IMPACT OF SOCIO-ECONOMIC FACTORS ON ADOPTION OF SOIL AND WATER CONSERVATION PRACTICES IN KENYA:

A CASE STUDY OF KYOGONG CATCHMENT IN BOMET DISTRICT, RIFT VALLEY PROVINCE

BY

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Declaration

This research project is my original work and has never been presented for a degree award in any other University.

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Dedication

I dedicate this research project to my beloved wife Rebecca Chepkemoi Kenduiwo and my children Gilbert, Duncan, Justus, Millicent, Mercy and Victor. Their prayers, financial and moral support were a great encouragement to me in my entire research process.

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Abstract

World wide inappropriate agricultural practices account for 28% of the degraded soils. Of this, one fourth of them are found in Africa and Asia and nearly two thirds of the degraded soils in North America (World Resources Institute (WRI), 1996). In Kenya, various ways have been put in place by the government to enhance soil and water conservation as well as reduce soil degradation. However despite these efforts, no significant results have been achieved yet. As a result, human activities have been blamed as the impediment to the successful implementation of soil and water conservation practices (SWC). Therefore this study sought to investigate the impacts of socio-economic factors on adoption of soil and water conservation programmes in Kenya, through a case study of Kyogong Catchment in Bomet District, Rift Valley Province.

The study area was Kyogong catchment area in Bomet district. Data was collected using questionnaires as the principal data collection instrument and were administered to the households around Kyogong catchment in Bomet district. The target population consisted of all the 600 households around Kyogong catchment area in Bomet district from which 120 respondents (which represent 20%) were selected using simple random sampling method. Data was analyzed using inferential and descriptive statistics which included frequency distribution tables and percentages. The data was presented using bar graphs, pie charts and cross-tabulations. Computer package Excel and SPSS computer software was used to carry out the analysis of the data.

The study established the various socio-economic factors that affect soil and water conservation (SWC) Practices in Kyogong Catchment area in Bomet District. These included overstocking, poor ploughing methods, lack of skilled labour, low education level of the residents, farm size, age of the farmer, and farmer's economic activities. The challenges that face the adoption of soil and water conservation (SWC) practices were identified as Overgrazing, low education level of the residents, small farm size, lack of extension officers and destruction of conservation practices by livestock.

The study recommended that in order to enable farmers to willingly maintain and continue to use conservation structures wisely, effective participation of farmers in SWC planning and implementation process is needed. In addition, the introduction of alternative biological and agronomic conservation measures is also important to enhance effective conservation. Finally, the study recommended that in order to control the declining trends in agriculture, the World Food Program (WFP), Governmental and Non-Governmental Organizations (NGO) need to come together and help the local farmers in conserving the scarce and depleted natural resource (water and soil) in the catchment areas.

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List of Acronyms

DAO - District Agricultural Officer

DPT - Divisional Planning Team

SIDA - Sweden International Development Authority

SWC - Soil and Water Conservation

ALDEV - Agricultural Land Development

F/Y -Financial Year

PRA -Participatory Rural Appraisal.

Operational Definition of Terms

Catchment

This term is used to mean a focal area, where a community is willing to work towards the conservation of their environment. The concept encompasses mobilization and participation of the entire community and takes into account farmers' felt needs, and areas of priority. It, therefore, does not, in all cases, reflect a hydrological Catchment.

Divisional Planning Team (DPT)

This refers to technical staffs of the Ministry of agriculture, who are stationed at the catchment to assist farmers in implementation of SWC programmes within a particular F/Y.

Financial Year (F/Y)

This term refers to the government of Kenya's year of budgeting and it starts from 1st July to 30th June of the preceding year.

Contact Farmer

This refers to the person who was charged with the responsibility of SWC programme implementation in specific farms.

CHAPTER ONE

INTRODUCTION

1.1 Background of the Study

Soil conservation practices are implemented to deal with the problem of soil erosion processes. Soil erosion is a common phenomenon in the East African highlands, where it causes wide spread soil degradation, (Edwards, 1989, Tiffen 1994). The main reason for accelerated soil erosion is over-exploitation of some natural resources due to an increasing demand for food, fibre and fodder by the growing human and livestock population, without economic means to sustain the resources base.

The key determinant to adoption of soil conservation practices are the farmers' perception of the problem of soil erosion, its cost and benefits (Wade and Heady 1978). Farmers are aware of the problem of soil erosion. However they are quite often not concerned about soil conservation practices. The main reason is that they can substitute other inputs for soil depths. This causes the failure to incorporate long-term soil use benefit in their utility function (Lee, 1980).

Sustainable community can be enhanced if the community put more efforts to improve and protect their natural resources, especially those that are vital to their livelihoods. Reforestation, soil conservation, watershed protection and irrigation, organic farming, and the use of alternatives to chemical fertilizers and insecticides are all important elements in the efforts to promote good stewardship of the earth and ensure sustainable community–based natural resources necessary for human beings, environments and agricultural production. (IFAD, 1996).

SWC activities in the target catchment were introduced during the 1992/93 F/Y. The catchment has an area of 128.2 hectares with a population of over 600 contact farmers. Its soil types are predominantly sandy loam with depth of 0.6m. It receives a mean annual rainfall of 800mm with reliability of about 50%. The main food crops grown in this catchment are maize and beans, with a few hectarages of cash crops, mainly pyrethrum and coffee. Figure 1.1 shows the Kyogong Catchment area where SWC activities were introduced by the government in 1992/93 financial year.

Landowners will conserve soil as long as the benefits of soil conservation are greater than its costs. However, this may result in soil depletion and a socially non-optimal land use. Therefore this study aimed at establishing the effects of socio-economic factors on adoption of SWC practices in Kyogong Catchment area in Bomet District.

Figure 1.1: Kyogong Catchment area

Figure 1.1 shows a photograph of Kyogong Catchment area where SWC activities were implemented. The tarmac road is the Narok-Bomet-Kaplong road that links the catchment area to Bomet town.

1.2 Problem Statement

Great changes have taken place in SWC since early 1980s. By using modern techniques such as remote sensing, modeling and new field and laboratory procedures, the knowledge base on the effects of soil erosion, as well as the actual processes, has increased substantially. At the same time, soil conservation technology has moved forward and large areas are now being farmed both profitably and sustainably through the introduction of such practices as minimum tillage in temperate regions and sloping agricultural land technology (SALT) in the tropics (Palmer 1999). However, undoubtedly the biggest breakthrough has come with the widespread realization that for SWC to succeed there has to be a greater involvement of the farmer and others who use the land in the whole process of identifying the problems, developing solutions and implementing the necessary measures.

In spite of these promising developments as reflected in the literature, Kerr, 1998, pointed out that the adoptions of SWC practices still remain very limited in many regions. Soil erosion remains widespread and a major environmental problem internationally. There are a number of reasons for this, stemming from the fact that it is socio-economic conditions, which primarily dictate how land users manage the land (Kerr, 1998). In spite of the advances that have been made to conserve soil and water resources, good results haven't yet been realized. Until there is a combined effort to address the socio-economic factors affecting SWC, then the effectiveness of SWC programmes will always be limited.

In most of the developing countries, soil erosion accelerated by economic activities is being addressed by the promotion of SWC technologies, such as cross-slope barriers.

However, the performance of past SWC programmes has, in most cases, been disappointing (Hudson, 1992). Too often, farmers or extension workers are blamed for this and accused of being ignorant, uncooperative and conservative (Douglas, 1993). Most of the people involved in SWC planning have realized that the top-down planning approach applied during introduction was wrong since it resulted in recommendations that were not perceived as immediate priorities by the farmers or outside their context. (Hudson and Cheatle, 1993).

The steep slope that characterizes Kyogong catchment area in Bomet district makes it sensitive to soil erosion, hence, necessitate the need for effective soil and water conservation structures (SWC). This made the government, through the Ministry of Agriculture, to introduce soil and water conservation (SWC) programmes in 1992/1993 financial year (F/Y). Presently, despite this move by the government, soil and water conservation hasn't yet been effectively achieved in Kyogong catchment as targeted by the government. The adoption of SWC practices is still very limited within Kyogong Catchment despite huge financial assistance available at the start of the programme introduction. Records held at District Agricultural Office in Bomet indicates that several SWC structures had been introduced in Kyogong catchment, but a transect walk through the catchment reveals only very few structures on site. This raises the question; why has SWC implementation in Kyogong Catchment unsuccessful despite huge financial assistance by the government? The local people living within Kyogong Catchment area practice small scale agriculture among other socio-economic activities. These socio-economic activities might have greatly inhibited the adoption of conservation strategies in the area. This study therefore investigated the effects of socio-economic factors on the adoption of SWC practices in Kyogong Catchment area in Bomet District.

1.3 Objectives of the Study

The overall objective of this study was to establish the effects of socio-economic factors on the adoption of SWC practices in Kyogong Catchment area of Bomet District.

Specific Objectives

1. To identify socio-economic factors that influence the adoption of SWC practices in Kyogong Catchment area in Bomet District.
2. To establish the challenges facing the implementation of SWC practices in Kyogong Catchment area in Bomet District.
3. To establish the major soil and water conservation (SWC) practices employed by farmers in Kyogong Catchment area in Bomet District.
4. To find out whether farmers' level of education and income have a significant impact on adoption of SWC structures.

1.4 Research Hypothesis

- **H_0:** The farmers' level of education had no significant impact on adoption of SWC structures.
- **H_1:** The farmers' level of education had a significant impact on adoption of SWC structures.
- **H_0:** There is no relationship between the farmers' level of income and the adoption of SWC structures.
- **H_1:** There is a relationship between the farmers' level of income and the adoption of SWC structures.

1.5 Rationale/Justification of the Study

Land is the most important resource in agricultural production. Generally, limited availability of productive land is a major constraint to agricultural production. Kenya has an area of about 587,000 KM^2, out of which, 11,000 KM^2 is water. Out of the remaining 576,000 KM^2 of landmass, only about 16% is of high and medium agricultural potential with adequate and reliable rainfall. This high and medium potential arable land is dominated by subsistence and commercial agriculture, with a crop land occupying 31%, grazing land accounting for 30% and forest occupy 22%. The rest is used for game parks, urban centers, markets, homestead and infrastructure. About 84 % of Kenya is arid and semi arid and not sustainable for rain-fed farming due to low and erratic rainfall, even though there is limited cultivation of some crops (Government of Kenya, 2004). The 16% of Kenya's landmass which is productive supports over 30 million people in terms of food production and other livelihoods, yet it is also the most degraded resource due to accelerated soil erosion. The erosion has been accelerated due to socio-economic factors which have resulted to putting a lot of pressure on the available scare resources.

There have been several efforts by the Kenya government towards SWC activities though the successes have been very low. Cases of reduced agricultural growth due to degradation have been reported necessitating the need for improved SWC approaches. One such approach is the incorporation of socio-economic factors in planning SWC programmes. This study was therefore designed to establish the effects of socio-economic factors on the adoption of SWC practices.

The findings of this study will be useful to policy makers and planning branches of the government Ministries. The study will also be useful for future SWC planning and implementation programmes. In this way, it is hoped that this research will contribute towards the conservation of soil and water as well as efficient and sustainable use of land as a major natural resource for agricultural production.

1.6 Scope of the Study

The focus of the study was the Kyogong Catchment in Bomet District. The study covered all the population living within Kyogong Catchment area. The specific respondents were the household heads or the household head representatives. The research confined itself to socio-economic factors and excluded other factors like institutional, political and policies that may also influence adoption of soil and water conservation practices.

1.7 Limitations of the Study

The limitations of the study included hostility of the respondents. Most of the respondents did not know the importance of the study and hence were reluctant to give the needed information. Illiteracy was also a major limitation that was encountered during the field study. Many of the respondents did not know how to read and write. Therefore the researcher and the research assistants had to interpret the content of the questionnaire to them in the native local language during the field study. This was necessary to increase the response rate in the study.

CHAPTER TWO

LITERATURE REVIEW

2.1 Introduction

This chapter presents a review of the related literature on the subject under study. The purpose of the review is to set the study into a broader context through investigation of the relevant literature. Material has been drawn from several sources, which are closely related to the theme and the objectives of the study. Models by writers are used to illustrate the various concepts of the study.

The main goal of Soil and Water conservation practices is to deal with the problem of soil erosion processes. The word erosion is derived from Latin word *"erosio"* meaning "to gnaw away". According to Soil conservation society of America (SCSA) 1982, erosion is the wearing away of the land surface by running water, wind, ice or other geological agents, including such processes as gravitational creep. Soil erosion, therefore, lessens soil productivity through physiological loss of topsoil, reduction in rooting depth, removal of plant nutrients and loss of water. It is usually a quick process. In contrast, soil depletion means loss or decline of soil fertility due to crop removal or removal of nutrients by eluviations from water passing through soil profile. The soil depletion process is less drastic and can be easily remedied through cultural practices and by adding appropriate soil amendments. Both soil erosion and depletion leads to soil degradation, which implies the decline in soil quality through deterioration of the physical, chemical and biological properties of the soil. However, it is soil erosion which has remained a big challenge to SWC programmes and hence maintenance of human livelihoods.

2.2 Global Responses to SWC Technologies and Approaches

2.2.1 Global view on SWC Technologies

Faced with the danger that farmer-induced land degradation will undermine efforts to increase agricultural productivity on a sustainable basis, planners and policy makers have invested in SWC technologies. In the last 40-50 years SWC programmes have been initiated in many parts of the developing world (Hudson, 1995).

A variety of SWC technologies and approaches have been implemented worldwide including Central America (Lutz, 1994). The focus has been on controlling run off and preventing soil loss (Young, 1989; Norman and Douglas 1994, Hurni 1996). Typically, cross slope technologies such as live barriers, rock walls, infiltration ditches, terraces and earth bunds have been promoted along with drainage channels and vegetated water ways. Recently, attention has been directed at no-burn policies and the use of cover crops, such as Mucuna *spp* and conservation tillage systems (Anderson and Carter, 2001).

Most SWC initiatives have emphasized technology transfer, involving a small array of techniques. SWC programmes have sought to educate and involve the "uninformed" farming communities and specialists have provided farmers with technical advice and assistance (Suresh, 2000).

2.2.2 Adoption of SWC Technologies and the Use of Incentives

One criterion often used to judge the success or failure of a SWC programme is the degree to which farmers adopt and/or adapt the technologies promoted. Based on this criterion the results of many SWC project worldwide have been disappointing. Blaikie

1989, Hudson 1992, Hinchclif 1995, Bunch 1982, and chambers 1993 pointed out that when farmers do not adopt recommended SWC technologies, they are often accused of being ignorant, unco-operative, conservative and unwilling to change. This interpretation of farmer's behaviour stems from the fact that there is abundance of literature that suggests that many SWC technologies do reduce soil loss and increase productivity (Doolette and Smyle, 1990, National research council, 1993). This published scientific research strengthens the official presumption that SWC specialists know best. Even though there are many reasons why farmers may not readily adopt SWC recommendations, the conventional view is that farmers ought to be concerned about soil loss and ought to adopt SWC recommendations.

Government and NGOs, world-wide (Kenya included) have often sought to stimulate farmer adoption of SWC technologies by offering a range of incentives (Kerr 1996; Zaal.1998; Giger.1999). Incentives are "any inducement on the part of an external agency (government, NGO or other), meant to allow and motivate the local population, be it collectively or on an individual basis, to adopt new techniques and methods aimed at improving natural resources management (Laman, 1996).

Sanders (2000), distinguished between direct and indirect incentives. Direct incentives include cash payments for labour, grants, subsidies, loans and also in-kind payments such as provision of food aid (food for work) and agricultural implements. Indirect incentives include fiscal and legislative measures such as concessions, secure access to land and the removal of price distortions (sanders and Cahill, 1999). However, direct incentives are commonly used by most governments. One of the justifications for offering incentives to farmers is that the incentives represent a legitimate payment for the offsite benefits of conservation that are enjoyed by society (Stocking and Tenberg, 1999). These benefits include reduced downstream siltation of reservoirs and impairment of aquatic ecosystems (Huszar, 1999). It is also argued that incentives at the beginning of a SWC programme are critical because farmers may not be able to afford investments in SWC, and the economic benefits of SWC, in terms of improved yields can be delayed for several years (Heissenhuber, 1998).

In theory, once farmers are aware of the benefits of the SWC technologies, direct incentives can be phased out. However, whilst farmer implementation rates worldwide have been enhanced by these temporary subsidies, more often than not farmers abandon the technologies once external support is withdrawn (Herweg, 1993; Hurni, 1996; IFAD, 1996; Kerr, 1996; pretty, 1998). Clearly this prevailing conventional SWC approach is not working and an indication that other factors influencing adoption of SWC practices need to be explored. Socio-economic characteristics are, therefore, such factors that need closer attention of researchers.

2.2.3 Empirical Studies on adoption of Conservation Technologies

Studies on the factors affecting adoption of soil conservation practices began, for the most part, in the 1950s (Ervin and Ervin, 1982). Since then, several empirical studies evaluated the factors affecting the adoption of soil conservation technology. Bekele and Holden (1998) analyzed the resource degradation and conservation behavior of farm households in the degraded part of Ethiopian highlands. They modelled peasant households' choice of conservation technology as a two-stage process and employed an ordinal logit model of estimation. Their results showed that perception of the threat of soil erosion, household, land and farm characteristics, perception of technology-specific attributes, and land quality differentials influence conservation decisions of farmers. Grepperud (1995) presented the analysis of the effects on the resource management of land from different aid policies and concluded that governments should be careful when designing support measures if improved resource management is a policy goal.

Pender and Kerr (1997) investigated the determinants of farmers' indigenous soil and water conservation investment in the semi-arid tropics of India. They found that conservation investment is significantly lower on leased land in two of the studied villages and lower on plots that are subject to sales restrictions in one village. In another village they found that households with more adult males, more farm servants, and less land invest more. Other factors that significantly determine farmers' investment include farmer and plot characteristics and the presence of existing land investments. Lapar and Pandey (1999) undertook a micro-economic analysis of adoption of contour hedgerows by upland farmers in the Philippines to identify the factors that determine adoption. They found that adoption depends on several farm and farmer characteristics. They concluded by calling for the need to develop a range of cost-effective technologies and particularly pointed that in the more marginal environments, on-site benefits alone may not justify investment in soil conservation.

Makoha (1999) (Unpublished Thesis) conducted a study on farmers' perception and adoption of soil management technologies in western Kenya. The study was to test the twin hypotheses that farming conditions significantly influence farmers' perceptions of new agricultural technologies and probability of adoption, and that farmers' perceptions of technology-specific attributes associated with use of new technologies significantly influence adoption decisions. A Tobit analysis was employed and the results of the model showed that farmers' participation in agricultural seminars and workshops, contact with extension officers and decision to reduce use level of fertilizer, and other technology-specific attributes and the impacts of technologies on plants growth vigor and yield were statistically significant and related to adoption behavior. Technology attribute was found to be important in shaping adoption of conservation practices (Rogers, 1983). Keil (2001) explored the adoption of leguminous tree fallows in Zambia using Probit and Tobit Regression Models. The results revealed that adoption of improved fallow practice was associated positively with the availability of land and labor.

Alemu (1999) estimated the factors influencing the decisions to invest in soil conservation in Tigray and Oromiya of Ethiopia. He found that there is a significant relationship between tenure security and the probability of participating in constructing physical soil conservation structures. In addition to this, he identified the characteristics of each plot rather than tenures security as important factor influencing the amount of investment that a farmer will make.

Swinton (2000), based on data from farm surveys in erosion-prone area of Peru, analyzed the impact of social capital in inducing sustainable land management. The hypotheses tested were that farming practices influence soil erosion and social capital influences the adoption of sustainable farming practices. A two stage econometric analysis was applied and the social capital variables were found to associate positively and significantly with the adoption of soil-conserving farming. The study concluded by emphasizing the role of local institutions that enforce norms that contribute to the benefit of the community and highlighted strengthening them would serve a low-cost means of contributing to the sustainable management of natural resources.

2.3 An Overview of the History of SWC in Kenya

The soil conservation service in Kenya was started during the 1930s. At that time, the land which was occupied by the European settlers and the former 'native reserves' or the African lands, already had serious erosion problem that warranted immediate attention. The situation was studied by the government and it became compulsory to practice soil and water conservation from 1937 to the end of the colonial era in 1963.

In the 1930s, emphasis was on the introduction of simple cross-slope barriers such as trash-lines, rows of stones and vegetative strips. These structures were introduced in all cultivated areas. At that time, African farmers employed such conservation techniques as shifting cultivation, trash lines and simple terracing. Shifting cultivation was widespread and effective as Kenya's population was low and the land was not intensively cultivated and grazed. But as the population of both humans and livestock grew, the pressure on land increased. As a result, a number of conservation policies and strategies were introduced and vigorously enforced. These policies include: Discouraging ploughing of steep land, stopping cultivation along water courses, encouraging terracing and tree planting on hillsides, controlling forest clearing and promoting de-stocking.

Administrative and agricultural extension personnel were employed to ensure that the policies were observed and those who did not comply were punished. The main aim was to combat declining soil fertility and productivity in cultivated and overgrazed areas. Soil erosion, was closely linked to the decline in soil fertility. Mixed farming was recommended as a solution to both these problems. Other methods such as crop rotation, inter-planting of crops and legumes as well as mulching were emphasized. As soil erosion continued, more activities such as pastures reclamation, gully control and tree planting were added to the list of conservation methods.

Throughout the late 1940s and 1950s, SWC initiatives in the areas occupied by Africans were promoted through the African land Development Board (ALDEV) and the Swynnerton Plan (1953-1957). The efforts of the ALDEV ten years plan (1946-1955) and its subsequent endeavors up to 1963 were mainly focused on re-conditioning of African areas and settlements. SWC was promoted by construction of terraces, stonewalls, drainage ways, provision of water supplies (surface dams catchment) and controlled grazing. The Swynnerton Plan emphasized the need to substantially improve the economy of the African producer and the economy of the country by developing sound and intensive systems of farming. Conservation measures such as grass strips, trash lines, and rotational grazing were promoted to supplement the terraces.

Soil conservation stations equipped with heavy machinery were started in Mariakani, Ruiru, Nakuru, Nyahururu (Thomson's falls), Kipkeloin, Eldoret and Kitale specifically to cater for mechanized terracing, bush clearing and construction of dams and farm roads. Mechanized conservation works were concentrated on European farms.

Resulting from the initiatives of the Swynnerton Plan, most of the settled high and medium–potential areas were terraced with the aid of coercive and restrictive regulations. This period also coincided with the peak of political agitation for freedom. People associated soil and water conservation with colonialism and local political activists persuaded farmers not to construct new terraces and stop maintaining the old ones. By 1961, most of the farming community was interested in the political development of the country and nobody wanted to talk about terracing. This situation continued up to the time of independence in 1963.

The decade that followed independence was marked by low SWC activity. The focus was on settlement of landless people in the newly created settlement schemes. Few new terraces were constructed and the old ones were left to degenerate, or were simply pulled down. Steep slopes under good vegetation cover were cleared for cultivation and forests were cut down for timber, building materials and fuel wood. Erosion accelerated to alarming levels and there were signs of decline in soil fertility. As the population continued to increase and the shortage of good arable land became acute, Kenya resolved to address the problem of increasing soil erosion as a step towards improving food production. The country asked for international assistance and SWC activities were revived from 1974 with the initiation of the national soil and water conservation project supported by Sweden International Development Authority (SIDA).

Since then, to date, SIDA has been in the forefront in the support of SWC programmes in Kenya, through the Ministry of Agriculture. However, in spite of the presence of the donor agency and the government's commitment to SWC, soil erosion continues to remain widespread and a major environmental problem in Kenya, as it is, internationally. The unfortunate truth is that the adoption of SWC practice is still very limited in many parts of the country.

2.4 SWC Extension in Kenya

2.4.1 Kenyan Case

SWC extension in Kenya has undergone many changes in approach. In the 1970s, attention was given to the small-scale farmers in high potential areas (zones I-III) through subsidies for construction of cut-off drains, artificial water ways, and the provision of fodder grasses and seedlings of fruit and other trees. This was aimed at showing farmers the benefits of soil and water conservation such as run-off control, extra fodder grass production from terrace risers and the utilization of terrace edges for planting fruit trees. It was intended to show that terracing does not mean loss of productive land.

This was the individual on-farm approach where the willing farmers adopted the measures that they felt were good after receiving extension advice. There was limited consultation with farmers on the most appropriate measures from a technical, financial and socio-economic point of view. The involvement of the farmers was mainly at the implementation stage. This approach followed what Zobisch (1997) described as the 'conventional concept of SWC'. In this concept, it is the role of the research worker to identify and analyze the land users' problems. Solutions should then be developed on research stations and transferred to the farmers via extension service. In this way, a one way link was established through which new technology can be put into practice by the farmers, usually with the aid of one or more incentives.

The result of this individual on-farm approach pointed out that the farmers who adopted SWC practices were scattered and that there was no overall plan for conservation within catchment and sub-catchments. As a result, the run-off from un-conserved farms interfered with the conservation structures installed by the early adopters. This individual farm approach was slow and did not lead to better land management of all farms within a given area.

With the introduction, in the 1980s, of the training and visits (T&V) extension systems by the Ministry of Agriculture, Livestock Development and Marketing, extension agent became more overloaded with responsibilities so that it was not possible to give the type of conservation extension needed by farmers such as farm planning, surveying and laying out conservation measures (Thomas,1997). The idea of the group approach was then conceived and led to the catchment conservation strategy. This shift in conservation strategy was taking place globally too. According to FAO (1990), there was a global realization in the 1980s that the way the land is used and managed depends upon the perceptions and behaviour of the many individual land users. These people have the ability to bring about fundamental changes in the land use for better. It was seen that for this to happen the people had to be more closely involved in the process of identifying the problems, working out solutions and then implementing what needed to be done.

Under the catchment conservation strategy, all the farmers within a farming unit or cluster were highly motivated and mobilized through PRA exercises to conserve their cultivated land within their own area. This focal area is locally referred to as a catchment and the conservation strategy is referred to as the catchment approach to soil and water conservation. The catchment boundary may not coincide with a hydrological catchment but the proposals developed for conservation are based on the catchment concept. This means that the disposal of run off is planned and integrated from the top to the bottom of a slope in such a way that no conservation measures will be damaged by uncontrolled run off from upstream.

Farmers within identified catchments are made aware of the erosion problems and the impact of erosion on land productivity. After a series of group discussions, educational tours, public barazas and demonstrations, farmers within a catchment collectively agree to conserve their farm holdings. Participating farmers elects a catchment management committee. The main function of the catchment management committee is to co-ordinate individual conservation efforts and to encourage reluctant farmers to undertake conservation in accordance with the agreed plan.

The Ministry of Agriculture, through the divisional planning team (DPT) gives technical advice and guidance to the communities in selecting catchments and prioritizing them. The DPT should involve all local leaders in proposing priority catchment for each location within the division. Kyogong catchment in Bomet District was selected through this approach and it is here where this research study was conducted. This catchment was chosen for study based on Government reports at DAO's office that indicated this catchment as the best in terms of adoption of SWC structures. There was no independent report to support this, hence a likelihood of bias in the Government reporting. Figure 2.1 shows un-ploughed strip which act as terraces in the catchment area while figure 2.2 shows uncut Napier grass planted along the terrace to conserve soil.

Figure 2.1: Un-Ploughed Terraces in the Catchment Area

Figure 2.1 shows a photograph of un-ploughed strip which act as terraces in the Kyogong catchment area.

Figure 2.2: Napier Grass planted along the terrace in the Catchment Area

Figure 2.2 shows a photograph of un-cut Napier grass planted along the terraces as a soil conservation measure.

2.4.2 Extent of Soil Degradation in Kenya

Degradation of land involves deterioration in soil, water and vegetation resources. The most conspicuous effect is soil erosion by water, but this is closely linked with a less conspicuous process-the loss of soil fertility. Loss of vegetative cover is both a cause and a consequence of soil erosion. It leads to increased run off of short duration and deterioration in water resources. These problems are wide spread in Kenya in spite of all the conservation work that has been done (Thomas, 1997). These areas, which are most seriously affected, are the semi-humid, semi-humid to semi-arid, semi-arid and arid zones, which together comprise 46% of Kenya's Land area. This is because of the erratic nature of the rainfall and long dry periods that often leads to poor ground cover, both on cropland and on grazing land (Thomas, 1997).

The more humid areas are generally better protected because they usually have sufficient rain to support a close cover of vegetation, which include perennial crops such as tea, sugarcane, bananas and Napier grass. However, if cover is stripped off steep slope to grow annual crops and if conservation measures are not taken, the risk of erosion is very high.

The very arid areas are less affected by water erosion because rainfall is lower and the terrain is not so steep. Although soil can move by water and wind, the overall impact of erosion on the productivity of land under pastoralism is much less than the impact of erosion on the small-scale farmer who has nowhere else to move to. In the study area, the residents have adopted various methods to harvest and conserve water. They use tanks and borehole to harvest and conserve water as shown in figure 2.3 and 2.4.

Figure 2.3: Rain Water Harvesting in the Kyogong Catchment Area

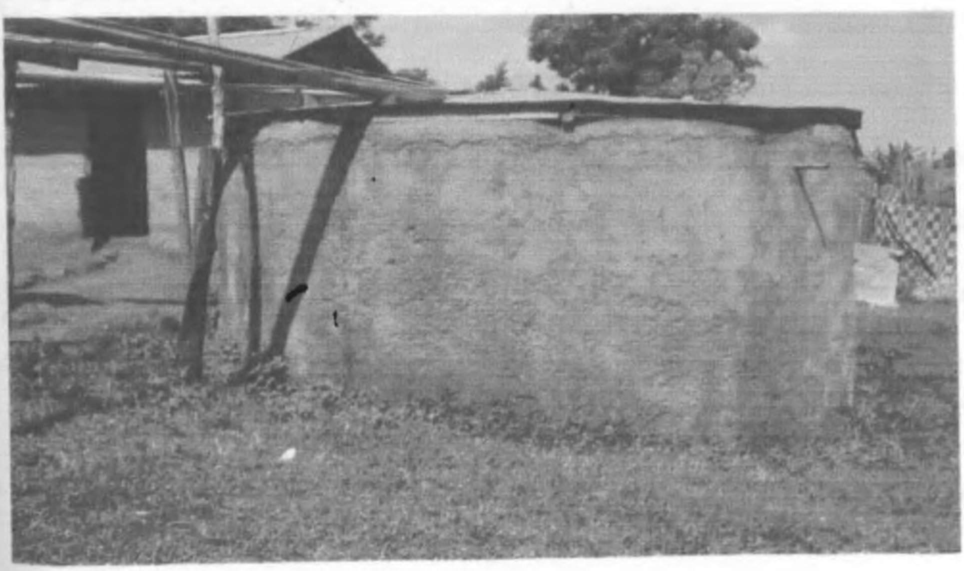


Figure 2.3 shows the Rain Water Harvesting and storing method by the residents in Kyogong Catchment area.

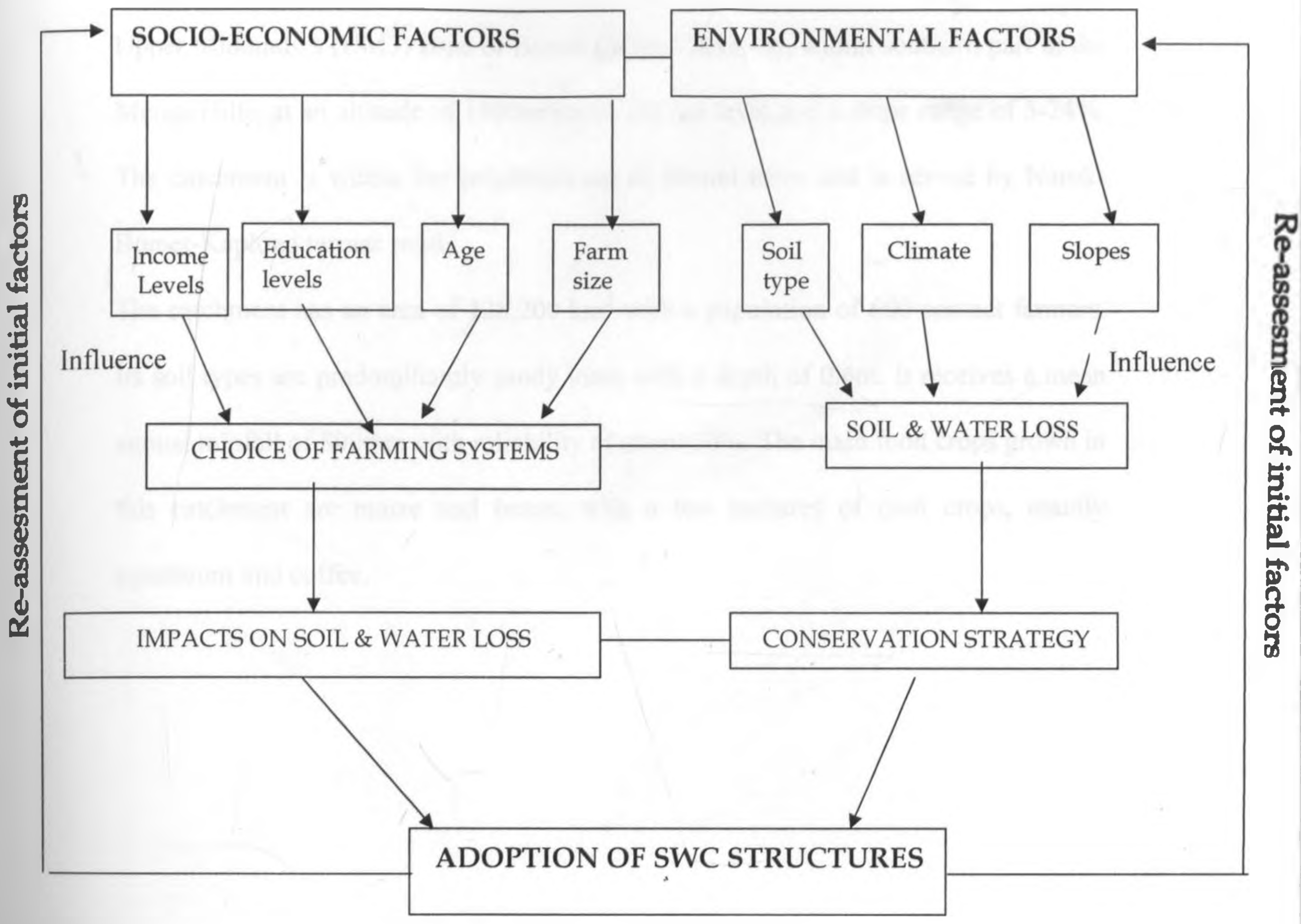
Figure 2.4: Water Harvesting from a Borehole in the Catchment Area

Figure 2.4 shows a Borehole and a Water harvesting structure within the Catchment area.

2.5 CONCEPTUAL FRAMEWORK

This conceptual framework was adopted and modified from Morgan (1980) to illustrate one possible way of integrating SWC with agricultural development as is influenced by socio-economic factors of the rural population. It shows a series of interactive procedures in which a choice of development, based on socio-economic consideration, blends well with accepted conservation strategy, leading to higher adoption rates for soil and water conservation programmes (Morgan, 1980).

Figure 2.5: Conceptual Framework



(Source: Modified from Morgan, 1980)

2.6 Location of the Study area

The study was conducted along Kyogong Catchment area of Bomet District. Kyogong catchment is situated in Bomet District which is occupied by the Kipsigis sub-tribe of the Kalenjin community. These people are predominantly mixed farmers who keep livestock and at the same time cultivate crops. Bomet District lies within the southern parts of Rift Valley Province of Kenya. The major part of Bomet District is characterized by undulating topography that gives way to flatter terrain in the South.

Kyogong Catchment is the product of the 1990s new conservation strategy referred to as the Catchment approach to soil and water conservation (SWC). It is situated in Upper Midlands 3 (UM3) zone of Bomet Central Division, within southern part of the Merigi Hills, at an altitude of 1900m above the sea level and a slope range of 5-24%. The catchment is within the neighborhood of Bomet town and is served by Narok-Bomet-Kaplong tarmac road.

The catchment has an area of 128,200 km^2 with a population of 600 contact farmers. Its soil types are predominantly sandy loam with a depth of 0.6m. It receives a mean annual rainfall of 800mm with reliability of about 50%. The main food crops grown in this catchment are maize and beans, with a few hectares of cash crops, mainly pyrethrum and coffee.

Figure 2.6: The Map of Bomet District and its position in Kenya

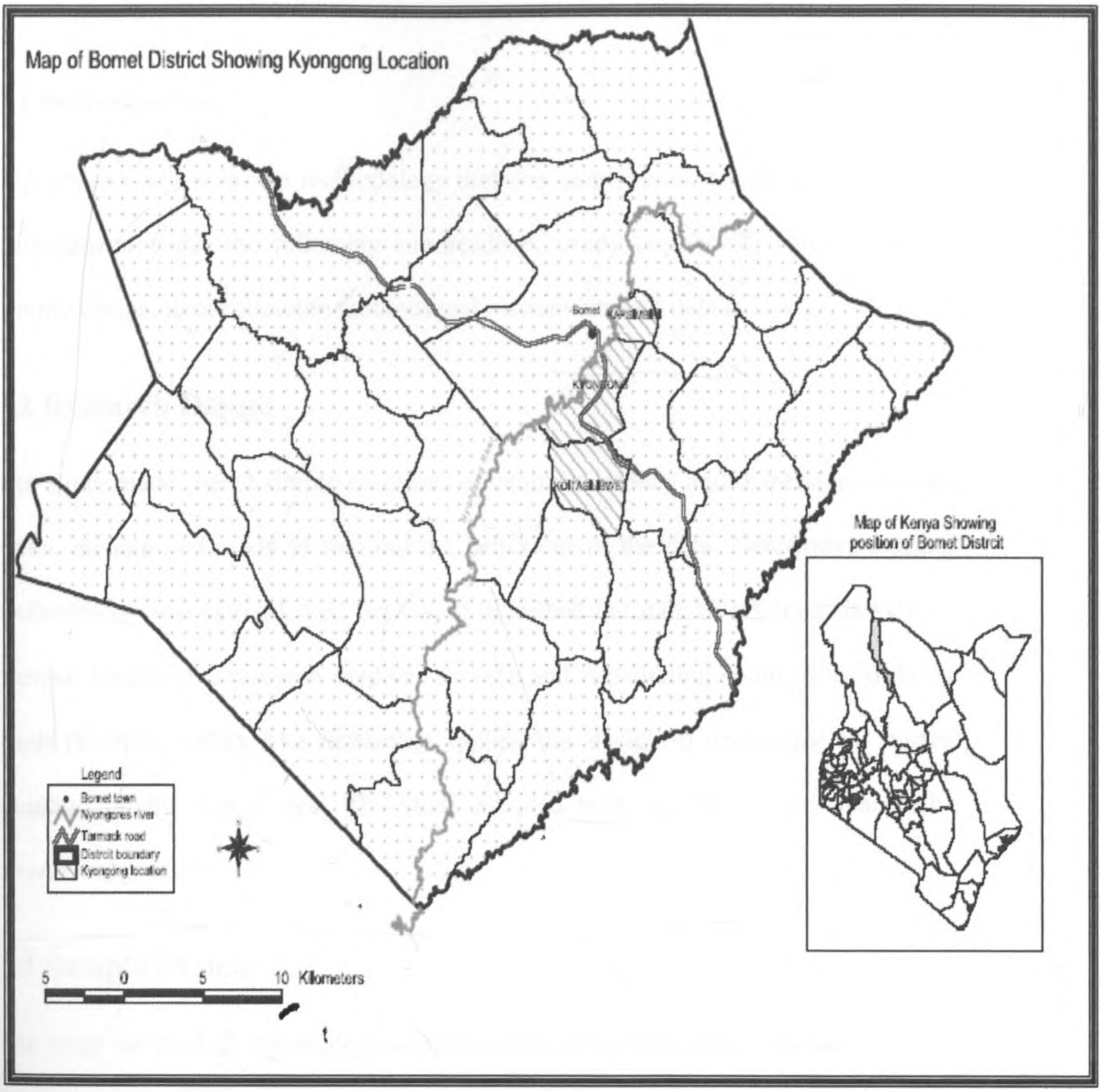


Figure 2.6 above shows the map of Bomet District with Kyogong Catchment area highlighted and its position in Kenya.

CHAPTER THREE

RESEARCH METHODOLOGY

3.1 Introduction

This chapter addresses the methodology that was employed in the study. The chapter is organized under the following sub-headings; study population, research design, sample design, data collection methods and instruments and data analysis.

3.2 Research Design

The study made use of simple measures of central tendency and dispersion, example mean, median and mode to find out the behaviour of the data. Descriptive research methodology was also adopted because it described the state of affairs as it exists at present. Descriptive research involves surveys and fact-finding enquiries of different kinds (Kothari, 1999). The researcher applied this design to investigate the current situation on the target area. The study adopted both qualitative and quantitative research approaches.

3.3 Sample Design

The study adopted simple random sampling methods for selecting respondents for the study. Simple random sampling was used to select the target household. This technique was employed because it gave each of the household in the target population an equal chance of being selected in the sample. This eliminated biasness. Kyogong catchment was divided into four blocks, based on administrative boundaries, during sampling. Each household in every block was assigned a number and randomly selected for the studies. A household head was used to mean one who makes decisions

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The target population for this study was all the 600 households of Kyogong Catchment area of Bomet district. The study targeted the head/representative of the household around the Kyogong Catchment area. Samples of the contact household head/representative were made from which primary data was collected.

Since the target population for this study was 600 households, a sample of 120 respondents was randomly selected which represented 20% of the target population. Questionnaires were administered to randomly selected households' heads/ representative.

3.4 Data Collection Methods and Instruments

The study adopted both quantitative and qualitative research approaches. The study utilized the primary data which was collected through the use of questionnaire method. Questionnaires contained both open-ended and closed ended questions. Four research assistants were identified and trained for the field work. The research assistants were able to interpret the questionnaires to the respondents in the native local language during the field study. This was necessary because most of the local people were semi-literate. The open-ended parts of the questionnaire provided an opportunity for the respondents to describe their experiences, and simultaneously, to discuss their opinions regarding the adoption of SWC programmes. This helped to collect good qualitative data for the study.

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3.5 Data Analysis

After the fieldwork, all the questionnaires were adequately checked for reliability and validation. The information was codified and entered into a spreadsheet and analyzed using SPSS (Statistical Package for Social Sciences). Exploratory analysis was first performed to ensure that the output was free from outliers and the effect of missing responses was at minimum. The data was analyzed using both quantitative and qualitative techniques. Quantitative techniques involved generation of descriptive statistics such as mean, percentages and frequencies. Inferential statistics were also used. These included the Chi-square and ANOVA tests. Chi square test (X^2) was used to test whether the farmers' level of income has any impact on the adoption of SWC programmes. ANOVA test was used to test whether farmers' level of education has any significant impact on adoption of SWC programmes. Qualitative data was analyzed through content analysis method. This involved segregation of field notes according to codes, categorization of codes according to similarities and organization of data according to study themes from which conclusions were drawn. Computer package Excel and SPSS computer software was used to carry out the analysis of the data. The data was presented using tables, pie charts, bar graphs and cross-tabulations among others.

CHAPTER FOUR

RESULTS AND DISCUSSION

4.1 Introduction

This chapter shows the results and interpretation of the study findings. The study achieved 100% response rate since all the targeted 120 respondents were adequately sampled. This formed the basis of this chapter. The chapter is organized by first showing the demographic information of the respondents which is followed by results and interpretation arranged per each objective of the study. The data is presented using tables, charts, frequencies, cross tabulation and percentages where applicable.

4.2 Demographic Information of the Respondents

4.2.1 Gender and Age of the respondents

Table 4.1 shows a cross-tabulation of age category and gender of the respondents. Majority of the respondents were male who accounted for 55% of the total respondents closely followed by female 45%. In.terms of the age categories, majority of the respondents were within the age category of 25-35 years (35%) with the male accounting for 20.8% and the female 14.2% of the total population. The study also achieved 13.3% and 2.5% response of the total population from male and female respectively of those above 45 years of age as shown in table 4.1.This shows that majority of the heads of the households living within the Kyogong Catchment area of Bomet district are male of age category 25-35 years and females of age category 15-24 years.

Table 4.1: Cross-Tabulation of Age and Gender of the Respondents

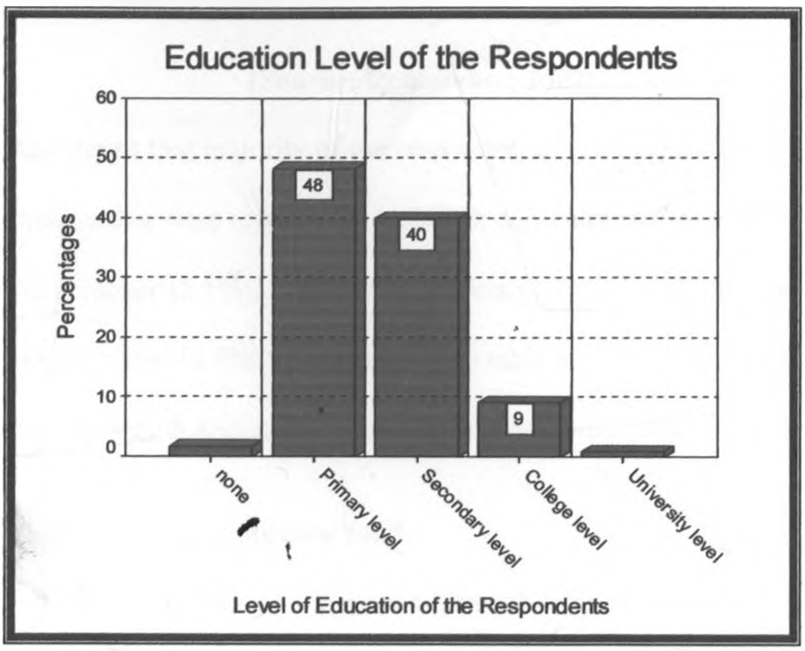
Cross-tabulation of Age verses Gender of the Respondents				
Age Category of the Respondents		Gender of the Respondents		Total
		Male	Female	
Up to 14 years	Count	0	0	0
	% of Total	0	0	0
15 to 24 years	Count	13	24	37
	% within Age of the respondent	35.1%	64.9%	100.0%
	% of Total	10.8%	20%	30.8%
25 to 35 years	Count	25	17	42
	% within Age of the respondent	59.5%	40.5%	100.0%
	% of Total	20.8%	14.2%	35.0%
36 to 45 years	Count	12	10	22
	% within Age of the respondent	54.5%	45.5%	100.0%
	% of Total	10.0%	8.3%	18.3%
Above 45 years	Count	16	3	19
	% within Age of the respondent	84.2%	15.8%	100.0%
	% of Total	13.3%	2.5%	15.8%
Total	Count	66	54	120
	% within Age of the respondent	55.0%	45.0%	100.0%
	% of Total	**55.0%**	**45.0%**	**100.0%**

(Source: Researcher, 2007)

4.2.2 Level of Education of the Respondents

The study established that most of the respondents had acquired primary and secondary levels of education as accounted for by 48.3% and 40% respectively. However college and university education levels accounted for 9.2% and 0.8%. This is shown in figure 4.1. This shows that the people living around the study area have basic primary and secondary education. Therefore more training on SWC is needed to equip them on the soil and water conservation strategies.

Figure 4.1: Education Level of the Respondents



(Source: Researcher, 2007)

4.2.3 Occupation of the respondents

Table 4.2: Occupation of the respondents (N=117)

Occupation of the Respondents	Frequency	Percentage	Cumulative Percentage
Farmer	84	71.8	71.8
Teacher	6	5.1	76.9
Medical Doctor/Nurse	4	3.4	80.3
Agricultural officer	9	7.7	88.0
Business man	9	7.7	95.7
Religious man	3	2.6	98.3
Community leader	2	1.7	100.0
Total	**117**	**100.0**	

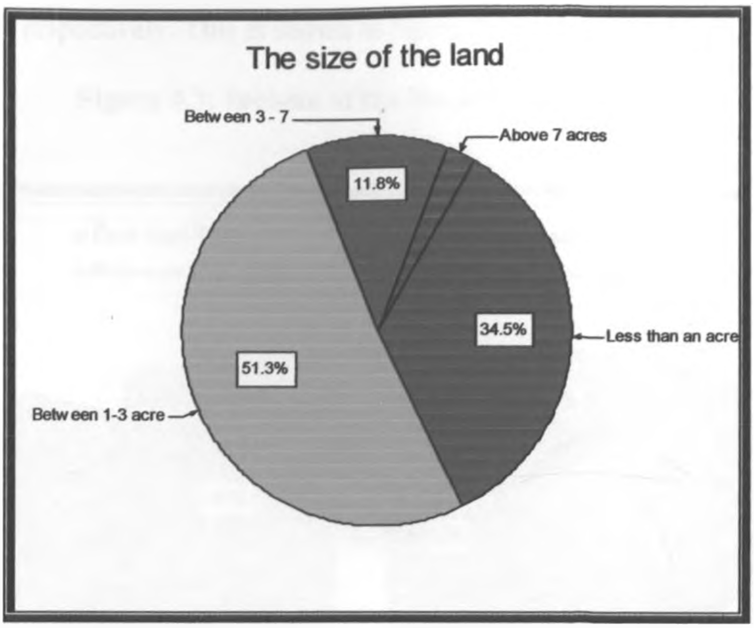
(Source: Researcher, 2007)

The findings shows that majority of the respondents were farmers (71.8%). However other occupation that were represented included; Agricultural officer (7.7%), Business man (7.7%), Teacher (5.1%), Community leaders (1.7%), Religious man (2.6%) and Medical Doctor/Nurse (3.4%). This is shown in table 4.2. This shows that majority of the people living within Kyogong Catchment area of Bomet District are farmers.

4.2.4 The Size of the Respondents' land

The study showed that most of the respondents owned between 1-3 acres of land as accounted for by 51.3%, while 34.4% of the respondents owned less than an acre of the land. Those with 3-7 acres and above 7 acres were represented by 11.8% and 2.5% respectively. This is shown in figure 4.2. This means that people living within the target catchment area have small pieces of land and this has affected soil and water conservation practices due to competition with other agricultural practices such as farming and livestock rearing.

Figure 4.2: Size of the Land of the Respondents



(Source: Researcher, 2007)

4.2.5 Income levels of the respondents

Table 4.3: Income of the Respondent per Month

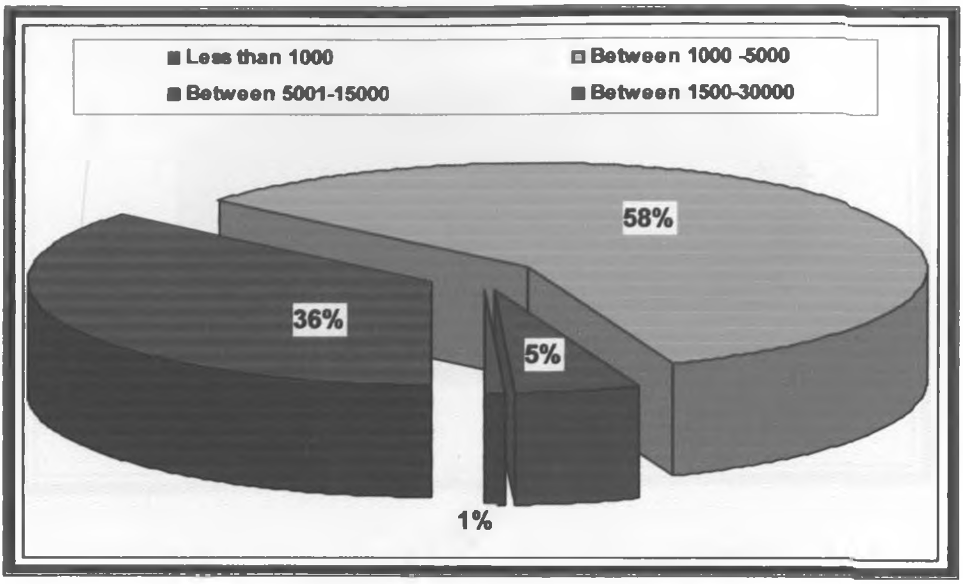
Income In Ksh.	Frequency	Percentage (%)	Cumulative Percent
Less than 1000	43	36.1	36.1
Between 1000 -5000	69	58.0	94.1
Between 5001-15000	6	5.0	99.2
Between 15000-30000	1	0.8	100.0
Total	**119**	**100.0**	

(Source: Researcher, 2007)

Most of the respondents (58%) estimated their monthly income between 1000-5000 as shown in table 4.4. However, a considerable population of the respondents (36.1%) estimated their monthly income to be less than 1000 per month. However, 5% and

0.8% of the respondents estimated their monthly income between 15000-30000 and 5001-15000 respectively. This is shown in figure 4.3.

Figure 4.3: Income of the Respondent per Month



(Source: Researcher, 2007)

4.2.6 Main economic Activity of the respondents

Table 4.4: Main Economic Activity of the Respondents

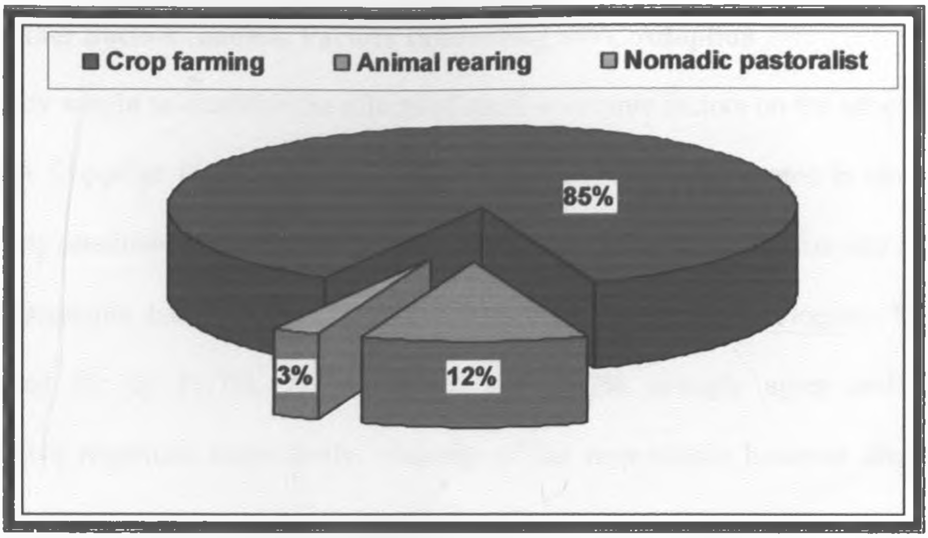
Economic Activities	Frequency	Percentage	Cumulative Percent
Crop farming	102	85.7	85.7
Animal rearing	14	11.8	97.5
Agro-Pastoralist	3	2.5	100.0
Total	**119**	**100.0**	

(Source: Researcher, 2007)

The main economic Activity of the respondents was crop farming (85.7%), followed by animal rearing (11.8%) and Agro-Pastoralist (2.5%) as shown in table 4.5 and figure 4.3. This shows that the main economic Activity of the people living within

Kyogong Catchment area of Bomet District is crop farming and little of animal rearing.

Figure 4.4: Main Economic Activity of the Respondents



(Source: Researcher, 2007)

4.3 Factors Affecting SWC Practices

The first objective of the study was to identify the factors that influence the adoption of SWC Practices.

4.3.1 Socio-Economic factors Affecting SWC Practices

According to the respondents, there were various factors that affected SWC Practices in Kyogong Catchment area in Bomet District. Among the major socio-economic factors cited by the respondents included; overstocking, poor ploughing methods, lack of skilled labour, education level, farm size, family size and farmers' economic activities. Kyogong catchment is characterized by steep slopes which make the catchment sensitive to soil erosion. The respondents suggested the best practices that should be adopted to preserve this catchment and control the soil erosion in the area. Among the suggestion given by the respondents included; building of terraces, building of diversion ditches, planting trees, planting cover crops, intercropping and massive education of the residents on the importance of ploughing along the contours.

4.3.2 Other Socio-Economic Factors Influencing SWC Adoption

The study sought to establish the effects of socio-economic factors on the adoption of SWC. A five-point likert scale was used and the findings are presented in table 4.6. The study established that Education level, Economic activities, Farm Size and Age of the respondents had an impact on the adoption of SWC technologies. This is accounted for by 81.7%, 72.3%, 49.6% and 56.7% strongly agree and agree cumulative responses respectively. Majority of the respondents however disagreed with the fact that there was no significant difference between the socio-economic factors and adoption of SWC programmes. This is accounted for by 74.6% strongly disagree and disagree cumulative responses. These findings are shown in table 4.6. The higher the level of education, the higher the rate of adoption of the SWC practices. The economic activities of the farmers were also found to have influence on SWC adoption. This is because economic activities play a significant role in accelerating and decelerating soil erosion. Therefore conservation measures should be integrated within the economic activities of the people if effective conservation of soil and water is to be achieved.

Table 4.5: Factors Influencing SWC Adoption

	Strongly agree %	Agree %	Neutral %	Disagree %	Strongly Disagree %
Impact of Education On SWC Adoption	35.0%	46.7%	10.0%	7.5%	.8%
Economic activities influence on SWC adoption	26.1%	46.2%	13.4%	5.9%	8.4%
Impacts of Age of the respondent on SWC adoption	18.6%	38.1%	14.4%	24.6%	4.2%
Farm Size Influence On SWC adoption	19.7%	29.9%	19.7%	18.8%	12.0%
No difference between socio economic and SWC	7.0%	10.5%	7.9%	20.2%	54.4%

(Source: Researcher, 2007)

4.4 Challenges Facing the Adoption of the SWC Practices.

The second objective sought to establish the challenges that face the adoption of the soil and water conservation (SWC) practices in Kyogong Catchment area in Bomet District. The respondents cited the challenges that face the adoption of the soil and water conservation (SWC) practices in Kyogong Catchment area in Bomet District. These included; low education level of the residents, small farm size, overstocking of livestock, lack of extension officers and destruction of conservation practices by livestock. The respondents also identified various reasons as to why SWC conservation programmes appear to be so difficult to implement, among the reasons given included; lack of unity among communities involved, lack of keen responsibilities in soil and water conservation in the households, Lack of farm implements for soil conservation, difficulties in terraces renovations, Topography of the area, Lack of extension officers, and Lack of keen interest in conservation by the locals.

4.5 Soil and Water Conservation Practices

The third objective sought to establish major soil and water conservation (SWC) practices employed by farmers in Kyogong Catchment area of Bomet District. This objective was achieved through the investigation of the following issues of soil and water conservation (SWC). These included; Household Engagement in Soil Conservation Practices, Awareness on SWC Technologies, Adequacy of SWC Technologies and the mechanisms for Water Conservation.

4.5.1 Household Engagement in Soil and Water Conservation Practices.

The study showed that majority of the respondents were engaged with their household in soil and water conservation practices. This is shown by 89.9% yes responses while minority of the respondents were not involved, neither do they involve their household in soil and water conservation practices as represented by 10.1% No response. This is shown in table 4.5. This shows that engagement of the household is a major conservation strategy employed by farmers living within Kyogong Catchment area of Bomet District to conserve soil. Engagement of the household in soil and water conservation practices is an effective conservation strategy and should be adopted to implement soil conservation in the prone areas.

Table 4.6: Household Engagement in Soil Conservation (n=119)

Responses	Frequency	Percentage (%)	Cumulative Percent
Yes	107	89.9	89.9
No	12	10.1	100.0
Total	**119**	**100.0**	

(Source: Researcher, 2007)

4.5.2 Awareness of SWC Technologies

Table 4.7 shows respondents' awareness of SWC technologies in the study area. The study revealed that majority of the respondents (52.1%) were aware of the existence of SWC technologies in the area while 47.9% of the respondents were not aware of the SWC technologies in the area as shown in table 4.7. Among the technologies that the respondents were aware of, in the area included, mulching, Terrace construction, planting of trees, Gabion constructions, Diversion of ditches and Contour ploughing.

Table 4.7: Respondents' Awareness of SWC Technologies (N=119)

Responses	Frequency	Percentage	Cumulative Percentage
Yes	62	52.1	52.1
No	57	47.9	100.0
Total	119	100.0	

(Source: Researcher, 2007)

4.5.3 Adequacy of SWC Technologies

The respondents were expected to state whether the conservation methods applied in the region were adequate in conserving both soil and water. Findings showed that conservation methods applied are not adequate as accounted for by 63.3% (No response) of the respondents. Only 36.7% of the respondents responded yes to this issue as shown in table 4.8.This means that the conservation methods applied in Kyogong Catchment area are not adequate and hence more conservation measures are needed to supplement the existing ones.

Table 4.8: Adequacy of SWC in the area

Responses	Frequency	Percentage	Cumulative Percentage
Yes	44	36.7	36.7
No	76	63.3	100.0
Total	120	100.0	

(Source: Researcher, 2007)

4.5.4 Mechanisms for Water Conservation

The study sought to establish whether the respondent had measures for water conservation especially the rain water. The findings show that 50% of the respondents had mechanisms for water conservation especially rain water while 50% of the respondents did not have measures to conserve water. These findings are shown in table 4.9. This means that more measures for water conservation need to be intensified if conservation has to succeed.

Table 4.9: Existence of Mechanism for Water Conservation (N=114)

Responses	Frequency	Percentage
Yes	57	50.0
No	57	50.0
Total	114	100.0

(Source: Researcher, 2007)

4.6 Impact of Education and Income levels on the adoption of SWC programmes.

The fourth objective sought to establish whether farmers' level of education and income have any significant impact on adoption of SWC programmes. Two statistical tests were used to measure these impacts. These were the ANOVA Test and the Chi-Square test. These are shown in tables 4.10 and 4.11 below.

4.6.1 Level of Education and Adoption of SWC Structures.

An ANOVA test was used to test whether farmers' level of education have any significant impact on adoption of SWC Structures. In this test, the null hypothesis was that the farmers' level of education had no significant impact on adoption of SWC structures with the alternative hypothesis being that the farmers' level of education had a significant impact on adoption of SWC structures. The P-value for the test was found to be 0.008(0.8%); f-statistics. (7.202) as shown in table 4.10. The P-value of 0.8% was less than 5% level of significance. This lead to rejection of the null hypothesis that the farmers' level of education had no significant impact on adoption of SWC structures and acceptance of the alternative hypothesis that the farmers' level of education had a significant impact on the adoption of SWC structures. This means that the higher the level of education of the farmers, the higher the rate of adoption of the SWC structures.

Table 4.10: ANOVA Test

	Mean Square	F-statistics	Sig.(P-value)
Level of education of the Respondents	3.516	7.202	.008

(Source: Researcher, 2007)

4.6.2 Farmers' level of income and adoption of SWC structures.

Chi-Square test was used to test the significance of farmers' level of income on adoption of SWC structures. This test was performed on the null hypothesis that there is no relationship between the farmers' level of income and the adoption of SWC structures against an alternative hypothesis that there is a relationship between the farmers' level of income and the adoption of SWC structures. The chi-square statistic was computed using the formula below.

$$\chi^2 = \sum_{i=1}^{k} \frac{(O_i - E_i)^2}{E_i}$$

Where; X^2 is the chi-square value; O_i is the observed value; E_i is the expected value. Table 4.11 shows a cross-tabulation of the Income of the respondents per month against the household engagement in SWC Conservation with the expected and observed values which were used in chi-square computation. Table 4.12 shows the chi-square computation using the formula shown above. The computed value of the X^2 was found to be 3.014 against the chi-square table value of 7.815. The computed X^2 value was found to be less than the X^2 table value (i.e. $3.014 < 7.815$) as shown in table 4.12. This leads to accepting of the null hypothesis that there is no relationship between the farmers' level of income and the adoption of SWC structures. This means that adoption of SWC structures by the farmers living within Kyogong Catchment area of Bomet District is not dependent on the farmers' level of income.

Table 4.11: Cross-Tabulation of Income and Household SWC Conservation.

Income of the respondents per month	Values	Household engagement in soil and water Conservation		Totals
		Yes	No	
Less than Ksh 1000	Observed Values	36	7	43
	Expected Values	38.6	4.4	43.0
Between Ksh. 1000 to 5000	Observed Values	64	5	69
	Expected values	62.0	7.0	69.0
between Kshs 5001 to 15000	Observed Values	5	0	5
	Expected values	4.5	.5	5.0
Between Kshs 15001 to 30000	Observed Value	1	0	1
	Expected values	.9	.1	1.0
Total		106	12	118

(Source: Researcher, 2007)

Table 4.12: Chi-square Computation

ij	Observed (O)	Expected (E)	O-E	$(O-E)^2$	$(O-E)^2/E$
11	36	38.6	-2.6	6.76	0.17513
12	7	4.4	2.6	6.76	1.536364
21	64	62	2	4	0.064516
22	5	7	-2	4	0.571429
31	5	4.5	0.5	0.25	0.055556
32	0	0.5	-0.5	0.25	0.5
41	1	0.9	0.1	0.01	0.011111
42	0	0.1	-0.1	0.01	0.1
Computed Chi-square statistic	$\chi^2 = \sum_{i=1}^{k} \frac{(O_i - E_i)^2}{E_i}$				3.014
Table X^2 values					7.815

(Source: Researcher, 2007)

4.7 Respondents' Recommendations

The respondents gave various recommendations that pertain to the adoption of SWC programmes in the region. These included; Extension officers to be visiting the area to give the locals professional advice on conservation, government should give incentives to the best farmer in soil conservation to motivate others to conserve both soil and water, the ministry of agriculture should organize regular field days with farmers and conduct educational seminars for all the locals and finally the government should organize for constant water supply to the residents and participate in construction of tanks for water conservation.

CHAPTER FIVE

SUMMARY OF FINDINGS, CONCLUSIONS AND RECOMMENDATIONS

5.1 Summary of the Findings

The study aimed at establishing the impacts of socio-economic factors on the adoption of SWC practices of the people living within the Kyogong Catchment area of Bomet District. The study revealed that majority of the people (71.8%) living within Kyogong Catchment area of Bomet District were farmers of which most of them had acquired either primary and secondary levels of education. The study revealed that most of the people living along the Kyogong Catchment area owned between 1-3 acres of land which they used mostly for crop farming and livestock rearing.

In addition, the study revealed that most of the people living within Kyogong Catchment area were low income earners, earning an estimated income of 1000-5000 Kenya shillings per month. Despite this low income the study, however, revealed that majority of them (52.1%) were aware of the existence of some of the SWC technologies in the area. Among the technologies that they were aware of included, mulching, Terrace construction, planting of trees, Gabion constructions, diversion ditches and Contour ploughing. The study also established that majority (89.9%) of residents living within Kyogong Catchment area engage themselves and their household in soil and water conservation practices although in smaller scale. They however acknowledged that conservation methods applied were inadequate in soil and water conservation.

The study established through the ANOVA test that the farmers' level of education had a significant impact on the adoption of SWC programmes. (P-Value of 0.008{0.8%} and F-statistics of 7.202). This means that the higher the level of education of the farmers, the higher the rate of adoption of the SWC programmes.

In addition, through the Chi-Square test, the study established that there is no relationship between the farmers' level of income and the adoption of SWC programmes. {Computed X^2 Value= 3.014. i.e. 3.014 < 7.815}. This means that adoption of SWC structures by the farmers living within Kyogong Catchment area of Bomet District is not dependent on the farmers' level of income.

The study established the various socio-economic factors that affect SWC Practices in Kyogong Catchment area in Bomet District. These included overstocking, poor ploughing methods, lack of skilled labour, low education level, farm size and family size. The challenges that face the adoption of the soil and water conservation (SWC) practices in Kyogong Catchment area in Bomet District were identified as Overgrazing, low education level of the residents, small farm size, overstocking of livestock, lack of extension officers and destruction of conservation practices by animal.

Major socio-economic factors that were found to affect adoption of SWC structures were ranked in order of priorities as follows:

- Education levels
- Economic activities
- Farmers' age
- Farm size
- Poor ploughing methods
- Overstocking

5.2 Conclusions

In general, the cost of conservation practices exceed benefit in the short run, though being profitable on the long run, hence discouraging adoption by farmers. The negative effect of soil erosion (or the benefit of SWC practices) takes place in the long run, while the costs of conservation practices are incurred in the short run. Farmers' response to soil erosion therefore, depend on many diverging factors both technical (cropping patterns, slopes, types of soil) and socio- economic (farmers age, skills, economic activities) among others.

The most frequently identified causes of depletion of natural resources (water and soil) include continuous cropping with short or no fallow period triggered by high population pressure, cultivation of highly inclined and marginal lands without adequate erosion-controlling measures, insufficient drainage of irrigation water and deforestation. Overgrazing by livestock population is also another factor that leads to land degradation.

The study showed that most farmers are low income earners with small farm sizes therefore efficient farming practices is an important significant factor that needs urgent attention if maximum soil and water conservation is to be achieved. From the research findings it was also observed that those farmers, who were farming for economic purposes, were better adopters of SWC structures than subsistence farmers. Hence any SWC measures proposed must strive to improve on crop yields as a motivating factor for adoption. Using the results of this study, different explanations can be made to explain the daunting performance of the agricultural sector in the country. Inappropriate agricultural policies, natural calamities as well as low use of technological yield enhancing inputs and poorly structured markets for agricultural inputs and outputs have contributed enormously to the poor adoption of SWC structures. To reduce these declining trends in agriculture, through improvement in adoption rates of SWC structures, the World Food Program (WFP) and other governmental and non-governmental organizations (NGO) need to come together with the farmers and agree on the best SWC strategy acceptable to all.

5.3 Recommendations

5.3.1 Recommendations to Policy Makers

To enable farmers willingly maintain and continue use of conservation structures, effective participation of farmers in the planning and implementation process is indispensable. The introduction of alternative biological and agronomic conservation measures is also important. Promotions of yield enhancing inputs that complement the conservation effort have to be extended together with conservation activities. The blanket recommendation of uniform conservation measures to all locations should be terminated and instead conservation technologies have to be targeted taking into account the specificity of the location. Regular monitoring of farmers' pieces of land together with farmers to learn from experience has to be put in place. More research, extension demonstration and training that help increase farmers' technical know-how are imperative. It is recommended that in the design of conservation measures, more attention need to be put on both the distribution in land quality as well as to the equal distribution of the net returns from adopting soil conservation.

5.3.2 Future Research

Future studies need to be carried out to focus on the effectiveness of extension demonstration offered to farmers during the implementation of SWC programmes in the area. This will help to access the extent to which the SWC programmes have been successful. More research need to focus on the effects of farmers' training as useful tool in impacting technical know-how in the implementation of SWC programmes in the catchment areas. Finally more studies need to be conducted in other catchment areas in the country to compare their situation with the Kyogong Catchment area of Bomet District.

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Appendix 1: Questionnaire

Questionnaire Serial No....................

Instructions:-

This questionnaire is designed to obtain information on impact of socio- economic factors on adoption of soil and water conservation practices in Rift Valley Province, Kenya. A case study of Kyogong Catchment in Bomet District. The information that you provide will be treated with utmost confidence. Please respond by ticking the boxes (✓) or by writing your responses where applicable.

SECTION ONE: SOCIO-DEMOGRAPHIC INFORMATION

1. State your gender:

1) Male ☐
2) Female ☐

2. Please indicate your Age category (in years)?

1) Less than 14 Years ☐
2) 15-24 Years ☐
3) 25-35 Years ☐
4) 36-45 Years ☐
5) Above 45 Years ☐

3. Please indicate your highest level of education.

1) None ☐
2) Primary Level ☐
3) Secondary level ☐
4) College level ☐
5) University ☐

6) Others (specify)..

4. What is your occupation?

1) Farmer
2) Teacher
3) Medical Doctor/nurse
4) Agricultural officers
5) Business person
6) Religious leader
7) Community leader(chief, assistant chief ,village elder etc)
8) Others (specify)..

5. How big is Family household ....

6. What is the approximate size of your land?

1) Less than an acre
2) Between 1-3 acres
3) Between 4-7 acres
4) Above 7 acres

7. What is your level of income per month?

1) Less than Kshs.1000
2) Between Kshs. 1000-5000
3) Between Kshs. 5001-15,000
4) Between Kshs. 15001- 30,000
5) 0ver Kshs. 30,000

SECTION TWO: SOIL AND WATER CONSERVATION PRACTICES

8. What is the main economic activity of the people in this area?

1) Crop farming
2) Animal rearing
3) Nomadic pastoralists
4) Mining

5) Others (specify)………………………………………..

9. The rate of soil erosion in this area is quite intensity and urgent measures are needed for control?

1) Strongly agree ☐
2) Agree ☐
3) Disagree ☐
4) Strongly disagree ☐

10. Do you and your household members engage in soil and water conservation practices?

1) Yes ☐
2) No ☐

Please explain your answer

____

____

____

11. In your own opinion, what are major socio-economic factors that affect the adoption of soil and water conservation (SWC) practices in this region?

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____

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12. What do you think are the impacts of the above listed socio-economic factors to the adoption of soil and water conservation (SWC) practices in this region?

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13. Kyogong catchment is characterized by steep slopes which make the catchments sensitive to soil erosion. In your own opinion, what are the best practices that should be adopted to preserve this catchment and control the soil erosion in the area?

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14. Please rank these factors by ticking the statement that best describes your opinion on the following set of statements.

Where; 1=Strongly Agree, 2=Agree, 3= Neutral, 4=Disagree, 5=Strongly Disagree. (SWC=soil and water conservation)

Statements	1	2	3	4	5
There is a significant relationship between the level of income of the residents and the adoption of soil and water conservation in this area.					
The education level of the residents have an impact on implementation of SWC programmes					
The economic activities of the people of the area influence significantly the adoption of the SWC programmes.					
Farmer's age has a significant impact on the adoption of SWC programmes.					
Farm size has a significant impact on the adoption of SWC programmes.					
There was no significant difference between the social-economic factors and adoption of SWC programmes					

15. Do you think soil and water conservation methods applied in this region are adequate?

1) Yes ☐

2) No ☐

Please explain your answer.

16. What challenges do you think face the adoption of the soil and water conservation (SWC) practices in this area?

17. Why do you think SWC conservation programmes appear to be so difficult to implement in this region?

18. Are you aware of the existence of soil and water conservation (SWC) technologies in this area?

1) Yes ☐

2) No ☐

If yes above, what do you think are the importance of these SWC technologies?

19. Do you have mechanism for water conservation especially for rainwater?

1) Yes ☐

2) No ☐

20. What recommendations can you make as pertains to the adoption of SWC programmes in this region?

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____

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THANK YOU FOR YOUR RESPONSE