SOCIO-ECONOMIC FACTORS INFLUENCING PARTICIPATION BY FARM HOUSEHOLDS ON SOIL EROSION MANAGEMENT IN WEST POKOT COUNTY, KENYA

BY

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DECLARATION

Declaration by the Student

I hereby declare that this is my original work and has not been presented in this or any other academic institution and shall not be produced in part/full without prior permission from author and/or University of Eldoret.

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DEDICATION

I dedicate this work to my late father Kipkosgei Joseph Laboso and my entire family for their selfless sacrifices and encouragements which help me complete my studies. I also thank my lovely husband Ronoh and my son Kipruttoh for their understanding, support and prayers throughout my research study and to my friends Jane and Siren for their moral support which make my study a success. May the Almighty God bless you.

ABSTRACT

Soil erosion is the most important land problem and pronounced form of soil degradation which negates the ecosystem function, productivity, livelihoods and national economy. To enable sustainable functioning of the ecosystem, it necessitates a need for proper management. Literatures explained that most ecosystem management studies focused on biophysical approaches and assessment, while few studies have explored the social and economic attributes underlying their decisions. Participation is a key element for rural development in Kenya, however rural community have a limited understanding of their responsibilities and the possible outcomes on soil erosion management, limiting participation. Socio-economic attributes have influential roles in farmers' decisions on innovative measures in different areas of Kenya, which has not yet been studied in West Pokot County. Therefore, this study sought to test the hypothesis that the mentioned factors significantly influence the participation of farm households in management of soil erosion in West Pokot County. The study was anchored in Diffussion of Innovation and Social-ecological System theory which supports social and economic capital assessments underlying individual decision in conservation plans to attain sustainable ecosystem services. To achieve this objective, a descriptive survey was undertaken from the selected ward with a total of 7,495 households which constitute a unit of analysis for the study and a target population of 100 households were employed using a formula adopted by Nassiuma 2000 using a questionnaire. Purposive sampling was used to select the study area and a simple random sampling to obtain the respondents. Data was analyzed in descriptive and binary logit regression model using the SPSS software version 20. The results obtained indicate that age(β=-1.349; p=0.003), education level of the respondent(β=-2.118; p=0.015),cost of technology(β=19.53; p=0.00), land acreage(β=-1.76 ;p=0.036) and membership to farmer group(β=5.007; P<0.008) were the possible predictor factors that showed significant effect at p<0.05 level of significance, hence supports the hypothesis tested. The study findings will aid decision makers, local community, individual farmers, researchers, land planners and other practitioners in involvement of local community when designing management interventions of soil erosion while accommodating their socio-economic status and the needs of the farmers thus improving participation of rural community as the primary stakeholders, hence encourages achievement of sustainable development on soil erosion management. This research was limited to participation of farm households in Chepareria, West Pokot County; therefore, the study recommends future studies to focus on other dry land areas within Kenya with varied political, cultural and environmental contexts.

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LIST OF ABBREVIATIONS AND ACRONYMS

ASAL: Arid and Semi-Arid Lands

CIDP: County Integrated Development Plan

FAO: Food Agricultural Organization

FRN: Farmers Research Network Project

HA: Hectare

KNBS: Kenya National Bureau of Statistics

MA: Millennium Ecosystem Assessment

NDMA: National Drought Management Authority

SDG: Sustainable Development Goal

SEM: Soil Erosion Management

SPSS: Statistical Package for Social Sciences

SWC: Soil and Water Conservation Technologies

UNDP: United National Development Programme

UNEP: United Nations Environment Program

DEFINITION OF OPERATIONAL TERMS

Access to Extension Services: This is the ability of a household to acquire information that is relevant in ecosystem management from extension agents.

Age: This refers to the number of years of the household head or the representative respondent.

Economic Factors: These are the monetary value that helps in investment in soil erosion management. This includes the farm size, on-farm and off-farm income, access to credits and cost of technology, farmer groups, land tenure, and extension services.

Educational Level: The highest level of education attained by a farmer/ respondent.

Farm Income: This is the household amount of income acquired from farm activities such as sale of livestock, crops.

Off-farm Income: This is the household amount of income acquired from the off-farm activities such as employment, non-agricultural businesses such as shops, hotels.

Farm Household: A group of people who live together under the same roof, bounded together by joint decision in participation of soil erosion management strategies.

Gender: This refers to sex of the household head or the representative respondent.

Household Size: This is the number of household members living under the same roof.

Land Acreage: This is the size of the land owned by the farm household, usually measured in acres.

Land Tenure: This is land security that provides an incentive and authority to farm household to use and invest in the implementation of soil erosion management strategies. Land ownership and security document such as title deed defines the land tenure.

Membership to Farmer Groups: This entails the households with members of any farm organization which engages in community participation and sharing of information.

Participation: This is engaging in soil erosion management either, in the adoption and uptake of soil erosion management measures.

Social Factors: These are social systems in an environment where people interact through roles and relationships in soil erosion management defined by gender, age, level of education, and household size.

Soil Erosion Management: These are the activities carried out by the farm households to lessen the erosion rates and manage the ecosystem, rendering its services through terracing, ditches/micro-catchments, trash lines, gabions, sand dams, live fencing among others.

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CHAPTER ONE

INTRODUCTION

1.1 Overview

This chapter gives an insight into the background information, the statement of the problem, objectives, justification, the scope and limitation of the study.

1.2 Background of the Study

The whole creation depends on soil which is the vital foundation of our existence (Kibemo, 2011). According to Masila (2016), soil is considered as a limited resource which cannot be renewed in the world. Pal (2016) also stated that about 80% of agricultural land in the world is highly degraded, considerably; accelerating soil erosion is a significant factor. Furthermore, land degradation is a critical environmental concern, covering 41% in drylands globally (Reynolds *et al.*, 2007), 43% in Africa (Wairore, 2015a) and 22% in Kenya (Kirui and Mirzabaev, 2014). Pimentel (2006) confirmed that about 10 million hectares (ha) of cropland estimated to be lost due to soil erosion annually and overall soil loss from land areas are 10 to 40 times faster than the rate of soil revitalization declining future human food security and environmental quality. Land degradation and desertification are more severe in Sub-Saharan Africa, (Kiage, 2013), suggesting a loss of productivity of at least 20% over the last 40 years (Sivakumar & Stefanski, 2007). The ecosystem services are disturbed leading to inadequate land rights and access to land, unfavorable policies not promoting pastoralists, and awareness of the significance of ecosystem management (Nganga & Robinson, 2016).

According to Scherr and McNeely (2008), poor land management, lack of adequate planning and implementation for soil conservation are responsible for degradation of agricultural land. Acceleration of soil erosion in ASALS has been a severe environmental and economic problem, as it results to loss of millions of productive acres of land in Kenya (Mulinge *et al.,* 2016), leading to food insecurity; compromised ecosystem integrity and low quality dryland livelihoods (Cowie *et al.,* 2011). It also decreases soil' capacity to support plant growth, thus reducing its ability to support biodiversity (Dominati et al., 2010). The ASALs in Kenya covers about 80% of the total land area and support over 30% of the Kenyan human population (Mganga, 2010). A study by Wanjiku (2015) identified ASALS as fragile ecosystems and more vulnerable to erosion than other regions. Further, a survey by De Groot *et al.* (2012), explained that despite the awareness of the importance of ecosystems and biodiversity to human welfare, biodiversity loss and ecosystem degradation remain on a big scale. Furthermore, recognition of the potential benefits of drylands has necessitated the efforts for soil management to meet basic human needs and provide ecosystem services. Hence, it requires an interdisciplinary regulatory approach by incorporating the stakeholders' perceptions and values in decision-making processes and conservation plans. This provides a challenge to decision makers, the local community, individual farmers, researchers, land planners and other practitioners in intervention strategies (Keesstra *et al.,* 2016).

In ensuring sustainable development and long-term productivity of ASALs, land management is essential (Vogt *et al.*, 2011). This is in line with the Kenya Government campaign on emphasis of soil and water conservation in the country as supported in the Sustainable Development Goal (SDG 15) and Vision 2030 Document (Mohieldin &

Caballero, 2015). Many attempts to rehabilitate degraded lands has a limited success in Chepareria Ward. The concerned initiatives such as Kerio Valley Development Authority (KVDA), VI-Agroforestry and Livelihoods, Livestock and Land (Triple L) placed more efforts on the technicality of the interventions than the socio-economic and cultural needs of the people (Wairore *et al.,* 2015b).

Despite these efforts so far seem to have limited success hence failed to meet the anticipated objectives. Insufficient attention has been given to assess human capital attributes that may influence the uptake of these management measures. Community participation is an essential element for rural development in Kenya (Kimani *et al.,* 2012). To achieve common development goals, it needs an effective coordination of local activities to enable people come together and participate in planning, implementation, monitoring of management activities. Attree *et al.,* (2011) defined participation as active engagement of individuals within a community to solve conditions, influence policies and programs that are being geared towards improving the quality of their lives.

Participation helps in tapping the potential of the people in improving their living standards as it has been positively perceived in the developing countries where the majority of the population is still living undeveloped rural areas (Toyobo *et al.,* 2014). According to Tam (2012), community participation development was introduced in Kenya in 1980`s, aiming at collective responsibility in development agenda. In addition, a study by Nyaguthii & Oyugi, 2013 in operation of constituency development fund projects on community participation in Mwea Constituency reported that when the community are involved in decision-making process, the more likely they will develop a

sense of teamwork and cooperation, hence promotes motivation, commitment and contribution to development process.

Drylands collaborative farmers Research Network project which is concerned with this study working in collaboration with other actors including local schools, Ministry of Agriculture aimed to support the community with technical training and restoration of ecosystem services and degraded landscape. They support implementation of management measures such as Terraces, cut-off drains, sand dams, stone lines, gabions and micro-catchments. Some farm households in Chepareria Ward have gained prominence in regards to the uptake and utilization of these introduced technologies while others have not. Following these stages of accepting new techniques, there social, economic constraints for different groups of adopters (Karidjo *et al.*, 2018). To date, most ecosystem management studies have focused mostly on biophysical approaches while few studies have explored the more intangible social factors underlying their decisions (Villamor *et al.*, 2014).

Besides, by incorporating the stakeholders' perceptions and values in decision-making processes, conservation plans will achieve anticipated goals and targets (Berkley, 2013). Hence, investment in soil erosion management could be influenced by human capital because of their resource requirements, especially labor, finances, among others. Therefore, this study sought to examine the effect of socio-economic factors on participation by farm households in soil erosion management.

1.3 Statement of the Problem

A study by Keesstra *et al.* (2016), explained that soil is an essential resource in agriculture which feeds and provides required needs for the entire life. Moreover, humans have been reported that they obtain more than 99.7% of their food from the land and less than 0.3% from acquatic ecosystems (Evan *et al.,* 2017); hence, land needs much attention in its management. Due to continued soil erosion rates in Chepareria, the government, and other development agents such as VI agroforestry, KVDA, Triple L, and other initiatives attempt to mitigate the severity of soil erosion by introducing enclosures and planting of trees, however it had a limited success with minimal interest from many farm households.

This has been severally attributed to the limited engagement when SEM strategies are being initiated. Since the initiatives placed put more emphasis on the technicality of the interventions than the socio-economic and cultural needs of the people as confirmed by Wairore *et al.* (2016). The rural community have a limited understanding of their responsibilities and the possible outcomes, limiting participation. Socio-economic attributes have influential roles in farmers' decisions on innovative measures in different areas of Kenya. Thus, the concern of the study to understand the factors underlying low participation of farm households in SEM activities.

1.4 General Objective

The main objective of the study was to analyze socio-economic factors affecting participation by farm households in soil erosion management in Chepareria Ward, West Pokot County, Kenya.

1.4.1 Specific Objectives

i. To examine social factors affecting household participation in soil erosion management in the study area.
ii. To analyze economic factors affecting household participation in soil erosion management in the study area.

1.4.2 Hypotheses

In this study, it was hypothesized that;

HA1: Social factors have a significant effect on participation by farm households in soil erosion management in the study area.

HA2: Economic factors have a significant effect on participation by farm households in soil erosion management in the study area.

1.5 Justification of the Study

The recommendations from this study are endeavored to aid decision makers, the local community, individual farmers, researchers, development planners and other practitioners in intervention strategies of sustainable measure of SEM, which are better tailored to the needs of the farmers in Chepareria and other areas with conditions similar to West Pokot. It will also provide information to the county government to come up with appropriate community sensitization programs, training on the importance of ecosystem management which will address soil erosion issue. Also, understanding the existing situation and documentation of this study will generate useful knowledge to the rural community to

understand of their responsibilities and the possible outcomes of SEM thus, promoting participation in the intervention activities.

The study will be an important step in fighting severe rates of soil erosion, food insecurity while, improving the production capacity of the farmlands and ecosystem functioning, thus a sure way towards improvement in household's welfare, and general theme of change in Chepareria, West Pokot County and will in turn positively affect the national economy. Furthermore, it will act as a reference for other studies in the area with similar or other themes of study. Therefore this study is significant to address the issue in regards to socio-economic issues affecting participation of livelihoods in soil erosion management.

1.6 The Scope of the Study

This study focused on the analysis of socio-economic factors affecting participation of farm households in soil erosion management considerably in Chepareria Ward, West Pokot County. However, the study only considers the ward most affected by soil erosion leading to threat in soil production capacity, ecosystem functions, and livelihoods.

1.7 Limitations of the Study

The study was limited to time and resources hence; the researcher carried out the study on limited number of respondents. Since Chepareria Ward is a rural setup, the researcher found majority of the respondents busy in market places since most engage in income-generating activities such as businesses in cattle, poultry, honey, and firewood thus the research study exceeded by two days to complete the exercise. Moreover, others tried to

shun away from participating in the research as they expected to be given an allowance, but they were prior informed about the possible outcome of the study through the remedy of the issue which is being addressed by this study that it will, in turn, improve their livelihoods. Hence, they became flexible and took part in the study. Further, language was another limitation to the researcher since many respondents find it hard to communicate in English or Kiswahili. This could have affected the accuracy and quality of information collected. However, the researcher overcame this limitation by seeking the research assistants who were well conversant with the Pokot language and were trained before the actual study. Hence, they could well translate the questions to the respondents.

CHAPTER TWO

LITERATURE REVIEW

2.1 Overview

The literature related to factors affecting participation of farm households in soil erosion management has been reviewed in this chapter. This includes; soil erosion in ASALS Kenya, participation of rural community, socio-economic factors such as age, household size, educational level, gender of the respondent, access to agricultural extension services, membership to farmer groups, land tenure, farm and off-farm income, land size, access to credit, cost of technology and participation in soil erosion management; theoretical framework and conceptual framework of the study.

2.2 Soil Erosion in Kenya ASALs

Much of the rangelands have been degraded and indigenous vegetation depleted through charcoal burning, firewood harvesting and overgrazing thus leaving ground cover in a bare state (Wambua & Kithiia 2014) In the final draft of the National Land Reclamation Policy (GoK, 2011), ASALS in Kenya covers over 80% of landmass with about 10 million people majority of whom are smallholder farmers thus soil erosion poses a threat to the future generation who are expected to live on such marginal lands. Githui *et al.*, (2009) identified ASALS as fragile ecosystems and more vulnerable to erosion than other regions as ddocumented also by Nandwa (2001) that ASALs are considered by relatively shallow soils and experience irregular rainfall making soil erosion the most pronounced process causing soil degradation. A study by Mwase (2015) found that about 50% of precipitation from annual rainfall is being lost due to decreased infiltration and high surface runoff from the bare surfaces.

2.3 Participation of Rural Community

Sheikh *et al.*, (2014) define community participation as an active engagement of individuals within a community to solve conditions, influence programs that are geared towards improving the quality of livelihoods. Stoll-Kleemann, (2010) explained that the concept of community participation assumes that value accrues to the community members through the acts of participation and association. Therefore, the more community are involved in a decision-making process, they develop teamwork and cooperation, thereby become motivated, committed, and contribute to development process (Sanoff, 2006). Community participation was introduced in Kenya in 1980`s, to enable the collective responsibility in development agenda on sustainable human development and the capability approach (Pelenc *et al.*, 2013).

Most rural development initiatives in developing countries fail to benefit communities over the long term due to limited understanding of community involvement and sustainability (Toyobo *et al.*, 2014). According to the Kenya social policy report of 2012, Kenya's population of about 46%,lives below the poverty line. This situation may undermine sustainability of community contributions on soil erosion management among the farm households since it requires resources in implementation and operation of these interventions.

For the rural communities to play an effective role in community development, access to resources is of great concern (Ade Freeman *et al.*, 2004). However, limited knowledge and skills by the community members due to the high illiteracy levels have undermine the scope of community participation (Kimani & Kombo 2010). Therefore, this research

would like analyze how socio-economic of the community affect their participation in soil erosion management activities.

2.4 Social Demographic Factors and Participation by Farm Households in Soil Erosion Management

Most studies concerned on adoption uptake have endeavored to measure human capital through farmer's education, age, gender, and household size (Mwangi & Kariuki, 2015; Muchangi, 2016; Mohammed,2018). This study sought to analyze the following social factors affecting participation by farm households in soil erosion management.

2.4.1 Age of the Household Head and Participation in Soil Erosion Management.

According to Brooks *et al.* (2013) and Mazodze (2016), the age of the farmer affect conservation decision may be either negative or positive. Baumüller (2012) argues that older farmers are late adopters in uptake of new techniques compared to younger farmers. Bocquého *et al.* (2015) also confirmed that as farmers grow older, they risk averse taking risks and lost interest in longterm investment among the French farmers in adoption of perennial crops and behavioral preferences. Averting risk shows that older farmers are more conservative than their counterparts in technology adoption (Alemaw, 2014) who are risk takers and can uptake easily and invest in new techniques since they have longer planning horizon (Mauceri *et al.,* (2007).

In contrary, a study by Muchangi, (2016) on farmer's characteristics showed that older farmers in Embu West have gained knowledge, skills and experience and can evaluate new information than younger farmers. According to Babu *et al.* (2012), farmer's age is

correlated to farming experience and influence access of information; hence could positively influence conservation decisions (Owombo & Idumah, 2015). Also, Alufah and Shisanya (2012) confirmed that increasing the age of farmers increases the odd of adopting SWC measure by about 1.36 times. Hence, age of the farmer was hypothesized to have an effect on participation in soil erosion management in this study.

2.4.2 Household Size and Participation in Soil Erosion Management

According to Bandura (2001), family is one of the social institutions that has vital role in the process of information sharing and performing collective work. Hence, family size has an essential implication in household's decision making and ability to take part in implementation of new techniques (Amsalu & De Graaff, 2007). since most of the conservation practices are labour intensive hence family members can provide labor force (Shiferaw *et al.*, 2009). A larger household can lighten up the labor constraints required during implementation of new technology (Muchangi, 2016).

Okello *et al.* (2011) confirmed that the household size is a factor that affects agricultural information access and use. In addition, Hassan and Nhemachena (2008) also explained that higher number of family members in a household leads to higher access of information. In contrary, Mekuriaw *et al.* (2018) in adoption of soil and water conservation practices in Ethiopian Highlands indicated that households with large family members have greater number of mouths to feed hence food given is priority and labor is diverted as many would indulge in off-farm activities to satisfy a demand for food in the household. Hence, family size was hypothesized to influence participation by farm households in soil erosion management.

2.4.3 Education Level and Participation in Soil Erosion Management

Farmers' education level has been affirmed to have a positive influence on adoption of new technologies (Mariano *et al.,* 2012). According to Gundu (2009), the adoption and use of new innovation also assume a higher level of literacy. Shibru *et al.* (2016) argues that farmers who have education can read, understand and comprehend information about technologies and make decision than those who have no education; hence they are likely to implement new techniques. Further, Farid *et al.* (2010) also argued that as awareness and knowledge increases, it is more likely that there will be a consistent increase technology uptake and utilization. However, in developing world, most farmers are rural based and are have little knowledge (Rehman *et al.,* 2013). A study by Oladele (2011) identified that high illiteracy levels are the major constraint to access of information and technology utilization by farmers. In this study therefore, sought to analyze the effect of the level of education attained by the respondent on participation in soil erosion management.

2.4.4 Gender of the Household Head and Participation in Soil Erosion Management

Gender considers both men and women and their interdependent relationship within a specific social setting. According to Ragasa, (2012), there exist a relationship between these two sets of gender which affects the access, use, and priorities of the innovation's uptake. Marenya and Barett (2007) showed that gender of the household head had influenced the likelihood of use and adoption of natural resource management practices among the smallholder farmers in Western Kenya. Further, traditionally men have been considered to have a sole power in decision-making and planning of farm activities as

concluded by Mekuria and Aynekulu (2013). Although women contribute mostly to agricultural labor force in many developing countries, their roles in farming communities are ignored, and have limited access to information (Fletschner & Kenney, 2014; Parks *et al.,* 2015). Also, women tend to be excluded from most decision-making processes at both household and community levels (Karmebäck *et al.,* 2015).

In community participation, issues and views aired by women are most times left unrecognized and when they attend meetings, they would not be free to voice their opinions since they will not be taken into consideration (Karebwa, 2017). In addition, the services from the agricultural extension agents and technology development recurrently targets men, as they assume that men will share information to women hence, they are left behind in information sharing.

Also socio-cultural values and norms in most communities define male to have freedom of mobility, engaged in more geographically dispersed social networks, and participation in different development programs and as a result they have greater access to diverse information (Katungi *et al.,* 2008 and Mwangi *et al.,* 2015). Further, male household heads participated more actively than female household heads in family activities because female household heads have more responsibilities at home.

However, Karmeback *et al.* (2015) reported that gender roles are becoming flexible in West Pokot hence the environmental degradation has led to changes in gender-differential roles in household activities and decision-making processes. Notably, women taking up entrepreneurial duties to raise family income and taking part in decision-making.

Also, gender influence the uptake of technology since the household head is the ultimate decision-maker and men have more access to and control over vital production resources than women (Mwangi & Kariuki, 2015). Further, Sulo *et al.* (2012) confirmed that women experience the constraints such as lack of access to land, capital, credit facilities, membership of women's group, information by the agricultural agents and extension services, thus limits the technology uptake. Therefore, gender of the respondent was hypothesized to influence participation in soil erosion management.

2.5 Socio-institutional Variables

2.5.1 Access to Extension Services and Participation in Soil Erosion Management

The attribute of diffusion of innovation requires a channel to disseminate the information to the end users. According to Kiplang'at and Ocholla (2005), Agricultural Extension Service (AES) is a two way communication and training process which aims at improving knowledge, change attitude, lead to uptake of new technologies thus, promoting farmers' incomes and productivity on a sustained basis.

For information access to be effective, dissemination channels need to be geared towards the user's needs with a concern about the form of information and language preferred by the user (Omogor, 2013). Therefore, farmer visits by the extension agents and participation in field days, tours, agricultural shows or seminars are the best dissemination channels to farmers and as they will be able to get diverse information (Obayelu and Ajayi, 2018). According to Nguthi (2008), extension services are considered avenues of bringing change in farmers' behavior, to adopt innovations relating to agriculture. Further, De Graaff *et al.* (2008) and Aker, (2011) confirmed that access

to extension services is a key aspect in technology adoption whereby farmers are usually informed about the effective use and benefits of technology.

Extension agent acts as a link between the researchers of the technology and the end-users (Sumberg, 2005; Vignare, 2013). Therefore, the frequency of extension contact with end users has a significant role in the access to and utilization of agricultural information (Sani *et al.,* 2015). Moreover, Rehman *et al.* (2013) stated that fellow farmers who are experienced are personal dissemination channels of agricultural information due to their easy reach; hence enhance information sharing with other farmers (Lukuyu *et al.,* 2012). Thus, farm households that are frequently contacted with extension agent are believed to get know-how and better farming decisions that are relevant to soil erosion management in this study. Hence, effect of access to extension services on participation of farm household in soil erosion management was assessed.

2.5.2 Farmer Group Membership and Participation in Soil Erosion Management

Farmers consider most of the soil conservation interventions as laborious and time consuming (Anley *et al.,* 2007). However, farmers who are in groups tend to work together, reduce time spend and also saving on cost (Baaru, 2011). Therefore, belonging to a social group also promotes social capital building trust, information sharing and gaining experience from each other (Kabunga *et al.,* 2012; Korir *et al.,* 2015). According to Davis and Negash (2007), farmer groups provide a means of collective action by farmers, pooling resources such as credit and provision of labor. Wollni *et al.* (2010) and Eric (2012) also explained that membership to farmer group provides a valuable learning and collective bargaining opportunity for farmers in access of diverse information and

promotes capacity building such as training and study visits. Farmers' membership to local groups is also associated with significant effect on demand-induced extension and serves as a factor to farmer's decision on farm management practices (Julius, 2013). Hence, effect of membership to farmer group on participation by farm household in management of soil erosion was assessed in this study.

2.5.3 Land Tenure and Participation in Soil Erosion Management

Reynolds *et al.* (2007) confirmed that drylands have important potential for socio-economic development however; desertification, land degradation, deforestation caused by change in land use and soil erosion are rampant. Initially, the lifestyle in West Pokot was nomadic pastoralism however, now slowly changing to sedentary agro- pastoral lifestyle (Karmebäck *et al.,* 2015). This resulting to the subdivision of communal land and subsequent privatisation leading to changes which conflicts with sustainable land use and many flexibilities in land use which provided a framework for land management.

A study by Nyberg *et al.* (2015) and Forrest *et al.* (2015) confirmed that land ownership and flexibilities in land use and management allows individuals to exercise and explore the various benefits and opportunities. The private incentives have been supported by secure land tenure rights to make long-term investments in soil conservation (Hagos & Holden, 2006). If property rights to land are well-defined and enforceable, farmers will have incentives to conserve soil, as future benefits from soil conservation (Anley *et al.,* 2007). A study on land conservation and tenure security in Kenya by Kabubo-Mariara, (2007), show that lack of secure property rights affects the household investment.

These are influenced by tribal customs and traditions, which often create barriers for women to equal rights of ownership to land and inheritance (Clover and Eriksen (2009). Fenske, (2011) concluded that farmers lack concern for land conservation because of the insecure tenure. Kabubo-Mariara *et al.* (2010) also confirmed that adoption of SWC measures is influenced by inheritance, rental contracts and other land acquisition sources. Therefore, the effect of land tenure hypothesized to influence participation by farm households in soil erosion management in this study.

2.6 Economic Factors and Participation by Farm Households in Soil Erosion Management

Management of soil erosion is an essential way of rehabilitation of degraded farms and reducing the erosion rates. These activities are labour intensive and involve the costly measures. Hence, farmers invest their financial capital during the adoption of these management strategies. Economic factors were therefore hypothesized in this study to influence participation in soil erosion management.

2.6.1 Income Status and Participation in Soil Erosion Management

The ability of farmers to participate in soil erosion management requires financing (Knowler & Bradshaw, 2007). Also, income is related to the wealth status of the farmers, which helps them to invest on sustainability of soil conservation structures in their fields as reported by Tesfaye *et al.* (2014). Muchena *et al.* (2005) argue that land degradation in East Africa needs assessment on the challenges facing the rural households about resource allocation, where people can invest labour and decision making to reduce the risks.

2.6.1.1 Farm Income

A study by Ligonja and Shrestha (2015) in soil erosion assessment in Kondoa, Tanzania on socio-economic approach confirmed that a greater income from the land inspires farmers to invest in land management. Farm income status was therefore expected to enhance access to finance for cost of technology in soil erosion management.

2.6.1.2 Off-Farm Income

Participation on off-farm activities is expected to positively influence farmers uptake of new technologies since it earns incomes that would make them more likely to afford the cost involved in new innovations (Tura *et al.,* 2010). However, the involvement in non-farm activities may negatively influence the continual use of technologies because famers spend more time in non-farm activities and less time on farm management strategies (Nahayo *et al.,* 2016).

In other studies, farm households in West Pokot with community ownership have improved livelihoods, diversified income generating activities which have enabled them to invest in household activities (Wairore *et al.,* 2016). Hence, off-farm income are expected to increase the additional household income and develops the capacity to afford the cost involved in their preferred technologies hence encourages participation. Thus, the effect of household income status on participation in soil erosion management was then assessed.

2.6.2 Land Size and Participation in Soil Erosion Management

Land is an essential resource in Kenya as it is the basis for farming operations (Alila & Atieno, 2006). Endowment of resources is an element influencing farmers' choices to accept and utilize a new agricultural technology (Noltze *et al.,* 2012). Land size has been considered as an indicator of wealth and social status (Tittonell *et al.,* 2010). A study by Obiero (2013) argue that it is probable that farmers with big farms will be more keen to find information on enhanced techniques in Siaya County; because farmers who are able to handle big land sizes can allocate portion of the property to soil conservation than farmers with smaller farms (Tesfaye *et al.*, 2014).

Further, Marenya and Barett (2007) showed that the size of a household-owned farm had a substantial beneficial impact on the probability of enhanced natural resource management practices among Western Kenyan smallholder farmers. According to Donkor and Awuni (2011) adoption of SWC technologies increased with increase in land acreage. Hence, land acreage owned by farm households in this study was assessed whether it has a significant influence on participation by farm households in soil erosion management.

2.6.3 Access to Credits and Participation in Soil Erosion Management

According to Akudugu *et al.* (2012), farm credit is broadly considered as a factor that affects adoptions of advanced agricultural technologies among rural farmers. Individual farmers or farm operators borrow capital from formal or informal credit institutions for farm operations (Odoh *et al.,* 2009). However, Nouman *et al.* (2013) found that households which have more educated members , wealthier and have labor can easily

access financial institutions. On the other hand, farmer who do not possess land and who have small pieces of land, and lack other collaterals such as title deeds, may face obstacles in accessing credit.

In order to access the credits, farmers have to provide assets such as crops, cattle, commitment of future labor and third party as a guarantor. Hence this shows the relationship between access to credit and other variables for example land size, household size, income, level of education among others. In Kenya, the rural coverage of financial services are currently about 10% while formal financial organizations are mostly not accessible to farmers, particularly in the more remote areas where the banking infrastructure tends are under-represented (Kiplimo *et al.*, 2015). Thus, farmers from the rural areas may be disadvantaged in access of credit.

Further, Mutavi (2013) explained that women in Machakos district has been efficient in repaying loans however, they experience challenges in securing loans without collaterals, male consent and security against the loan. Bose *et al.* (2009) also explained that most of the institutional services in rural development target men first, and when women are targeted especially by NGOs', micro- credit programs, they are often used as a front and men take control over the credit management. However, Fletschner and Kenney (2014) emphasized on promoting of gender-sensitive entrepreneurship in microfinance by empowering culture of women inclusion in financial organizations aiming to discourage gender disparities. Hence this study sought to analyze the effect of access to credits on participation by farm household in soil erosion management.

2.6.4 Cost of Technology and Participation in Soil Erosion Management

According to Mwangi and Kariuki (2015), the smallholder farmer's uptake of new agricultural technology in developing countries are influenced by the interaction between technology characteristics and the conditions existing. These decisions are resulted from comparison of the possible benefits and costs of adopting new invention (Uaiene *et al.,* 2009). Further, Mariano *et al*. (2012) found that wealthier farmers can only afford to invest in technologies that are capital intensive. Soil erosion management is considered as costly as it entails labour intensive in construction and maintenance; construction materials, required trainings before implementation. Hence, the effect of cost of technology on participation in soil erosion management was analyzed in this study.

2.7 Theoretical Framework on Farmers Participation Decision.

This framework entails the theories which supported this study, overviews and research findings which are closely related to the present study. This study was anchored within Social-ecological system (SES) framework which promotes understanding ecological processes at the landscape level, with a concern that insufficient consideration of social systems can compromise the conservation activities hence advocates for participatory development in rural development (Cote & Nightingale, 2012; Villamor *et al.,* 2014).

It also involve the analysis of interactions and feedbacks between human and natural systems from both the ecological and social sciences. Moreover, the framework encompasses ecosystem management studies through socio-cultural assessments, identifying the individual decisions towards ecosystem management, based on their preferences, needs, values and norms. This study also was anchored by Adoption of

Innovation Theory, advanced by Rogers (2005) in relation to the introduced and indigenous soil erosion management measures employed by farm households in the study area. Adoption is a decision-making process whereby an individual gain knowledge about an innovation, develop an attitude towards innovation, decide either to adopt or reject, put into practice the new ideas and confirm his/er decision (Rogers, 2005).

Research and development scientists from diverse disciplines such as agriculture to marketing, have adopted this theory with the aim of increasing adoption of innovative products and practices. Farmers accepts and utilize the improved practices basing on their capacities to acquire and use information about new techniques and put knowledge into practice (Abebe, 2007). For efficient utilization of the sustainable soil erosion management measures, the fulfillment of specific socio-economic conditions are required. The general attributes that consistently influenced the adoption of innovations are stated as follows:

i. **Relative advantage:** when an innovation has an advantage over other innovations or the present circumstance, it will be regarded as of advantage to the adopters. Social status, short-term and long term benefits are among the factors influencing the relative advantage (Panell et al., 2006; Huckett, 2010). Hence farmers are able to uptake and invest on soil erosion management when they are aware about the possible outcomes of SEM measures.

ii. **Compatibility:** An innovation is regarded as compatible when there is apparent consistency of the new technology with the adopter's current situation, values and beliefs, past experiences and perceived needs of potential adopters. Soil erosion

management interventions fits closely with the situation which is being addressed in this study on devastating soil erosion rates.

iii. **Complexity:** An innovation which is easy to be understood and implemented will be easily adopted by the adopters (Rogers, 2003). If more effort is required to implement the technology, then the complexities increases, failing its adoption by the end users. Hence farmers will easily uptake soil erosion management measures that are easy to understand about their sustainability and easy to implement.

iv. **Trialability:** An innovation which can be tested on a small-scale can increases the capacity for adoption of new technology since to reduce the uncertainties which may be associated with adoption can be realized earlier by the potential adopter (Pannell *et al.,* 2006). It also provide an opportunity to learn new skills essential in implementation of the innovation.

v. **Observability:** An innovation with measurable effects which are visible to the adopter and the community encourages its adoption (Pannell *et al.,* 2006). It promotes evaluation for relative advantage and complexity by potential adopters in the social system.

In regards to this theory, if innovations are compatible with the farm household's current situation and demonstrate high degrees of relative advantage, less complexity, trialability, and observability, it will ease the uptake of the technology, hence encouraging participation on soil erosion management.

2.8 Conceptual Framework of the Study

The conceptual framework is a hypothesized model which identifies the concepts under the study and the relationship between the variables (Mugenda and Mugenda, 2003). Fig. 2.2 illustrates the relationship between the independent (socio-economic factors) and farm households' participation in soil erosion management. Intervening variable in this research is the political and cultural factors. Government policies and legislation frameworks is also considered as the moderating variable that affects farm household's participation in soil erosion management as illustrated in the figure 2.1.

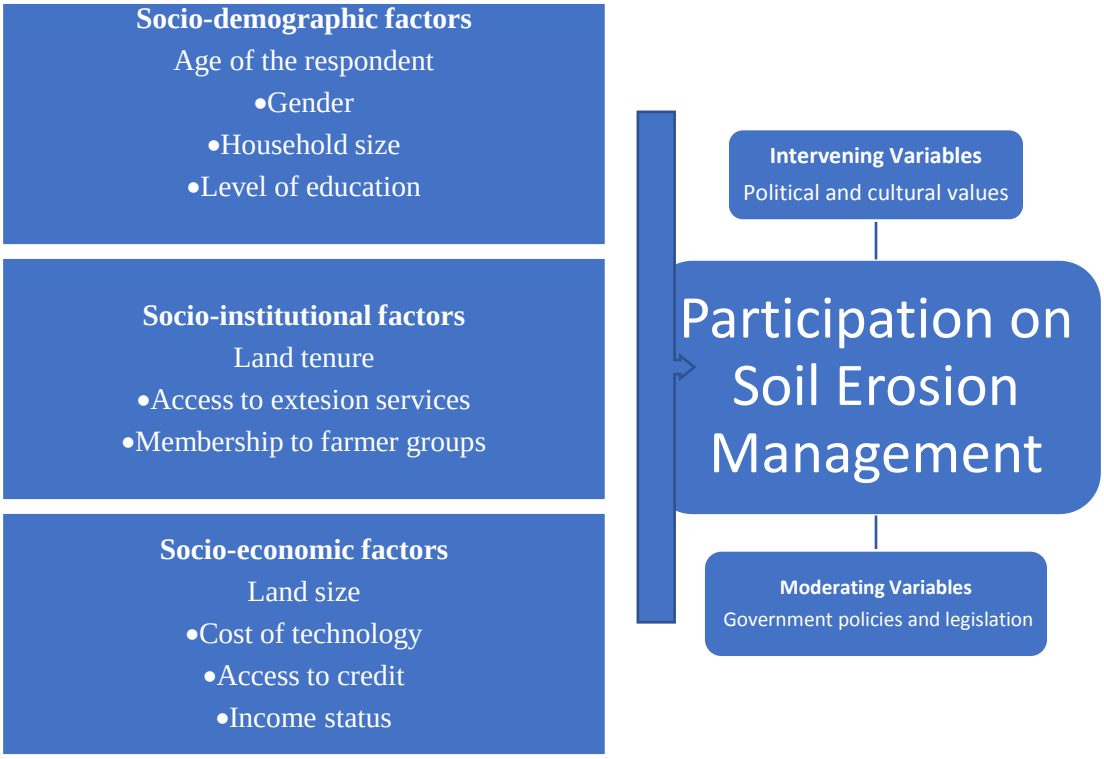

Figure 2.1 Conceptual Framework of the Study.

Source: Researcher's Own Conceptualization, 2017.

CHAPTER THREE

RESEARCH METHODOLOGY

3.1 Overview

This chapter gives an overview of the various methods that was employed in the study. It gives a description of the study area, research design, target population, sample size, sampling technique, data sources, data collection instrument, reliability and validity of the research instrument, data collection procedure, data analysis (binary logistic model) and the ethical consideration.

3.2 Study Area

The study was conducted in Chepareria Ward, West Pokot County. The ward lies between latitude 10 15' and 1055' N and longitude 350 7' and 35027' E (Maphill, 2013). Its altitude range between 1200-1600m above sea level. According to County Government of West Pokot (2013) and NDMA, (2014), the ward bimodal rainfall averages to 600 mm and receives long rains between March and May and the short rains from August to November. The average annual temperature ranges from 24°C to 28°C. It also covers an area of about 495 km2 and is mainly inhabited by the Pokot ethnic group characterized by livestock keeping (Cheserek et al., 2012). The livelihoods have also partly shifted to agro-pastoralism in which they grow beans, millet, sorghum (Wernersson, 2013) and most recently fruits (banana and mango) and maize (Bostedt *et al.*, 2016) as shown in figure 3.1

West Pokot County is one of the most eroded areas in Kenya characterized by fragile ecosystem, unfavorable climate, poor soils, hilly topography and a history of land

degradation attributed by the fact that livestock have also been squeezed to smaller lands resulting to overgrazing making these areas more prone to erosion (Gathaara *et al.*, 2010). Participation on soil erosion management is minimal and farm households to play an active role in community development, access to resources is of great concern.

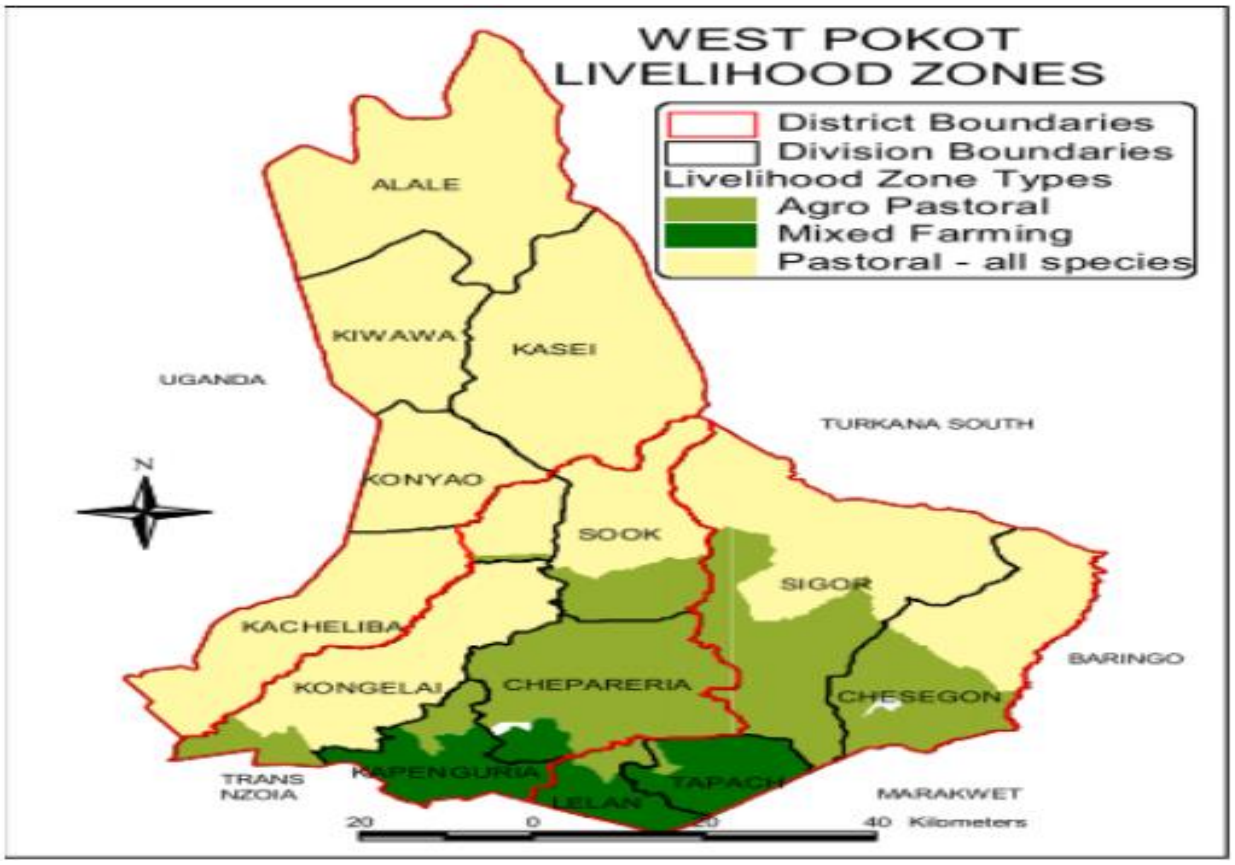

Figure 3.1 West Pokot County Livelihood Zones

Source: Adapted from the National Drought Management Authority (NDMA, 2014)

3.3 Research Design

A descriptive survey research design was employed in this study since it provides a broad capability which provides a more accurate sample to gather the anticipated objective in which to draw the conclusion and make important decision in managing soil erosion rates in West Pokot. It also involves trend description in a population and describes relationships between the variables of the study through describing, recording, analyzing and reporting situations that exist or existed (Rossi *et al.,* (2013).

3.4 Target Population

The selected ward for the study was Chepareria with 7,495 households (KNBS, 2013), which constituted a unit of analysis for the study. This is because decisions of participation in soil erosion management and other farm activities are done by the head of the household as the decision maker at household level among the Pokot community. Thus, household heads or their representatives were the respondents for this study. A number of 100 farm households were targeted from Senetwo and Chepturnguny Locations.

3.5 Sample Size Determination

The sample size from which data was collected was determined using a formula by Nassiuma (2000) assuming 95% of confidence level and precision of 0.5 as illustrated below.

$n = [NCv2] \div [Cv2 + (N-1)\ e2]$

Where: n= sample size

N= Target Population (7495)

Cv = Coefficient of variation (take 0.5)

e = Tolerance at desired level of confidence (0.05 at 95% confidence level)

n = [7495 x 0.52] ÷ [0.52 + (7495-1) x 0.052]

n = 1873.75÷ 18.985 n = 98.69

Therefore, a sample size of 100 households was selected, to represent the entire population due to the homogeneous characteristics of the whole population.

3.6 Sampling Technique

This study purposively selected Chepareria Ward within Pokot South Constituency basing on the topography variations and severity status of landscapes notably with gullies and bare grounds. A simple random technique was used to select specific villages within Senetwo and Chepturnguny locations where the respondents were randomly selected until the desired number (n=100) was achieved. The selected villages for the study was Cheseto (20), Taparach (24), Korellach (10), Koloswo (20) and Tingwoi (26).

3.7 Data Sources

Primary data was collected during the actual field study to obtain specific and first hand information which was required in achieving the objectives of this study. A structured questionnaire was used to capture the information. Secondary data such as related studies to this research study, household density of the study area, was also collected in order to provide the necessary support to the primary data as it gives information that are not

obtained from primary data. This was gathered from reports, books, research journals, MOA, publication and internet.

3.8 Data Collection Instrument

3.8.1 Questionnaire

The questionnaire was used as an instrument for data collection from the selected sample households. It was structured with close ended questions and designed in such a way that it covers and gives the responses relevant to the study (Appendix I).

3.8.2 Pilot Study

A questionnaire was tested in order to standardize them before the actual study. This was done in the adjacent ward to the study area called Korellach location using simple random sampling. The items in the questionnaire was examined if it will yield the required data for the study. The study selected 10% of the study sample size as suggested by Mugenda and Mugenda (2003). Subsequently, basing on the results obtained from the pretest, necessary modifications were made on the questionnaire to improve its reliability and accurate assessment on whether the respondents understood the questions and whether the respondents are able to participate during the survey. The questionnaire was therefore used in the main study.

3.9 Validity and Reliability of the Instrument

This research study was concerned with the validity whereby it ensured that the instrument used, covers the objective of the study as intended by the researcher. While the reliability of this study was considered in the pilot study, whereby the researcher

tested the consistency of the questionnaire to return the same measurement when used in the actual study. A questionnaire was filled by the respondents of the pilot test and the data were analyzed in Cronbach's alpha to determine its reliability. The correlation coefficient was found to be 0.673. Boermansab and Kattenbergb (2011) recommend that when the correlation coefficient of the instruments is >0.6, the instrument is considered to be reliable and suitable for data collection.

3.10 Data Analysis

In order to achieve the objective of this study, both quantitative and qualitative analysis was employed. This provides a description of analysis of the data set which helped to test the hypothesis and shows the statistical significance of various factors hypothesized to influence participation by farm households in soil erosion management.

Descriptive analysis was computed in Statistical Package for Social Sciences (SPSS) software version 20 and was presented in frequencies and percentages. Logit regression model was used in inferential statistics to test the hypothesis and to draw the conclusions showing the effect of selected variables on participation by farm households in soil erosion management. The logit econometric model is described below.

3.10.1 Logit Regression Model

According to Feder et al. (1985), many models which have been employed in adoption studies failed to achieved the statistical assumptions required to validate the conclusions based on the hypothesis tested. This necessitates the use of qualitative response models. Therefore, this study focused on a farmer’s decision to participate or not to participate

in soil erosion management, it further quantifies the probability of the variables that significantly influence the decision on participation in SEM.

The logistic regression model was appropriate statistical tool since it will determine the influence of independent variables on dependent variable (dichotomous) that is, participating or not participating. Many researchers have used the logit regression model in practice because of its accuracy and effectiveness. In this logit model, the coefficients are compared with the probability of an event occurring or not occurring and bounded between 0 and 1 (Sheikh *et al.,* 2003).

The dependent variable is the natural logarithm of the odds when a positive choice is made. The odds ratio and predicted probability of the independent variables indicate the influence of these variables on the likelihood of participating in soil erosion management if other variables remain constant. Therefore, to test the hypothesis, a binary logit model was used which identified the social, economic variables that influence participation of farm households in soil erosion management in Chepareria Ward. According to Pindyck & Rubinfeld (1998), the cumulative logistic probability probability model is econometrically specified as:

$$\mathbf{P_{i=}\ F\ (Z_i) = F\ (\alpha + \sum_{i=1}^{n} \beta_1 X_1) = \frac{1}{1+e^{-Zi}}} \qquad \text{…….}$$

(Equation3.1)

Where, P is the probability that farm household participate in soil erosion management. The subscript i denotes the ith observation in the sample, X represents the explanatory variables; e denotes the base of natural logarithms, which is approximately equal to 2.718; β1... βn are the coefficient of the parameters to be estimated. The estimated

coefficients do not directly indicate the effect of change in the corresponding explanatory variables on probability (P) of the outcome occurring but it reflects the effect of every explanatory variables on its log of odds. Where the expression for log of odds is given as

$$Ln\frac{P_i}{1-p_i}$$

Central to the use of logistic regression is the logit transformation of P given by Z. That is, to get linearity, the research thesis take the natural logarithms of odds ratio equation 3.1, which results in the logit model is given by:

$$\mathbf{Z_i = Ln\frac{P_i}{1-p_i} = \alpha+\beta_1X_1+\beta_2X_2+\beta_3X_3\ldots\ldots+\beta_nX_n} \quad \textbf{…… (Equation 3.2)}$$

Where Zi is the indicator of a farm household participating in soil erosion management or not, P is the probability of participation of farm household, 1-Pi is the probability of not participating. β0 is the intercept term (constant), β1, β2…….. βn are the coefficients of the explanatory variables and X1, X2…. Xn are the corresponding vectors of regression. Finally, taking the natural log of the equation 3.2, with introduction of disturbance term e, the logit model model becomes

$$\mathbf{Z_i\ (1,\ 0) = \beta_0+\beta_1X_1+\beta_2X_2+\beta_3X_3+\beta_4X_4+\beta_5X_5\ldots+\beta_nX_n + e}$$ **…(Equation 3.3)**

Therefore, taking the predictor variables of the study,

$$\mathbf{PARTSEM= \beta_0+\beta_1(GEN)+B_2(EDU)+B_3(AGE)+B_4(HHs)+B_5(LSIZE)+B_6(COST)+B_7(FARM)+B_8(O/FARM)+B_9(CRDT)+B_{10}(LTNRE)+\beta_{11}(EXTN)+\beta_{12}(MEMBR)+e}$$ **……**(Equation 3.4)

Table 3.1 Definitions and Measurement Units of Variables Included in the Model

Variable	Variable code	Variable Type	Measurement Unit
Dependent Variable			
Participation in SEM	PARTSEM	Binary	1if participating in SEM;0 if otherwise
Predictor Variable			
Age of the respondent	AGE	Continous	Measured in years
Level of education	EDU	Continous	Measured in category of education level
Gender	GEN	Binary	1 if male; 0 if female
Household size	HHs	Continous	Measured in numbers
Farm income	FARM	Continous	Measured in Ksh/Month
Off-farm income	O/FARM	Continous	Measured in Ksh/Month
Credit accessibility	CRDT	Binary	1 If can access credits;
Land acreage	L SIZE	Continous	Measured in
Cost of technology	COST	Continous	Measured in Ksh/Month
Access to extension services	EXTN	Binary	1 if accessible to services;0 if not
Membership to farmer group	MEMBR	Binary	1 if the respondent is a member to any farmer group;0 if otherwise
Land tenure	L TNRE	Binary	1 if individually owning the land; 0 if otherwise

3.12 Diagnostic Test

The binary logistic model used in data analysis was later subjected to the diagnostic test to confirm that the data was not violated.

3.13 Ethical Considerations

The respondents was informed early enough about the purpose of the study prior to the main study. The research was for academic study and the respondents were assured of the confidentiality of the information which they provided, including their own personal information since the FRN project was already in the ground implementing its activities in collaboration with the ministry of agriculture, schools, churches and the local

community. This assurance enables them to provide the information without any suspicions during the data collection exercise.

CHAPTER FOUR

RESULTS OF THE STUDY

4.1 Overview

The study findings are presented in this chapter in subheadings of questionnaire return rate, descriptive and inferential statistics of demographic variables and social economic factors on participation by farm households in soil erosion management in Chepareria Ward, West Pokot County; Model diagnostic tests; and discussion of the study findings.

4.2 Questionnaire Return Rate

The return rate was 100 subjects of 54% male and 46% women, which represents 100%, which was possible with the help of research assistants and the lead farmers. According to Frankel and Wallen (2004), the response rate of above 95% of the respondent can adequately represent the study sample and adequate information for the study analysis, conclusion and recommendations.

4.3 Descriptive Statistics

4.3.1 Socio-demographic Factors and Participation in Soil Erosion Management

The descriptive statistics of the selected factors examined in this study are presented in percetages to check the variability in regards with participation on soil erosion management; this is illustrated in figure 4.1.

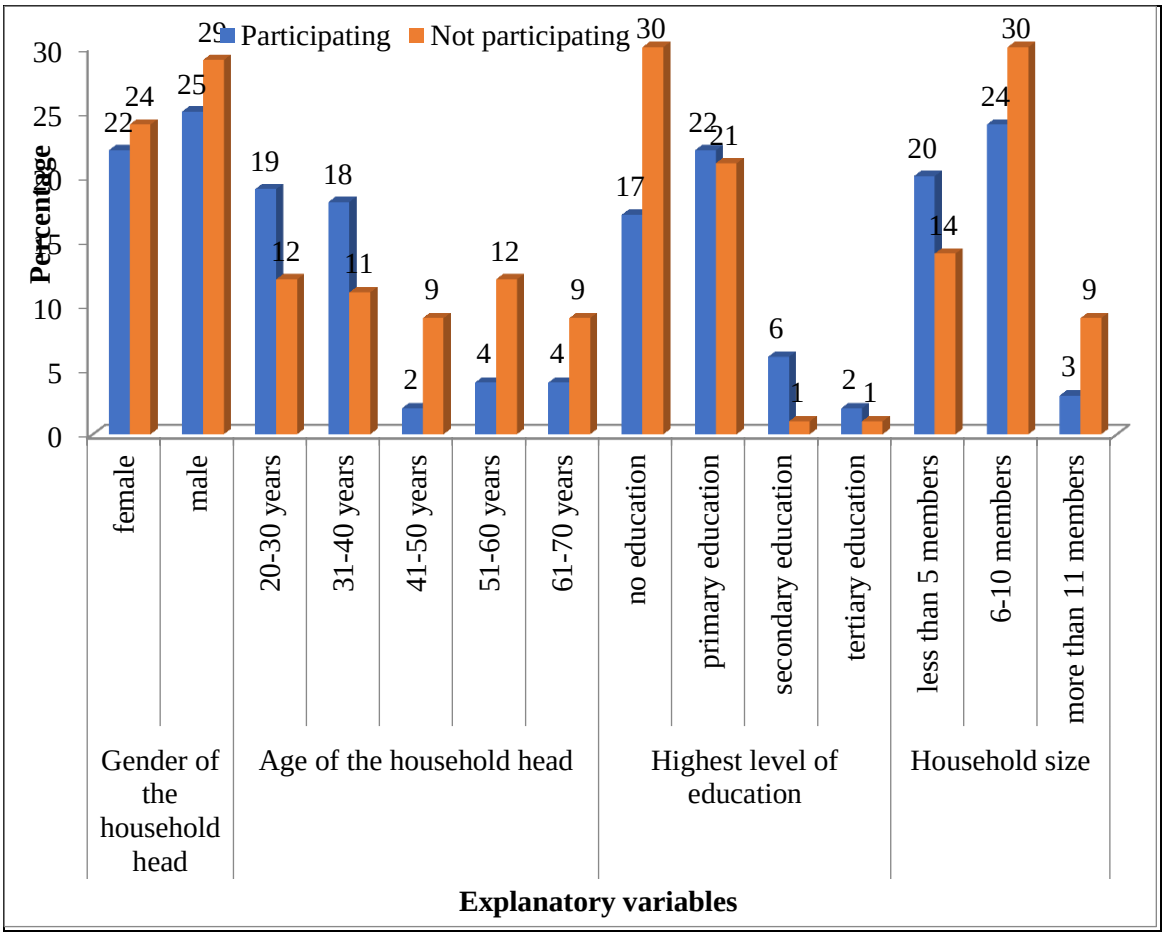

Figure 4.1 Descriptive Analysis of the Demographic Variables of Participants and Non-participants in Soil Erosion Management.

Gender of the Respondents

Figure 4.1 shows that 54 % of the respondents were male and 46 % were female. Gender of the household head was hypothesized to influence participation in soil erosion management in this study since household head is the primary decision maker in all the planning of farm activities. From the regression findings (Table 4.3), gender was found to have no significant influence on participation in soil erosion management (β= 0.82; p=0.078) at 5% level of significance (p>0.05).

Age Distribution of the Respondents

The frequency of respondent's age in relation to participation on soil erosion management activities shows that the majority of the respondents was 37(79%) were from age category of 20-40 years. The middle-aged farmers from the age category of 41-60 years who take part in soil erosion management was 6 (13%) respondents and the minority of the participants was 4(9%) respondents which was from the age category of 61-70 years who are regarded as older farmers. Age show a positive significant influence on participation in soil erosion management (β=-1.349; p=0.003) at 0.001% significance level (Table 4.3).

Education Level of the Respondents

The respondents were categorized into groups of respondents with formal education, primary, secondary and tertiary levels. This study revealed that majority of the respondents i.e 47 % had formal education, 43 % had attained primary education, 7% of the respondents had attained secondary education and 3 % had attained tertiary education level. This reflects some handicap in formal education standards in West Pokot County which requires further research because such low levels of education can affect the uptake of new innovations among farm households. Further, this regression analysis also shows that level of education reported negative significant effect (β=-2.118; p=0.015) on participation in soil erosion management at 0.05% significance level (Table 4.3).

Household Size

The research endeavored to find out about family size of respondents to verify their capability to participate in soil erosion management in terms of labour. The results as presented in figure 4.1, as the household sizes was categorized in intervals of three, the majority of respondents i.e 53 % acknowledge that they have 6-10 members, followed by the households which have less than five members with 34 % and 13 % of the households have more than eleven members.

Family is one of the social institutions that has vital role in the process of information sharing and performing collective work hence family size was hypothesized to have influence on soil erosion management since it could contributed labour force. However, from the results of this study, household size was found to have no significant influence on participation in soil erosion management at 5% level of significance (β=2.502; p=0.132) as shown in Table 4.3.

4.3.2 Socio-institutional Variables and Participation in Soil Erosion Management

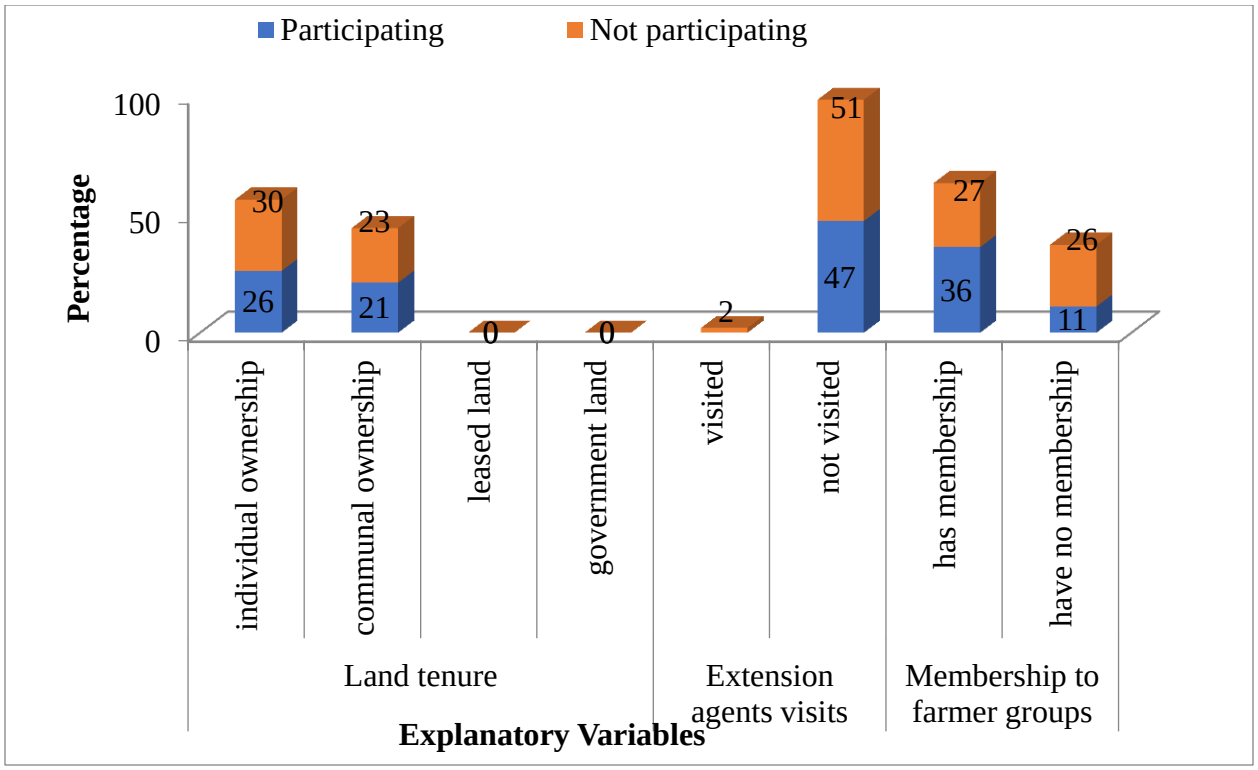

Figure 4.2 Descriptive Analysis of the Socio-institutional Variables of Participants and Non-participants in Soil Erosion Management.

Membership to Farmer Groups

The analysis of the farmer memberships to any farmer groups existing in the locality was important for this study so as to find out its influence on participation in soil erosion management. These could be formally organized groups or informal groups of people who meet regularly to talk or do an activity collectively. Figure 4.2 shows that the majority of the respondents represent 63%, who have membership in farmer groups and among them, 36% of the respondents participate in soil erosion management activities while 27% do not participate.

The minority of the respondent represents 37 % has no membership to farmer groups and among them 11% of the respondents take part in the same activities, while 26% of them do not take part in soil erosion management. This show the respondents who have

membership to farmer groups were the majority of the participants in the study. From the regression findings, membership to farmer group (β =5.007; P<0.008) recorded positive significant effect on participation in soil erosion management (Table 4.3).

Land Tenure

The finding shows that 26 (46%) respondents who own land individually take part in soil erosion management activities, whereas 30 (54%) respondents do not participate. On the other hand, 21 (48%) respondents who communally own their land, take part in the same activities whereas, 23 (52%) respondents do not participate. Land tenure were among the variables that was hypothesized to influence participation on soil erosion management. however the study findings depicted (β=-0.029; p=0.897) which shows no significance at 5% level of significance (Table 4.3).

Access to Extension Services

The study findings as represented in figure 4.2, shows that the contact between farmers and the agricultural extension staff was found to be minimal in this study. Out of the hundred interviewed farmers, 98 % of the respondents do not have access to extension services while only 2 % reported that they had received extension advice within the last two years and were given agricultural information orally. Without demonstrations and field days, the farmers perceived the information given as irrelevant to their region in relation to their soil management circumstances. The greater number of participants despite having not contacted the extension agents (47 of 98 respondents) is an indication that farmers learn from one another during the farmer visits, as many respondents explained. Access to extension services and (β=-12.717; p=0.179) which shows no

significant effect at 5% level of significance. Furthermore, most of the respondents explained their sources of information other than the extension system as illustrate in the figure 4.3.

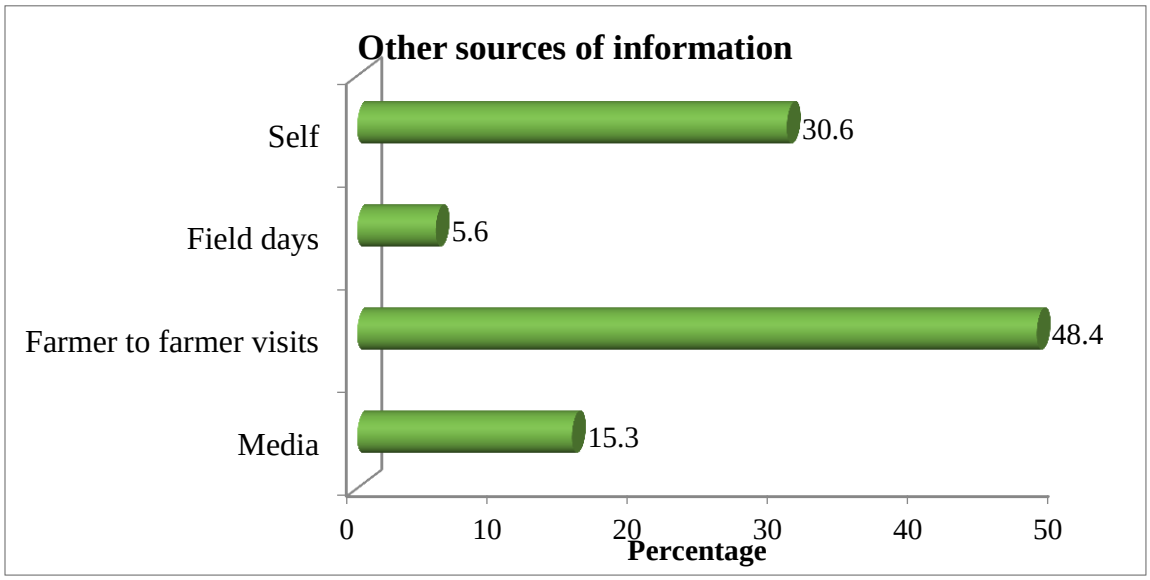

Figure 4.3 Respondent's Sources of Information

The study findings showed that information about soil management can diffuse to the farmers through other channels than from the extension system. The findings show that the majority of the respondents (48.4%) acknowledged that they get more diverse information from farmer to farmer visits. 30.6 % of the farmers acknowledged that they have their indigenous knowledge which helps them in utilization of conservation measures. 15.3 % explained that they get information from the media such as radios while 5.6 % of the respondents get information through the field days and barazas.

4.3.3 Economic Factors and Participation in Soil Erosion Management

Table 4.1 Descriptive Analysis of the selected Economic Factors

Explanatory Variables	Category	Percent	Participating	Not participating in SEM
Farm Income	Less than 10000	81	38	43
	10001-20000	11	4	7
	20001-30000	3	2	1
	More than 30000	5	3	2
Off-farm Income	Less than 10000	63	29	34
	10001-20000	2	2	0
	20001-30000	2	0	2
	More than 30000	0	0	0
Land Acreage	Less than 5 acres	39	14	25
	6-10 acres	30	14	16
	11-15 acres	20	12	8
	More than 15 acres	11	7	4
Cost of Technology	None	61	8	53
	Less than 5000	2	2	0
	5001-10,000	3	3	0
	More than 10,000	34	34	0
Credit Accessibility	Access credits	70	34	36
	Have no access to credits	30	13	17

The study sought to evaluate the income earned which support the livelihood of the respondents since the ability of farmers to participate in soil erosion management requires financing. As presented in table 4.1, the majority of the respondents earn an average of less than 10000 Ksh per month; 81 % from farm income and 94 % from the off- farm activities. Out of the respondents who have average farm income of less than 20000 per month, 42% engage in soil erosion management activities.

However, most of the respondents (50%) who earn the same average income of less than 20,000 Ksh do not take part in the same activities. The identifiable farm income sources in the area include; cattle and poultry production, fruit farming, particularly mangoes, bananas and pawpaw in the wetter areas of Chepareria and bee keeping while, non-farm

activities identified in the area also includes brick making, selling charcoal, sand harvesting, roof thatching and hand cultivation.

Income earnings of the farm households was hypothesized to influence participation on soil erosion management in this study. However, the findings as illustrated in table 4.1 clearly shows that income levels, do not dictates the participation of the farmer as it is depicted in the findings across the four income categories because there were many participants and also non-participants of soil erosion management. It is confirmed that off-farm income (β=-0.459; p=0.902) and farm income (β=0.411; p=0.605) depicted no significance influence on participation on soil erosion management at 5% level of significance.

Land Acreage

Land is an essential resource as it is the base upon which agriculture activities are carried out. Our results showed variations in land size distributions. Table 4.1 shows that majority of the respondents (39%) owned less than five acres of land. Households which owned 6-10 acres of land represents 30%, 11-15 acres represents 20% and 11 % represents the lesser number of households owned more than 15 acres of land. This shows that there is variation in land size distributions.

Credit Accessibility

Farm households who have access to and use of credit can overcome their financial constraints and invest in soil conservation measures since these activities are labour intensive and costly. Table 4.3 shows that 70 % of the respondents had access to credits

while 30 % of the respondents did not. For the farm households which did not have access to credits in financial institutions, they explained various reasons as summarized in table 4.2.

Table4.2 Credit Constraints as explained by the Respondents

Credit Constraints	Frequency n=30	Percent
Borrowing is risky	10	30.0
High interest rate	5	16.7
Too many procedures	10	30.0
Expected to be rejected	1	3.33
No assets for collaterals	4	13.3

As illustrated in table 4.2, majority of the respondents (30%) explained that borrowing is risky and also other 30 % of the respondents claim the fact that the procedures to borrow the services requires too much paperwork and are cumbersome for the farmers. The credit access problem is also attributed to the inability of formal institutions to lend to smallholder farmers due to lack of farm records, lack of tangible collateral such as title deeds, and lack of valuable assets, as explained by 13.3 % of the respondents.

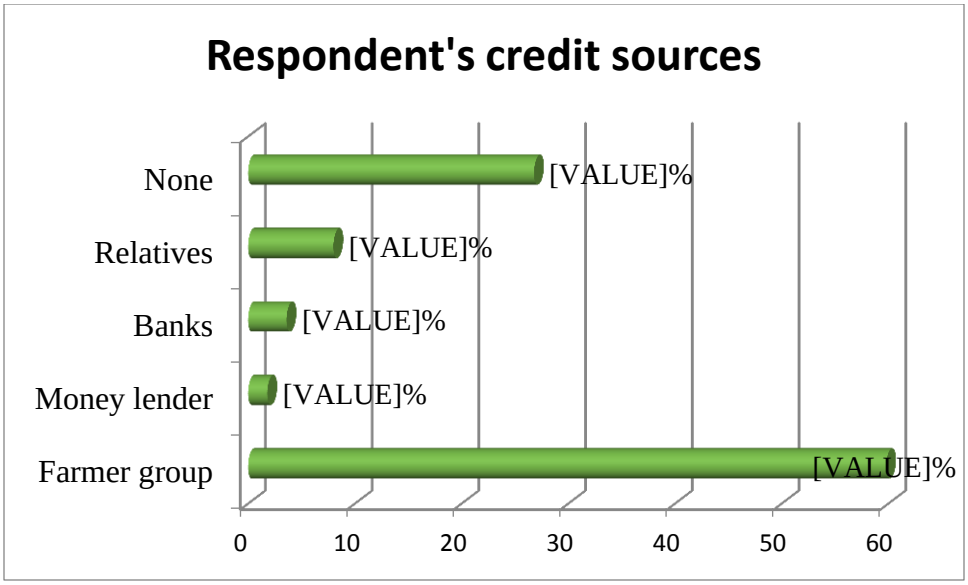

Figure 4.4 Respondents Credit Sources

As illustrated in Figure 4.4, in trying to overcome access to credit financial services obstacles from the financial institutions as illustrated in table 4.2, many smallholders' farmers resort to get access from other informal credit sources such as friends or relatives 8% and informal money lenders 1.8%, while the 59.8 % represents the greater percentage from farmer groups through which they mobilize funds to loan to each other. However, such credit is limited in amounts due to low funds mobilization restricted by membership and geographical spread.

In this study, the hypothesized proposition of access to credit on participation in soil erosion management was not supported since access to credit (β=-6.48; p=0.631) at 5% level of significance, which is translated to insignificant influence.

Cost of Technology

Cost of technology influences adoption of most technologies and on whether farmers possess the required resources and are able to invest on their preferred technologies.

Table 4.1 shows that 34(72%) of the participants on soil erosion management acknowledged that they incurred less than five thousand in implementation of soil erosion management measures, 5(10%) of the respondents incurred more than five thousand, while 8 (18%) of the respondents explained that they do not use any amount because of the availability of labour within the household. This shows that most of the farm households earn the income of less than five thousand; hence they have no capability of getting indulge in costly technology such as structural measure for example, sand dams.

Soil erosion management is considered as costly as it is labour intensive in construction and maintenance; construction materials, required trainings before implementation and time consuming hence, cost of technology was hypothesized to influence participation by farm household in soil erosion management. From the study findings, however the cost of technology depicted a strong significant effect on participation by farm households in soil erosion management activities (β=19.53; p=0.00) at 1% level of significance.

4.4 Inferential Statistics

The binary logistic regression model was used in the study to test the hypothesis, to test the effect of the selected factors on participation by farm households in soil erosion management and to validate the conclusions basing on the findings of the study. It is a statistical procedure that measures the effect of every independent variable on the dependent and is useful in forecasting. The regression formula that best describes the relationship between the variables, from the findings, is as defined below.

Participation on SEM=-49.245+0.82X_1+-2.118 X_2+-1.349 X_3+2.205 X_4+-1.76X_5+19.532 X_6+0.411 X_7+0.469 X_8+-6.482 X_9+-0.029 X_{10}+-12.717 X_{11}+5.007 X_{12}

Table 4.3 Regression Analysis of the Selected Variables on Participation in Soil Erosion Management

				Collinearity statistics	
VARIALES	**B**	**P-Value**	**Odd Ratio**	**Tolerance**	**VIF**
GEN (X1)	0.82	0.879	2.27	0.876	1.142
AGE (X2)	-1.349	0.003*	3.85	0.903	1.107
EDU (X3)	-2.118	0.015*	0.12	0.847	1.181
HH SIZE (X4)	2.502	0.132	12.20	0.811	1.234
L ACREAGE (X5)	-1.76	0.036*		0.923	1.083
FARM I (X6)	-0.411	0.605	0.66	0.783	1.277
OFF-FARM I (X7)	0.469	0.902	1.59	0.845	1.184
CRDT (X8)	-6.48	0.631	0.00	0.596	1.677
L TEN (X9)	-0.029	0.897	0.97	0.845	1.183
EXT (X10)	-12.717	0.179	0	0.924	1.083
MEMBR (X11)	5.007	0.008*	14.94	0.525	1.905
COST (X12)	19.532	0**	3.04E+0	0.905	1.105
CONSTANT	-49.245	0	0		

Model Chi-square=122.0 - Chi square=0.49
Nekelkerke R^2=0.942 - Significance =1.00
Hosmer and lemeshow test - Cut value=0.

4.5 Model Diagnostic Test

The binary regression analysis results were satisfactorily accepted since the model used was then tested to confirm that the assumptions of the model was not violated. The test findings are as explained below.

4.5.1 Model Multi-collinearity Test

The variables included in the binary logistic regression model were tested for multi-collinearity by subjecting to linear regression analysis and examining the tolerance value and the Variance Inflation Factor (VIF). Menard (2000) and Chen et al, (2008)

recommends that a tolerance value of <0.1 shows extreme collinearity while a VIF >5 is of greater concern (Mansfield & Helms, 1982). The standard errors are inflated while the power of analysis become weak when the variables included in the model are linearly dependent (Craney & Surles, 2002). From the analysis of this study, the tolerance values of all the variables were > 0.1 and VIF was <5 (Table 4.3). This indicates that there was no multi-collinearity between the predictor variables of the study.

4.5.2 Model Goodness-of-Fit Test

The model Chi-square and the chi-square Hosmer and Lemeshow Test was used to test the goodness-of-fit of the model. Hosmer et al, (2013) explained that there is a poor fitness if the significant value is < 0.05. In addition, Bentler and Bonett, (1980) also explained that a high Chi-square value indicates the variables in the model significantly impact the dependent variable. The overall significant value from the findings was 1.0 (>0.05) and a Chi-square value of 0.459, this translates to good fitness of the model (Table 4.3).

4.5.3 Model Strength of Prediction Test

The strength of association was measured using Nagelkerke pseudo R2 as recommended by (Hu et al., 2006) which stated that values from 0 (shows the weakness in predicting the dependent variable) to 1(the model accurately predicts the dependent variable) as explained by Hoetker, (2007) and Mukherjee et al, (2013). From the study findings, the Nagelkerke R2 was 0.942, hence the model showed a strong accuracy of explanatory variable in predicting the dependent variable.

CHAPTER FIVE

DISCUSSION OF THE STUDY FINDINGS

5.1 Overview

This chapter interprets findings obtained in relation to other studies

5.2 Influence of Social demographic and Institutional Factors on Participation in Soil Erosion Management

The majority of men was because men are the heads of the households as they were identified by the community as the ultimate decision makers. However, 46 % of female being involved in land management showed the affirmation that women are gradually taking over in decision making on land management practices. Most of the women explained that they have membership to farmer groups in which they can learn from other member's experiences and thus taking concern on soil erosion management. However, gender did not show any significant effect on participation in soil erosion management.

The study sought to probe the age of the respondents to determine their experiences and interest on soil erosion management. From the study findings, the older group of farmers implies that they are no longer actively engaged in soil erosion management activities due to their advancing age and they have left the responsibilities to the young members of their families, as most respondents explained. The inferential statistics shows that age have significant influence on participation in soil erosion management (β=-1.349; p=0.003) at 0.001% significance level. This shows that as the age of a farmer increases, the probability of taking part in soil erosion management also decreases. This findings concurs with Mwase et al. (2015) and Bocqueno et al. (2015) which explained that

younger farmers are risk-takers and are more willing to try new techniques since they have longer development aspiration and they invest in soil and water conservation. However this disagrees with study done in Embu West by Muchangi, (2016) on farmer's characteristics, which concluded that older farmers have gained knowledge and experience over time and are better able to evaluate new information than younger farmers hence easily adopt new technologies.

The study also sought to examine the level of education of respondents to assess their knowledge of soil erosion and the participation on its management. The regression analysis also shows that level of education reported negative significant effect (β=-2.118; p=0.015) on participation in soil erosion management at 0.05% significance level (Table 4.3). This shows that farmers who have attained higher education level are 0.12 times less likely to invest in soil erosion management activities. This was attributed by the fact that there is low level of educational attainment of farmers in the area, while most of the respondents who had no education and some with primary education were mostly confined in the farms due to their obligations of meeting food demands for their families and so, taking concern in soil erosion management.

In addition, they have the indigenous knowledge and can acquire other information from farmer to farmer visits as it was founded from this study, hence increase in participation. The study findings also disagrees with Omodona, (2016) which explains that as formal education increases, the level of technology uptake and utilization increases since the educated can read, understand and comprehend information about available technology and make choices than those who have no formal education.

From the findings, gender had no significant effect on participation on soil erosion management. This was attributed by the fact that they all participate in these management activities.

Plate 4.1 Farmers Participatory Work in Soil Erosion Management in the Study Area. (Source: Author,

The insignificant effect was also attributed by the contribution of both male and female headed households in management of soil erosion and mostly confined in the farms due to their obligations of meeting food demands for their families as most respondents explained (plate 4.1). This disagrees from the norm that, females are disadvantaged economically in decision making and planning of farm activities.

The computed p-values showed that only membership to farmer group shows positive significant influence on participation in soil erosion management. This explains that farm households who have members in farmer groups are able to invest in soil erosion management 14.9 times than the households who do not have the membership. Farmers

consider most of the soil conservation management as laborious and time consuming (Anley *et al.,* 2007). Hence, farmers who are in groups tend to work together in management activities share their knowledge, experiences thus, reducing time spend and also saving on cost as it is confirmed by Wangari (2015).

The identified farmer groups in the area include Chomyo group, SLCK group, Kabor group among others. It was noted that most farm households who have membership in the farm households, take part in soil erosion management activities.

The study findings correlates with a study by Indeche and Ondieki- Mwaura (2016) on the influence of farmer's socio-economic characteristics found that the stronger the networks the more likely the farmer has the chance to see innovations from among his/her networks in on implementation of sustainable agriculture practices (SAPs) on rice farming in Mwea, Kirinyaga County. This promotes peer discussion of new ideas, because farmers can evaluate information about the innovation, enhancing sharing of experiences which empower them in decision-making. Similarly, membership to farmer groups has also been found to promote utilization of soil fertility management technologies in Meru South district, Kenya (Kimaru-Muchai, 2013). Further, Sebatta *et al.* (2014) also found that belonging to a farmer's group significantly influenced the extent of farmers' participation in Banana and potato markets.

The study findings shows that owning the land individually or communally do not dictate farmers' decision in participation on soil erosion management activities.

5.3 Effect of Economic Factors on Participation by Farm Households in Soil Erosion Management

As explained by Tittonell *et al.* (2010) that land size is often used as an determinant of wealth and influence utilization of agricultural technologies. Land acreage was then hypothesized to influence participation on soil erosion management in this study. Therefore, the study findings supported the hypothesized proposition since land acreage showed a negative significant influence in participation on soil erosion management. This explains that the farmers owning larger land acreage are 0.172 times less likely to take part in soil erosion management. The study found out that farmers with smaller pieces of land, devoted their time and much concern on soil erosion management to acquire maximum benefits since they have no other farms, as most respndents explained. Hence these findings disagrees with the studies by Tesfaye *et al*. (2014) which explained that the uptake of Soil and Water Conservation technologies increased with increase in acreage of land since they can manage large land size and can allocate part of the land for soil conservation than those who have smaller farms. Also, Obiero (2013) argue that farmers with large farms are likely to be aggressive in accessing for information on improved technologies. Soil erosion management is considered as costly as it entails labour intensive in construction and maintenance; construction materials, required trainings before implementation and time consuming hence, cost of technology was hypothesized to influence participation by farm household in soil erosion management.

The findings by Mariano *et al.* (2012) confirmed that wealthier farmers are easy to afford and implement technologies that require more capital. The cost of technology from the

regression analysis, therefore, shows a strong significant influence on participation by farm households in soil erosion management activities. Most respondents explained that they summed up their farm and off-farm income so that they can afford and invest more in the sustainable soil erosion management strategies which are considered as expensive. Therefore, the farmers should be strengthened in the social groups that they are actively participating in, to improve in their financial capital and invest in these sustainable strategies.

CHAPTER SIX

CONCLUSION AND RECOMMENDATIONS

6.1 Conclusion

Soil erosion is known to be the major factor on environmental issues in the developing world especially in the tropics because of different reasons. Therefore, analyzing factors that influence participation by farm households in soil erosion management activities was essential. The study findings on social aspects depict that age, education level of the respondents and membership to farmer groups were the main factors which showed significant influence on participation in SEM. The majority of the participants were young, and middle-aged groups of farmers, with low level of formal education, were regarded as active and energetic farmers who could engage in soil erosion management activities since they were devoted in learning from others experiences during the farm visits, as many respondents explained.

Among the economic variables, land acreage and the cost of technology were the main variables, which showed significant influence on respondent's participation in soil erosion management. From the findings, it was revealed that most households have invested in management measures which are labor-intensive and expensive such as micro-catchments as farmers regard as sustainable unlike live plants such as euphorbia, sisal, and aloe vera.

Therefore, socio-economic factors contribute significantly in determining the farmer's decision to participate in SEM. Hence, to invest and take part in soil management sustainably, the government and NGO's in collaboration with the development partners should take into consideration the involvement of local community when designing

management interventions and accommodating their socio-economic status and needs to achieve maximum community participation and a sense of ownership.

6.2 Recommendations

The government should consider the registered farmer groups in terms of flexibilities in formal institutions to allow smallholder farmers get access to credits to promote community investment on more sustainable measures such as sand dams, terraces, gabions. The farmers who do not have any membership to farmer groups also should be encouraged to join for them to work collectively while sharing experiences, aiming at rehabilitating their farmlands to restore the soil production capacity. The young and middle-aged farmers also should be encouraged and inducted on other sustainable soil management techniques, hence integrating indigenous and scientific knowledge.

Besides, from the regression analysis, the adjusted R2 of the selected socio-economic variables shows their contribution to participation in soil erosion management was 74.2% (Appendix II), this indicates that there exist other factors that might be influencing the involvement of these management activities. Thus, this study recommends that further studies should be done to validate the conclusions of this study.

The study findings also creates a challenge also to land-use planners and other development practitioners to investigate other significant factors contributing to soil erosion management practices, intercede thus encouraging community participation in aim of lessening the erosion rates and improving ecosystem functioning at national and local environment.

The local community socio-economic status should be strengthened, and community should be empowered with the right skills and knowledge to enable them effectively participated in SEM.

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APPENDIX I: Household Questionnaire Survey

Introductory Statement

My name is Cherono Janeth, Msc student at University of Eldoret. I am doing a research on the topic titled "Factors Influencing Participation by Farm Households in Soil Erosion Management in Chepareria Ward, West Pokot County". I am collecting data to assist in the research and I kindly request you to respond to the questionnaire so as to help me get information in order to achieve the objectives of the study. All the information supplied will be treated confidential and will be used purposely to improve agricultural productivity, ecosystem management and economic welfare of the people of West Pokot County and other regions.

Administrative Units

County	**West Pokot**
Location	
Sub location	
Village	
Questionnaire number	

PART A: Background Information of the Respondent – Effect of Social demographic Factors in Participation by Farm Households soil erosion management in Pokot South, West Pokot County.

1a. Household Identification

Name/contacts of the Household Head	
Sex of the Household Head 0= Female 1=Male	

b. Respondent's age and the level of education

i. What is your age bracket?

1=20-30 years [ ] 5= 61-70 years [ ]

2=31-40 years [ ]

3=41-50 years [ ]

4=51-60 years [ ]

ii. What is your highest level of education?

0= No education [ ] 2=Secondary education [ ]

1=Primary education [ ] 3=Tertiary education [

iii. What is the size of your household?

1= Less than 5 members [ ] 3= More than 11 members [ ]

2= 6-10 members [ ]

PART B: Effect of Economic Factors in Participation by Farm Households in Soil Erosion Management in Pokot South, West Pokot County

i. What is the total acreage of land owned by the household

1= ≤5 Acres [ ] 3=11-15 Acres [ ]

2=6-10 Acres [ ] 4=≥15Acres [ ]

ii. Household Income Sources(On farm/Off farm income) per month in Ksh

a. How much income do you earn per month on average from farm sources?

1= less than 10000 [ ] 3=20001-30000 [ ]

2=10001-20000 [ ] 4=More than 30000 [ ]

b. How much income do you earn per month on average from your off-farm employment?

1= less than 10000 [ ] 3=20001-30000 [ ]

2=10001-20000 [ ] 4=More than 30000 [ ]

iii. **Household Credit Accessibility, Sources and Constraints.**

a. Did your household have access to credits?

0=No [ ] 1 =Yes [ ]

b. If no, what might be the reason?

1=Borrowing is risky [ ] 3=Too much procedures [ ]

2=Interest rate is high [ ] 4=Expected to be rejected [ ]

c. If yes, specify your credit source?

1. Farmer group [ ]
2. Money lender [ ]
3. Banks [ ]
4. Relatives [ ]
5. No asset for collateral [ ]
6. Other, specify……

PART C: Effect of Socio-Institutional Factors in Participation by Farm Households in soil erosion management in Pokot South, West Pokot County

a. Land tenure

i. In which statutory tenure is the land you owned registered?

1= Individual land ownership [ ] 3= Leased land [ ]

2= Communal land ownership [ ] 4= Government land [ ]

ii. Is your farm household having flexibility in land use and freedom in land management?

0=No [ ] 1 =Yes [ ]

iii. Do you have a secure land tenure right which shows your land ownership i.e title deed

0=No [ ] 1 =Yes [ ]

b. Extension services

i. Have you ever been visited by Agricultural extension agents who discussed on soil erosion management in the last one year?

0=No [ ] 1 =Yes [ ] - If no, skip to (Question iii)

ii. If yes, what is their frequency of visits to your farm?

1= Weekly [ ] 2= Monthly [ ] 3= Yearly [ ]

iii. How do you rate their importance of extension services as methods of improving farming practices?

1=Very important [ ] 3= Important [ ]

2= Not important [ ] 4= Don't know [ ]

iv. What methods do they use to disseminate information to you?

1= Oral information [ ] 3= Use of charts [ ]

2= Demonstration [ ] 4=Video [ ]

v.Apart from Extension agents, what are the other sources of information concerning soil erosion management that has been of importance to your farm household?

1=Media [ ] 4=Self [ ]

2=Farmer to farmer visits [ ] 5=Others(specify)……..…

3=Field days [ ] ……

c. Membership to Farmer Group

i. Do you belong to any farmer group within your locality?

0= No [ ] 1=Yes [ ]

ii. If yes, name these farmer group/s

1…… 2……

iii. What is your frequency of attending the meetings conducted by these farmers groups?

1= Rarely [ ] 2= Sometimes [ ] 3= Often [ ]

iv. How membership / association to farmer group mentioned above, contributes to soil erosion management in your locality?

1= Information sharing [ ] 3= Collective actions [ ]

2= Social capital [ ] 4=Other,specify……

PART D; Participation of farm households in soil erosion management in Pokot South, West Pokot County

I. How can you rate the landscape status on your farm?

1= Very severe [ ]2= Severe [ ]3= Moderate [ ]4=Not eroded [ ]

II. Do you participate in soil erosion management within your farm household?

0= No [ ] 1=Yes [ ] If No, move to (Question number vii)

III. Which soil erosion management measure have you implemented?

1. Terraces [ ] 4. Stonelines [ ]
2. Micro-catchments [ ] 5. Others,specify……
3. Live fences [ ] ……

IV. What is the cost incurred during implementation of this measure (ksh)?

.....

V. How is the effectiveness of the measure mentioned above in rehabilitation of your farm?

1=Not effective [ ] 3=More effective [ ]

2=Less effective [ ]

VI. What motivates you to participate in soil erosion management?

1= Perceived benefits of land restoration [ ]

2= Awareness was raised and most members participated [ ]

3= Due to reduced soil production capacity in my farm [ ]

4= Sense of ownership [ ]

5= Others,specify……

VII. If you are not participating, what could be the problem?

1= I have no time [ ]

2= Socio-cultural values e.g gender freedom of mobility, decision making [ ]

3= The household size is small thus no availability of labour [ ]

4=Not informed of the impacts of soil erosion [ ]

5=Others(specify)……

…….……..……

APPENDIX II: Analysis of Variance and Model Test

a. Dependent Variable: participation in soil erosion management

Model		Sum of Squares	df	Mean Square	F	Sig.
1	Regression	14.560	12	1.213	54.172	.000[b]
	Residual	2.220	87	.025		
	Total	54.810	99			

ANOVA[a]

a. Predictors: (Constant), cost incurred, farm average off-farm average income, household size, membership to target groups

Model	R	R Square	Adjusted R Square	Std. Error of the Estimate
1	.919[a]	.773	.745	.15848

Model Summary

Omnibus Tests of Model Coefficients

		Chi-square	df	Sig.
Step 1	Step	122.176	12	.000
	Block	122.176	12	.000
	Model	122.176	12	.000

Model Summary

Step	-2 Log likelihood	Cox & Snell R Square	Nagelkerke R Square
1	16.094[a]	.705	.942

a. Estimation terminated at iteration number 20 because maximum iterations has been reached. Final solution cannot be found.

Hosmer and Lemeshow Test

Step	Chi-square	df	Sig.
1	.459	8	1.000