
**COVER CROPS AND SOIL-WATER CONSERVATION IN KANUNGU DISTRICT: A CASE
STUDY OF KIHIFI SUB-COUNTY**

1 Arineitwe Jim, 2 Dr Ariyo Gracious Kazaara, 3 Dr Omedo Vincent

1, 2, 3 Metropolitan International University

ABSTRACT

The major objective of this study lied in finding out whether there was a relationship between cover crops and soil-water conservation in Kihifi sub-county, Kanungu district. Other objectives included: to find out the extent of planting cover crops by farmers in Kihifi sub-county, to find out the level of soil-water conservation in Kihifi sub-county. The study employed a case study research design, cross-sectional, a qualitative and quantitative research designs and simple random probability sampling and purposive sampling techniques were used to obtain a sample size 80 respondents from Kihifi sub-county using solvin's formula. Microsoft Excel was used to analyze the data, which was then displayed as frequency distribution tables and pie charts. The study's data were analyzed using SPSS software. The level of importance required to declare an important connection between cover crops and soil-water preservation is 0.01, and it was discovered that there is a significant positive correlation between cover crops and soil-water conservation at $r = 0.864$. This suggests that when the extent of establishing cover crops is high, the level of soil-water conservation is also high, and when the extent of establishing cover crops is low, the level of soil-water conservation is also low. The extent of planting cover crops by farmers in Kihifi sub-county was analyzed and interpreted using the mean which was 4.8400, the mean is close to code 5 of the Likert Scale, hence declaring a high extent of planting cover crops by farmers in Kihifi sub-county.

Key words: cover crops and soil-water conservation

Background of the study

A cover crop is described as a close-growing crop that offers protecting the soil, seeding safeguarding, and enhancement of the soil in between cycles of regular crop growth, according to the Soil Science Society of America (2008). A cover crop is a crop that is typically a legume that is sown to prevent soil erosion, weed growth, and nutrient loss (Abadi, E., 2013). Plants called "cover crops" are those that are planted to cover the soil rather than to be harvested. In an agricultural ecosystem, cover crops control soil erosion, soil fertility, soil quality, soil water, weeds, pests, diseases, biodiversity, and animals. A transitory vegetative cover known as a "cover crop" is planted to preserve the soil and encourage the growth of plants, especially those that develop slowly.

Trees and bushes that receive fertilizer enhance the physical qualities of soil. Particularly, the accumulation of soil is higher in fields with fertilizer trees, which improves soil water penetration and retention of water and lowers water runoff and soil erosion (Phiri, 2013). Thus, nutrient trees and shrubs may be able to lessen the effects of droughts, which are a typical seasonal occurrence in southern Africa where agricultural is primarily rain-fed. Continuous placement of tree biomass enhances the organic matter in the soil, which improves the soil's ability to retain water.

Furthermore, to their varied efficiency, it incorporates an ecosystem-focused approach that takes into account the stability, environmental responsibility, and equity of land use processes. In this paper, an attempt has been made to review the impact of agro forestry on soil health to increase the productivity of hill soils.

Statement of the problem

Due to ignorance, numerous farmers do not know about cover crops, and only a few small farmers have the necessary equipment for manually planting or destroying cover crops (Patiram, 2014). Farmers find it challenging to plant cover crops due to the labor requirements, cover crop timing, and the limited availability of technology. The use of

cover crops in cropping systems would result in an increase in initial costs, labor costs, and equipment costs because they would not yield immediate benefits. Additionally, there are few advertising assets available for perennial commodities including orchard grass, red clover, and alfalfa (Phiri, 2013). Insects and diseases may use cover crops as an alternative host during the off-season. A small number of insect and disease species exploit the cover crop to finish their life cycles over the winter and serve as significant pests for the primary succeeding crop. Long-term cash crop rotations and the use of cover crops might not be sustainable (Brown, L., 2013). The preservation of soil and water face a number of difficulties, such as production losses on the area used for these practices (Altshul & Okoba, 1997). Another issue is the estimated amount of land lost to conservation. This was the main motivation behind the investigation that was done in Kihhi Sub-County, Kanungu District to determine the connection between Cover Crops and Soil-Water Preservation.

Specific objectives

1. To find out the extent of planting Cover Crops in Kihhi Sub- County, Kanungu District.
2. To find out the level of Soil-water Conservation in Kihhi Sub- County, Kanungu District.
3. To find out the relationship between Cover Crops and Soil-water Conservation in Kihhi

Sub-county, Kanungu
District.

Research questions

1. What is the extent of planting Cover Crops in Kihhi Sub- County, Kanungu District?
2. What is the level of Soil-water Conservation in Kihhi Sub- County, Kanungu District?

3. What is the relationship between Cover Crops and Soil-water Conservation in Kihhi Sub- County, Kanungu District?

Methodology

Research design

The study also used both quantitative and qualitative data collection and analysis techniques. Quantitative techniques were to be applied to numeric data, such as influence of cover crops on soil-water conservation while qualitative techniques were deployed for non-numeric data, such as respondents' views or opinions, preferences, attitudes and feelings.

Target population

This is the aggregation of elements from which sample is actually selected (Babbie, 2004).

The study targeted a population of 100 residents in Kihhi sub-county and these included 98 farmers, LC1 Chairperson and a district agriculture officer of Kanungu district. This was correlated with Solvin's formula of sample size determination to arrive at a sample size of 80 respondents.

Sampling procedures

Sampling procedure refers to choosing part of a population to use to test hypotheses about the entire population (Jowin, 2003). The procedures included simple random sampling and purposive sampling and they were used to select respondents in the study.

Sample size

A sample is a small subset of the total population (George & Mallery, 2003).

The study sample comprised of 80 respondents out of 100 of the total population where

78 respondents were farmers, LC1 Chairperson and a district agriculture officer.

Sampling techniques

Ahuja Ram (2010), defines sampling as the act or process of selecting a suitable sample of the population for the purpose of determining parameters of characteristics of the whole population, and these can be either probability or non- probability sampling techniques.

Sampling Techniques

Ahuja Ram (2010), defines sampling as the act or process of selecting a suitable sample of the population for the purpose of determining parameters of characteristics of the whole population, and these can be either probability or non- probability sampling techniques.

Simple random sampling

According to simple random sampling, each member of the community has an equal and distinct likelihood of being chosen for the sample (Orodho, 2004).

In this study, farmers, the LC1 Chairperson, and the district agricultural officer all provided feedback. Two district agriculture officers and the chairperson of LC1 served as the study's primary participants. In order to choose responders from the group of farmers and community people, simple random sampling was used. A simple random sampling was used to choose the 78 farmers who took part in the study. Special emphasis was given to including both male and female respondents in the study area.

Purposive sampling

The units in the sample that included LC1 were chosen using a purposeful sampling strategy.

A district agriculture officer and the chair. This method is founded on the study's goal and the characteristics of a population. This method was employed by the investigator

because it is extremely helpful in circumstances when you must quickly achieve a specified sample and where sampling for symmetry is not the major issue.

Only those people who are pertinent to the research design are chosen through purposeful sampling, which is less expensive, more easily available, and more comfortable. In addition, there is no way to guarantee that the sample is actually equivalent to the population, therefore the ability of the investigator to evaluate the community's constituent parts is given additional weight.

Data collection methods and instruments

Both the use of secondary and primary data methods was used by the researcher to collect qualitative and quantitative data information. Thus, different two methods were used to collect data which included questionnaire and interview method. These were used to collect data from all the community members and farmers in Kihhi Sub-County, Kanungu District.

Data analysis

Through the distribution of structured surveys, information on evaluation of learning was gathered. This information was coded and stored into a database. The statistical package for social scientists (SPSS) software program was used to analyze quantitative data. In order to analyze the data and determine the connections between cover crops and soil-water conservation in Kihhi sub-county, cross tabulations, Pearson's correlation coefficient, regression, and ANOVA tests and analyses were performed on the data. Themes derived from the study questions were used to arrange the qualitative data, which was then subjected to content analysis. Information from interviewees was compiled and presented in the report.

RESULTS

Response rate

Questionnaire return rate

All the 80 questionnaires were given out, 50 were returned, thus representing 65% response. The study was considered good because according to Peil (1995), questionnaire return rate above 50% is considered good for a study.

Personal information of respondents

Information regarding to the personal background of the respondents included their age, gender, marital status, occupation, and education level

Age of the respondents

Information regarding the age of the respondents was added to questionnaires during the piloting process. The following information regarding the ages of the respondents was analyzed using SPSS Software and presented in form of grouped data as shown in the table 1

Statistics		
AGE OF RESPONDENTS		
N	Valid	50
	Missing	0
Mean		3.7000
Median		4.0000
Std. Deviation		1.38873
Range		5.00

AGE OF RESPONDENTS

Frequency	Percent	Valid Percent	Cumulative Percent
Valid 0-10	8 16.0	16.0	16.0

10-20	1	2.0	2.0	18.0
20-30	3	6.0	6.0	24.0
30-40	27	54.0	54.0	78.0
40-50	8	16.0	16.0	94.0
50+	3	6.0	6.0	100.0
Total	50	100.0	100.0	

Therefore, from the mean (3.7000) it was deduced that most of the respondents who participated in the study were from a mature group i.e., were within the age range of 30-40 years with 54.0% and this was because such people within that age group of 30-40 years are mature and can carry out farming activities like mulching and manuring crops. This led to the conclusion that the researched adult brains were responsible for the correctness and dependability of the information that was gathered. Additionally, the investigator learned from table 1 that 2.0% of those who participated in the Kihikihi sub-county were amongst the ages of 10 and 20 years, 6.0% were amongst the ages of 20 and 30, 16.0% were amongst the ages of 40 and 50 years, and 6.0% were beyond the age of 50. 5.00 and Standard were the ranges. The difference was 1.38873. 4.0000 is the median.

Gender of Respondents

The study investigated the gender of the respondents and the findings were as shown in the table

2. The following information regarding the gender of the respondents was analyzed using SPSS Software and presented in form of grouped data as shown in the table 2

GENDER OF RESPONDENTS

Frequency		Percent	Valid Percent	Cumulative Percent
Valid	MALE	33	66.0	66.0
	FEMALE	17	34.0	100.0
	Total	50	100.0	

From table 2, it was found out that, majority of the respondents were males with 66.0%

compared to females with 34.0%.

Occupation of the respondents

Information regarding the occupation of the respondents in Kihhi sub-county, Kanungu District was collected and presented in table 3

OCCUPATION OF RESPONDENTS

		Frequency	Percent	Valid Percent	Cumulative Percent
Valid	FARMER	26	52.0	52.0	52.0
	CIVIL SERVANT	11	22.0	22.0	74.0
	TRADER	6	12.0	12.0	86.0
	PEASANT	7	14.0	14.0	100.0
	Total	50	100.0	100.0	

From table 3, it was found out that 52.0% of the respondents were farmers, 22.0% were civil servants, 12.0 were traders and only 14.0% of the respondents in Kihhi sub-county were peasants.

Marital status

Information regarding the marital status of the respondents in Kihhi sub-county was collected and presented in table 4

Table 4: Marital status of respondents

MARITAL STATUS OF RESPONDENTS

		Frequency	Percent	Valid Percent	Cumulative Percent
Valid	SINGLE	16	32.0	32.0	32.0
	MARRIED	25	50.0	50.0	82.0
	DIVORCED	9	18.0	18.0	100.0
	Total	50	100.0	100.0	

From table 4, it was found out that, majority of the respondents were married with 50.0%,

32.0% of the respondents were single and only 18.0% had divorced.

Educational level of the respondents

Information regarding the academic background of respondents in Kihhi sub-county, Kanungu

District was obtained and tabulated as shown in table 5

Table 5: Educational background of the respondents

EDUCATION LEVEL OF RESPONDENTS

		Frequency	Percent	Valid Percent	Cumulative Percent
Valid	Primary and below	27	54.0	54.0	54.0
	O level	10	20.0	20.0	74.0
	Certificate	4	8.0	8.0	82.0
	Diploma	6	12.0	12.0	94.0
	None	3	6.0	6.0	100.0
	Total	50	100.0	100.0	

When interviews and questionnaire responses were analyzed, it was revealed from table

5 that the majority of the participants (54.0%) only had completed the primary level of education and had never pursued further education, while 20.0% had graduated from the ordinary level, 8.0% had completed their certificate level of education, 12.0% had completed their diploma level of education, and 6.0% had never attended any level of education in their lives. According to the statistics, the education in Kihhi sub-county, Kanungu District, is deficient and needs improvement.

The mean, which was 3.8300, was used to assess and interpret the degree of soil-water conservation in the Kihhi sub-county. Because the mean is close to code 4 on the Likert Scale, this sub-county is considered to have a high level of soil-water conservation practices. This is attributed to high extent of planting cover crops by farmers in Kihhi sub-county, fertile soils, reliable rainfall and majority of the residents in the study area were found to be farmers who practice mulching, planting cover crops, agro-forestry and irrigation which all the practices increase water in soils.

The extent of planting Cover Crops in Kihhi Sub- County, Kanungu District

This Section describes the independent variable (Cover Crops). The independent variable was addressed in Section B of the questionnaire for respondents.

Table 6: The extent of planting cover crops

Descriptive Statistics						
	N	Range	Minimum	Maximum	Mean	Std. Deviation
Extent of planting cover crops	50	2.00	1.00	3.00	4.8400	.70595
	50					

Source: SPSS Output page

The extent of planting cover crops by farmers in Kihhi sub-county was analyzed and

interpreted using the mean which was 4.8400, the mean is close to code 5 of the Likert Scale, hence declaring a high extent of planting cover crops by farmers in Kihhi sub-county. This is attributed to fertile soils in the area, high rates of soil erosion, the sloping relief, and all these factors force farmers in Kihhi sub-county to plant cover crops like pumpkins which cover the soil and reduce on the speed of moving water and also most farmers revealed that cover crops can reduce on the rate of growth of weeds in the gardens.

Relationship between cover crops and soil-water conservation

Table 7: Showing Pearson Correlation between cover crops and soil water conservation

Correlations		Cover crops	Soil-water conservation
Cover crops	Pearson Correlation	1.00	.864
	Sig. (2-tailed)		.000
	N	50	50
Soil-water conservation	Pearson Correlation	.864	1.00
	Sig. (2-tailed)	.000	
	N	50	50

Correlation is significant at the 0.01 level (2-tailed).

Source: SPSS output

Table 7 indicates that there is a very strong positive relationship between cover crops and soil-

water conservation at $r = 0.864$ and since the sig. value (.000) was far less than 0.01, which is the maximum level of significance required declaring a significant relationship between cover crops and soil-water conservation, this implies that when the extent of planting cover crops is high, the level of soil-water conservation is also high and when the extent of planting cover crops is low, the level of soil-water conservation is also low.

Conclusion of the findings

The researcher concluded from the findings that the extent is high and this is attributed to fertile soils in the area, high rates of soil erosion, the sloping relief, and all these factors force farmers in Kihikihi sub-county to plant cover crops like pumpkins which cover the soil and reduce on the speed of moving water and also most farmers revealed that cover crops can reduce on the rate of growth of weeds in the gardens.

The researcher concluded on this objective from the findings that the level of soil-water conservation is very high and this is attributed to high extent of planting cover crops by farmers in Kihikihi sub-county, fertile soils, reliable rainfall and majority of the residents in the study area were found to be farmers who practice mulching, planting cover crops, agro-forestry and irrigation which all the practices increase water in soils.

Recommendations of the study

The researcher recommends the government to sensitize the farmers to always plant cover crops in gardens to reduce on rates of soil erosion and nutrient leaching. The government through its programmes like NAADS should provide planting materials like seeds, banana suckers among others to the farmers.

The researcher recommends the farmers to plant cover crops and practice methods of

soil-water conservation like mulching and irrigation.

References

Abadi, E., (2013), *Profitability of medium to low rainfall agro forestry in the cropping zone.*

Barton, Australia, Rural Industries Research and Development Corporation Publication No. 02.

Abdu, K., (2014), *Trees on the Farm: Assessing the Adoption Potential of Agro forestry Adoption in Africa.* CAB International, Wallingford, UK.

Ayuk, E. T. (2007), Adoption of agro forestry technology: The case of live hedges in the central plateau of Burkina Faso. *Agricultural Systems*, 54(2), 189-206

Bradley, T., (2013), Scaling up the benefits of agro forestry research: lessons learned and research challenges. *Development in Practice*, 11(4): 524-534.

Briones, R., (2013), Agro forestry research and development in southern Africa during the 1990s:

review and challenges ahead. *Agro forestry systems* 59 (3), 173-186.

Brown, L., (2013), The costs and benefits of agro forestry to farmers. *The World Bank Research*

Observer, 10(2), 151-180.

Casey, R., (2010), Deforestation and Agro forestry Adoption in Tropical Forests: Can we generalize? A paper presented at the Western Agricultural Economics Association Annual Meetings.

Current, E., and Scherr, Y., (2015), *Contribution of agro forestry for rural livelihoods: a case of Dhading District, Nepal.* Paper presented at the International Conference on Rural Livelihoods, Forests and Biodiversity; May 19-3, Bonn, Germany. p. 1-19.

Fernandes, S., (2014), *The Chagga home gardens*. ICRAF, Nairobi, Kenya.

Forman, K., (2015), *Farmer Experimentation and Innovation. A Case Study of Knowledge Generation Processes in Agro forestry Systems in Rwanda*, Community Forestry Case Study No. 12, FAO, Rome

ICRAF, (2014), *The Quality of Science in Participatory Research: A Case Study from Eastern*

Zambia. *World Development*, 30(4), 523-543

Kaonga, P., (2015), *Socio-Economic Evaluation of Eucalyptus Growing on Small-Scale Farms in*

Vihiga Division, Kakamega District. Nairobi: Ministry of Agriculture, SWCB, 48 pp.

Kerkhof, H., (2010), *Uptake of Agro forestry Technologies among Smallholder Farmers in*

Zambia. Thesis

Kijkars, J., (2013), *Economic analysis of industrial agro forestry: poplar (Populus deltoids) in*

Uttar Pradesh, India. *Agro forestry Systems*, 49: 255-273.

Korwar, D., and Pratibha, E., (2014), *Alley cropping of sorghum with Leucaena during the post- rainy season on Vertisols in semi-arid India*. *Agro forestry Systems* 37:265-277.

Kwesiga, M., and Coe, G., (2014), *Dissemination Pathways for Agro forestry Technologies: the case for improved fallows in eastern Zambia*. Unpublished MSc Thesis, Stellenbosch University, South Africa, Stellenbosch.

Lasco, H., (2014), *Fundamentals of Agro forestry Syllabus*. UPLB Faculty Grant Program,

Ludeki, H., (2014), *The role of trees for sustainable management of less favoured land:*

The case of Eucalyptus in Ethiopia. *Forest Policy and Economics*.

Matata, D, (2012), *Agro forestry in sustainable agricultural systems*. Lewis Publishers UK. PP

416

McAdam, T., (2011), The Economics of Agro forestry Systems in the United Kingdom and their future prospects. *Scottish Forestry*, 53(1): 37-41.