya has not been documented adequately. There was therefore a need to study the FoF programme in Kenya primary schools and document empirical data on the programme's activities on the site and the related effects on the learners' perceptions towards natural resources management for sustainable development.

This paper explores the effects of the Farmers of the Future (FoF) programme on learners' perceptions towards natural resources management in selected primary schools in western region of Kenya hence ascertaining the contribution and potentials of the FoF programme in advancing sustainable development in Kenya.

Lopokoiyit (1995) observed that perceptions of learners towards agriculture are enhanced by an appropriate curriculum. Perceptions of natural resources management among learners as a re-

sult of participation in FoF activities can be measured in terms of scores that learners obtain in validated instruments (Makau, 1997). It is therefore imperative to utilise locally available resources to inculcate positive perceptions among school going pupils. World Agroforestry Centre through FoF is enhancing positive perceptions towards natural resources management among learners particularly in primary schools by using approaches that entertaining for instance, drama, with the theme of environmental sustainability.

Sustainable agriculture and natural resources management cannot be achieved without adopting a more holistic approach to land management. African educators have realized that they have a major role to play in bringing about better integration and coordination of land use education (Temu, *et al.*, 1995). Parties involved in this systematic joint learning process can benefit from the synergy generated which is superior to individualized working. Collaborating schools and the farmers forms a strong bond for agroforestry and natural resources management at farm level (Noordin, *et al.*, 2001).

### **Purpose and Objectives**

The purpose of the study was to investigate effects of the Farmers of the Future programme on primary school learners' perceptions towards natural resource management. The study sought to investigate the activities of FoF programme and also determine if there is any difference in perceptions towards natural resources management by gender among the learners who are exposed to the FoF programme in primary schools.

The specific objectives of the study were:-

Document the activities of the Farmers of the Future programme in Kenyan schools.

Describe and compare the primary school pupils' perceptions towards natural resources management between those exposed to FoF activities and those not exposed.

Describe and compare differences in perceptions towards natural resources management by gender among primary school pupils exposed to Farmers of the Future programme.

### **MATERIALS AND METHODS**

This study employed an ex-post facto design. In the study, learners' perceptions towards management of natural resources as a result of exposure to Farmers of the Future programme were studied. Adoption of ex-post facto design in the study was supported by the fact that the researcher was seeking to determine possible antecedents of events that had happened and was not in a position to manipulate them. These events were the FoF activities and the effects that they had already caused on the learners' perceptions towards natural resources management.

The research was conducted in Siaya, Kisumu, Bondo and Vihiga districts in western region of Kenya. Bondo, Siaya and Kisumu districts are in Nyanza province while Vihiga district is within Western province. A total of 29 schools were involved in the FoF programme. For a learner to be involved in FoF, he must be a member of agriculture or environmental related club in his school because FoF works with such clubs. The target population of the study was primary school pupils in classes 6, 7 and 8 who are members of environment club, agroforestry club, wildlife club, 4-k club and their patrons.

Questionnaires were used in the data collection. The researcher presented the developed instruments to two experts in the Department of Agricultural Education and Extension at Egerton University and one expert from ICRAF for review and necessary corrections. The Egerton University experts are lecturers who have been teaching agricultural education to post-graduate students. They also have adequate experience in research gained through supervising and guiding post-graduate students. The ICRAF expert has a wide experience in agricultural and environmental programmes in learning institutions. He is the global coordinator of the Farmers of the Future (FoF) initiative. The questionnaires were developed through researcher's experience and review of literature, particularly the one related to perceptions towards agriculture and sustainable development

Reliability was tested through pilot testing where thirty primary school pupils were involved. Cronbach's alpha was used to determine the reliability of items. Reliability coefficient of

0.716 was realised. This was above the reliability coefficient of 0.70 thresholds as recommended by Koul (1993). Six primary schools were randomly selected for inclusion in the study; three were obtained from the schools involved in FoF programme while the other three were obtained from schools that are not involved in the FoF programme. Twenty pupils were randomly selected from each participating school, thus sixty pupils from schools involved in FoF programme and also sixty from control group. The sample was composed of 120 learners and 6 teachers, making a total of 126 respondents. The six teachers were randomly selected from those teaching science in the involved schools. Three questionnaires from pupils were discarded due to errors in filling in.

The statements related to natural resources management which primary school pupils responded to were scored on a five point Likert scale. The legend were strongly disagree (SD), disagree (D), Undecided (U), agree (A), and strongly agree (SA). Sorting out of the positive and negative items in the questionnaire was done manually before coding of the data for analysis. Some items in the questionnaire were stated positively while others negatively. This was done to minimise chances of pattern answering of the items by some respondents. In the scoring of the negatively stated items therefore “SD” carried a maximum of 5 points, “D” 4 points, “U” 3 points, “A” 2 points and “SA” 1 point. SD in this case indicated very positive perceptions while SA indicated very negative perceptions towards natural resources management. The Statistical Package for Social Science (SPSS) was used for data analyses. The hypotheses were analysed using t-test at alpha = 0.05.

### RESULTS

Objective one sought to document the activities of the Farmers of the Future programme in Kenya schools. Data for this objective were obtained from schools that are covered by the Farmers of the Future programme. There were three primary schools from which the data were obtained. The data were collected using questionnaires that were administered to learners who were involved in FoF activities and their patrons.

The data for this objective were analysed by use of frequencies and percentages.

Table 1 reveals that the most common activities in primary schools are planting of cover crops with a frequency of 42 which is equivalent to 49.4% of the primary school pupils who are involved FoF and responded to the questionnaire. Soil conservation (47.1%), tree nursery management (43.5%) and tree planting with a frequency of 32 accounting for 37.6% of the respondents.

Table 1: Activities of the Farmers of the Future programme in Kenya primary schools

Activity	f	%
Planting cover crops	42	49.4
Soil conservation	40	47.1
Tree nursery management	37	43.5
Planting trees	32	37.6
Planting vegetables	31	36.5
Livestock keeping	4	4.7
Collecting seeds	3	3.5

(n=58)

The activities indicated in Table1 may however vary slightly from one school to the other depending on the availability of resources in the schools and the level of learners’ awareness and involvement in the agricultural activities both at school and at home. The n=58 refers to the number of pupils involved in FoF programme.

Objective two of the study was to describe and compare primary school pupils’ perceptions towards natural resources management between those exposed to FoF programme and those not exposed. The data for this objective were gathered from primary school pupils using a questionnaire. Descriptive statistics from Table 2 indicate that the pupils who were exposed to FoF programme expressed positive perceptions over those not involved in the programme. It is only in item number 3 where pupils not exposed to FoF recorded higher mean value than those exposed to programme. However the mean difference between the two groups in the same item was low at 0.14. Pupils exposed to FoF had interestingly high mean score in individual items particularly in items number 4, 5 and 13. Those exposed to the FoF programme had a mean score

Table 2: Comparison of perceptions of primary school pupils towards natural resources management between those involved in FoF and those not involved by mean and standard deviation per statement

Statements related to natural resources management which primary school pupils responded to	Exposure to FoF initiative	Mean	Std. Deviation
1. Large forests in Kenya should be cleared to settle the landless	Not exposed	4.08	1.55
	Exposed	4.50	0.94
2. I perform better in Kiswahili than in agriculture	Not exposed	3.22	1.62
	Exposed	3.26	1.68
3. I like watching wild animals than listening to music	Not exposed	3.88	1.47
	Exposed	3.74	1.56
4. I find it difficult to do what the 4-k club patron tells us	Not exposed	3.22	1.66
	Exposed	4.26	1.32
5. I don't like agriculture	Not exposed	3.75	1.56
	Exposed	4.60	0.90
6. Parents should do business instead of farming	Not exposed	4.07	1.45
	Exposed	4.40	0.94
7. Teachers force us to water the seedlings in the tree nursery	Not exposed	3.59	1.57
	Exposed	4.40	1.12
8. I feel comfortable with Kiswahili and English teachers than Science and agriculture teachers	Not exposed	4.05	1.38
	Exposed	4.14	1.13
9. Soil erosion will always take place even if people plant trees	Not exposed	4.02	1.40
	Exposed	4.76	0.68
10. Cleaning cloths in the river makes people save time for other jobs	Not exposed	3.58	1.53
	Exposed	4.00	1.12
11. Planting and caring for the trees can be a hobby	Not exposed	4.12	1.29
	Exposed	4.74	0.78
12. Debate on athletics in more entertaining than of pollution	Not exposed	3.07	1.51
	Exposed	3.16	1.80
13. Cultivation next to river can be very beneficial to farmers and should be encouraged	Not exposed	2.49	1.56
	Exposed	3.59	1.57
14. We always take some time in the tree nursery with our club patrons	Not exposed	4.29	0.97
	Exposed	4.50	0.92
15. Am likely to become a successful environmental conservationist	Not exposed	4.47	1.01
	Exposed	4.88	0.33

(n=117)

of 4.26, 4.60 and 3.59 respectively in the three items against 3.22, 3.75 and 2.49 respectively of those pupils not exposed to the programme. The positive perceptions towards natural resources management in individual items among pupils exposed to FoF programme indicates the potential of FoF programme in enhancing natural resources management among the school going pupils.

The overall mean values in Table 3 indicated that pupils who were exposed to FoF had positive perceptions towards natural resources management over those not exposed. Exposure to FoF programme may have contributed to the difference in perceptions of pupils towards natural resources management.

The higher the mean value per item in the instruments, the higher the perceptions towards natural resources management. The findings of this study support Farrel's (1993) argument that

academic achievement and learners' perceptions in developing countries are hampered by scarcity of resources. Learners who were not exposed to FoF initiative performed poorly compared to those involved in the imitative.

FoF initiative emphasises on sustainable exploitation of natural resources for sustainable development. The learners who are involved in FoF have more resources than those not involved in relation to natural resources education. This factor could have therefore influenced the outcome. Learners who are not involved in FoF initiative may actually not be exploiting the available resources in learning about the environment, as do those who are involved in FoF activities.

The overall mean for the primary school pupils who are involved in FoF was 4.19 with a standard deviation of 0.39 while the mean of those

Table 3: perceptions index towards natural resources management of primary school pupils exposed to FoF programme and those not exposed.

Exposure to FoF	Overall mean	Overall SD
Not exposed	3.72	0.61
Exposed	4.19	0.39

Significant at the 0.05 level

not involved in FoF was 3.72 with a standard deviation of 0.61. Those involved in FoF programme indicated better perceptions towards natural resources management.

t-test was applied to determine whether there was a significant difference in perceptions towards natural resources management between primary school pupils exposed to the Farmers of the Future programme (FoF) and those not exposed. The results of the analysis are provided in table 4. From table 4 the significance level of 0.001 is lower than the set alpha level of 0.05. This implies that the difference in the perceptions by means between the two groups of pupils is statistically significant. There was a significant difference in perceptions towards natural resources management between primary school pupils exposed to FoF programme and those not exposed. The findings suggests that primary school pupils who are exposed to the Farmers of the Future programme are more likely to have better perceptions towards natural resources management than those who are not exposed to the programme.

Data from three questionnaires were discarded due to errors in answering the items by the respective pupils.

Objective three sought to describe and compare differences in perceptions towards natural resources management by gender among primary school pupils exposed to Farmers of the Future programme. Data for this objective were obtained from primary school pupils using a

Table 4: T-test on perceptions towards natural resources management of primary school pupils involved (participate) in FoF and those not exposed

Participation in FoF	N	Mean	Std. Dev.	t-value	df	P-value
No	59	3.72	0.61	4.90	115	0.001
Yes	58	4.19	0.39			

Significant at the 0.05 level

Table 5: Perceptions index of primary school pupils towards natural resources management by gender among those exposed to FoF programme

Gender	Overall mean	Overall SD
Boys	4.2117	0.4005
Girls	4.1556	0.3934

Significant at the 0.05 level

questionnaire. Data in this objective were analysed descriptively by mean and standard deviation. Respondents were drawn from schools that are participating in FoF programme.

Pupils were categorised into two groups, boys and girls. Data were obtained from primary school pupils using a questionnaire. Data were analysed descriptively by mean and standard deviation. Respondents were drawn from schools that are participating in FoF programme.

Gender differences are not evident among infants although over a lifetime the social worlds of males and females are distinguished in many ways (Turner, 1986). It is on this premise that the study investigated whether there was any gender difference in perceptions towards natural resources management among learners who were exposed to Farmers of the Future programme. The results of this study indicated that there was no difference in perceptions towards natural resources management by gender among primary school pupils exposed to FoF initiative. These findings are consistent with Amudavi (1993) who found that there is no gender difference in the attitude towards farming innovations hence adoption of the agricultural technologies. These findings may be supported by the fact that there is no biasness by gender in the approach adopted by FoF initiative in its school activities.

Table 5 presents a comparison of primary school boys and girls' perceptions towards natural resources management by mean and standard

Table 6: T-test on perceptions towards natural resources management by gender among primary school pupils exposed (participants) to FoF programme

Gender	N	Mean	Std. Dev.	t-value	df	P-value
Boys	40	4.21	0.40	0.49	56	0.622
Girls	18	4.15	0.39			

Significant at the 0.05 level

deviation. A perceptions index of the overall mean and standard deviation in each gender category is shown.

The overall mean of boys was 4.2117 while that of girls was 4.1556 and the standard deviation was 0.4005 for boys and 0.3934 for girls. The two means are quite close, implying that there might not be a significant difference in perceptions towards natural resources management between boys and girls who are involved in FoF programme. This may be attributed to the fact that both boys and girls are involved indiscriminately in FoF initiative.

The study examined whether there is a statistical significant difference in perceptions towards natural resources management by gender among primary school pupils who are exposed to the Farmers of the Future programme. From the data collected, the mean ratings were calculated.

Primary school pupils who are involved in FoF programme were grouped into two categories according to their gender. Rubin (1985) indicated that although the differences between the sexes may be relatively small they are still worth serious attention. This study also got interested to discover whether there was a significant gender difference in perceptions towards natural resources management among primary school pupils who are involved in FoF programme. The t-test outputs shown in table 6 indicate insignificant difference in means between boys and girls.

From Table 6 the significant level of 0.622 P-value is more than the set alpha of 0.05. The mean difference in perceptions between boys and girls who are exposed to FoF was therefore not statistically significant. This could be due to the fact that the FoF initiative put emphasis on cooperation between boys and girls and uses instructional methods that are preferred across the gender.

## CONCLUSIONS

The study revealed that FoF programme in western region of Kenya is involved in several activities in primary schools. All the activities are geared towards sustainable agriculture. The activities that were common in the schools were:

- Tree nursery management
- Tree planting
- Collection of seeds of trees
- Planting of cover crops
- Soil conservation measures on sloping areas
- Livestock rearing in some schools
- Growing of vegetable crops
- Schools feeding programme in some schools
- Poems and drama on agroforestry and environmental management by learners.

The activities are well integrated in the schools that are within the FoF network. Certain activities such as livestock rearing and feeding programmes in schools are limited to few schools due to their high initial capital investment. These activities were however well managed in the schools where they were undertaken.

The perceptions of primary school learners towards natural resources management varied significantly depending on whether they are involved in FoF programme or not. Those involved indicated better perceptions than those not involved. This could be attributed to the fact that FoF programme empowers learners with real life skills in agroforestry and natural resources. The overall mean scores of primary school pupils' perceptions towards natural resources management were 4.19 and 3.72 for those involved in FoF programme and those not involved respectively. It can therefore be concluded that FoF effectively integrated natural resource management in the basic education curriculum.

Comparison of boys and girls who are involved in FoF programme was made to ascertain

whether there was a statistical significant difference in their perceptions. There was no significant difference between the two groups.

### RECOMMENDATIONS

The following recommendations can be significant to people involved in planning, designing curriculum and teaching of agriculture in Kenyan schools.

The government's line ministry and other related organisations should adopt the planning and implementation of integrated agriculture and natural resources management curriculum in primary schools in Kenya.

The FoF programme should be expanded to cover more schools since the impacts of the programme were evident.

The instructional approach of FoF should be maintained and where possible be enhanced. This is due to the fact that boys and girls who were involved in the programme indicated no significant differences thus the FoF is not subjective to either of the gender.

Other organisations should team up and work together to ensure integrated practical and relevant education that is relevant to the United Nations millennium development goals. This is the information delivered by the FoF initiative.

### REFERENCES

- 1- Amudavi, M.A. (1993). Influence of Soil Economic Factors on Adoption of Maize Related Technologies: The case of Smallholder Farmers in Hamisi, Kakamega district. (Unpublished MSc Thesis). Melbourne: University of Melbourne.
- 2- Farrel, J.P. (1993) International Lessons for School Effectiveness. The View from Developed world. In J.P. Farrel and J.B. Oliveira (eds), Teachers in developing countries: Improving effectiveness and managing costs (pp28-30). Washington DC: World Bank.
- 3- Foster, R. & Dodge, G. (1991). Interpersonal Skill Development Instruction for Colleges of Agriculture. National Association of College and Teachers of Agriculture Journal, 34 (2): 26-29.
- 4- Kanyi, M.G. (2007). Effects of the Farmers of the Future (FoF) Programme on Learners' Perceptions Towards Natural Resources Management in selected schools in Western region of Kenya. (Unpublished MSc Thesis). Njoro, Kenya: Egerton University.

- 5- Kathuri, N.J., & Pals, A.D. (1993). Introduction to Educational Research. Njoro, Kenya: Educational Media Centre. Egerton University.
- 6- Koul, L. (1993). Methodology of educational research. Delhi: Vikas publishing house limited.
- 7- Lopokoiyit, M.C. (1995). A study of the effects of attitude gender and previous agriculture students: A case study of Egerton University. (Unpublished MSc Thesis). Njoro, Kenya: Egerton University.
- 8- Makau, B.M. (1997). Measuring and analysing gender differences in primary and secondary schools. Research framework No. 2 (pp 8-15) Nairobi: Academy science publishers.
- 9- Maundu, P., Tengnas, B. (2005). Useful trees and shrubs for Kenya. Technical handbook No.35. Nairobi: ICRAF-ECA.
- 10- Mwangi, J.G & McCaslin, N.L.(1994). The motivation of Kenya's Rift Valley extension agents. Journal of Agricultural Education, 35(3): 35-43.
- 11- Ndirangu, M.(2003). Improvisation as a strategy for providing science teaching resources: an experience from Kenya. International Journal of Educational Development, 23: 75-84.
- 12- Noordin, Q., Niang, A., Jama, B. & Nyasimi, M. (2001). Scaling up adoption and impact of agro-Forestry Technologies: Experiences from western Kenya. Development in practice 11. (4): 509 – 523
- 13- Rubin, Z., & McNeil, B.E. (1985). Psychology, being human. New York: Harper and Row publishers.
- 14- Temu, A.B., Rudebjer, P. & Zulberti, E. (1996). Integrated land use education in Africa: towards the 21<sup>st</sup> century. Training and education report no. 38. Nairobi: ICRAF.
- 15- Turner, J.H. (1986). Sociology, The science of human organisation. Chicago: Nelson-Hall Inc.
- 16- United States Office of Education Bulletin(1976). Objectives for vocational-technical education in agriculture 4 (p.4). Washington, D.C.: United State Government Printing Office.
- 17- Vandenbosch, T., Taylor, P., Beniast, J., & Tesemma, B.A. (2002). Farmers of the Future: A strategy for action. Nairobi: World Agroforestry Centre (ICRAF).