FACTORS AFFECTING FARMERS' DECISION ON SOIL AND WATER CONSERVATION IN SULULTA WOREDA, OROMIA NATIONAL REGIONAL STATE, ETHIOPIA

BY SAMUEL TINSAETESSEMA

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This is to certify that the thesis prepared by Samuel Tinsae, entitled *Factors Affecting Farmers' Decision onSoil and Water Conservation Structures in Sululta Woreda, Oromia National Regional State, Ethiopia,*in partial fulfillment of the requirements for the Degree of Masters of Arts in Social Anthropology complies with regulations of the University and meets the accepted standards with respect to originality and quality.

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List of Acronyms

CBWM..... Campaign-Based Watershed Management

DA ..... Development Agent

FGD..... Focus Group Discussions

MoARD..... Ministry of Agriculture and Rural Development

MoWR..... Ministry of Water Resources

Definitions of Important Terms

Demolish:- Damaging the stone bund from the farm land purposely for various reasons.

Ignore:- Leaving the stone bund as it is after it is constructed (not maintaining and not demolishing the stone bund).

Kebele:An administrative division below Woreda and above *Got.*

Maintain:- Rebuild/reconstruct a structure

Structure:- A stone bund (locally named Daagaa) farmers construct on their communal or farm land to control run-off

Woreda: An administrative division in the past below *Awraja* since 1991 which is a vast administrative division below *Zone* and above *Kebele.*

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Abstract

In this thesis, attempt has been made to explore factors that influence farmers' decision on Soil and Water Conservation (SWC) structures in Keta Welele and Wererso- Nono Mene AbechuKebelesof Sululta Woreda, Oromia National Regional State, Ethiopia. Watershed works in Ethiopia has three phases-planning, implementation and post implementation. This thesis focuses only on the third phase which is the maintenance of SWC structures constructed through community mobilization on the farmers' plot of land.In order to gather reliable and valid information, care was taken in designing research methodology as well as in carrying out the research. Methods, data sources and instruments were triangulated. Household survey, in-depth interview, key informants interviews and focus group discussions were methods of primary data collection, while different published and unpublished materials were used as sources of secondary data.The finding shows that farmers' maintenance decision of SWC structures was influenced by farmers' awareness about SWC structures, topography of the land, place of residence of the household head and dependence on the land. Those farmers who perceive SWC structures positively are more interested to maintain structures. Some of the benefits SWC structuresmentioned by farmers include controls soil erosion, help in moisture retention, improves soil fertility and increase inagriculturalproductivity.There are some farmers who perceive SWC structures contributes for infestation by rats which could damage the product. These farmers are not interested to maintain SWC structures. Farmers whose lands are steep slope are interested to maintain SWC structures as compared to farmers whose land is gentle slopebecause such types of land are exposed to soil erosion. In addition, farmers permanently living in the Kebele/rural are inclined to maintain SWC structures as compared to those living outside the Kebele for other task in town which in turn contributes for less attention to SWC works. Added to these, farmers cultivating their own land are interested to maintain structures as compared to those farmers who rented a land from others. Again, engagement in off-farm activity was the other factor that influenced farmers decision to maintain SWC structures. Farmers engaged in other off-farm activities are less interested to maintain SWC structures.Based on the finding, there are suggestions for areas of improvement identified during the study to increase the effectiveness of SWC works which include, awareness raising and experience sharing among farmers to increase awareness about the benefits of SWC structures and strengthening the extension service provided by agricultural extension workers and follow up by theKebeleadministration.

CHAPTER ONE

INTRODUCTION

1.1. Description of the Study Area

The research was conducted in Sululta *Woreda*, Oromia National Regional State. The *Woreda* is bordered on the North by Semien Shewa Zone, on the South by the city of Addis Ababa, on the West by the Mulo and Mirab Shewa Zone, and on the East by Bereh. The *Woreda* is characterized by the Sululta plain, which is wide, shallow valley with an elevation of 2,500 meters above sea level. The total area of the Woreda is 1151230545.08 sq.km (115123.0545 hectare). Whereas the area of Keta-Welele *Kebele* is 39896826.4601 Sq.km (3989.6826 hectare) and Wererso-Nono Mene Abechu *Kebele* is 73823529.1604 Sq.km (7382.3529 hectare)

According to the population projection of Oromia Region BoFED based on the 2007 population and housing census result, an estimated total population of the *Woreda* is 116,870, whom 58,587 were males and 58,283 were females in the year 2016. According to Sululta *Woreda* Agriculture Office (2016), the major soil types of the *Woreda* are sandy soil (53%), silt soil (35%) and clay soil (12%). Vegetation varies widely both in space and time, and is closely dependent on rainfall. Annual rainfall is between 834 mm and 1,447 mm and the annual temperature ranges from $4.4c^0$ and $25.5c^0$.

According to Sululta *Woreda* Agricultural office (2016), the major soil natures of the district are silt soils (35%), clay soil (12%) and sandy soil (53%). The three soils are found on the highland areas, and they are red, brown and black brown in colors and on sloping terrain and their utilization are good under natural vegetation.

Vegetation varies widely both in space and time, and is closely dependent on rainfall. Evidences from Sululta *Woreda* Agricultural office (2016) indicates reliable sources of grass with high productivity are high in area and widely scattered. The woody vegetation is also considerably influenced by rainfall variability, but the density of tree and bush cover is low. Sululta *Woreda* has a wide variety of wildlife like hyena, monkey, ape, leopard, Columbus monkey, tortoise, fox, civet cat, and rabbit. However, in the Sululta *Woreda* there is no any reserved area for wildlife conservation. The major source of domestic energy supply in the *Woreda* is fire wood, crop residue and charcoal.

Agriculture is the backbone of the society. Agricultural type is traditional subsistence mixed farming that combines crop cultivation and animal rearing. The farming aims at producing different crops only for consumption. The major crops grown are *Teff*, wheat and barley from cereals and haricot beans from pulses and linseed seeds. Livestock production has supported here for many generations and animals are now supplied to a variety of domestic and export markets.

Generally, there are some developmental activities in the study area; the major ongoing projects and programs in the Sululta *Woreda* are through both government and non-government like; some small-scale projects expansion of potable water supply, schools, health institutions, extension services, rural roads, and others are under operation in the *Woreda* in the year understudy.

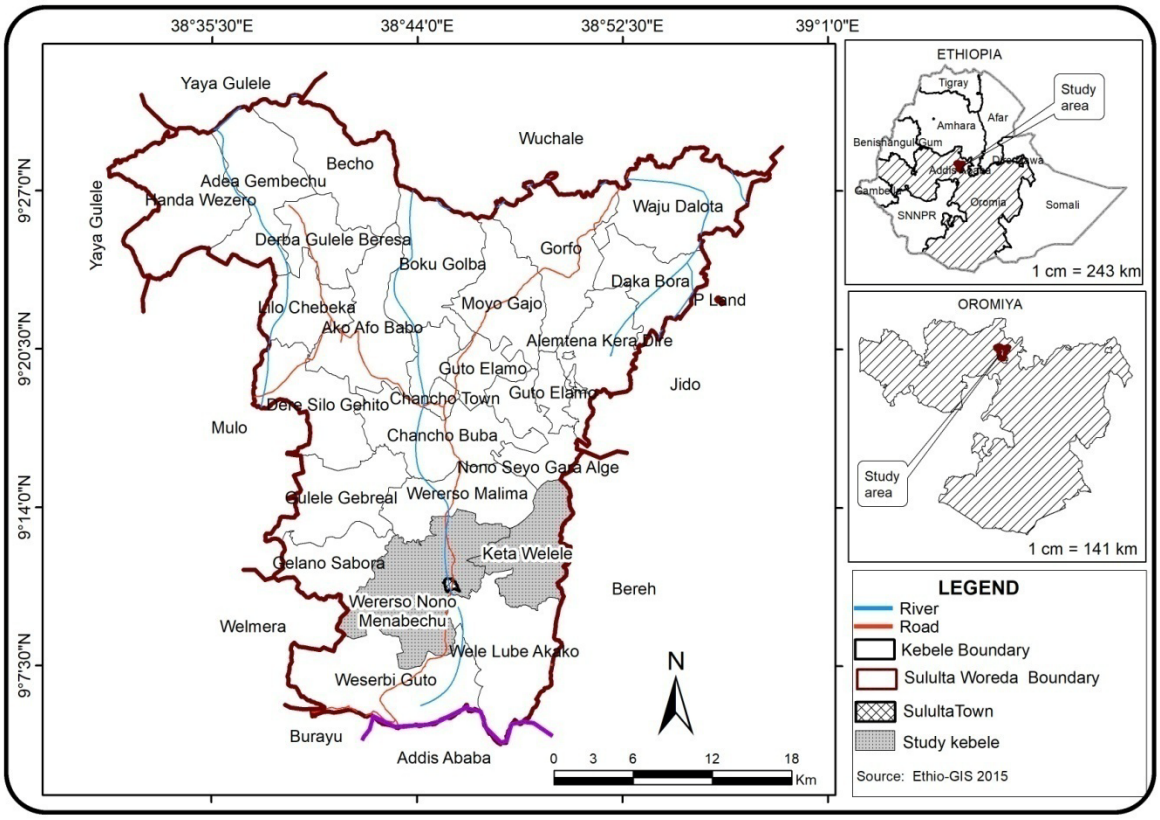

Figure 1: Map of the study area: Ethiopia, Sululta Woreda, and *Kebeles* (Source: GIS 2015)

1.2. Background of the Thesis

Land degradation is often cited as one of the key factors underlying Ethiopia's low agricultural production and productivity, unrelenting food insecurity, and poverty (Desta, Kassie,Benin and Pender, 2000; Taddese, 2001; Berry, 2003; Asefa and Zegeye, 2003; Rahmato and Assefa, 2006). It is estimated that some 30,000 hectaresof land are annually lost due to water erosion, with over 2 million hectares already severely damaged. Similarly, 62,000 hectares of forest and woodland are estimated to be cleared annually (MoARD, 2008).

In order to respond to land degradation, successive governments of the country have introduced land management practices since 1970s, including soil and water conservation, soil fertility management, controlled-grazing, and afforestation (Gebremedhin, 1998). However, the impact of these efforts did not curb the problem of land degradation in a meaningful and sustainable manner due mainly to governments' top down approach and inappropriate structures (Bewket and Sterk, 2002), focus on technical and physical works alone (Zeleke, 2006), focus on a relatively larger watersheds (Desta, CarUCCi, Wendem-Ageliehu, Abebe, 2005), and failure to consider indigenous land management practices (Amsalu and De Graaff, 2006a). Hence, it can be said that previous land management interventions failed to achieve their targets largely because of poor planning and management practices, and lack of community participation.

The current government has put in place different policies, programs and initiatives that are geared towards the maintenance of natural resources(through watershed management) for improved rural livelihoods and food security situation. These include Food Security Strategy (1996, 2002), the New Coalition for Food Security Program (2003), Rural Development Policy and Strategies (2001), Ethiopian Water Sector Policy (2001) and the Ethiopian Strategic Investment Framework for Sustainable Land Management (2008).

As Degefa (2005) indicated, the Food Security Strategy is designed to address both food availability and entitlement. The food availability dimension of food security is presumed to be achieved through improved agricultural production and productivity, which depends on the availability of environmental resources. The strategy acknowledges the need to rehabilitate environment to reverse the current trend in land degradation. Such effort is also believed to enhance the income of food insecure households. It also presents the need to focus on watershed

based water harvesting and introduction of high value crops, livestock, and agro-forestry development in chronically food-insecure and moisture-deficit areas (FDRE, 1996).

The 2003 New Coalition for Food Security Program identifies recurrent drought and environmental degradation as essential factors of food insecurity. As a remedy, it emphasizes the resettlement of people from degraded and drought prone regions into regions with better potential (MoRD, 2003).

The 2001 Rural Development Policy and Strategies of Ethiopia indicate the importance of land management for sustainable agricultural development: farming and livestock production. It envisages to promote participatory natural resource conservation and management to benefit communities concerned. The policy highlights need to improve land productivity through different conservation and rehabilitation mechanisms as well as rational utilization of the country's land resource. In addition, it underscores the importance of water conservation and rational utilization, particularly in arid and semi arid areas of the country (MoFED, 2003).

The Ethiopian Water Sector Policy that was introduced in 2001 identifies watershed management as one of the strategies to enhance national efforts towards the efficient, equitable and optimum utilization of the available water resource for significant socioeconomic development on sustainable basis. The policy ensures that watershed management practices constitute an integral part of the overall water resources management. It promotes practices of efficient and appropriate watershed management to maximize water yields and quality. The policy also recognizes the importance of involving stakeholders, particularly local communities in the relevant aspects of water resource management (MoWR, 2001).

The Ethiopian Strategic Investment Framework for Sustainable Land Management was proposed in 2008 to serve as a national strategic planning framework. It calls for an alternative approach based on multi-sectoral partnerships in which the different stakeholders seek to harmonize and align their investments to address the interlinked problems of poverty, vulnerability and land degradation in rural communities. The framework has dual objectives: rebuilding natural capital, and improving livelihoods and economic well-being of farmers and herders (MoARD, 2008).

According to Assefa et al (2019), these interventions can be divided into two: project based (with incentive) and non-project-based (without any form of remuneration).In the case of the project based, local communities are encouraged to participate mainly through food for work activities. This approach has been practiced by government and Non-governmental organizations in food deficit areas of the country. The non-project based is campaign-based watershed management intervention. This approach requires each household to participate in watershed management activities for 30 to 40 days every year. The activities are carried out without incentives through the coordination of Woreda administration, *Kebele* administration, development agents, extension workers, watershed management committees, and leaders of development teams (Assefa et al., 2019). Campaign-Based Watershed management involves constructing soil and water conservation structures (SWC) both on communal land and farmland.It has three main elements: (1) identify one or more micro-watersheds every year, (2) construct SWC structures and plant tree seedlings in the micro-watersheds, and (3) enclose the micro-watersheds and hand them over to associations who will use, protect, or maintain the micro-watersheds.

The government has been promoting the latter approach at wider scale since 2010/11. Between 2010/11 and 2013/14, soil and water conservation activities alone were carried out in 16.3 million hectares of land in the country. The construction of SWC structuresthrough mass mobilization of farmers in different *villages* are great successes of the Campaign-Based Watershed management Program (Assefa et al., 2019).

Though sustainable watershed management presupposes maintenance of the structures built both on the communal land and farmland, maintenance of SWC structures constructed through mass mobilization of farmers or campaign works is questionable (Assefa et at., 2019). In this regard, understanding factors that could influence farmers maintenance decision is critical. Thisthesis is aimed at explaining factors affecting farmers' maintenance decision of SWC structures constructed on private farmlands. The study was conducted in Keta-Welele and Wererso-Nono Mene Abechu *Kebeles* in Sululta *Woreda*, Ethiopia.

1.3. Statement of the Problem

In their study of farmers' willingness to participate in campaign-based watershed management in Boset District, Ethiopia, Assefa et al (2019) have assessed farmers' perception of the outcomes of theCampaign-Based Watershed Management (CBWM) program in Ethiopia and how this influencestheir willingness to participate in the program. Their findings showed that the construction of SWC structures, planting tree seedlings, and area closures haveimproved biophysical and socio-economic conditions in the study area. However, farmers' perceivedoutcomes of the program hardly motivated them to participate in the program. Particularly, physicaleffects of the program as perceived by the farmers demotivated them to continue participating in theprogram. This was especially due to the limited direct biophysical

benefits of the program to farmhouseholds, and the destruction of previously developed micro-watersheds by frequent run-off fromneighboring *Kebeles* and human and animal disturbances. The only motivating outcome of the programconcerned its effect on personal capacities, which was particularly appreciated in localities that werevulnerable to erosion. This means farmers who obtained skills on how to construct SWC structuresand those who startedconstructing SWC structures on their own farmlands were more motivated toparticipate in the program.But the study focused more on the planning and implementation aspect of campaign-based watershed works, giving less attention to the post implementation aspect/maintenance of SWC structures at farmers' plot of land.

The effectiveness and networks among actorsand rules in use could influence the participation of households in the collective action for watershed development. Hence, attempt to understand factors of successful watershed development without proper analysis of actors and institutions will be incomplete. The ineffectiveness of regional, district, and local administrative bodies to promote watershed development activities have been cited as an obstacle for watershed development (Zeleke, 2006; Kacho and Asfaw, 2014). But this study focused on the role of actors in collective watershed development, disregarding their role in effective watershed development works at farmers' plot level such as the maintain structures (stone bund) constructed at farmers plot.

Others studies showed that watershed management have generally overlooked the attributes of communities: size, heterogeneity and social capital. They focus on how the attributes of community affects sustainable management of common grazing lands through access restriction

and regulating use (Benin and John, 2006). This study also focused on the influence of attributes of community on common grazing land, giving less attention at farmers' plot level.

Households' perceived characteristics of watershed and recommended technologies for its management are posited to affect the participation of households in collective watershed management. Though not consistent, land size, land fertility, vulnerability to water erosion, and land slope were identified as attributes that influence farmers' adoption of land management practices on their own plots (Amsalu and De Graaff, 2006; Adimassu et al., 2012; AgWater Solutions, 2012; Tafa et al., 2014). This paper tries to assess whether these attributes affect farmers' maintenance decision in soil and water conservation structures at the households' plot of land in the study areas.

Another study by Wolka et al (2015), in Bokole and Toni sub watershed in Southern Ethiopia showed that in Bokole sub-watershed, the age of the household head, education level, farm size, frequency of Development Agent (DA) contact and perception of soil erosion seriousness, had positively but insignificantly affected maintenance of SWC structures. In Toni sub-watershed, family size, educational level and workability of structures showed a positive effect. Both educational level and farmers' perception of the workability of the structures were significantly correlated with maintenance of the structures. The positive effect of age shows that with increasing age, farmers accumulate experience about the importance of land management. Thus, the tendency to maintain the structures increases. Contact with DAs showed a positive impact on the maintenance of SWC structures in Bokole. However, contact with DAs had a negative coefficient in Toni. The finding also showed that family size was positively correlated with the maintenance of SWC structures in Toni but a contradictory result was obtained in Bokole.

However, there is no other similar study conducted in the study area that focused on farmers' decision on Soil and Water Conservation (SWC) structures (stone bund locally named *Daaga*) at farmers' plot level. And some of the reviewed researches focused on collective action and communal land ignoring individual households decision on their farm plots. This study tried to fill these gaps and focused to assess factors that affect farmers' decision on SWC structures constructed on their plot of land in Sululta *Woreda*, Oromia National Regional State. For this purpose, two *Kebeles*, Keta-Welele and Wererso-Nono Mene Abechu were selected.

1.4. Objectives of the thesis

1.4.1. General Objective

The general objective of the thesis is tostudy conditions under which farmers maintain soil and water conservation structures constructed on their plot of land.

1.4.2. Specific Objectives

- To explore the people of Sululta *Woreda* and socioeconomic situations in the *Woreda*
- To identify factors that influence households' decision to maintain Soil and Water Conservation (SWC) structures/stone bund.
- To assess the impact of householdattributes on farmers' maintenance decision on SWC structures
- To understand the role of actors and socio-cultural factors (informal institutions, norms and values) in increasing farmers' maintenance decision of SWC structures

1.5.Scope of the Thesis

This study conducted to explore factors affectingfarmers' maintenancedecision on soil and water conservation structures in Sululta *Woreda*, Oromia National Regional State. Particularly, out of

total 23 *Kebeles* found in the *Woreda*, 2 *Kebeles*; namely Keta-Welele and Wererso-Nono Mene Abechu were selected purposely. As the information obtained from the *Woreda* agriculture office, Wererso Nono Mene Abechu *Kebele* is relatively better than Keta Welele *Kebele* in terms of SWC works. Thus, focus was made on the two *Kebeles* to made a comparison. The research also focused on the factors that influence farmers' maintenance decision, the impact of slope of land, attributes of households and farmers' perception of structures (stone bund which is locally named *Daagaa*) on maintenance decisionin the study *Kebeles*.

1.6. Significance of the Thesis

The researcher believes that the findings of the study have significant contribution in order to understand the factors affecting farmers' maintenance decision on soil and water conservation structures. Thus, it helps to explore some of the major problems and suggests measures to be taken to overcome the problems. It may help the leadership at local levels, the community, policy makers and implementers, in an endeavor to implement the soil and water conservation works. The study also helpful to intervention or to react to this social problem for those interested in and concerned with the issue. Finally, it will leave the door open for more research to be conducted in this area and serves as a reference by providing relevant information for further investigation.

1.7. Limitations of the Thesis

As a result of time and budget constraint, this thesiswas limited only in Sululta *Woreda,* and two selected *Kebeles*, with a limited number of research participants. There were also difficulty of getting the 2018/19 statistics of farmers due to the fact that it is not published neither by the government nor by national or international non-governmental organizations. To fill this gap reports of the *Woreda* agriculture office was reviewed and used.

1.8. Organization of the Thesis

This thesis has five chapters that are arranged as follow. Chapter one deals withdescription of the study area,background of the thesis, statement of the problem, objectives of the thesis, scope of the thesis, significance of the thesis andlimitationsof the thesis. Chapter two tries todevelop related theoretical frameworks and the existing literature. Chapter three deals research methodology. Chapter four focuses on results and discussion and chapter five deals about conclusions and recommendations.

Research Questions

1. What are the factors affecting farmers' decision on soil and water conservation?
2. What are the basic problems?
3. How do farmers preserve remedies for the problem?

CHAPTER TWO

LITERATURE REVIEW

2.1. The Concept of Land Degradation

As defined by Vu et al. (2014), land degradation is a process that involves a decline in the processes and productivity of a land. It poses enormous challenges to both humanity and ecological systems. This challenge is experienced across all regions in the world (Vu et al., 2014), but particularly in sub-Saharan Africa, which has the highest rate of land degradation (Tully et al., 2015). SWC activities refer to technologies which are aimed to preserve and enhance the productive capabilities of a land, or they embrace those practices that significantly reduce soil losses and their consequences.

2.2. Theoretical Frameworks of the Study

Ostrom (2009) contends that frameworks provide the mostgeneral list of variables that should be used to analyze all types of institutionalarrangements. The elements contained in a framework help analysts generate thequestions that need to be addressed when they first conduct an analysis. Whereas, The development and use of theories enable the analyst to specify which elements of theframework are particularly relevant to certain kinds of questions and to make generalworking assumptions about these elements. Thus, theories focus on a framework andmake specific assumptions that are necessary for an analyst to diagnose a phenomenon,explain its processes, and predict outcomes.

Thus, in order to identify a theoretical framework that guides the study, threeapproaches are persued: Beliefs, Desire, Intention (BDI);Social ecological System (SES); and Institutional Analysis and Development (IAD) .

2.2.1. Beliefs, Desire, Intention (BDI) Model

The belief-desire-intention (BDI) model (Bratman et al, 1998) is possibly the best known and most studied model of practical reasoning. It was developed for software agents (Wooldridge, 2009), but the theoretical framework applies equally well to human agents. This model contends that the daily activities of deliberation (deciding what to do) and means-ends reasoning (deciding how to do it) are based on the following principles. Based on an agent's beliefs (which are constantly updated with sensory input from the environment), an agent generates desires (goals), which are states of the world that may be worth achieving. These desires are then filtered according to their desirability and achievability to determine concrete goals to be adopted. As a result of this deliberation phase, the agent examines plans and commits to the one with the most potential, which becomes the intentions.

The BDI model provides an iterative mechanism that dynamically generates and selects goals, then designs appropriate plans and ultimately chooses actions guided by these plans. Beliefs are the informative component of the decision process, while desires are its motivational component. Intentionsplay an essential role in restricting the set of options about which the agent mustthink. They involve a commitment to action and allow the agent to ignore optionsthat do not correspond with the previously adopted intentions. Thus, theconcept of intention is one way to limit the time spent deliberating about whatto do.

The model has several limitations. It omits mechanisms that induce farmers to change their perceptions andbehavior, i.e. , the mechanisms of learning. Learning is the combination ofprocesses individuals use to improve their decision behavior. Another limitationis the overly restrictive view of the farm decision-maker as a single agent. Farmmanagement tasks are often performed by several members of the householdand therefore involve a social dimension.

2.2.2. Social-Ecological Systems (SES)

The Social-ecological Systems (SES) framework (Ostrom 2007, 2009, Poteete et al. 2010) is a conceptual framework providing a list of variables that may be interacting and affecting outcomes in social-ecological systems (SES). Its discusses how a resource system, resource units, governance system, and users embedded in larger or smaller social, economic, and political settings and related ecosystems might affect and affected by interactions and outcomes (Ostrom, 2007b).

2.2.3. Institutional Analysis and Development (IAD)

Ostrom's IAD framework has been widely employed in research aimed at studying local management of common resources (Benson et al., 2013, Clement and Amezaga, 2013, Rudd, 2004). The IAD framework provides guidance for highlighting key insights on institutional, technical, and participatory aspects of collective SWC interventions, or the commons problem, and their resulting effects. At the framework's core is the 'action arena'. The action arena is composed of an action situation and actors. The action situation refers to a social space where the actors interact, solve the commons problem, and exchange goods and services; the actors are those who participate in the situation (Ostrom, 2007, Ostrom et al., 1994).

Thus, taking into consideration the objectives of this study, the Institutional Analysis and Development (IAD) framework was employed.

The following figure shows the causal relationship between the dependent variable and the independent variables.

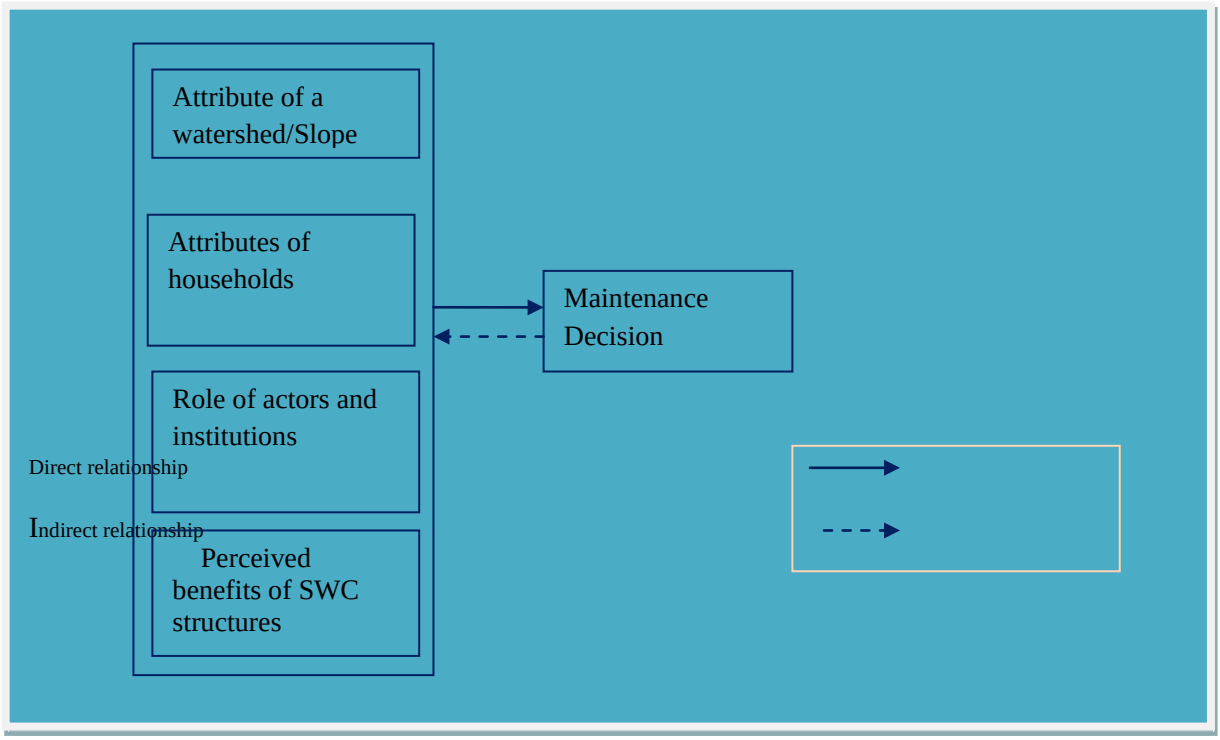

Figure 2: Factors affecting farmers' maintenance decision of SWC structures, Adopted from Ostrom *et al.*, 1994 cited in Araral, factors that influence collective action in watershed management and its outcomes.

Figure 2shows the causal relationship between the dependent variable (maintenance decision of farmers) and the independent variables (attribute of watershed/slope of land, attribute of households such as educational level, age, distance from farmland, type of land ownership and house hold size and role of actors and institutions.The maintenance decision of farmers towards soil and water conservation structures could be positively or negatively affected by the independent variables. This is presented in detail in the data presentation and analysis part in chapter four.

2.3. Empirical Discussions

In their study on the assessment of farmers' willingness to participate on community based waters shed management, Assefa et al(2018) found that perceptions of the usefulness of training given before campaign works, belief that the community based watershed management program could contribute to ecosystem restoration or livelihood improvement, and approval of the construction of SWC structures on their farmland and communal land were the factors that pushed farmers to participate in the program. These three items indicate that farmers were more motivated to undertake training to improve their knowledge and skills on activities that were implemented during campaign works and support the construction of SWC structures on their farmland and the communal land they use because they believed that these will benefit them.

Other study conducted by Walko et al (2015) on farmers' adoption of soil and water conservation technology showed that that farmers having a favorable attitude to SWC readily adopt the new technologies. Anteneh et al (2014) on the other hand showed that age of the household head was not found to be the main factor to determining maintenance of improved SWC technologies. In addition, education level of household heads and maintenance decision of conservation technologies had negative and significant relationship. The study further showed that education level of household heads had negative and significant relationship. Each additional year of schooling decreased the probability of maintenance decision of conservation technologies by 4.4 percent.

Physical Environment and Social Contexts

In the context of collective watershed management, the main external factors are identified to be characteristics of physical environment, governance, socio-economic and socio – cultural conditions (Agrawal, 2001; Araral, 2008).Physical environment encompasses, terrain, geological structure, and climate.Governance arrangement involves actors and institutions that would affect the use and management of natural resources. Institutions refer to government policies and programs, laws and protocols regarding collective watershed management. Socio-economic contexts comprises of social and economic conditions within which local residents engage in the use and management of resources. This includes population size and change, market integration, technology and historical contexts.Socio-cultural factors refer to informal organizations and institutions that local communities use to collectively manage natural resources, including collective action organizations, and values and norms guiding resource use and management.

In this study, among the various external factors, actors and institutions, values and norms that can influence farmers' maintenance decision were assessed.

Attributes of Watersheds

In the context of watershed, there is evidence that soil types and its fertility, level of precipitation, and amount and intensity of rainfall influence the extent to which farmers are willing to exert their effort for its management (Shiferaw*et al*., 2008). In their study of Central Rift Valley of Ethiopia, Adimassu *et al*. (2012)show that farmers' were more willing to invest in plots that were vulnerable to water erosion and had better soil fertility.Other studies also showed that at plots level, there is evidence that steep slope is positively and significantly associated with

the adoption of stone terraces in Beressa watershed in highlands of Ethiopia (Amsalu and De Graaff, 2006b). Again, in this study, the link between topography of a farmers' plot with the households' decisionwas assessed.

Attributes of Households

Participation of households in collective action for watershed management is presumed to be affected by their demographic and socio – economic characteristics. Though limited to farmers own plot level, studies show that the age of household head (Tafa*et al.*, 2014; Amsalu and De Graaff, 2006b) and availability of family labor (Adimassu, et al., 2012) are positively related to adoption of natural resource conservation measures, while this reduces with increased dependency ratio (Tafa, et al., 2014).

Asset endowment results in livelihood activities, which includes farm, off-farm and non-farm (Ellis, 2000). The livelihood activities of households reflect the extent of dependence on the watershed resources. Households that have diversified their livelihood away from agriculture are less likely to directly depend on watershed resources. The resources will be perceived to be important by households that directly depend on the resource. Thus, households that perceive watershed resources as important are more likely to invest their time and energy for its management (Wade, 1988; Dietz, Ostrom, and Stern, 2003).

Actors and Institutions

Actors involve organizations, groups and individuals who aim at achieving some common objectives (Ellis, 2000). The performance of local non households' actors could influence the participation of households in collective action for watershed management. Empirical evidences on Ethiopia show that the linkage and effectiveness of stakeholders, including regional, district and Keble level administrative bodies and development agents are key in the success of resource management (Zeleke, 2006; Belay and Bewket, 2013; Adimassu et al., 2013a; Kacho and Asfaw, 2014).

The main local non household actors in the ongoing integrated participatory watershed management are: district watershed management teams, *Kebele*administrations, *Kebele*and community watershed management teams, zone level committees and surveyors (in the *Kebeles*), development agents and leaders of development teams (Desta *et al*., 2005).

Attributes of the Program/Technologies

Studies conducted in Ethiopia show that farmers adopt technologies that are perceived to be advantageous. Amsalu and De Graaff (2006b) state that farmers' perception of stone terraces influences their adoption in Beressa watershed, highlands of Ethiopia. Similarly, Bewket and Sterk (2002) stated that farmers' perceived ineffectiveness of physical structural measures was the main factor discouraging them to participate in soil and water conservation activities in Chemoga watershed. This study, thus assessed the factors' that affect farmers' maintenance decision of SWC structures in Keta-Welele and Wererso-Nono Mene Abechu *Kebeles* in Sululta Woreda, Oromia Region.

CHAPTER THREE

RESEARCH METHODS

3.1. Research Approach

To achieve the intended study objectives, the study used a mixed research approach.Mixed methods research is a methodology for conducting research that involves collecting, analyzing and integrating quantitative and qualitative data. This approach is used when integration provides a better understanding of the research problem than either of each alone.More specifically, the qualitative approach was selected and applied in order to assess farmers' willingness to maintain Soil and Water Conservation (SWC) structures. In addition, it was selected to assess the influence of attribute of a watershed and attribute of households on farmers' maintenance decision. Finally, it was selected to check the role of actors and institutions in encouraging farmers to maintain SWC structures.

3.2. Research Design

As Kothari (2004) notes, research design is the conceptual structure within which a research is conducted; it constitutes the blueprint for the collection, measurement and analyses of data. Therefore, the study employed descriptive and explanatory research design because it elaborates what factors affected farmers' maintenance decision of soil and water conservation structures and then described and explained the phenomenon.

3.3. Target Population

According to Gupta and Rangi (2010) study population is a study of a group of individuals taken from the general population who share a common characteristic. Moreover, Berg (2001)

described that to develop purposive sample, researchers use their own knowledge or expertise about some group to select subjects who represent the population.The targetpopulation of the study were household heads in the studied *Kebeles*.

3.4.Sampling Design

The researcher used simple random sampling design which was applied so as to determine sample unit of the study which is used to select sampled heads of the household within the selected farmers and purposive sampling to select key informants.

3.4.1 Sampling Techniques

In qualitative research, the site and participants are mostly selected by researchers purposefully and that will best help them to understand the problems and research questions (Creswell, 2009). As Berg (2001) stated, under purposive sample, researchers use their knowledge or expertise about some group to select subjects who represent this population. Therefore, purposive sampling technique used to get data from farmers and available sampling for key informants in the study area.

The researcher sampled the population because to check the factors affecting farmers' maintenance decision in soil and water conservation structures and whether they were practically changed in practice in the study area. Thus, the researcher selected respondents. The researcher used multi-stage sampling procedure. Firstly, Sululta Woreda is selected as one of the farmers Woreda from Oromia National Regional State.

Also out of total 23 farmers Kebele found within the Woreda, 2 *Kebeles* namely *Keta Welele and* Wererso Nono Mene Abechuselected by considering that Wererso Nono Mene AbechuKebele is relatively successful in soil and water conservation structures.Secondly, simple random sampling technique was applied so as to determine sample unit of the study which is used to select sampled heads of the household within the selected farmers, list of the households was taken from the Woreda agriculture office.

Then, in the third step, sampled heads of the household from two*Kebeles* were selected using data saturation. Accordingly, the researcher reaches 92 respondents, out of 92 respondents 82 of them are farmers and 12 of them are key informants such as Land administration and management head and experts, Development agent's /DAs/ of Kebeles and Local council 1/5 leaders.

3.5. Methods of Data Collection

3.5.1.Primary Sources

Using multiple data collection strategy is more advantageous than single data collection strategy in research work (Brihan, 2011). Based on the research problem and objectives, both primary and secondary data sources were used to generate appropriate information for the study. Primary data were collected from farmers, the Woreda agriculture office expert, extension workers and local leaders and elderly people in the study *Kebeles*.

Household survey

In this thesis, survey method was used to collection data. The method was used to collect data about farmers' maintenance decision of SWC structures. It was also used to assess the influence of attribute of a watershed and attribute of households on farmers' maintenance decision. In addition to these, the method was used to the see the role of actors and socio-cultural factors in encouraging farmers to maintain structures. Attention was given on the nature and magnitude of support given for farmers from actors (*Kebele* administration, extension workers, development team) as well as influence of local norms in increasing farmers' maintenance decision.

The main unit of analysis for the study was head of the household. To draw sample households from the selected *Kebeles*, a list of resident households were taken from each *Kebele* administration. Sululta *Woreda* has 23 *Kebeles*. From the 23 *Kebeles*, Keta Welele and Wererso Nono Mene Abechu *Kebeles* were selected purposely to made a comparison among the two Kebeles. As the information obtained from the *Woreda* agriculture office, Wererso Nono Mene Abechu *Kebele* is relatively better than Keta Welele *Kebele* in terms of soil and water conservation works. The total population of Keta Welele *Kebele* is 454and that of Wererso Nono Mene Abechu Kebele is 355.Assuming the 10% rule, 82 household heads (46 from Keta-Welele *Kebele* and 36 from Wererso-Nono Mene Abechu *Kebele*)were randomly selected.

Questionnaire was prepared in the local language,Oromifa, and administered to farmers who had the capacity of understanding the questions during the survey. The researcher had used questionnaires to collect data about overall demographic and socio-economic characteristics of farmers in reference to the farmer’s maintenance decision of soil and water conservation, challenges that farmers faced and hindered to maintain structures. Based on the objectives of the study, closed ended and open ended structured questions were administered.

Key Informants Interviews

According to Kothari, (2004) interview is the verbal conversation between two people with the objective of collecting relevant information for the purpose of research. The use of these instruments is necessitated by sampling procedures that was employed. The key informant may be an expert or knowledgeable person with first-hand information about concerned issues.

The key informant interview was carried out by the researcher and the interview included attributes of a watershed, attributes of households and the role of actors and socio-cultural factors in increasing farmers' maintenance decision. For the key informant interview individuals who are near to the issue and have knowledge about the topic under consideration like*Kebele* administrators, two agricultural extension workers and agricultural extension workers supervisor were purposively selected and interviewed.The interviews were conducted with the consent of the informants using interview guides. It also helped to facilitates the collection, analysis and triangulation of data.

In-depth Individual Interviews

As Kumar, 2005 stated, in-depth interview makes it possible for a researcher to obtain detail information by probing. In other word, in-depth interview is effective qualitative method for getting people to talk about their personal feelings, opinions and experiences. An interview can cover any number of issue in a study and is a relatively inexpensive and efficient way to collect a wide variety of information that does not require formal testing (Geoffrey et al, 2005). This method of data collection takes the notion that people are experts on their own experience and so best able to report how they experienced a particular event and phenomenon.

In this study, depth individual interviews were conducted with 12 selected individuals to see personal experiences. The interview was conducted to collect data about farmers' maintenance decision of SWC structures, influence of attribute of a watershed and attribute of households on farmers' maintenance decision as well as the role of actors and socio-cultural factors in encouraging farmers to maintain structures.

Focus Group Discussions

Another research tool that was employed by the present researcher in the process of data collection was Focused Group Discussion (FGD). Focus group discussion allows deeper examination of complex issues than other forms of survey research, because when people hear others talk, it often generates responses or ideas that did not think before (Bhattacherjee, 2012). Moreover, it is more appropriate when group interactions are capable of producing detailed data and new thoughts and illuminating conflicting views of respondents (Bloor et al., 2000). This method was primarily employed for assessing the factors affecting farmers' maintenance decision of social and water conservation structures and role of actors and informal institutions in encouraging farmers to maintain SWC structures. In addition, it was used to cross-check data collected through survey questions and from key informant's interview.

Four focused group discussions (two per *Kebele*) held in the study area. A total of 26local leaders and elderly people have participated in the Focus Group Discussions (FGDs). The participants in the FGDs were selected purposively. The criteria used in the selection process were sex, age, expertise and a better communication skill. The FGDs were organized in an open area.

Figure 3: Focus Group Discussion (FGD), Keta Welele Kebele

3.5.2. Secondary sources

Secondary sources of data as those ones from the published and documented sources that may aid in providing answers to the research problem and they included documents comprising research works, textbooks, journals, office records/statistics and the internet. The aim of collecting secondary data was to gather essential information and either to confirm or reject the primary data.

3.6. Methods of Data Analysis

The quantitative data which was collected through household survey was analyzed using the descriptive statistics (frequency distribution and percentage, and cross-tab).The qualitative data which was collected through key informants and in depth interview as well as FGDs were analyzed through qualitative way by narration and comparative analyses.

3.7. Data Quality Control

3.7.1. Validity and Reliability

Validity is the extent to which the research instrument allows to get correct information. The researcher tried to maintain the validity of the data through applying different methods to collect information on the same topic from different sources by using techniques such as in depth-interviews, focus group discussion and questionnaires and that helped in triangulating the information. On the other hand, to maintain reliability of the data, the researcher conducted pre-testing and as a result, the household survey questionnaire was a little bit modified.

3.7.2. Ethical Considerations

Research ethics deals with how to treat those who participate in the study and how to handle the necessary data after collection (Wanderstoep and Johnston, 2009). In relation to ethical consideration, all the research participants and concerned bodies were informed about the objectives and the purpose of the research. Throughout the research work, sense of confidentiality and respect for the respondents in all occasions of data collection, analyses and interpretation had been given due attention. In addition, the researcher by clarifying the objectives of the study and issues of confidentiality get permission of the participants in FGDs for recording responses and taking photographs.

CHAPTER FOUR

DATA PRESENTATION AND INTERPRETATION

This chapter hasfive sections and discusses findings of the study. The first section deals with assessing farmers' maintenance decision of soil and water conservation structures(stone bund which is locally namedDaagaa*)*constructed on theirfarmland. The second section deals with the impact of attribute of a watershed (topography of land) on farmers' maintenance decision of soil and water conservation structures. This is followed by analyzing the impact of attributes of householdson farmers' maintenance decision of soil and water conservation structures. The fourth part deals with role of actors and institutions in increasing farmers' maintenance decision of soil and water conservation structures. The last part deals with conclusions and recommendations.

4.1. Farmer's Maintenance Decision of SWC Structures

Construction of SWC structures are done through the annual campaign-based watershed works which is done between February to March. In the campaign-based watershed work, both communal and farmers' plot of land are considered. In addition, farmers also construct a structure at their plot of land by their own. The structure could be damaged unconsciously during agricultural activity such as the cultivation of the land using oxen. But once it is constructed at the farmers' plot of land, maintenance of the damaged structuresis the only responsibility of the individual household.The following figure shows a stone bund constructed at a farmers' plot of land in Keta Welele *Kebele*.

Figure 4: A Structure (Stone Bund/Daagaa) at a farmers' plot of land, Keta Welele Kebele

Table 1shows farmers' maintenance decision of structures by *Kebele*.

Table 1: Frequency and Percentage Distributions of Farmers' Maintenance Decision by *Kebeles*

Decisions	**Keta-Welele**		**Wererso-Nono Mene Abechu**		**Total**	
	N	%	N	%	N	%
Maintain	34	74	27	75	61	74
Ignore	7	15	6	17	13	16
Demolish	5	11	3	8	8	10
Total	46	100	36	100	82	100

As can be seen from Table 1, from the total 82 respondents, 61 (74%) maintained SWC structuresconstructed on their plot of land.And 13 (16%) ignored the structures and 9 (10%) demolished the structures. Farmers ignore or demolish a structure when they perceive it as

disadvantageous.As some respondents of the household survey mentioned, famers give less attention to maintenance of SWC structures because they believe that the structures contribute for the spread of rats which could damage what is produced. This finding is similar with the finding of Walko et al (2015) that perceptions of farmers' contribute substantially to the acceptance and dissemination of SWC technology.

Across the study *Kebeles*, in Keta-Welele, out of the 46 respondents, 34 (74%) maintained the structure.And 7 (15%) ignored the structure. Again, 5 (11%) demolishedthe structure.On the other hand, during the key informant interview I had with the*Woreda* agriculture officeextension workers supervisor and the agricultural extension worker, the *Woreda* agriculture office has tried much to continue the soil and water conservation works in Keta-Welele*Kebele*. In the *Kebele*, soil and water conservation works (the annual campaign-based watershed works) are totally abandoned in 2018/19. As the agricultural extension workers supervisor and agricultural extension worker mentioned, frequent discussions were made with farmers but,still, farmers are resistant to participate in SWC works.They further mentioned that this emanated not because farmers don't have knowledge about benefits of soil and water conservation structures but they attach it with electricity and water demandsfrom the government. As the respondents mentioned, they have frequently asked the local government to supply water and electricity and the government is not able to respond this request. Although farmers' justification not to participate in SWC works is because of such non response from the local government, it seems that they don't have enough knowledge about the benefits of SWC structures.

On the other hand, in Wererso-Nono Mene Abechu*Kebele*, out of the 36 respondents, 27 (75%) maintained the structure. In addition, 6 (17%) ignored the structure. And 3 (8%) demolished the structure. Based on the sampled population, farmers in Wererso-Nono Mene Abechu *Kebele* maintained more (75%) than farmers in Keta-Welele *Kebele*which is 74%.

As it is seen from Table 1, in both the *Kebeles*, majority of the respondents maintained structures. But the number of respondents who ignore or demolish structures cannot be underestimated taking into consideration the seriousness of the problem in the area.This could be associated with the problem of awareness or knowledge gap about the benefits of structures and much has to be done in both *Kebeles* by all the relevant stakeholders to reduce such gaps.

Although the level of understanding vary from farmer to farmer, majority of the respondents explained the benefits of soil and water conservation structures over its disadvantages. As far as the benefits of structures are concerned, most respondents mentioned at least one benefit of structures which include that that structures help to control run-off and increase agricultural productivity. According to an informant of FGD participant from Keta-Welele *Kebele,*

> *Soil and water conservation works are vital for the farmer and the country at large. Structures control run-off and also help to increase agricultural productivity. In general, soil and water conservation works are helpful for the farmer and we have to transfer the knowledge to our children. When we maintain damaged structures, there are few farmers who say you are doing this because you are not busy in other task. This thinking emanated from knowledge gap and we have to teach such kind of farmers. Even if they know the benefits of structures, some farmers are not willing to maintain structures because they try*

to attach it with the government's in ability to fulfill needs of the residents of the Kebele like Kebele water and electricity. This should not be attached with soil and water conservation works at all.

Supporting the above idea, another FGD participant woman from Wererso Nono Mene Abechu *Kebele* said,

Naturally, all people are not equally responsible for a certain task. Some are more committed and others could be reluctant. The same is true for soil and water conservation structures. In our Kebele, except few people, majority of residents of the Kebele are aware of the benefits of structures and are very much interested to maintain structures when it is damaged. Very few are not interested to do so for reasons. I think the Kebele administration and agricultural extension workers have to be serious on these kind of farmers.

Supporting the above ideas and more importantly, an agricultural extension worker from Wererso-Nono Mene Abechu*Kebele* said:

Although recently soil and water conservation works in the Kebele are decreasing, through awareness creation and by observing the benefits of structures from others, farmers are becoming more and more interested to maintain structures. But still, we are responsible to change the minds of few farmers who still didn't understood benefits of structures and those who attach it with other development-related requests.

Some respondents also perceive structures negatively. In this regard, a respondentof one of the household survey participants from Wererso-Nono Mene Abechu *Kebele*mentioned that:

> *In areas where stone bunds are constructed, rats and rabbit spread widely and eat what is available in the farm. This reduces the quantity of the product a farmer desires to get. In such circumstances, it is better not to construct or maintain a structure.*

Similarly, as Beshah (2003) noted, among the farmers in Wolaita and Wollo where farmers failed to maintain or even deliberately cleaned out SWC structures because the structures were not perceived as profitable by farmers. Again, Anteneh et al (2014) mentioned that the willingness of farmers to maintain soil and water conservation structures was also somehow affected by farmers perception of the technology. They mentioned that farmers who found the technologies profitable have retained improved soil and water conservation. They further mentioned that to ensure continued use, the conservation component must be profitable to the farmer. Particularly, farmers are very curious about the yield effect of the technology since the structures take up productive land, and maintenance is often labor intensive and costly.

In addition to the perception of farmers towards structures, few respondents also mentioned their unwillingness to maintain structure because of expansion of town and the governments' ina bility to full fill needs of the community like water and electricity. As one of a respondent of the household survey from Keta-Welele*Kebele* mentioned,

> *We are living within 5 kms radius from Sululta. Even if this is the case, we are not able to get water and electricity for years. We have raised our concern so many times but no one is able to listen us. We know very well about the benefits of soil and water conservation works. But,*

*now a days, since the government is not responding our request, farmers in our Kebele are not interested to participate in soil and water conservation works.*This may indicate that there has to be a series and open discussion between the local government and residents of the Kebele to minimize the gap.

In conclusion, in both the *Kebeles,* majority of the respondents maintained structures. Despite this, the number of farmers who ignored or demolished structures is also remarkable assuming the problem of soil erosion and land degradation in the areas. This could be associated with lack of awareness and motivation of farmers or farmers are not benefiting from the structures.

4.2. Impact of Attribute of a Watershed on Farmers' Maintenance Decision

In this section, the influence of attribute of a watershed (topography of the land) of farmers' plot of land on farmers' maintenance decision was presented.Table 2 shows topography/slope of land of farmers with their maintenance decision.

Table 2: Slope of Farm Land of Household Heads and Maintenance Decision

	Slope					
	Flat		Steep		Total	
Decisions	N	%	N	%	N	%
Maintain	-	-	61	88	61	74
Ignore	8	62	5	7	13	16
Demolish	5	38	3	5	8	10
Total	13	100	69	100	82	100

As shown in Table 2, out of the 82 respondents, the land slope of 69 (84%) respondents is steep and 13 (16%) is flat. From the 69 respondents whose land is steep, 61(88%) maintained the structures,5 (7%) ignored the structures and 3 (5%) demolished the structures.On the other hand, all the respondents whose land is flat, did not maintained the structures.As the respondents mentioned, it is useless to construct a structure (stone bund) on flat land and doing so only consumes time and energy. They further mentioned that constructing a structure on flat land have no role in preventing run-off. This is more elaborated by the views of an in-depth interview respondent from Wererso-Nono Mene Abechu *Kebele* and said:

> *My land is flat. But extension workers and the Kebele chairman insisted me to construct a stone bund in my farm land through campaign works. For the time being, I constructed the structure for the sake of reducing conflict. But later, I destroyed the bunds. In a more flat field, the contribution of bunds is minimal. The structures unnecessarily occupy fields that could be used to produce crops. Constructing a bund on such type of land, rather taking space of my land, it hasn't any benefit for me. That is why I gradually demolished it.*

This implies that farmers are more interested to maintain structures when the land is steep. This view was triangulated with the view of focus group discussion participants, extension workers and development team leaders and all these informants mentioned that farmers who have steep slope of land are interested to maintain structures. This is because steep slope is exposed to run-off and constructing stone bund on such type of land prevents run-off. In their study, Amsalu and De Graaff (2006) have alsofound that steep slope is positively associated with the adoption of

stone terraces in Beressa watershed in highlands of Ethiopia. This is more elaborated by one of the in-depth interview respondents in Keta-Welele and said:

> *The plot of land I have is a steep one. Before the construction of the stone bund, the soil was washed away. In 2012, the structure was constructed in my farm land. This has significantly reduced the problem of run-off. This in turn has contributed in increasing agricultural production. For example, I have one hectare of land and before the structure was constructed, I produce only 3 quintals of wheat and 2 quintals of barley. Now I produce 8 quintals of wheat and 10 quintals of barley. This has helped me to feed my family and sell the product which is beyond the household consumption. I know its benefit and am ready any time to maintain it when damage occurred.*

This is consistent with the finding of Anteneh et al (2014) on the determinants of maintenance decision introduced soil and water conservation practices in Fagita Lekoma District, North West Highlands of Ethiopia, that steep slope farm plots increased the probability of maintenance decision by 56 percent. The researchers further mentioned that since soil erosion severity is much likely to increase as the steepness of the slope increases, farmers who had a steeper farm plots tend to maintain introduced soil and water conservation technologies than those having flat and gentle slope lands.On the other hand, Table 3 shows slope of land of household heads and maintenance decision by *Kebele*.

Table 3: Slope of Farm Land of Household Heads and Maintenance Decision by *Kebeles*

Decisions	**Keta-Welele**						**Wererso-Nono Mene Abechu**							
	Flat		Steep		Total		Flat		Steep		Total		Total	
	N	%	N	%	N	%	N	%	N	%	N	%	N	%
Maintain	-	-	34	87	34	74	-	-	27	87	27	75	61	74
Ignore	4	57	3	8	7	15	3	60	3	10	6	17	13	16
Demolish	3	43	2	5	5	11	2	40	1	3	3	8	8	10
Total	7	100	39	100	46	100	5	100	31	100	36	100	82	100

As can be seen from Table 3, in both *Kebeles*, 87% of the respondents whose land is steep maintained the structures. It also shows that as compared to Keta-Welele *Kebele*, respondents in Wererso-Nono Mene Abechu *Kebele* ignored more (which accounted 17%) and on contrary, respondents in Keta-Welele *Kebele*demolished more, which accounted 11%.

Farmers are more interested to maintain a structure when the slope of the land is steeper. We have also seen that farmers are less interested to maintain a structure when the slope of the land is flat. This may indicate that farmers have to be consulted well at the planning stage to select the field to be conserved. This helps to create a sense of ownership and at the end ensures sustainability of structures.

4.3. Impact of Attributes of Households on Farmers' Maintenance Decision

The influence of age of the household head, educational level, place of residence of the household head, availability of labor in the household, dependence on the land, and engagement in off-farm activities on the farmers' maintenance decision were explored in the thesis. We will see first average age of household heads and maintenance decision.

Table 4 shows average age of household heads and maintenance decision.

Table 4: Average Age of Household Heads and Maintenance Decision by *Kebele*

Decisions	**Keta-Welele**		**Wererso-Nono Mene Abechu**		**Total**	
	N	Mean	N	Mean	N	Mean
Maintain	34	50	27	49	61	49.5
Ignore	7	43	6	55	13	49
Demolish	5	28	3	52	8	40
Total	46	40.3	36	52	82	46.1

Table 4 shows that the average age of respondents who maintained structures is 49.5. The average age of respondents who ignored structures is 49 and the average age of respondents who demolished structures is 40.Again, the average age of respondents who maintained structures in Keta-Welele *Kebele* is 50 and that of Wererso-Nono Mene Abechu *Kebele* is 49.This indicates that as far as maintenance decision is concerned, there is no significant age difference between the two *Kebeles*. But disparity is seen between the two *Kebeles* in-terms of ignorance and demolishing of structures. For example, the mean age of respondents who ignored structures in Keta-Welele *Kebele* is 43 and 55 in Wererso-Nono Mene Abechu *Kebele.* Similarly, respondents in Wererso-Nono Mene Abechu *Kebele* demolished more when the age of the respondents grow older, the mean age of respondents who demolished structures in Keta-Welele *Kebele* is 28 and that of Wererso-Nono Mene Abechu *Kebele* is 52.This could be associated with that as the age of people increase, their capacity to work decreases. On the other hand, extension workers in both *Kebeles*have mentioned that in the community, there is a culture of assisting older people and people with disabilities to construct or maintain soil and water conservation strictures on such farmers' plot of land. So, when farmers are not able to maintain due to age or disability, other abled-people provide such kind of assistance.

From the finding, we can understandthat age is nota determinant factor for farmers to maintain or ignore structures.Very few respondents in the 40s demolish structures. This finding is similarwith the finding of Tafa et al (2014) and Amsalu and Graaff (2006). Their finding showed that age of household head was not found to be the main factor to determining maintenance of improved SWC technologies in the study area.

The educational level of respondents was also seen whether it influences respondents maintenance decision or not. Table 5 shows educational level of household heads and their maintenance decision.

Table 5: Educational Level of Household Heads and Maintenance Decision

Decisions	**Educational status**											
	Illiterate/no schooling		Read and Write		1-4		5-8		9-12		Total	
	N	%	N	%	N	%	N	%	N	%	N	%
Maintain	18	78	17	71	9	75	3	60	14	78	61	74
Ignore	3	13	4	17	1	8	2	40	3	17	13	16
Demolish	2	9	3	12	2	17	-	-	1	5	8	10
Total	23	100	24	100	12	100	5	100	18	100	82	100

Majority of the respondents are in the educational level of “read and write” which accounted 24 (29%) followed by "illiterate/no schooling which accounted 23 (28%). The least are in the educational level ofsecond cycle primary education (5-8) which accounted 5 (6%). Out of the total 23 respondents in the educational level ofilliterate/no schooling,18 (78%) maintained the structures. Similarly, out of the total 18 respondents in the educational level of "high school" (9-12), 14 (78%) maintained the structures.The percentage of respondents who ignored structures in

the educational level of "read and write" is similar with the high school completes which is 17%. Whereas, respondents in the educational level of 1st cycle primary education (1-4) ignored structures more which accounted 17%. The finding also showed that in both the educational levels (illiterate/no schooling and high school completes), the percentage of respondents maintained structures is similar and accounts 78%. In addition, it shows that although the frequency varies among the different educational levels of respondents, respondents in all the educational levels have maintained the structure. This may show that educational level doesn't affect farmers maintenance decision of structures (stone bund).This could be associated with the understanding on the benefits of soil and water conservation structures.

This is different with the study of Anteneh et al (2014) on the determinants of maintenance decision of introduced soil and water conservation practices in Fagita Lekoma District, North West Highlands of Ethiopia, that education level of household heads and maintenance decision of conservation technologies had negative and significant relationship. Each additional year of schooling decreased the probability of maintenance decision of conservation technologies by 4.4 percent. They further mentioned that the effect of insufficient education was not the main hindrance of farmers' involvement in maintenance of soil and water conservation. Anteneh et al (2014) further expressed that one of the reasons for low maintenance behavior of sample educated farmers was probably that educated farmers are more involved in off-farm activities.

The other attribute of a household head assessed was the place of residence of the household head and its impactt on maintenance decision. Table 6 shows residence place of household heads and maintenance decision.

Table 6: Residence Place of Household Heads and Maintenance Decision

Decisions	Keta-Welele						Wererso-Nono Mene Abechu							
	Rural		Urban		Total		Rural		Urban		Total		Total	
	N	%	N	%	N	%	N	%	N	%	N	%	N	%
Maintain	28	85	6	46	34	74	22	81	5	56	27	75	61	74
Ignore	2	6	5	38	7	15	3	11	3	33	6	17	13	16
Demolish	3	9	2	16	5	11	2	8	1	11	3	8	8	10
Total	33	100	13	100	46	100	27	100	9	100	36	100	82	100

As can be seen from Table 6 , out of the total 82 respondents, 60 live in the rural(33 in Keta-Welele *Kebele* and 27 in Wererso-Nono Mene Abechu *Kebele*) and the remaining 22 live in town (13 Keta Welele and 9 in Wererso-Nono Mene Abechu). In Keta-Welele *Kebele*, out of the 33 respondents living in the rural, 28 (85%) maintained the structures. Whereas, in Wererso-Nono Mene Abechu *Kebele*, out of the 27 respondents living in the rural, 22 (81%) maintained the structures. In both the *Kebeles*, more than 80% of the respondents living in the rural maintained the structures. Added to these, respondents in both *Kebeles* ignored or demolished structures less as compared to respondents living in the urban. This could be associated with time constraint and as a result, farmers may not come to the rural frequently to maintain structures. As some respondents also mentioned, this could also be associated with employment in the urban.In relation with this idea, a respondent from Wererso-Nono Mene Abechu*Kebele* said "I have a farm land in the *Kebele*. I have also a house in the town/Sululta. I spent much of my time in the town. I visit the village at times of harvest. Because of this, it is difficult for me to maintain the structure." Similarly, Berhane, an agricultural extension worker from the same *Kebele* mentioned that farmers who live in the town and frequently travel to such places are less participating in soil

and water conservation works. This implies that place of residence of respondents affected the maintenance decision.

Farmland as the only means of Income

Dependence on the landis the other factor that influenced farmers' maintenance decision. Table 7 shows land ownership of household heads and maintenance decision.

Table 7: Land ownership of Household Heads and Maintenance Decision

Decisions	**Keta-Welele**						**Wererso-Nono Mene Abechu**							
	Own		Rented		Total		Own		Rented		Total		Total	
	N	%	N	%	N	%	N	%	N	%	N	%	N	%
Maintain	31	78	3	50	34	74	25	81	2	40	27	75	61	74
Ignore	5	13	2	33	7	15	4	13	2	40	6	17	13	16
Demolish	4	9	1	17	5	11	2	6	1	20	3	8	8	10
Total	40	100	6	100	46		31	24	5	100	36	100	82	100

At times, there are situations where owner of a land gives use right (rent the land) to other farmer and share what is produced. In such situations, as one of the respondents in Keta-Welele*Kebele* mentioned during the in depth interview, those who have use right are less interested to maintain structures because the land belongs to others and rented individuals feel less responsible to maintain structures. He further mentioned that the rented farmers are not sure when they may be forced to leave the land and as a result, are not much interested to maintain structures.

As can be seen from Table7, in Keta-Welele*Kebele*, out of the total 46 respondents, 40 (87%) use their own land and the rest 6 (13%) rented the land.Out of the 40 respondents who use their own land, 31 (78%) maintained the structure. And out of the 6 respondents who rented the land, only 3 (50%) maintained the structure.Respondents who own the land in Wererso-Nono Mene Abechu *Kebele* maintained more as compared to those in Keta-Welele *Kebele*. Respondents in Wererso-Nono Mene Abechu *Kebele* ignored structures more than those in Keta-Welele *Kebele.* The Table further shows that in both the *Kebeles*, those respondents who use their own land are relatively more interested to maintain structures. Based on the sample size, in both of the *Kebeles*, it is those who are using their own land interested to maintain structures and this may show that ownership of land affects farmers' maintenance decision of structures.

Availability of labor in the household was studied whether it affects farmers' maintenance decision or not. Table 8 showsthe number of children available at the household and maintenance decision in the two *Kebeles*.

Table 8: Average Household Size and Maintenance Decision by *Kebele*

Decisions	**Keta-Welele**		**Wererso-Nono Mene Abechu**		**Total**	
	N	Mean	N	Mean	N	Mean
Maintain	34	6.4	27	4.9	61	5.65
Ignore	7	4.4	6	3	13	3.70
Demolish	5	1	3	3.1	8	2.05
Total	46	3.9	36	3.6	82	100

As can be seen from Table 8,the average household size who maintained structures is 5.65 and the average household size who ignored structures is 3.70. It also shows the average household

size who demolished structures is 2.05. The Table also shows respondents tend to ignore or demolish structures as the household size decreases.

Specific result for each *Kebele* shows that the average household size in Keta-Welele *Kebele* who maintained structures is 6.4 whereas it is 4.9 in Wererso-Nono Mene Abechu *Kebele*. Respondents in both the *Kebeles* tend to ignore or demolish structures as the household size decreased. This may show that number of available labor in the household can influence maintenance decision negatively, i.e., those who have large number of children are interested to maintain structures and vice versa. This is similar with the finding of the study conducted by Anteneh et al (2014). In their study of the determinants of maintenance decision of introduced soil and water conservation practice in Fagita Lekoma District in North West Highlands of Ethiopia, they found that low labor availability is a deterrent factor.

In this thesis, the land size of the household heads in affecting farmers' maintenance decision was assessed. Table 9 shows the average land size of households and maintenance decision.

Table 9: Average Land Size of Household Heads and Maintenance Decision by *Kebele*

Decisions	Keta-Welele		Wererso-Nono Mene Abechu		Total	
	N	Mean	N	Mean	N	Mean
Maintain	34	2.4	27	2.3	61	2.3
Ignore	7	1	6	1.2	13	1.1
Demolish	5	2.7	3	1.4	8	2.1
Total	46	2.0	36	100	82	1.8

As can be seen from Table9,the average land size of respondents who maintained structures is 2.3 and the average land size of respondents who demolished structures is 2.1. In Keta-Welele *Kebele,* the average land size of respondents who demolished structures is 2.7 which is greater than those who maintained structures in the *Kebele*.On contrary, in Wererso-Nono Mene Abechu *Kebele,* those who have large land size maintained more and ignored or demolished as the land size decreased. Thus, based on this and the similarity on the average land size of respondents who maintained and demolished structures, land size is not a determinant factor for farmers to maintain structures.This finding is different with the study finding of Anteneh et al(2014) in which farm size of households was found to be positive and significant, suggesting that farmers who hold large farms were more likely to maintain improved soil and water conservation technologies. Each additional hectare of land increased the probability of maintenance decision of conservation technologies by 31.1 percent.

Livelihood activity (engagement in off-farm) was also explored whether it has relation with farmers' maintenance decision or not. Out of the total 82 respondents, 9 engaged in off-farm activities. With regard to their maintenance decision, out of the 9 engaged in off-farm activities, the 6 are fully engaged in employment and are less interested to maintain structures. This is similar with the finding of Antenne et al (2014) that farmers who did not participate in off-farm work increased the probability of maintenance decision of conservation technologies by 19.7 percent. They further argued that, on average, farmers who did not participate in off-farm work increased the length of maintenance of improved SWC technologies by 7.62 m/ha. As the respondents mentioned, this is associated with shortage of time to maintain structures.

In this regard,a respondent from Keta-Wele*Kebele* said, *"I am fully employed in a factory and am expected to work the whole week. As a result, I don't have time to participate in soil and water conservation works. I understand the benefits of soil and water conservation works. But I don't have time to do what is expected from me (maintain).*This may imply that the *Kebele* administration and extension workers are not playing their role well in executing SWC work plans.

As similar idea was raised by a teacher who participated in the FGD atKeta Welele *Kebele* said: *"I am a high school teacher in the Sululta and am fully engaged in the teaching task. I have few spare time during school break and the time constraint forbids me from actively participating in watershed works. We are living in the town and we may not feel the problem of land degradation equally with those of permanently living in the Kebele. As we see and hear from other people, watershed works in my Kebele is decreasing from time to time for multiple reasons. For people like me, the land is secondary means of livelihood and we are wholly dependent on the formal sector. Farmers may have complaint on the government regarding basic infrastructure needs. For the farmer, the land is everything and farmers should take the lead in actively participating and sustaining soil and water conservation works. But, this will be attained only when the relevant stakeholders specially agricultural extension workers and the Kebele administration should stood at the side of farmers and provide the necessary support and guidance.*

In general, it appears that accompanied with relectance of extension workers and *Kebele* administration, awareness and motivation of farmers is a problem in both the *Kebeles*.

4.4. Role ofActors and Socio-cultural Factors in Influencing Farmers' Maintenance Decision

Actors and institutions can also affect farmers' maintenance decision of soil and water conservation structures. In this thesis, the role of local network groups (1 to 5), development team, extension workers, *Kebele* administration, Woreda level experts and local leaders and elderly people and were assessed.

In both *Kebeles*, agricultural extension workers are assigned by the Woreda agriculture office. Out of the 82 respondents, 43(52%) said agricultural extension workers didn't provide assistance to farmers. And39(48%) said extension workers provide assistance to farmers. As explained by the household survey respondents, awareness creation about the benefits of soil and water conservation structures and technical advisers are some of the supportsfarmers obtained from the agricultural extension workers. With regard to the frequency of contact with farmers, respondents have varied opinions. Out of the 39 respondents who said extension workers provide support to farmers, 18 (46%) said the extension workers provide such services on weekly basis. The rest 21 (54%)said on monthly.

In the previous paragraph, we have seen that around 52% of the farmers mentioned that agricultural extension workers are not providing the necessary support to farmers. Since this can contribute negatively in increasing the maintaining soil and water conservation structures, the Woreda agriculture office is expected to conduct the necessary monitoring in the Kebeles.This idea is more supported by Anteneh et al (2014) that each additional visit of a farmer by the extension agent increased the probability of maintenance decision by 18.2%. They further mentioned that farmers having more contact and receive extension advice was found to maintain

the introduced soil and water conservation technologies. This is probably due to the fact that they got technical support and information about the importance of soil and water conservation structures.

The *Kebele* administration is the other major stakeholder which is responsible to mobilize the community on soil and water conservation and other plans to be accomplished in the *Kebele*. The *Kebele* administration participates the community at the planning, implementation and post implementation phases (maintenance of SWC structures constructed through campaign works). The *Kebele* administration has also the power to punish farmers when they refuse to participate in soil and water conservation-related works. The punishment could be in monetary terms which could reach up to 1,000.00 Birr, more burden during annual campaign based watershed works, restriction from improved seed or sometimes aid. As one of the respondents in Keta-Welele *Kebele* raised:

At one time, a farmer demolished a structure which was constructed on his plot of land through the community mobilization work. But later on, the farmer damaged the structure believing that the structure is not important for him. We advised him to maintain the structure and he was not willing to do so. Following this, we took the case to the Kebele administration. After seeing the case seriously, the Kebele administration passed a decision on the farmer to maintain the structure. He was also given a notice not to commit a similar mistake in the future. In fear of this as well as seeing the benefits of structures from others, such kind of people are changing their mind through time.

Contrary view was also raised by some farmers regarding the in ability of the *Kebele* administration in terms of executing its responsibilities. As a farmer from Wererso-Nono Mene Abechu *Kebele* mentioned, *"the Kebele administration was expected to play a leading role on SWC structure works. But since most of the time they are busy on other political tasks, they are not able to execute what is expected from them. That is why we see gaps on SWC works."*

Added to the above points, as the household survey respondents explained, the support and follow up of Woreda level experts was minimal. Out of the 82 respondents, only 13(16%) said Woreda level experts provide support for farmers. This could be associated with the fact that due to the nature of the work, Woreda level experts have less frequency of contact with farmers.They may conduct field visits on a certain period of time.

In addition to the household survey respondents, respondents of the in-depth interview and FGD participants in both *Kebeles*have a similar idea concerning the support an follow up of agricultural extension workers and *Kebele* administration. Although agricultural extension workers and the *Kebele* administration are providing technical support and follow up, as the respondents indicated, it is not enough and as is expected to deliver. More specifically, a model farmer in the FGD discussion at Keta Welele *Kebele* mentioned:

I am a model farmer in the Kebele. For my success, the support I got from agricultural extension workers was immense. But through time and recently, this support is decreasing and sometimes it is difficult to get the agricultural extension workers easily in the Kebele. This, accompanied with residents' increasing demand for water and electricity, campaign-based watershed works in our Kebele are almost non existence. Farmers on their plot of land are maintaining structures.

But since this is not enough and should be integrated with the campaign work, stakeholders at the Kebele, Woreda, Zone and Region level should give attention to the problem and there should be an open discussion and consensus have to be reached among all stakeholders.

Local leaders and elderly people are the most widely accepted actors contributing in increasing farmers' maintenance decision in the studied *Kebeles*. All the respondent households explained the pivotal role played by local leaders and elderly people. Respondents mentioned that local leaders and elderly people are playing a great role in resolving environment-related concerns and encouraging farmers to actively participate on other development works. Respondents mentioned that local leaders and elderly people reprimand farmers who didn't maintain structures and teach farmers about the benefits of structures. This greatly indicates that the various governmental structures in the *Kebeles* have to recognize and use the existing informal system properly to address environmental and other development works in the *Kebeles*.

CHAPTER FIVE

CONCLUSIONS AND RECOMMENDATIONS

5.1.Conclusions

The research assessed factors affecting farmers' decision onSoil and Water Conservation (SWC) structures constructed through campaign works in two *Kebeles* (villages) ofSululta Woreda, Oromia National Regional State, Ethiopia.The results of the study shows that most of the farmers are aware of the benefits of SWC structuresin preventing soil erosion, retaining moisture, improving soil fertility and increasing agricultural production. As a result, a significant number of farmers maintained the structures on their plot of land.However, few farmers stated that SWC structures are contributing to infestation by rats and at the end decrease agricultural production.In addition,campaign works were abandoned in a locality wherethe governments' in ability to respond basic infrastructure requests of the community such as water and electricity exist. This may show that awareness and motivation of farmers are the factorscontributing not to maintain SWC structures.

The study shows that farmers whose farmland is steeper maintained SWC structures more as compared to those farmers whose farmland is flat. It shows that farmers ignored or demolished structures in a locality where the slope of the farmland is flat.

Furthermore, farmers living in the rural/*Kebele*and those who are using their own land maintained the structures as compared to those farmers living outside the *Kebele*, those who rented the land from others and those engaged in non-farm activities. This indicates that there is no clear maintenance strategy, weak extension support and follow up from the

*Kebele*administration and in general maintenance of SWC structures were not properly scrutinized before campaign works.

More importantly, although it is essential, the role of extension workers was limited only in teaching farmers about the benefits of SWC structures. This was accompanied by weak follow up from the *Kebele* administration in terms of controlling farmers whether they are maintaining structures or not.

In general, lack of awareness and motivation of farmers, lack of bottom-up planning approach and consultation of farmers as well as weak commitment of local administration contributed in decreasing maintenance decision of farmers.

5.2. Recommendations

Some farmers perceive soil and water conservation works aggravate infestation by rats and this decreases agricultural production. Thus, in order to reduce such misconceptions and share successes stories, there should be awareness raising programs and experience sharing among *Kebeles* and farmers.

It is observed that farmers ignore or demolish structures when the slope of the land is flat. This shows less participation of farmers during the planning stage and thus farmers have to be participated well during the planning stage. In addition, local knowledge has to be recognized and there should be a bottom-up planning approach to create a sense of ownership and ensure sustainability of SWC structure works.

There should be a clear SWC structures maintenance strategy to make SWC works all-farmers encompassing. In addition, there should be strong support and follow up from agricultural extension workers and the *Kebele* administration.

In the community of the studied *Kebeles*, there is a trend of assisting elderly people and people with disabilities. Thus, such kind of norms of the community have to be encouraged and strengthened to make the maintenance of soil and waters conservation structures more fruitful and scalable.

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List of Appendices

Appendix 1: Household Survey Questionnaire

Dear respondent,

I am a masters degree program student at Addis Ababa University, department of social anthropology. The purpose of this interview is to assess factors that affect farmers' maintenance decision of soil and water structures. Results of the study shall be kept confidentially and only for the study purpose. Thank you in advance for giving your time for the interview and answering the questions.

Direction: Please put the number of your specified choice number in the given box.

Code: --------

Kebele: ---------- ☐

1. Keta Welele
2. Wererso-Nono Mene Abechu

Section I: Socio-demographic Profile of Respondents/Household Heads

1. Sex---------- ☐

1.Male

2.Female

2. Age (in years) ----------

3. Marital Status---------- ☐

1. Married
2. Unmarried
3. Divorced
4. Widow/er

4. Place of residence---------- ☐

1. In the village
2. Outside the village/nearby urban area

5. Education level---------- ☐

1. Read and write
2. Illiterate, no schooling
3. Elementary 1st cycle (1-4)
4. Elementary 2nd cycle (5-8)
5. High school (9-12)
6. Above grade 12

6. Land size (in Ha):_____

7. Land ownership type---------- ☐

1. Own
2. Rented

8. Religious Affiliation---------- ☐

1. Orthodox Christian
2. Islam
3. Protestant
4. Catholic
5. Traditional Religion/Waqefeta

9. Major livelihood activity---------- ☐

1. Agriculture
2. Animal husbandry
3. Agriculture and animal husbandry
4. Agriculture/animal husbandry and trade
5. Daily trade
6. Employee
7. A combination of agriculture and animal husbandry
8. Animal trade
9. A combination of agriculture and trade

10. Ethnicity---------- ☐

1. Oromo

2.Amhara

3. Other, Specify----------

11. Profile of Children

11.1.Number of Children	11.2.Age of older children	11.3.Age of youngest children	11.4.Highest educational level of children	11.5.Lowest educational level of children	11.6.Number of children living with the household head in the Kebele
1.Male=					1. Male=
2.Female=					2. Female=
3.Total=					3. Total=
Code box for Q#11.4 and 11.5 **1. Read and write, 2. Illiterate (no schooling), 3.Elementary 1st cycle (1-4), 4. Elementary 2nd cycle (5-8), 5.High school (9-12), 6.Above grade 12**					

Section II: Factors Influencing Farmers' Construction and Maintenance Decision of Soil and Water Conservation (SWC) Structures

12. When was the soil and water conservation structure constructed in your farm land (E.C)?----------

13. Were you willing for the structure to be constructed on your farm land?---------- ☐

1. Yes

2. No

14. If your answer to question number 12 is yes, what was the reason?---------- ☐

1. Because I know its benefits

2. Because I was forced by the Kebele Chairman and extension worker to do so

3.Not applicable

15. If your answer to question number 12 is no, what was the reason?---------- ☐

1. Because it has many disadvantages

2. Because I don't have any knowledge about its advantages

3. Not applicable

16. Does damage had occurred to the structure after it was constructed? ----------

1. Yes
2. No

17. If your answer to question to number 15 is yes, what was cause of the damage? ----------

1. During agricultural activity
2. I did it deliberately (I demolished it)
3. Because I ignored it after the construction 4. Not applicable

18. If the damage occurred during agricultural activity, have you ever maintained it? ----------

1. Yes,
2. No

19. If your answer to question number 17 is yes, why you maintained it? ----------

1. Because it controls run-off
2. Because it increases agricultural production and productivity
3. Both 1 and 2
4. Not applicable

20. If your answer to question number 16 is I did it deliberately, why you do that? ----------

1. Because rats and rabbits spread on the structure and eat what is produced
2. Because it takes land of production
3. Because the structure is constructed in an inappropriate (flat slope land)
4. Not applicable

21. The following questions measure your willingness to participate in soil and water conservation structures. Five choices are given for each question. Could you please specify your position by indicating how much you agree with each statement in the past two years?

No.	Statements	How much do you agree with the following statements? *1= Strongly agree* *2= Agree* *3=Neutral* *4= Disagree* *5= Strongly disagree*
21.1	I found the awareness creation given by extension workers before starting constructing the soil and water conservation structure useful and valuable	
21.2	I am willing to participate in the annual community based water shed campaign works	
21.3	I have been contributing labor for maintaining the soil and water conservation structure in my farm land	
21.4	I have been maintaining soil and water conservation structure by my own initiative; not because of external pressure or persuasion	
21.5	I have been maintaining soil and water conservation structure because local officials and extension workers ordered/required me to do it	
21.6	I have been motivating other farmers to maintain soil and water conservation structures in their own farm land	
21.7	I have been participating in maintaining the soil and water conservation structure because I fear criticism, scorn, or punishment	

Attributes of Households and Communities: [size, heterogeneity, social capital] and Attributes of households [labour, asset possession]

22. Could you please tell us the number of livestock you have?

No.	Livestock	Number currently owned
22.1	Oxen	
22.2	Cows	
22.3	Calf, sheep, goats	
22.4	Heifer, young bulls	
22.5	Horses	
22.6	Donkey	
22.7	Mules	
22.8	Chickens	

23. How often have you engaged in off-farm activities in the last two years (Agricultural wage and environmental income)?---------- ☐

1. Never
2. Sometimes
3. Always

24. If you have engaged in off-farm activities, could you please tell us income you earn from the following activities in the past one year?

No.	Off-farm activities	Income (in Birr)
24.1	Wage obtained by working on the farms of other fellow farmers	
24.2	Sale of wood	
24.3	Sale of firewood	
24.4	Sale of grass	
24.5	Other, specify_____	

25. How often have you engaged in non-farm/non-agricultural activities in the last two years?------ ☐

1. Never
2. Sometimes
3. Always

26. If you have engaged in off-farm activities, could you please tell us income you earn from the following activities in the past one year?

No.	Non-farm activities	Income (in Birr)
26.1	Wages income	
26.2	Business income	
26.3	Rental income obtained from leasing land or property	
26.4	Remittances	
26.5	Other, specify_____	

27. How do you evaluate the success of maintaining the soil and water conservation structure on your farm land---------- ☐

1.It is very successful

2. It is moderately successful

3.It is not successful

Attributes of Watersheds

28. How do you describe the extent of degradation on own farm and grazing land after the construction of the SWC structure?

SN	Problems of land degradation	1= Severe 2=Medium 3= Low
1	Soil fertility depletion	
2	Soil erosion (soil loss)/ water erosion	
3	Deterioration of grazing land	

29. How do you describe the slope of your farmland?---------- ☐

1. Very flat
2. Flat
3. Moderate
4. Steep

Section IV: Attributes of Technology/Stone Bund

30. Could you please indicate to what extent you agree with each of the following statement?

No.	Statements	*1. Strongly agree* *2. Agree* *3. Neutral* *4. Disagree* *5. Strongly disagree*
30.1	SWC structures could reduce extent of runoff and land degradation	
30.2	I am inclined to the idea that SWC structures could ensure sediment accumulation near structures and moisture retention	
30.3	SWC structures have many benefits, including agricultural production and productivity	
30.4	SWC structures occupies significant proportion of farmland and usually minimizes crop production	
30.5	SWC structures should be abandon as it is so labor intensive & its outcome is minimal	

Households' Perceived impacts of SWC Structures

31. How do you rate the maintenance and sustainability of SWC structures?

No	Type of land	33.1. Maintenance (use code box below)	33.2. Sustainability (use code box below)
1	Own farmland		
2	Own grazing land		
Code box for Q#30.1 **1= I have been maintaining** **2= I have been ignoring** **3= I have been demolishing**			Code box for Q#30.2 1= Enduring 2= Some are enduring 3= Vanished immediately

32. How do you describe change in the problem of land degradation (e.g. soil fertility depletion, soil erosion,) after the construction of the structure on your farm land? ---------- ☐

1.= Increased

2. Decreased

3. No change

33. I have effectively learned how to maintain SWC structures?---------- ☐

1. Strongly agree
2. Agree
3. Disagree
4.Strongly disagree

34. I have started constructing SWC structures on my own land/farmland after seeing the benefits of the structures from other farmers---------- ☐

1.Agree
2.Disagree

35. Could you please tell us the benefits that your household obtained as a result of maintaining the soil and water conservation structure?

1. _____
2_____

36. Could you please tell us the negative effects of maintaining the soil and water conservation structure on your household in the past two years?

1_____
2_____

37. What challenges have you faced during and after the construction of SWC works?

1. _____
2._____

38. What should be done to make farmers maintain soil and water conservation structures?

1. _____
2._____

Section III: Role of actors (development team leaders, *Kebele* administration, extension workers) and institutions (rules, regulations, work norms, beliefs, cultural practices)

39. Have you ever received support from extension workers regarding the construction and maintenance of soil and water conservation structures/stone bund? ---------- ☐

1. Yes2. No

40. If your answer to question number 38 is yes, what kind of support you received?----------

41. Do Kebele chairman, development team leaders and extension workers follow you whether you maintain soil and water conservation structures/stone bund? ---------- ☐

1. Yes
2. No

42. If your answer to question number 40 is yes, how frequently?----------

43. Are there specific guidelines or frameworks to plan and monitor SWC works in your Kebele? ----- ☐

1.Yes
2. No.

44. Are there rules, norms or beliefs that encourage/push or hinder farmers to or not to construct and maintain SWC structures? ---------- ☐

1. Yes,
2. No.

45. If your answer to question number 43 is yes, please mention them_____

46. The following are actors and institutions that are put in place to plan, implement and follow up SWC structure works. Could you please evaluate their performance by indicating your level of agreement with the following statements?

No	Actors and Institutions	*1. Strongly agree* *2. Agree* *3. Neutral* *4. Disagree* *5. Strongly disagree*
46.1	The leader of our local network (i.e. 1 to 5 group) has been effectively working/mobilizing farmers for SWC works maintenance	
46.2	Leaders of our development team is working to ensure the participation of farmers in SWC works maintenance	

46.3	Extension workers are knowledgeable individuals who have been striving for the proper maintenance of SWC structures/stone bund	
46.4	The *Kebele* administrator is a very committed selfless person who has been striving to smoothly coordinate farmers to maintain SWC structures/Stone bund	
46.5.	District level experts have been effectively assisting us during the maintenance of SWC structures	
46.6	Local leaders and elderly people are playing pivotal role in ensuring environmental protection in general and SWC works in particular	
46.7	Farmers who fail to maintain SWC structures are usually labeled and ridiculed by other fellow farmers and actors	

Appendix 2: Focus Group Discussion (FGD) Guide

Dear respondents,

I am a master's degree program student at the Department of Social Anthropology, Addis Ababa University. The purpose of this interview is to assess factors that affect farmers' maintenance decision of soil and water structures. Results of the study shall be kept confidential and only for the study purpose. Thank you in advance for giving your time for the interview and answering the questions.

1. Socio-demographic profile of participants

- *Kebele*_____

SN	Name	Sex	Age	Social Position
1				
2				
3				
4				
5				
6				
7				
8				

Section II: Farmer's perception of land degradation and willingness to participate in soil and water conservation works

2. How do you see the problem of land degradation in your farm land and Kebele?_____

3. Do you participate in the annual campaign based water shed works? If yes, why do you participate and how many hours do you work per day?_____

4.Do you think soil and water conservation structures are useful for farmers? If yes, in what aspects are useful?_____

Section III: Attributes of Households

5. What kind of farmers (in terms of slope of land, number of children, education level, income/wealth) are willing to participate in the campaign and willing to construct and maintain soil and water conservation structures?_____

Section IV: Role of actors(development team leaders, Kebele administration, extension workers) and institutions (rules, regulations, work norms, beliefs, cultural practices)

6. Are there rules or norms that encourage or push farmers to participate in water shed works and main structures when damage occurred to the structure?_____

7.How do you see the support you receive from Kebele chairman, development team leaders and extension workers in relation with soil and water conservation works?_____

8.What do you think should be improved to encourage farmers to participate in the campaign work, construct and maintain soil and water conservation structures? (In terms of Actors' roles and responsibilities, Rules and regulations, Skills training, Awareness creation, Type of technology to be used)._____

Appendix 3: Interview Guide for Key Informants Interview

Dear respondent,

I am a masters degree program student at Addis Ababa University, department of social anthropology. The purpose of this interview is to assess factors that affect farmers' maintenance decision of soil and water structures. Results of the study shall be kept confidentially and only for the study purpose. Thank you in advance for giving your time for the interview and answering the questions.

A. Key Informant Interview Guide for a Supervisor

Section I: General

Socio-demographic profile of the informant

Expertise _____

Work position_____

Experience in the current position_____

Do you have specific guidelines or frameworks to plan, implement and monitor SWC structures in your *Kebeles*? If so:_____

Does it clearly stipulate activities in the planning, implementation and post-implementation phases? _____

Does it clearly stipulate roles and responsibilities of actors? _____

How do you describe limitations of the guidelines? _____

What are the gaps between the prescriptions of guidelines and your actual practices? _____

Could you please describe major activities you have carried out regarding SWC works in the past two years? _____

Section II: Actors and Institutions

How do you describe your interaction with major actors in SWC Works?

Major actors	*Means of communication*	*Support you receive*	*Support you render*	*Performance (limitations) of actors*
Sululta Woreda Agricultural Office				
Kebele administrators				
Extension workers				
Development team leaders				
Farmers				

Are there rules, norms or beliefs that encourage/push or hinder farmers to or not to construct and maintain SWC structures? If yes, please mention them?_____

Section III: Factors Influencing Farmers' SWC Structures Maintenance Decision

In your opinion, what kind of farmers are willing to construct SWC structures and maintain it accordingly? (In terms of age, sex, land slope, wealth, educational level)

_____

How do you participate (i.e. your roles and responsibilities) in SWC works? (In planning, implementation and post-implementation stages) _____ _____

What factors are hindering your participation? _____

What should be done to improve your participation in SWC works? (Skill training, awareness creation, type of technology to be used)

Section IV: Outcomes of SWC Works

How do you describe the impacts of SWC works (positive/negative) on farmers' own plots/farmland? (Soil fertility and agricultural production and productivity, controlling run off)

Section V: Alternative Strategies

What do you think should be improved to make SWC works more sustainable or to optimize its effects? (Actors' roles and responsibilities , rules and regulations, scale of intervention, type of technology to be used)_____

Key Informant Interview Guide for Extension Workers

Section I: General

Socio-demographic profile of the informant

*Kebele*_____

Expertise _____

Work position_____

Experience in the current position_____

Do you have specific guidelines or frameworks to plan, implement and monitor SWC works in your *Kebele*? If so: _____

Does it clearly stipulate activities in the planning, implementation and post-implementation phases?

_____

Does it clearly stipulate roles and responsibilities of actors? _____

How do you describe limitations of the guidelines? _____

What are the gaps between the prescriptions of guidelines and your actual practices? _____

Could you please describe major activities you have carried out regarding SWC works in the past two years in your *Kebele*? _____

Section II: Actors

How do you describe your interaction with major actors in SWC works?

Major actors	*Means of communication*	*Support you receive*	*Support you render*	*Performance (limitations) of actors*
Sululta Woreda Agricultural Office				
Kebele Administrators				
Supervisor				
Other extension workers in the *Kebele*				
Development team leaders				
Farmers				

Are there rules, norms or beliefs that encourage/push or hinder farmers to or not construct SWC structures? If yes, please mention them_____

Section III: Factors Influencing Farmers' SWC Structures Maintenance Decision

In your opinion, what kind of farmers are willing to construct SWC structures and maintain it accordingly?in terms of age, sex, land slope, wealth, educational level_____ _____

How do you participate (i.e. your roles and responsibilities) in SWC works? (In planning, implementation and post-implementation stages) _____ _____

What factors are hindering your participation at each stage? _____

What should be done to make farmers construct and maintain SWC structures? (Skill training, awareness creation, working condition, type technology to be used)_____

Section IV: Outcomes of SWC Works

How do you describe the impacts of SWC structures (positive/negative) on farmers' own plots/farmland? (Soil fertility and agricultural production and productivity, controlling run off)_____

Section V: Alternative Strategies

What do you think should be improved to make SWC works more sustainable or to optimize its effects? (Actors' roles and responsibilities, rules and regulations, scale of intervention, type of technology to be used, scheduling of activities)_____

Key Informant Interview Guide for Kebele Administrators

Section I: General

Socio-demographic profile of the informant

*Kebele*_____

Expertise _____

Work position_____

Experience in the current position_____

Do you have specific guidelines or frameworks to plan, implement and monitor SWC works in your *Kebele*? If so: _____

Does it clearly stipulate activities in the planning, implementation and post-implementation phases? _____

Does it clearly stipulate roles and responsibilities of actors? _____

How do you describe limitations of the guidelines? _____

What are the gaps between the prescriptions of guidelines and your actual practices? _____

Could you please describe major activities you have carried out regarding SWC works in the past two years in your *Kebele*? In terms of technologies used, size of land covered by SWC measures (farmland) _____

Section II: Actors and institutions

How do you describe your interaction with major actors in SWC works?

Major actors	*Means of communication*	*Support you receive*	*Support you render*	*Performance (limitations) of actors*
Sululta Woreda Agricultural Office				
Supervisor				
Extension workers in the *Kebele*				
Development team leaders				
Farmers				

Are there rules, norms or beliefs that encourage/push or hinder farmers to or not to construct and maintain SWC structures? If yes, please mention them_____

Section III: Participation in SWC Works

Could you please tell us how the planning, implementation, and post-implementation activities are carried out in your *Kebele*?

Planning _____

Implementation _____

Post-implementation _____

How do you participate (i.e. your roles and responsibilities) in SWC Works?

During Planning stage_____

Implementation stage_____

Post-implementation stage_____ _____

What factors are hindering your participation at each stage? _____

What should be done to improve your participation in SWC measures? (Skill training, awareness creation, type of technology to be used)_____

Section IV: Outcomes of SWC Works

How do you describe the impacts of SWC measures (positive/negative) on farmers' own plots/farmland? (Soil fertility and agricultural production and production, controlling run off)_____

Section V: Alternative Strategies

What do you think should be improved to make SWC works more sustainable or to optimize its effects? (Actors' roles and responsibilities, rules and regulations, scale of intervention, type of technology to be used, scheduling of activities)

Key Informant Interview Guide for Leaders of Development Teams

Section I: General

Socio-demographic profile of the informant

*Kebele*_____

Village_____

Experience as a development team leader _____

Number of households in your team_____

Could you please describe major activities you have carried out regarding SWC works in the past two years in your *Kebele*? In terms of: technologies used, size of land covered by SWC measures (farmland)

Section II: Actors and Institutions

How do you describe your interaction with major actors in SWC Works?

Major actors	***Means of communication***	***Support you receive***	***Support you render***	***Performance (limitations) of actors***
Kebele administrator				
Supervisor				
Extension workers in the *Kebele*				
Other development team leaders				
Farmers				

Are there rules, norms or beliefs that encourage/push farmers to or not construct SWC structures and maintain it accordingly? If yes, please mention them?_____

Section III: Participation in SWC Works

Could you please tell us how the planning, implementation, and post-implementation activities are carried out in your Kebele?

Planning _____

Implementation _____

Post-implementation _____

How do you participate (i.e. your roles and responsibilities) in each stage of SWC works?

Planning stage_____

Implementation stage _____

Post-implementation stage _____

What factors are hindering your participation in each stage? _____

Planning stage _____

Implementation stage _____

Post-implementation stage_____

What should be done to improve your participation in? (Skill training, awareness creation, schedule of activities, type technology to be used

Section IV: Outcomes of SWC Works

How do you describe the impacts of SWC measures(positive/negative) on farmers' own plots/farmland? (Soil fertility and agricultural production, controlling run off

Section V: Alternative Strategies

What do you think should be improved to make SWC works more sustainable or to optimize its effects? (Actors' roles and responsibilities, rules and regulations (e.g. bylaws, land tenure, work norms), scale of intervention, type of technology to be used, scheduling of activities)

Appendix 4: Interview Guide for In-depth Interview

In depth Interview guide

Dear respondent,

I am a master's degree program student at the Department of Social Anthropology, Addis Ababa University.. The purpose of this interview is to assess factors that affect farmers' maintenance decision of soil and water structures. Results of the study shall be kept confidential and only for the study purpose. Thank you in advance for giving your time for the interview and answering the questions.

Kebele: -

Section I: Socio-demographic Profile of the Respondent

1. Name: ----------

2. Age:----------

3.Sex: ----------

4. Marital Status:----------

5. How many children do you have?----------

6. For how long have you lived in the Kebele? ---------

7. What is your educational level?:----------

8. What is your major livelihood activity?----------

Section II: Factors Influencing Farmers' Construction and Maintenance Decision of Soil and Water Conservation (SWC) Structures_____

9. How do you see the problem of land degradation in your land?_____

10. What should be done to reduce these problems?_____

11. How do you see the benefits or disadvantages of Soil and Water Conservation (SWC) works?_____

12. How do you see the annual campaign-based water shed works?_____

13. Are there mechanisms or opportunities that encourage farmers to construct and maintain SWC works?_____

14.In your opinion, what kind of farmers are willing to construct and maintain SWC works?_____

15. Do you think that SWC works are effective in your specific case in particular and in the Kebele in general?_____

16. Are there challenges related with SWC works? _____

17.What should be done to make farmers maintain soil and water conservation structures?_____

Section III: Role of actors(development team leaders, Kebele administration, extension workers) and institutions (rules, regulations, work norms, beliefs, cultural practices)

18. How do you see the support of extension workers regarding the construction and maintenance of soil and water conservation structures? _____

19. How do you see the role of *Kebele* chairman and development team regarding the construction and maintenance of soil and water conservation structures? _____