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ASSESSING THE CONTRIBUTIONS OF COMMUNITY PARTICIPATION IN WATERSHED MANAGEMENT PROGRAM: THE CASE OF NANSABO *WOREDA*, WEST ARSI ZONE, OROMIA NATIONAL REGIONAL STATE, ETHIOPIA

BY: GISHE SINBRU

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ADVISOR:

GETACHEW DEMISSIE (PHD)

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ROBE- BALE, ETHIOPIA

Declaration

I hereby declare that the thesis entitled "Assessing the contributions of Community Participation in Watershed Management Program: The Case Of NansaboWoreda, West Arsi Zone, Oromia National Regional State, Ethiopia"submitted for the partial fulfillment of the requirement of the Master of ArtsDegree in Geography and Environmental Studies, is my original work and has not been presented for a degree in any other university and all sources of material used for this thesis have been duly acknowledged and references are listed at the end of the main text.

Name: GisheSimbiru

Signature: _____

Date of Submission: _____

Research Approval Sheet

As members of the board of examiners of the master's thesis open defence examination, we certify that we have read and evaluated the thesis prepared by the studentGisheSinbiru entitled"Assessing the contributionsof Community Participation in Watershed Management program: The Case of Nansabo*Woreda*, West Arsi Zone, Oromia National Regional State, Ethiopia" and recommended that the thesis requirement for the master of arts degree in Geography and Environmental Studies.

Chairperson	Signature	Date
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Internal examiner	Signature	Date
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Certification of the Thesis

I hereby certify that all the corrections and recommendations suggested by thesis examiners are incorporated into the final thesis proposal

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Name of the designate	Signature	Date

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TABLE OF CONTENTS

CONTENTS PAGE

Declaration i
Acknowledgements iii
List of Abbreviations and Acronyms vii
Abstract viii
1. INTRODUCTION 1
1.1. Background of the Study 1
1.2. Statement of the Problem 3
1.3. Objective of the Study 5
1.4. Research Questions 5
1.5. Scope of the Study 5
1.6. Significance of the Study 6
1.7. Limitation of the Study 6
1.8. Definitions of Key Concepts 7
1.9. Organization of the Study 7
2. REVIEW OF RELATED LITERATURE 8
2.1. Conceptual Literature 8
2.1.1 Levels of people's participation in watershed management programs 9
2.1.2 Contribution of peoples participation in watershed management programs 11
2.1.3. History of Watershed Management Practices in Ethiopia 12
2.1.4 Watershed management program in Nensebo woreda 14
2.1.5. Community-Based Approach to Watershed Management 15
2.1.6. Characteristics of Community-Based Watershed Management 16
2.1.6.1. Changing Roles and Relationships 16
2.1.6.2. Whole-System Perspective 16
2.1.6.3. Integration of Scientific Information and Societal Values 16
2.1.6.4. Adaptive Management Style 17
2.1.7.Factorsthataffect Land Management Practices 17

2.1.7.1. Lackof professionalismandtechnical standards 17
2.1.7.2. Socio-economicfactor 18
2.1.7.3. Incomplete technology packages 18
2.1.7.4. Physicalconstraints 19
2.1.7.5. Top-down planning approachto technical assistance 20
2.1.7.6. Weaklinkageamong inter-andintra-discipline 20
2.1.7.7. Limitedinformation flowand networking 20
2.1.2. Watershed Management Approaches 21
2.1.2.1. Collaborative watershed management 21
2.1.2.2. Holistic watershed management 22
2.1.2.3. Integrated watershed management 22
2.2. Theoretical Literature 24
2.3. The Empirical Literature 26
2.4. Conceptual Framework 29
CHAPTER THREE 33
3. RESEARCH METHODOLOGY 33
3.1. Description of the Study Area 33
3.1.1. Topography 34
3.1.2. Climate 35
3.1.3. Soil and Land Use of the Study Area 35
3.2. Socio-economic Characteristics of the Study Area 35
3.3. Research Approach 36
3.4. Research Design 37
3.5. Sources of Data 38
3.6. Sample Size Determination and Sampling Techniques 38
3.7 Data collection procedures 40
3.7. 1 Instruments of Data Collection 40
3.7.1.1 Questionnaire 40
3.7.1.2 Interview 41
3.7.1.3. Focus Group Discussion 41
3.8. Validity and Reliability of the Data Collection Instruments 42

3.9. Methods of Data Analysis and Presentation 43
3.10. Ethical Consideration 45
4. RESULTS AND DISCUSSION 46
4.1.Levels of Community Participation in Watershed Development 46
4.2. Contribution Of Community Participation In Watershed Program 51
4.3. Socio-Demographic Factors That Influences Farmers' Decisions To Participate In Watershed Programs 53
CHAPTER FIVE 58
5. CONCLUSIONS AND RECOMMENDATIONS 58
5.1. Conclusions 58
5.2. Recommendations 59
References 60
APPENDIXES 65
Checklist for Key Informants Interview 67
Checklist for Focus Group Discussion 68

List of Abbreviations and Acronyms

ARD	Agricultural & Rural Development
CPWMA	Community Participation in Watershed Activities
FAO	World Food and Agricultural Organization
IFAD	International Food and Agricultural Development
LEP	Land & Environmental Protection
MEFCC	Ministry of Environment and Forest and Climate Change
MoA	Ministry of Agriculture
NWAO	NansaboWoreda Agricultural Office
WMA	Watershed Management Activities
UNs	United Nations

Abstract

Watershed development program has served as the foundation for local community efforts to promote rural development. Therefore, this study was aimed to assess the contributionsof community participation in watershed management programs in Nansaboworeda,Oromia regional state. Mixed research approach and concurrent research design were used.In order to select and determine the sample kebeles from the woreda, agro - ecological zone was set as criteria and employed stratified random sampling. Then, one kebele from each homogenous agro-ecology was selected by simple random sampling. Namely; Gerenbamo from dega, Badesa from kola , and Hurobaro from woinaDega agro-ecologies.From the selected kebeles 316 houshold heads were selected by simple random sampling.Data were collected through household questionnaire survey, focused group discussion and informant interview. Both quantitative and qualitative methods were used in analyzing the information collected using different instruments and presented by using tables. The findings of the study indicated that, the overall community participation index onwatershed development and management in the study area was computed as 39.13%. This showed that the level of community participation in the study area fall within moderate level category. The result of the study confirmed that demographic and socio economic related factors were the major determinants that affect adoption decision of watershed management practices. The finding of the study also revealed that watershed management practices have a significant role in improving the livelihood and their income.Finally,capacitating the community through practical based training and scaling up strategies ofeffective watershed management practices need emphasis of the regional, zonal anddistricts government and NGOs.

Keywords: Community, Participation, Watershed

CHAPTER ONE

1. INTRODUCTION

1.1. Background of the Study

Due to issues with soil erosion, the productivity and production of agriculture worldwide have been hampered. Ethiopia is one of the nations most affected by soil degradation in Sub-Saharan Africa (SSA) ZewudeSufara and TeshomeYergu(2016). With almost 110 million people and an annual population growth rate of 2.6%, Ethiopia is the most populated country in Africa. Ethiopia's economy is based on agriculture, which generates 47.7% of the country's total GDP, 90% of its export revenue, 80% of its employment, 70% of its domestic industries' raw material needs, and a significant portion of its food supplies (FAO, 2016;).Particularly, rural residents are heavily reliant on the land, water, and forest resource bases for economic growth, food security, and other essential demands (FAO, 2003; Danyo et al., 2017).

Sustainable management of natural resources is crucial to ensuring agricultural development at the desired rate and on a sustainable basis. As a result, land resources are under a lot of stress, which exacerbates environmental degradation and increases the likelihood of food shortages (IFAD, 2016). According to the majority of studies on land degradation in Ethiopia, one of the biggest threats to the nation's food and agricultural security is land degradation. According to recent estimates based on satellite imagery, the country's land area is now covered by hotspots of land degradation from the previous three decades to the tune of roughly 23% (Gebresillasse et al., 2015). The dry Afro montane biome experiences an annual forest loss of about 70,000 hectares and an annual forest gain of about 30,000 relatively high annual forest gains (MEFCC, 2016). Soil erosion in combination with improper land management practices is another major factor causing degradation.

In the fragile and semi-arid environments of developing countries, the watershed development program has developed as a new paradigm for sustainable rural livelihoods and has taken center stage in rural development. It is acknowledged as a potential engine for agriculture growth and

development in vulnerable and marginal rain fed areas and is regarded as one elective instrument for resolving several of these issues (MEFCC, 2016).

Degradation of watersheds led to a long-term decrease in the amount and quality of water and land resources, which has an adverse effect on the livelihoods of the rural poor who depend on these resources for their survival and livelihoods. The Ethiopian government was inspired by this and initiated a significant soil and water conservation (SWC) initiative in the early 1970s(Woldemariam, 2012). For instance, the Food for Work (FFW) project, which was started in 1974 as an emergency relief initiative, was backed by the World Food Programme (WFP) in response to the famine that occurred in the northern region of the country between 1973 and 1974(Woldemariam, 2012). Later, this effort became a development initiative called "Managing Environmental Resources to Enable Transitions" (MERET), which connected emergency food assistance with sustainable long-term development options.

Between the 1970s and 1990s, the majority of SWC initiatives were focused on minimizing soil erosion rather than increasing agricultural output. Neither successful nor sustainable, these efforts lacked synergy between farm and non-farm measures (Bishaw, 2001; Eyasu, 2002; Bekele, 2003). With little beneficiary involvement, the intervention took a more top-down approach. Despite this, the SWC's operations enhanced land productivity and decreased soil erosion. Nevertheless, the initiative has come under fire for emphasizing mechanical techniques while ignoring other elements of sustainable land management, such as improved land-use systems, conservation land management practices, and livestock management (Osman and Sauerborn, 2001). Since the end of the 1990s, therefore, the SWC activities of the project were developed into a participatory integrated watershed management approach (German et al., 2007) to promote sustainable water and land resources management based on partnerships with the community.

Soil and water conservation technologies are not equally successful or effective in many parts of Ethiopia. Level of farmers participation in soil conservation activities are influenced by inadequate expertfollow-up and assistance, farmers landholding size andtechnical skills(Wolka and Negash 2014; Mekonen andTesfahunegn 2011; Sinore et al., 2018). Similarly, soil degradation and water management are critical environmental issues in Nenseboworeda. The woredas diverse topography and climate make it susceptible to soil erosion and land degradation, which intern affect agricultural productivity and food security (NWAO 2023/24). Soil erosion

driven by factors such as deforestation, over grassing, and unsustainable agricultural practices, leads to significant top soil loss. This degradation diminishes soil fertility reduces crop yields, and exacerbates food insecurity among local communities. Additionally the loss of vegetative cover increase surface runoff contributing to further erosion and sedimentation in water bodies(NWAO 2022/23).Therefore, the researcher was initiated to assess the contribution of community participation in watershed management program in Nansabo*Woreda*, West Arsi zone, Oromia national regional state, Ethiopia`.

1.2. Statement of the Problem

In Ethiopia, planning for watershed development began in the 1980s(Woldemariam, 2012). Since that time, the watershed development program has served as the foundation for government, nongovernmental groups, and local community efforts to promote rural development. Large-scale efforts, however, remained ineffective due to effective community participation, limited sense of ownership over the asset created, and unmanageable planning units.

The community based watershedmeasures in most cases were physical measures taking place through campaign. Moreover, the CBWM practice in the study area was still limited in both quality and quantity, and also it was practically through the pressure of external body from *Woreda* supervisors, *kebele* administrative bodies, and Developmental Agents (DAs) as a campaign rather than people's internal motivation and interest to conserve their land form degradation(NWAO, 2024).

According to information from Nansabo*woreda*agricultural office experts, there were a rarely watershedconservation practices introduced in the area. Moreover, the woreda was severely degraded kola (tropical) zone prone to frequent rain failure and unsuitable for crop cultivation. As a result the residents were vulnerable to climatic and market shocks.The land was more destroyed and currently no further progress was being made in regard to Soil Conservation (SC) intervention on rugged terrains. In addition to these it was unfortunate that watersheds,terraces and soilbunds were currently destroyed by farmers themselves with the pretention of cultivating accumulated fertile soil under the watersheds,terraces and soilbunds without any kind of concern or responsibility. This shows that farmers may still not to be convinced and well informed about the significance of watershed practice and soil erosion consequences.

Moreover, the communities are reluctant to accept the government instruction regardingwatershed management,rather they consider the program as useless(NWRAO, 2023). Therefore, they have no willingness to implement the soil conservation, especially farmers who concerned issue, except part of the communities that seek food aid and few people who are member of the government administration part. This may be because of lack of understanding about the contributions of community participation in watershed management programs. Hence, it was very important to study the contributions of community in CBWM programs.

The researcher tried his best to find related local literature which assess the contribution of community participation in watershed management. However, the researcher did not find any research title which is similar with this topic that conducted in the study area.Whereas, the researcher find research of Meaza(2015),Dejene, (2018) and Zemzem (2021). The study conducted by Meaza, (2017) on the title the role of community based watershed management for climate change adaptation in Adwa, central Tigray zone. The key finding of the research presents that due to different interventions the livelihood of the community was diversified and enhanced especially; income, soil fertility, crop productivity, forest, water and food availability become improved. Even if it has some gaps in the process of implementation such as lack of linkage between sectors, lack of targeting on the poor, young and women participation, weak stakeholder linkage. Here the study however, did not consider economic and environmental benefits obtained from community participation in watershed management activities.

Dejene(2018) studied on "community participation on watershed managementprogramme. The case of Gemechis District, Oromia, Ethiopia"found out thatthe overall community participation onwatershed development and management in the study area was computed as 39.28 percent.This study stressed on the level of community participation in three faces namely, planning, implementation and evaluation. It was nothing to say on the economic and environmental benefit of community participation in watershed management activities. The challenges influenced the community to participate in CBWM activities were also not investigated.Generally the contribution of community participation were not compressively addressed by all the above research works.

The absence of study on the contribution of community participation in watershed management activities, low or ineffective community participation, challenges that hinders effective

community involvement, the high degradation of soil in the study area and vulnerable to climatic shocks are initiated the researcher to conduct this study.

1.3. Objective of the Study

1.3.1. General Objective

The overall objective of this study is to assess the contributions of community participationin watershed management activity in Nansabo*woreda*.

1.3.2. Specific Objectives

The specific objectives of the research are:

- To assess the level of community participation in watershed managementactivities in Nansabo*woreda.*
- To identify factors that determine farmers' decisions to participate in watershed management activities.
- To examine the contribution of community participation in watershed management programs

1.4. Research Questions

The following are some of the research questions to be answered at the end of the investigation.

1. What is the level of community participation in watershed management activitiesin Nansabo*woreda*?
2. What are the factors that influence farmers' decisions to participate in watershed management program in the study area?
3. How does community participation in watershed management contributing to income of households in the study area?

1.5. Scope of the Study

It is more essential if the study was conducted in all *kebeles* of Nansabo*woreda*; however, such study requires much resource, time and human power. Therefore, geographically; the scope of the study was delimited to three *kebeles*in Nansabo*Woreda (*Gerenbamo,Badesa,andHurobaro*)*.

The selection of these three kebeles primarily based on the severity of soil degradation, over population and climate change in these three areas. Conceptually the study was delimited to assess thecontributions of community participation in watershed management, describing the benefits obtained from watershed management activities and identifying factors that influences farmers' decisions to participate in watershed management programs.Temporally,the study covered only 2023/24. Methodologically, the study was delimited to mixed research approach, concurrent research design, stratified, purposive and simple random sampling techniques.

1.6. Significance of the Study

The study can have academic as well as non-academic significances. Academically, the study might be significant as a point of reference for those researchers who may conduct a research on similar topic and with the gaps of this research. The non-academic dimension of the study is putting solution to influence farmers' decisions to participate in watershed management activities in the study area. It can be essential to maintain sustainable farmland management, and to develop economically viable agro-ecological system among others. Therefore, this study is expected to be informative for all concerned bodies of the agricultural sector. It can be achieved by using this research papers as a guide of references. Its finding will be shared with relevant stoke holders through a variety of platforms and method to maximize research and its impacts such as policy briefs and reports, stoke holders workshop and seminars and community meetings.Finally, the information on level of community participation in Nansabo*woreda* will assist the stakeholders (farmers, development agents, decision makers) in the participation for better outcomes.

1.7. Limitation of the Study

Any researchundertakingfacescertainlimitations.Similarly,thisresearchisnotfreefrom suchlimitationsparticularly duringtheprocessofdatacollectioncausedby topographicandtransportconstraints;absenceofrelatedresearcheswhichwere usefulfor comparisonpurposeinthestudyareaandunavailability ofsecondarydataneededto supplementtheprimarydata,however, in order to overcome topographic, transport and

unavailability of secondary data, the data sources focusing on only few most important issues were addressed and the four wheel accessible kebeles were selected.

1.8.Definitions of Key Concepts

Soil degradation: refers to decline in soil quality caused by its improper use or poor management usually due to agricultural, industrial or urban practices.

Community: a group of people that are bound and related by the same traditions and culture, and they have clear grouping and position of households (Ababa, 2014).

Community-based watershed management:is an approach to water-resource protection, restoration and development that enables individuals, groups, and institutions with a stake in management outcomes (often called stakeholders) to participate in identifying and addressing local issues that affect or are affected by watershed functions(Anon,014).

Land Management:- defined as the process of managing the use and development (both in urban and rural settings) of land resources. It is the methods used in managing land resources – the 'how' of land uses(Anon, 2013a)

Participatory watershed management: the collaborative work of people in the community, officials and researchers to meet the watershed management objectives(Woldemariam, 2012).

Watershed:- defined as the catchment or drainage basin. It refers to an area which has a ridge line on three sides and whose surplus run off is drained from a drainage point(Suryawanshi and Kamble, 2012).

1.9. Organization of the Study

The thesis arranged in to five chapters. The first chapter states the introduction part of the study which included back ground of the study, statement of the problem, objective of the study, research questions, significance of the study, scope, limitation of the study and rational. The second chapter explains literature reviews. The third chapter covers description of the study area and research methodology. Chapter four states about results and discussions and chapter five presents conclusion and recommendations.

CHAPTER TWO

2. REVIEW OF RELATED LITERATURE

2.1. Conceptual Literature

Watershed isdefined as a catchment or drainage basin. It refers to an area which has a ridgeline on three sides and whose surplus run-off is drained from a drainage point. It describes a region with ridgelines on three of its sides and drainage points for excess runoff. A watershed is a helpful unit of operation and analysis from a hydrological standpoint because it enables a systems approach to the usage of land and water in related upstream and downstream areas (Change, 2015).Watershed degradation is the overtime decline in the amount and quality of a watershed's water and land resources.

Watershed management is the art and technique of managing watershed resources in way that maximum benefits can be derived from them without affecting the ecological sustainability. It is a holistic concept, which tries to integrate several components like soil and water conservation, forestry development, agriculture and livestock. It tries to bring about the best possible balance in the environment between natural resources on the one side, and human and other living beings on the other and requires an integration of all scientific knowledge from many disciplines and a combination of technologies, strategies and techniques with the development and use of available tools(Anon, 2014).

Watershed management for water production is concerned with the quality and timing of the water which is produced and also referred to as water management and basin management. The sustainable utilization of integrated natural resources and environment by the stakeholder participation under both the principle of watershed and environmental management and the principle of natural resources conservation within the drainage basin area to protect, maintain and improve the water quantity, quality and timing including erosion, waste and pollution management from any human activities in the watershed areas(Meaza, 2015).

Sustainable land management can be defined as “a system of technologies and/or planning that aims to integrate ecological with socio-economic and political principles in the management of land for agricultural and other purposes to achieve intra- and intergenerational equity”(Tadesse, 2013). It is a knowledge-based procedure thathelps integrate land, water, biodiversity, and

environmental management (including input and output externalities) to meet rising food and fiber demands while sustaining ecosystem services and livelihoods (Tadesse, 2013).

Watershed management is an important part of eco-environment conservation. The main measures of watershed management are: ecosystem diagnosing; water, land and other renewable natural resources use planning; restoration of eroded land; processing of agricultural, forestry and animal husbandry production; supervision and administration; evaluation of benefit. Watersheds bear significant importance from ecological, aesthetic and socioeconomic perspectives. These watersheds are home to millions of people, a substantial proportion of whom are indigenous ethnic minorities seeking out their livelihoods by utilizing natural resources available there. To what extent or how long the ecosystem-balancing and economic opportunity-generating roles of watersheds will continue depends on their status as reflected in the distribution, density and type of vegetation cover, and the pace of soil erosion and land productivity. Due to the lack of comprehensive macro-level studies, no conclusions can be drawn about the status of watersheds on a regional scale (Winnegge, 2013). However, findings of several micro-level studies indicate that undergoing soil erosion, soil nutrient depletion and deforestation, though the extent of these problems varies from one area to another.

The specific issues being confronted in regard to watershed management are as follows: How to control or even reverse the process of forest and rangeland degradation? How to reduce the rate of soil erosion in agricultural land to a minimum possible limit? What should be done to improve the soil fertility, so as to increase crop yield on a sustainable basis? How to enable watershed settlers to improve their quality of life without inflicting damage on natural resources (Anon, 2013b).

2.1.1 Levels of people's participation in watershed management programs

Peoples participations in watershed management programsis an important strategyof different government for making watershed program successful.(DejeneTereessa 2008) was the opinion that participation is generally presented as the active involvement of target groups in the, planning, implementation and control programs and projects and merely there passive acquiesce in preforming pre-determined tasks, not merely there expiation in order to reduce the labor cost. Participation guarantees that the beneficiariesown interests are taken into account.This enhances

the likelihood that programs and projects will prove effective meeting felt development nears and that participants share equitable in all benefits.

Moulik (1978)cited in G.l.Baged2014 was the opinion that participation development process implies stimulating individual to take the initiative and mobilizing peoples to work for over all social development. The major benefit following from the participation of the people in developmental are: in planning and programming stage and thoughtthe implementation of development programs, rural peoples can provide valuable social, cultural, ecological, economical and technical endogenousknowledge ensuring consistency between objects of development and community value and preferences.

Bagdi2018stated that stake holdersparticipation as the time of planning a watershed development program is much needed to take decision the program should be according to the basic need of them.The local people should take interest and participate also in implication of program by contributing labor and money in construction of soil and water conservation structure on their filed and community land. Participation in maintenancestate is required because without protection and care by their local people the program will not be successful.The involvement of local people in program evaluation is also necessary, so that it may provide to be considered for improving in the future program planning(G.l.Baged,R.s.kurothe, 2014).

A detailed framework for assessing the level of participation especially in community development, stake holders engagement of participatory governance can be structured using atiered model that identifies various level of engagement, indicators and tolls for measurements (G.l.Baged 2014). To effectively access the level of participation in watershed management program a comprehensive SMOTE framework can be employed. These frameworkincludes five key components these arestake holders identification & mapping, modes of participation, objective alignment, tools & techniques for data collection, &evaluating &seoringmetrics(pretty 1995).Watershed management programs requires a phase specific approach with distinct indicators for each phases:- during the planning phase participation can be measured through indicators such as, the diversity & representation of stake holders in consultation the frequency of planning meetings.In the implementation phases key criteria include the level of community involvement in physical activities, participation in training and capacity building efforts, contribution of labor resources & ability of local groups to take initiative or resource challenges. In the monitoring and evolution phases meaning full participation is reflected through the

presence of local monitoring comities, the use of participatory tools like communities score cards or feedback session & transparency in sharing project outcomes & financial information(pretty 2008)

2.1.2 Contribution of peoples participation in watershed management programs

Community participation in watershed management program can improve the sustainability of the program and the quality of the result. Community participation can also help to improve the design of the project, increase the accessibility and promote the use of knowledge. According to Indian council of agricultural research 2015 Community participation can contribute to watershed management program in the following ways:-

A/ define problems and priorities

Communities can help to identify problems and priorities for watershed management

B/ evaluate alternatives

Communities can help to evaluates different solutions to watershed management problems

C/ implement programs

Communities can help to implement programs to address watershed management programs

D/ monitor and evaluate

Communities can help to monitor and evaluate the impact of watershed management program

E/ use local knowledge

Communities can use their local knowledge to improve the design of watershed management project

F/ promote resource mobilization

Communities can help to mobilized local resources to support watershed management program

Concerning the contribution of peoples participation certainly here are several case studies that highlight the significant benefits of community participation in watershed management. This is Elemo micro watershed southern Ethiopia 2018.

In 2005, the local government partnered with communities to implement watershed management in the Elemeo micro watershed. This initiatives lead to substantial increases in bush / shrub & agro forestry areas from 171 hectare & 34 hectare to 617 hectare & 152 hectare respectively. The restoration of degraded land resulted in improved soil fertility, the emergency of springs

&reduced water collection times for women & children. Additionally the reforestation efforts brought back wild life to the area.

2.1.3. History of Watershed Management Practices in Ethiopia

Ethiopia has a history of watershed management initiatives dating back to the 1970s. Watershed management methods began in Ethiopia in 1971 with the first SWC by USAID, followed by UN/FAO (under WFP) in 1974 and attempts to implement SWC by the Derguegovernment in 1976. 1988, 1990: TPLF (Under REST) began managing natural resources, Between 1991 and 2001, the current administration participated in SWC, emphasizing arable land (to persuade the populace), Between 2001 and 2009, there was a significant paradigm change in SWC, with cultivable land being managed by individual farmers and uncultivable area being managed by public activism. 2010: The region gave SWC measures top priority and there was a significant mobilization, 2012: Public mobilization for irrigation development has begun in addition to SWC (Woldemariam, 2012).

The basic approach has shifted from top-down infrastructure solutions to community-based approaches. The shift from top-down to community based(bottom-up) watershed management approaches has been driven by multiple factors such as ineffectiveness of top-down approaches, growing recognition of local knowledge's, decentralization & governance reforms, empowerment and capacity building & better outcome & sustainability(Rajendrasingh 2015). There is now a supportive policy and legal framework in the form of policies that facilitate decentralized and participatory development, institutional arrangements that allow and encourage public agencies at all levels to work together, and an approach to natural resources that rejects local legislation and tenure practices (Nihal, 2014).

Evidence suggests that Ethiopia has not yet achieved the full potential of its surface and groundwater resources. Watershed management programs based on lessons learned over the past several decades as new opportunities to reduce farmers' dependence on rain-fed, low-productivity subsistence agriculture, reverse land degradation and increase the level of water use and local participation in water management. The challenge is not one of "'ending solutions" but negotiating solutions that are inclusive and equitable and steer the country towards its stated goal of making rural agriculture the basis of economic growth (Final & Document, 2013). Ethiopia has been seriously affected by soil erosion for centuries. The tolerable rate of soil

erosion in Ethiopia is estimated on average of 6 Mg ha-1 per year, while a soil loss tolerance limit of about 10 Mg ha-1 per year is estimated for the Ethiopian highlands, depending on slope gradient and land use type. To reduce the negative consequences of soil erosion, the government of Ethiopia, in collaboration with international donors implemented various mechanical and biological SWC measures in various parts of the country where farmland terracing, microbasins, stone bunds, fanyajuu, soil bunds, vegetative measures are widely implemented practices.

The aim different SWC measures were to reduce the effect of soil erosion, improve environmental conditions, sustainable land management and stabilize or improve agricultural productivity(Anon, 2014).Watershed projects in Ethiopia implemented by Food and Agricultural Organization (FAO) were focused on the institutional strengthening and capacity building of the Ministry of Natural Resources‟ technicians and experts and development agents in the highland regions of the country. The projects used the sub-watershed as the planning unit and sought the views of local technicians and members of the farming community to prepare land use andcapability plans for soil and water conservation. This approach was tested at the pilot stage through FAO technical assistance under Ministry of Agriculturedуring 1988-1991. This was the first step in the evolution of the participatory planning approach to watershed development. By late 1990, watershed development was consideredthe focal point for rural development and poverty alleviation in Ethiopia (Final & Document, 2013).

Several Non-Governmental Organization (NGO) and bilateral organizations adopted watershed development, in the last decade their perspectives intervention areas were with the collaboration of government partners. Instances where the land rehabilitation project with World Food Program (WFP) and Food-for-Work assistance was aimed at addressing the problems of food insecurity through the construction of soil conservation structures, community forestry and rural infrastructureworks. The Deutsche Gesellschaft for TechnischeZusammenarbeit(GTZ) Integrated Food Security Program in South Gondar, with an integrated watershed management approach, was aimed at improving the nutritional food-insecure households in south Gondar through natural resource management by biological and physical soil conservation measures, crops and rural infrastructure works.

The project succeeded with a gully rehabilitation approach (Weith et al., 2013). At present, a wide variety of donors and development agencies are promoting watershed development. Watershed management was widely considered as a practice of soil and water conservation and

the success of the watershed projects were marked as the basis of major watershed initiatives in Ethiopia. In addition, in the dry lands of the Tigray Regional State in northern Ethiopia, the regional government and the general population have been making efforts to control the degradation of natural resources since 1991. As a result, many SWC measures have been initiated, particularly for soil erosion control, including the construction of stone bunds to conserve *in-situ* moisture and decrease sheet and rill erosion on arable land and hill slopes, the construction of check dams in gullies and the establishment of enclosures on steep slopes. Within the Tigrayregion, the extensive community involvement in SWC and the provision of free labor represent unique adaptation strategies. As a result, Tigray is among the national regional states in Ethiopia where SWC measures have been implemented extensively through collective decision making and participatory approach (Tadesse, 2013). Over time and in response to changing needs, the scope of watershed management has broadened from the initial concept of technical management of the water resource to an integrated discipline that applies biological, technical, social and economic principles to maintain the productivity of headwater and lowland areas through the scientific management of soil, plant and water resources (Nihal, 2014). Community based watershed management approaches in Ethiopia have shown notable success especially addressing land degradation, improving agricultural productivity & enhancing water resources(Nihal, 2014).

2.1.4 Watershed management program in Nenseboworeda

Nenseboworeda located in the west Arsi zone of oromia region, Ethiopia has been actively engaged in climate variability adaptation strategies, employed by local farmers to cope with climate variability and there impact on food security (NWAO 2021/22). While specific details about watershed management programs in Nenseboworeda are limited, the broader oromia region has implemented various community based watershed management initiatives. This programs aim to rehabilitate degraded lands improve soil fertility and enhance water availability, there by supporting sustainable agriculture and improving livelihoods. Given the similarities in environmental challenges across oromia, it's plausible that Nenseboworeda has undertaken similar watershed management initiates.This efforts likely involve community participation in soil and water conservation activities, reforestation, the construction of water

harvesting structures to mitigate the impacts of climate change and enhances food security(NWAO 2023/24). However in watershed management program can be influenced by ranges of factors particularly regions like Nenseboworeda, where environmental, social and economical conditions play a significant role. Some factors that could affect peoples participation in watershed management in Nenseboworeda; lack of awareness and education, absence of economic incentives, community involvement and social structures, cultural factors, environmental conditions, gender dynamics, access to resources and technologies, political and institutional support(NWAO 2022/23)

2.1.5. Community-Based Approach to Watershed Management

Community-based watershed management is an approach to water-resource protection that enables individuals, groups, and institutions with a stake in management outcomes (often called stakeholders) to participate in identifying and addressing local issues that affect or are affected by watershed functions. In Ethiopia, some key stakeholders include those people who have the authority to make land-use decisions, such as individual landowners, farmers, and local government officials (Schmidt &Tadesse, 2015).

Understanding these, Ethiopian government has been promoted a watershed based natural resourcedevelopment and management in the country as a suitable strategy for improving productivity and sustainableintensification of agriculture since 1980s. However, implementing community based watershed management in Ethiopia has encountered several challenges that affect its effectiveness and sustainability such as limited community participation, post project maintenance challenges, socio-economic conflicts, gender disparities, institutional and policy gaps and financial & resource constraints(DejeneTressa 2018). This implies that the sustainability of watershed development projects, therefore, depends on thelevel of participation, which requires effective planning, implementation and evaluation. Planning with the community also increase participation and produces better results. Participatory Watershed Management is aprocess in which stakeholders jointly negotiate how they will define their interests, set priorities, evaluatealternatives, and implement and monitor outcomes. Thus it provides opportunities to the stakeholders to jointlynegotiate their interests, set priorities, evaluate opportunities, implement and monitor the outcomes. Community participation is an important aspect of micro-watershed development program. The process of

communityinvolvement starts from identification of the village to problem analysis, and monitoring and evaluation of thewatershed program (Chadha, 2021).CBWM can be effectively integrated with other approaches by ensuring alignment in goals, process and stake holders engagement.

2.1.6. Characteristics of Community-Based Watershed Management

2.1.6.1. Changing Roles and Relationships

The responsibilities and interactions between stakeholders and resource managers will alter as local communities take a more active role in managing their watersheds. Resource managers have historically been seen as specialists who are particularly qualified to choose and put into practice watershed management tactics. However, community-based watershed management acknowledges that all stakeholders must play a significant part in the management planning process. When a community-based strategy is employed, resource managers and other stakeholders can each participate in a variety of ways, but they all must work together to comprehend and address watershed challenges (Ababa, 2014).

2.1.6.2. Whole-System Perspective

Watershed management is a broad method for protecting water resources that acknowledges the interdependence of all the landscape's physical and biological elements, including human communities. A community-based strategy takes into account social and economic aspects of watershed challenges in addition to the physical qualities of a watershed. Protecting and restoring watershed functions while taking into account the diversity of social and economic advantages of such functions is the aim of community-based watershed management (Danano Dale Daniel, 2010).

2.1.6.3. Integration of Scientific Information and Societal Values

When choosing options for problem solving and recognizing difficulties, watershed management decisions should be supported by solid scientific data. But resource managers have discovered that actions taken solely on the basis of scientific data frequently end up failing over time because they go against the social or economic norms of the community. Community-based

methods to watershed management involve representatives from a diverse cross-section of the community throughout the management planning process in an effort to incorporate a wide range of values in the management process. In some cases, by involving diverse interests early on, value conflicts can be resolved during the planning process, thereby avoiding more costly battles once plans are put into action (Kumar et al., 2013). Balancing scientific information with societal values in watershed management is both curtail and complex. Resource managers can achieve this balance through a contribution of participatory approaches, adopted planning & transparent decision making (LataHailu 2015)

2.1.6.4. Adaptive Management Style

It is challenging to address environmental, social, and economic problems at the watershed scale, and management choices can have unpredictably negative effects. Effective community-based watershed management necessitates an experimental management style in that participants must be willing to learn from their errors and modify their management plans in response to shifting environmental factors. Planning for watershed management is in many ways never finished since as soon as one problem is treated, another one crops up. This is why a community-based watershed management project's effectiveness depends on the stakeholders' dedication over the long term (Anon, 2014).

2.1.7.Factorsthataffect Land Management Practices

The factorsthattheimplementationof successfulpracticesforbetter watershed managementhavebeenidentified by Penderetal.(2002),Geteetal.(2006),MoARDand WorldBank(2007),among others.Thefollowing displaysthesummary ofthese factors thereareal soamongthekeyconstraintsthataffectthequality ofinterventionandup scaling of successful watershed management practices for sustainable environmental management in Ethiopia.

2.1.7.1. Lackof professionalismandtechnical standards

The lackof technicalstandardwithregardstotheconstructionof physicalsoilandwater conservation measuresis considered asimportantconstraintofwatershed management practices.The technicalrequirementsforthe effective maintenance anduse of these

measuresareoftenforgotten.Unfortunately,attentionismostly giventothenumber/quota ofinterventionsbutnottheirquality,standard,sustainability,andintegrationwithother soilandwatershed managementpractices.These‘mistakes’havesparkeddisillusionmentamong localexpertsanddevelopmentagentsaswellasresentmentamong farmerssothatboth develop atendencyto disregard professional opinions (Gete.et .al., 2006)

2.1.7.2. Socio-economicfactor

Theeffectofageofthefarmeronconservationdecisionmay beeithernegativeorpositive (Bekeleand Drake, 2003). Older age often associated with long years of farming experiencecouldpositively influenceconservationdecisions.Incontrast,youngerfarmers with longerplanninghorizons arelikelyto investmorein conservation (Aklilu, 2006).
Householdswithbetter educationareexpectedtobe more aware of newtechnologiesand thusmorelikelytoadoptthem.Theimpactsofeducationonlandmanagementpractices aremixed,butwitheducationgenerally favoringlandinvestmentsandimprovedland managementpractices(Pender andGebremedhin,2004).Farmer trainingandincreasein farmereducationareexpectedtoimprovefarmer’sadoptionofconservationfarming.On theotherhand,moreeducatedfarmersarelesslikely toadoptintercroppingsincethe practicehadintherecentpastbeenlesspreferredforpurecropstandsby cropresearchers (Jalloh, 2001).

AccordingtoILRI(2000),factorsunderlyingthedirectcausesarethesesocio-economic and institutional factors including population pressure, poverty, high cost agricultural inputsandcredit,andlimitedaccessto agriculturalinputsandcredits.Price effectsarising fromreducedmarkettransactioncostsareexpectedtonegativelyaffectintercropping.In thecaseofpotholing andconservationfarming practiceseasyaccesstomarketisexpected to haveapositiveinfluenceon thefarmer’s choiceofthepractice(Sayre.et.al.,2001).

2.1.7.3. Incomplete technology packages

Lack of proper integration of introduced practices with indigenous knowledge and practices,incompletenessofavailabletechnologiestoaddresstherequirementsofthediverse agro-

ecologicalconditionsof the country,andlackof properconsiderationof the socio-economicsettingofthedifferentcommunitiesduringintroductionoftechnologies aresomeoftheotherfactorsreportedby stakeholdersasnegatively affecting thesuccess improvementstolandresource management(Geteetal.,2006).One of the problemsthat contributedtothelimiteddissemination of sustainable landmanagementpracticesisthe misunderstanding oftheeffectsofthedifferentsustainablelandmanagementcomponents. Properly maintainedanddevelopedsoilandwaterconservationmeasuresinmanaging environmentalresourcetoenabletransitiontomoresustainablelivelihoods(FAO/WFP, 2004).

2.1.7.4. Physicalconstraints

Basic physicalconditionsinEthiopia,whichimpactenvironmentaldegradation,include rainfallvariability fromyeartoyearandplacetoplace,particularlyinthedrierpartsofthe highlands.Thesequenceofdrieryearswithreducedvegetationcoverfollowedby wetter yearswithheavy rainfallisconducivetohigh levelsofsoilloss.Additionally,thephysical make-upoftheEthiopianHighlandswithgorgesandothertopographicbarriersrestricts thedevelopment ofeffectiveinternal marketingsystems in some areas (Geteet al.,2006).

Climatevariability istheothersignificantfactor.Thedrylands(arid,semi-arid,anddry sub-humidareas)of Ethiopia,whichcover some70percentof the totalarea of thecountry, areparticularly vulnerabletoclimatechange,desertificationanddrought.Climatic variability causesrecurrentdroughtsandthisisassociatedwithhighrainfallvariability (bothinspace andtime),whichcontribute tothe decline invegetationcover,lossof biodiversity andworseninglanddegradation.Climatevariabilityworsened by human inducedenvironmentaldegradationinturnnegativelyaffectsthesustainability ofpractices forbettermanagement ofthe land(Gete*etal*.,2006).Inthe case ofconservationfarming, low rainfallinthepreviousseasonisexpectedtohave apositive influencewhereasthose zoneswithlowrainfallareexpectedtohaveeitherpositiveornegativeinfluenceon farmers'choiceofthepractices.Theeffectmay benegativeifthefarmerplacesahigh opportunitycost on cropresidue as fodder(Sayreet al., 2001).

2.1.7.5. Top-down planning approachto technical assistance

Apartfromitstop-downnature,theextension systemhas neverbeenconsistentinthe country.Often,newapproachesareintroducedwithoutadequately evaluating past experiences and investigatingthe suitability of the new approach. For instance, the training and visit system was changed to the ParticipatoryDemonstration Extension Training Systemwiththevisionofincreasingparticipationofcommunities,butthe participationelementwaslargely confinedtodemonstrationplotsbeingimplemented cooperatively withfarmersontheirownland.Sustainabledevelopmentcanonly be achievedwhenactualbeneficiariesofthetechnicalassistancefeelthey areequalpartners andthatthey,ratherthanthe government,arethe ownersanddriversofthe process (Ashworth, 2005).

2.1.7.6. Weaklinkageamong inter-andintra-discipline

Poor coordinationamong research, extension andeducation has affectedformal technology developmentandthe transfer of technologiesfromresearcherstolocal expertsandlocal communities,particularly thefarmers.Evenfollowingthedecentralizationofthe administrationsystemdownto*woreda* level,noclear andstronglinkages,andhencea formalandinbuiltsystemforinformationexchangeandsharing,hasemergedamongall the actors.The federalandregionalresearchinstitutesparticipate inannualreviewsof their researchagendas,buttheactiveinvolvementofotherstakeholdersisvery weakandthere areno efficientfeedbackmechanisms (MoARD&WB, 2007).

2.1.7.7. Limitedinformation flowand networking

Appropriate informationonthe resource base,theextentof environmentaldegradation,the costs and benefits of applying sustainable environmental management as well as informationonthenatureofthedifferentpracticesavailableisrequiredtomakedecisions atdifferentlevels.Althoughtherearesomeeffortshereandthere,eitherthey arepoorly organized,donotaddressthefullpicture,orthey aretoooldtobeabletorepresentthe

currentsituation.Moststudiesaddressonly apieceofthedilemma,andeventhenarenot formulatedinsuch awayastohelppolicymakers andbeneficiaries makeinformed decisions(Geteet al., 2006). Land management practice in Nenseboworeda also influenced by variety of factors which can be prioritized based on their impacts and prevalence's. here is a prioritized that population pressure, soil erosion and degradation, institutional capacity, education and awareness, & access to resource and technologies are the major ones(NWAO 2022/23)

2.1.2. Watershed Management Approaches

2.1.2.1. Collaborative watershed management

Collaborative watershed management has emerged in the last two decades as a promising approach to address nonpoint source pollution in waters. With such a wide variety of land use patterns across watersheds, it is important that collaborative approaches to water resource management are tailored to local land-use planning efforts (Wang, 2001; Scott etal., 2010). Urban and rural landscapes can have very different biological systems, leading watershed partnerships located in different areas to address different environmental issues. Moreover, collaborative management efforts in each setting can be impacted by different sets of variables, from the level of human capital (e.g., income, education) and social capital (e.g., trust, networks, norms of reciprocity) in watershed communities, to the financial, technical, and human resources made available by government agencies, NGO's, academic units, and local citizens (Hardy and Koontz, 2010). Successful collaborative watershed management programs emphasize active stakeholder engagement, employ integrated solutions, recognize the authority of multiple agencies and jurisdictions, and build on expertiseand resources across sectors. Out of biogeophysical necessity, managing a watershed involves coordinated stewardship of the water body and the land area that the water body drains. Consequently, watershed conservation and rehabilitation is typically a function of an array of public and private programs (Erdogan, 2013).

The collaborative watershed approach is on the agenda of the federal government in the United States.President Clinton's 1998 Clean Water Action Plan explicitly promotes such an approach nationwide. The plan encourages states to work with watershed stakeholders, including

interested citizens, to identify watersheds with critical water quality problems and to focus resources and implement strategies to solve these problems(Weith et al., 2013).

2.1.2.2.Holistic watershed management

Embraces the idea that all aspects of the watershed human resources, economic development, environmental quality, infrastructure development and public safety must be considered in a holistic watershed management decision-making process. Holistic watershed management's fundament approach is in a facilitated process designed for the integration of organizations and individuals having environmental knowledge, skills and resources in the water quality and comprehensive community planning (Erdogan, 2013). Consider the following roles agencies could play in sustainable holistic watershed management decision-making:

Catalyst–incentives or regulation enforcement to improve watershed environment (Water Quality). Agency representative living in the watershed experiencing a problem.

Responsive/Supportive provides technical resources as needed for sound holistic watershed management decision making. Stand back and let local people control the holistic watershed management planning process (Tadesse, 2013).

2.1.2.3. Integrated watershed management

An "integrated watershed management" approach should strive to create settings for collaboration and innovation by facilitating dialogue among local stakeholders. The overriding charge under the piloting of this approach is fostering a framework for dialogue among stakeholders for problem solving examining interdisciplinary solutions that are inherently multi-objective. That is, solutions able to address more than one problem simultaneously whileaddressing the entire resource based on local circumstances(Erdogan, 2013). The Integrated Watershed Management Program proposes a framework for fostering inter disciplinary on-ground implementation activities. Interdisciplinary takes on a meaning of multiple dimensions and scales. poor integration and coordination, which is either fostered or hindered by a complex set of environmental and socio-economic and institutional factors at various spatial levels such as "(1) legislation and regulations, (2) policies and guidelines, (3) administrative structures, (4) economic and financial arrangements, (5) political structures and processes, (6) historical and

traditional customs and values and (7) key participants or actors"(Erdogan, 2013).Watershed management approaches in Ethiopia have evolved to address the complex challenge of land degradation water scarcity and food insecurity. These approaches varies in their strategies, stake holders involvement and implementation mechanism's. Below is a comparative analysis of the three watershed approaches(TirhasGebregiorgis 2021)

1. **CBWM: -** emphasizes local communities' involvement in planning, implementation & monitoring of watershed management activities.

   Strengths:-

   - give local ownership
   -Tailored solutions
   -capacity building

   Weakness:-

   -resource limitations
   -conflict potential
   -dependency

2. Top down watershed management: - involves centralized planning and decision making with directive imposed on local community.

Strengths:-

- Standardized practices
- Efficient resource allocation

Weakness:-

- Limited local engagement
- Sustainability challenges
- Cultural disconnect

3.. Integrated watershed management:- is a holistic approaches that considers the entire watershed as a unit, integrating land, water and biodiversity management to achieve sustainable development.

Strengths:-

- Comprehensive planning

- Enhanced resilience
- Improved water qualities

Weakness:-

- Complex implementation
- High costs
- Sustainability issues

Based on Nenseboworeda unique environmental social and economic context CBWM emerges as the most suitable approaches for sustainable land and water resourcemanagement (NWAO 2023/24)

2.2. Theoretical Literature

The concept of sustainability in sustainable land management refers to a diverse and long running dispute over the direction of societal action. It contains the formulation, "Sustainable development is development that meets the needs of the present without compromising the ability of future generations to meet their own needs" (Weith et al., 2013).

Sustainable Land Management (SLM) is an integrated approach that addresses the sustainable management of land, water and other natural resources, and the services they provide. SLM seeks to counteract land degradiation, reclaim degraded areas and ensure the resilienceof theecosystems, their services and resources (Weith et al., 2013). The foundation of sustainable theory lies, first, in recognizing the biological limits to growth, the ecological carrying capacity and the maximum sustainable yield the ecological sustainability view. Sustainability in this view means environmental sustainability. The environmental and ecological base of sustainable development is very strong (Anon, 2015). The second foundation is sustainable economic growth. This refers to a situation where the economy is growing over a period of time and surviving periods of relative recession. Sustainable economic growth implies that if the economy is growing on its own momentum then there is sustainable (Weith et al., 2013).The third foundation is sustainable societies. The social approach considers the poor people and their basic needs first. Another key element of the social approach is an emphasis on social equity, justice and liberation (Weith et al., 2013). SLM is necessary to meet the requirements of a growing

population. Improper land management can lead to land degradation and a significant reduction in the productive and service functions Sustainable Land Managementmeans managing land without damaging ecological processes or reducing biological diversity. It is a knowledge-based procedure that helps integrate land, water, biodiversity, and environmental management(including input and output externalities)to meet life demands while sustaining ecosystem services and livelihoods. It is the use of land to meet changing human needs (agriculture, forestry and conservation) while ensuring the long term socio economics and ecological functions of the land.

Sustainable land management combines technologies, policies and activities aimed at integrating socio economic principles with environmental concerns, so as to simultaneously; maintain and enhance production (productivity),reduce the level of production risk and enhance soil capacity to buffer against degradation processes (stability/resilience),protect the potential of natural resources and prevent degradation of soil and water quality(protection), be economically viable (viability),be socially acceptable and assure access to the benefits improved land management(acceptability/equity). The definition and these criteria called pillars of SLM are the basic principles and the foundation on which sustainable land management is being developed. Thus, any evaluation of sustainability has to be based on the following objectives: Productivity, stability/resilience and production. SLM is necessary to meet the requirements of a growing population.

Improper land management can lead to land degradation and a significant reduction in the productive and service functions (Danano Dale Daniel, 2010). In lay terms, SLM involves these activities: Preserving and enhancing the productive capabilities of cropland, forestland, and grazing land (such as up land areas, down-slope areas, flatlands, and bottomlands), Sustaining productive forest areas and potentially commercial and noncommercial forest reserves, maintaining the integrity of watersheds for water supply and hydropower-generation needs and water conservation zones, maintaining the ability of aquifers to serve the needs of farm and other productive activities. In addition, SLM includes actions to stop and reverse degradation or at least to mitigate the adverse effects of earlier misuse. Such actions are increasingly important in uplands and watersheds especially those where pressures from the resident populations are severe and where the destructive consequences of upland degradation are being felt in far more densely populated areas downstream(Weith et al., 2013).

Sustainable land management (SLM) is crucial to minimizing land degradation, rehabilitating degraded areas and ensuring the optimal use of land resources for the benefit of present and future generations. SLM is based on four common principles: land-user-driven and participatory approaches; integrated use of natural resources at ecosystem and farming systems levels; Multilevel and multi stakeholder involvement; and Targeted policy and institutional support, including development of incentive mechanisms for SLM adoption andincome generation at the local level.Its application requires collaboration and partnership at all levels land users, technical experts and policymakers to ensure that the causes of the degradation and corrective measures are properly identified, and that the policy and regulatory environment enables the adoption of the most appropriate management measures(Tadesse, 2013). The concept of sustainability is central to watershed management in Ethiopia because it ensures that land and water resources are used in a ways that meet present needs without compromising the ability of the future generation to meet there's(IWMI 2016). Sustainable land management practice can be promoted and incentivized through a combination of policy, education, community engagement and technological advancements. Key strategies include implementing land use palnning and regulations providing financial and technological support to farmers and land managers, encouraging innovations & technology adopation and fostering community participation in decision making process(FAO 2025)

2.3. The Empirical Literature

It is becoming increasingly clear especially in the case of Ethiopia that watershed management practices are a complex issue requiring further investigation as they are influenced by different factors operating at different scales. These factors include government policies, program, and institutions at many levels.At the village or households level which may further influences land degradation(Pender & Place,2006).

Sustainable farm land management in the Ethiopian context defined as the use of renewable soil resources for agricultural and other purposes to meet individual and community needs, while simultaneously ensuring the long-term productive potential of these resources and the maintenance of their environmental functions through systematic use of indigenous and scientific knowledge/technologies. In this regard, sustainable land management involves more than the use

of physical soil conservation measures, it also includes the use of appropriate soil fertility management practices, agricultural water management, forestry and agro forestry practices forage and land management, and the application of these measures in a more integrated way to satisfy community needs while solving ecological problems (MoARD, 2007).

According to Tesfaye(2003) Ethiopia land management is a result of a continuous adaptation of the environment to meet the need of the community. These adaptation involves: controlled livestock husbandry and irrigated system based on flood harvesting,integrated soil and water conservation practice includes stone terraces, tied ridges, thrash line, agro forestry, intercropping, fallowing, maturing, shifting, burning of debris, minimum tillage and commercial fertilizer.

In Ethiopia efforts to conserve soil resources and preventing degradation date back to the mid 1970's and 1980's(Bekele et al., 2009, cited in Abera&Belachow, 2011).Since many NGOs' and public organizations have been involved in addressing the expansion of the problem, the conservation methods used include physical structures such as stone and soil bunds.

As an effort towards responding to the problem of soil erosion through application of conservation methods on erodible lands, the Ethiopian government initiated a massive soil conservation program following the 1975 land reform, which was involved in mobilizing labor and assignment of local responsibilities (Bekele et al., 2009). Between 1976 and 1990,71,000 ha of soil and stone bunds,233,000 ha of hillside terraces for Aforestation,12,000km^2 of check dams in gullied land,390,000 ha of closed area for naturalregeneration,448,000 ha of land planted with different trees species ,and 526,425 ha of bench terrace interventions were completed (USAID, 2000, cited in Abera&Belachew, 2011).

According to Shibru (2010), traditional as well as modern land management practices have been carried out in different parts of the country, to combat land degradation, soil erosion and soil nutrient depletion. For centuries communities in Ethiopia have been carrying out traditional land management practices. Land management practices that have been used to date include the construction of terraces, soil bunds, micro-basins, the protection of regenerating natural vegetation, and tree planting. Despite the efforts that have been made to conserve as well as restore soil fertility of arable lands, land degradation is proceeding so fast nowadays that it can constraint the hope of achieving sustainable agriculture in the foreseeable future.

Soil and water conservation practices consist of biological, mechanical measures and institutional arrangements. The first category refers to particular management practices that make use of agronomic skills and biological material rather than physical structures. Mechanical practices, on the other hand, refer to practices that involve physical structures, often with a barrier function. Institutional arrangements refer to land tenure arrangements, forms of labor sharing, and so forth that may also contribute to maintenance of soil fertility(Tolera, 2011).

To combat the often cited deleterious effects of intensification, particularly with regard to environmental effects requires the development and implementation of technologies and policies, which was result in sustainable land management (Gisladottir& Stocking, 2005). Assefa and Hans-Rudolf (2016) in Ethiopia reported that training of farmers and their participation in extension workshops improves their perception of soil degradation problem and facilitates the adoption of improved technologies.

Many indigenous people have extensive knowledge in management of natural resources in their traditional landscapes (Mathiui&Kariuki, 2007) Indigenous peoples have experimentation and ways of research, of knowing, which allow the local knowledge to be innovated in the local practices and systems (Reijntjes, 2004). Recognizing, empowering and incorporating indigenous knowledge in participatory rural development projects has been considered a means of ensuring socially, environmentally and economically sustainable natural resources management (Dixon,2002). As Olokesusi (2006) argues, indigenous knowledge, or indigenous technical knowledge systems are realities conceptualized by people in the way they think of their world. Indigenous knowledge systems are learned ways of knowing and looking at the world. They have evolved from very many years of experience and trial and error problem solving by groups of people, working to meet the challenges they face in their local environments, drawing upon the resources they have at hand.

Access to information (through media or extension services) is an important variable that shape farmers perception of soil fertility problem and used both modern and indigenous methods of land management. The farmers who had a radio (who often listen to) were more aware of soil fertility problems than those who did not (Anteneh, 2010). Information provision through

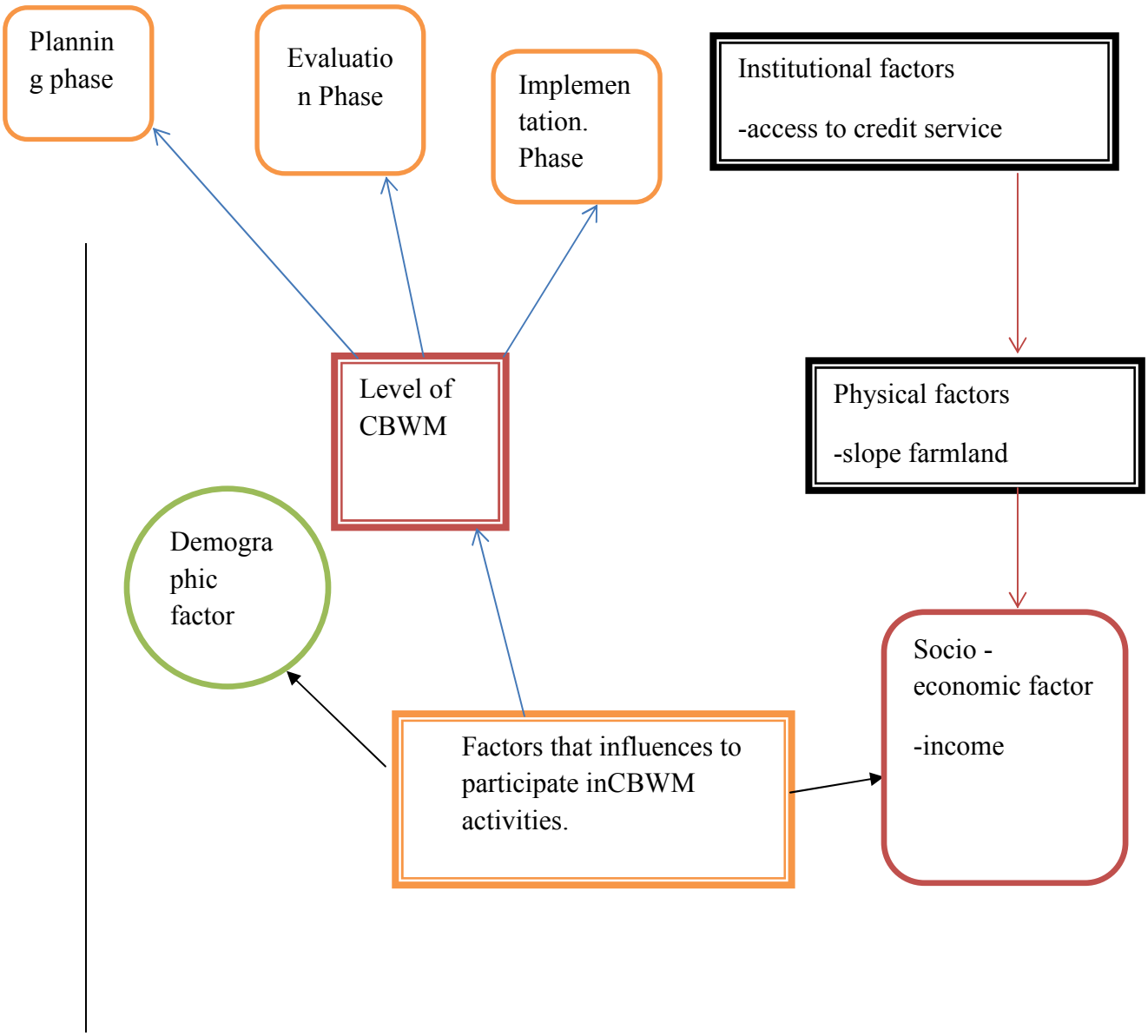
extension channels increased farmers' awareness on soil fertility problems and the adoption of composting techniques as soil fertility management option(Anteneh, 2010).

The core function of FTCs will be provision of extension services through training and demonstrations and also serve as information and exhibition centers on how to manage land and use technology and traditional methods. According to Berry, (2003) noted for effective rural development, participation of rural people in the development process is essential. As such, training and education is playing a vital role to make the rural people aware and act as subjects in the development process (Fisseha, 2009).

Monitoring and evaluation is a management tool that can contribute significantly to effective extension. Monitoring keeps track of extension activities and progress in the implementation of the extension system. Monitoring and evaluation is a tool that helps ensure the extension service operates efficiently, enables land management to take the necessary corrective action regarding shortcomings in extension operations, and provides policy makers with appropriate information on which to base decisions. It can create an atmosphere of trust, honesty, and self-criticism upon which effective extension depends (MOARD, 2008).In many organizations, monitoring and evaluation have a negative image because these units may concentrate on problems, exposing weaknesses and failures (Fisseha, 2009).According to Tesfa Work 2015, the key gap in the empirical literature on watershed management in Ethiopia include insufficient consideration of community participation, lack of emphasis on indigenous knowledge and a top-down approach to implementation. Additionally there is a need for a better integration of social, technical & institutional aspects within watershed management practices along with improved utilization of scientific research results focus on the long term of the intervention. The study on assessing community watershed management programs in Ethiopia focuses on evaluating the effectiveness of community based approaches and aims to address several key gaps in the current implementation of these programs. These are gap in community participation, gap in integrating local knowledge and practice, gap in capacity and institutional strength(DejeneTeressa 2018).

2.4. Conceptual Framework

The conceptual frame work of this study is based on the contribution on CBWM on economic, social and environmental development and the determinant factors affecting the adoption of CBWM. The most important independent variable which affects(CBWM practices) is: -the socio-economic, demographic, institutionalphysical factors are minimized in Figure 1 below.



Source : TemesgenArgew 2024 & open AI 2025

As the above diagram shows and a number of studies revealed that some dispositional, demographic, socio-economic, physical and institutional factors are significant in determining farmer's participation in watershed development programs (Faham etal., 2008). Moreover other studies have shown that participation may depend on individual characters such as age, gender marital status, household size and income (Dolisce et al., 2006).

CHAPTER THREE

3. RESEARCH METHODOLOGY

3.1. Description of the Study Area

Nansabo*Woreda's* is one of the *woredas* in West Arsi Zone, Oromia regional state, which is situated between $6^0 17' 15''$ to 6^0 48′ 10′′'N latitude and $38^0 56' 30''$to 39^0 30′′ E longitude. It is located at 407 km from Addis Ababa and 134.5 km from Shashemene, the capital city of West Arsi zone(Nansaboworeda administration office, 2023). Nansabo*Woreda* is bordered by eight *woredas* (Kokosa, Dodola, Adaba, MaddaWalabu(Bale zone),Girja (Guji zone), HarenaBuluk(Bale zone) Chiri,Bensa(Sidama region).

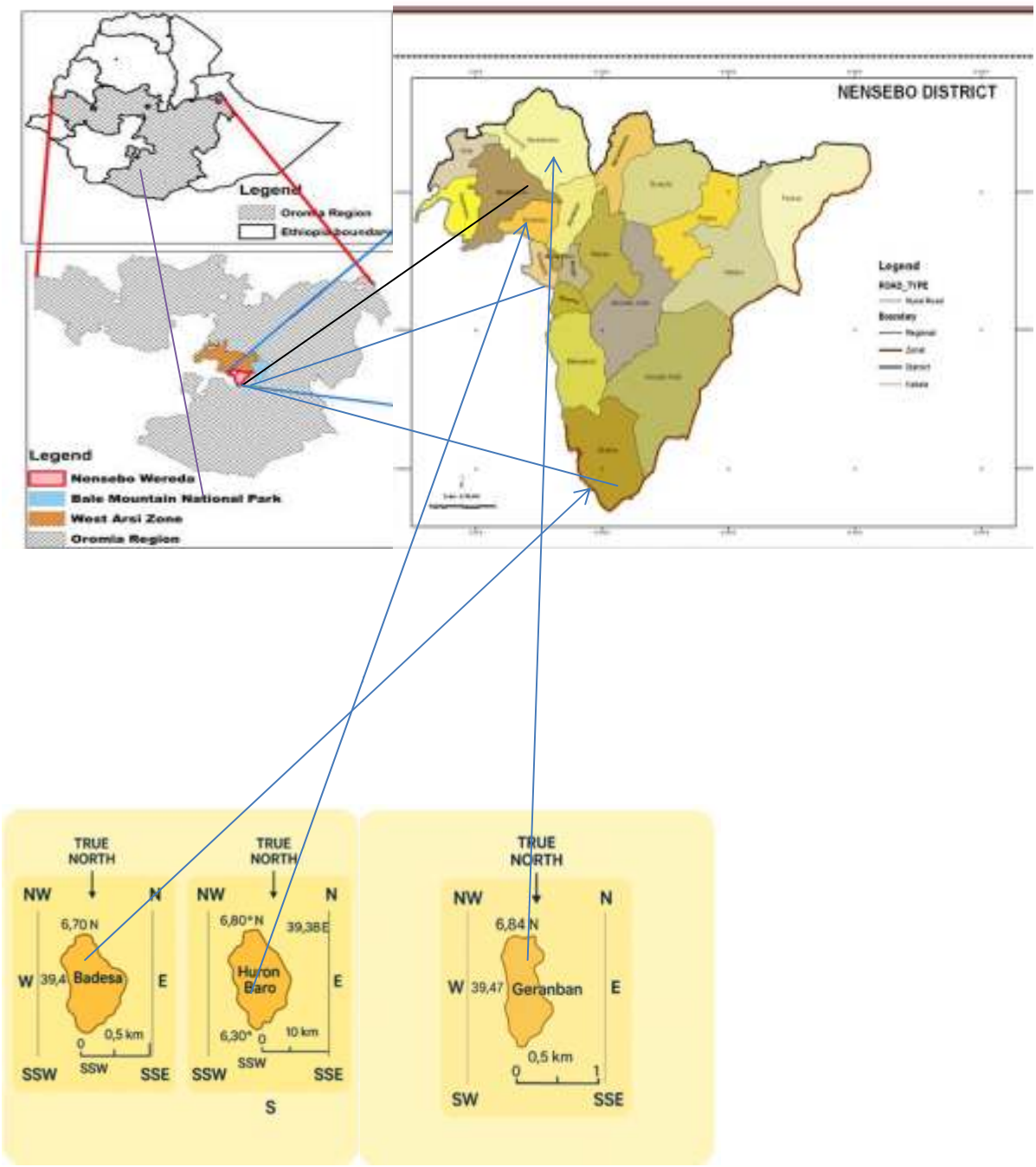


Figure 2: Map of the study area *Source: CSA, 2023*

3.1.1. Topography

The elevation of Nensebo*woreda* ranges between1501-3500 meter above sea level (masl). The major relief features includes 70%, of the *woreda*, is mountain, the remaining 30% is occupied

by valley, dissected land form, flat plain rolling plateaus(chiri plain and fecha)(Nansabo*Woreda* Agricultural Office, 2023/24).

3.1.2. Climate

The climatic condition is relatively humid. The *Woreda* lies within elevation of 1500-3,300 m a.s.l. mean annual temperature is ranges 18^0c; average annual total rainfall range between 900 to 1100mm which is characterized by rain-fall with high intensity in the high lands and its intensity reduces towards the low lands(Nansabo*Woreda* Agricultural Office, 2023/24).

3.1.3. Soil and Land Use of the Study Area

Soil is one of the natural resources which are used for the production of crops. The study area has fertile soil that contributes for the productive potential of the *Woreda*. The type of soils of the study area are heavy clay soil which is accounted for 66.5% covers the most part that is exposed for soil erosion(Nansabo*woreda* Agricultural Office, 2023*)*.Since the soil has a characteristic of crack, breaks into fine grains in the winter season, attached together and retains more water in the rainy season and exposed for severe erosion problem. While, sandy loom, clay loom and silt clay are accounted for 22.5%, 7%, and 4%, respectively. The major land use patterns of the study *Woreda* comprise cultivable land (52.8%), forest/bush land (30.6%), uncultivated land (16.59%) (Nansabo*Woreda* Agricultural Office, 2023/24).

The *Woreda* has a shortage of grazing land demarked as '*kalo'* and grazing land is small, and the majority of farmers in the *Woreda* graze their animals either on those small lands,degraded communal hillsides or on farmlands particularly during the long-dry season. Animals are allowed to graze crop residues and left over on the farmland and residuals of crops. A free grazing type of livestock management is practiced in the *Woreda* aggravated the cultivatable land to bear, break soil particles in to fine grains in dry season which is the cause for easily eroded in the rainy season (Nansabo*Woreda* Agricultural Office, 2023/24).

3.2. Socio-economic Characteristics of the Study Area

3.2.1. Population Characteristics

Nansabo*Woreda* is administratively divided in to 20*kebeles*. According to the 2007 report central statistical agency (CSA 2007), the total populations of the *Woreda* were about 155,280. Out of those populations 3.77 % and 96.22% live in the urban and rural parts of *Woreda*respectively. From those populations, 49.5% are males and about 50.49% are female population. (Nansabo*Woreda* Agricultural Office, 2023/24).

Most of the residents of the *Woreda* are Arsi, different Oromo clans, Amhara and with some SNNP which live in the rural and urban center of the study area. Hence, the predominant language is Afan Oromo while, Amharic is also spoken more in urban centers. Religious distribution of the *Woreda*comprises; Muslims, Orthodox and protestant followers(Nansabo*Woreda* Agricultural Office, 2013/24).

3.2.2 Economic Characteristics

Agriculture is the most common economic activity of rural population of Nansabo'woreda'. Farming system in the woreda is mixed farming both crop production and animal rearing. Worka town is the center of activities of the 'woreda' as distribution center. All rural *Kebeles* gain their goods and services from Worka town.

3.3. Research Approach

Research approaches are adopted based on the feasibility of the selected approaches. The common research approaches are quantitative, qualitative, and mixed research approaches. In a quantitative method, hypotheses are tested and knowledge is developed through reduction to particular variables, cause and effect thinking, and the application of postpositive statements. (Creswell, 2009).The quantitative research approach uses two strategies of inquiry known as surveys and experimental design. Survey research provides a quantitative or numeric description of trends, attitudes, or opinions in a population by studying a sample of that population. In experimental research, a specific treatment is given to one group while being withheld from another, and the results of both groups are compared to see if the specific treatment had any effect on the outcome (Creswell, 2009).

An alternative qualitative approach is one in which the researcher frequently bases knowledge claims on constructivist viewpoints, advocacy viewpoints, or participatory viewpoints (i.e., the various meanings of individual experiences as socially and historically constructed to develop a

theory or pattern)(Creswell , 2009). Finally, a mixed-methods approach tends to base knowledge claims on pragmatic considerations (such as consequence-oriented, problem-centered, and pluralistic) rather than on theoretical ones. To better comprehend the research problem, it uses methodologies of inquiry that entail gathering data both simultaneously and sequentially.

A mixed-methods research approachwas used for this study. Because, mixed method research offers several advantages primarily by combining the strength of both qualitative and quantitative approach to create a more comprehensive & robust understanding of research problem, it allows for a broader range of perspectives, strength, the rigor of both qualitative and quantitative components and provides amore nuanced understanding of complex issues (Tegan George 2025). Creswell(2009) advised researchers can be benefited if they use mixed approach as one fills the gap of the other. According to Tegan George 2025 using mixed research approach has also some disadvantages:- these are it causes work load and conflicting results. To ensure equitable consideration of both qualitative and quantitative data in the research a researcher adopted mixed approach. This strategy integrates the strength of both data types. Providing a comprehensive understanding of the research problem.

3.4. Research Design

According to Dawson (2002) research design is the conceptual structure within which research would be conducted.There are various designs for mixed research such as sequential explanatory, sequential exploratory, sequential transformative and concurrent triangulation (embedded) designs. For this study, the researcher used concurrent design. Because, the researcher was collected both the quantitative and qualitative data once at a time. A convergent or concurrent design is also used to give equal emphasis to both quantitative and qualitative types of data in the process of research study . however, these research design offers both strength and limitations. Strengths include the potential of a more comprehensive understanding of a research problem by combining different data sources & perspective. It can also shorten data collection time compered to sequential designs & strengths findings through triangulation. However, its limitation include the increased workload and complexity of managing to different data collection methods and the potential for conflicting or challenging to interprets results. Furthermore this research design is a cost effective design (Tegan George 2005).

3.5. Sources of Data

In the study primary and the secondary data sources were used for acquiring valuable data.

3.5.1. Primary Sources of Data

The primary sources are used to get-firsthand information, its more accurate & reliable because it comes from direct sources. It's faster & easier to collect primary data than secondary data, which can take weeks or even months to collect. Primary data can be collected in a real time, which makes it deal for tracking events or monitoring process. Hence the researcher used household heads, DAS, kebele leaders & model farmers.

3.5.2. SecondarySources of Data

In addition to the primary data sources, secondary data sources, such as census records, offices of Agricultural & Rural Development(ARD) as well as Land & Environmental Protection(LEP) documents and reports, past research works wereused as secondary data sources. Hence, the researcher in order to ensure the reliability & validity of secondary data sources he evaluate the sources creditability, assess the data relevance & timeliness & cross validate with other sources.

3.6. Sample Size Determination and Sampling Techniques

In order to select and determine the sample *kebeles* from the *woreda,* agro -ecological zone was setas criteria and employed stratified random sampling. First, all the *kebeles* in the *woreda* are classified into three agro-ecology(strata) that is *Kolla*(tropical), *Woinadega*(sub-tropical) and *Dega*(temperate). In the second stage, one *kebele* from each homogenous agro-ecology was selected by simple random sampling.Namely; Gerenbamofrom *dega* agro-ecology, Badesafrom *kolla* agro ecology,and Hurobarofrom *woinaDega* agro-ecology. Then the total household heads of the three *kebeles*were 1507 and the required sample size is 316 of the total household heads and it is determined based on sample size determination of Yemane (1967) at confidence level 95% and expected error 0.05.

$n= N/1+N(e)^2$

$n= 1507/1+1507(0.05)^2$

n= 316

Where n= sample size of the research

N = Total number of households in the district

e = Maximum variability of making error 5 % (0.05)

1 = the probability of event occurring

According to the *woreda's*land administration and land use bureaus in the sample *kebeles*, the total households are:

1. Gerenbamo= 461= N1

2. Badesa= 495= N2

3. Hurobaro= 551 = N3

Total= 1507 =Σ(N1, N2 and N3)

Accordingly the investigator used 20.9% of the sample household heads which was determined byYemane ,1967 statistical formula from the total household heads of the sample *kebeles* (Σ N) = 316.

Hence, based on the above formula and population data, the required sample household heads are drown from each *kebele* (Gerenbamo, Badesa and Hurobaro) 20.9% from each *kebele*resulting 97, 104 and 115 sample households respectively by simple random sampling. To mitigate recall bias and social desirability bias in survey responces, the researcher prioritize carefully survey design, used objective measures and ensured anonymity and confidentiality of the respondents.

Table 1: Summary of population and samples size

No.	Name of *kebeles*	Number of household	Sample size
1	Gerenbamo	461	97
2	Badesa	495	104
3	Hurobaro	551	115
Total		1507	316

Source: -NansaboWoreda Agriculture and Rural Development Office, 2023.

Moreover, 5 purposively selected *woreda* Agricultural and Rural Development office experts were selected to participate in the interview. All 6 DA workers(2 from each *kebele*), 3 *kebele* leaders(1 from each *kebele*)and 3 model farmers(1 from each *kebele*)in the selected three *kebeles*were selected by availability sampling techniques since they are manageable and small in number.

3.7 Data collection procedures

Both quantitative and qualitative data were collected from primary and secondary sources. Therefore the study used both quantitative and qualitative research method. The researcher before went there working site to collect the primary data he got the participated and non participated household list from the three kebles(gerenbemo, hurobaro, bedesa) administrative office

3.7. 1 Instruments of Data Collection

The instruments of data collection were questionnaires, interview and focus group discussion.

3.7.1.1 Questionnaire

A questionnaire consists of a number of questions printed or typed in definite order on a form or set of forms. It was distributed to respondents who are expected to read and understand the questions to write down the reply in the space meant for the purpose in the questionnaire itself,

whereas for the respondents who cannot read and write, the questionnaires were filled by the enumerator as structured interview. The respondents were answered the questions themselves.
In this study, structured questionnaires were used in order to collect primary data from the sample respondents. Regarding the household survey, structured questionnaires with both closed ended and open-ended questions were design in relation to the study area's community participation in watershed management practices and different variables related to the socio-economic, physical, demographic, and institutional aspects. For the sake of clarity, the questionnaires were translated in to *Afan-Oromo*version.

3.7.1.2 Interview

The interview permits greater depth of responsewhich is not possible through any other means. Thus, thepurpose of theinterview is tocollectmoresupplementary opinion, so as to stabilize thequestionnaireresponse. Withthis in mind, interview was conducted with *woreda* Agricultural and Rural Development office experts. Semi structure items were preparedfortheaboverespondents.Thereasonbehindthesemi-structuredinterviewitemsare theadvantagesof flexibilityinwhichnewquestionscouldbeforwardedduringtheinterview based on the responses of the interviewee.

The process of interviewwas conductedin Afan Oromolanguageandsupported by Audio (smart phone recorders)inorder tominimizelosesofaudioinformation.Therecordeddatawascategorized based on similarities of responses and then translated in to English language.

3.7.1.3. Focus Group Discussion

Focus group discussion (FGD is an important methods used to collect qualitative data by inter changing ideas between group of respondents. The focus group discussion was included 6 development agents, 3 *kebele* leaders and 3 model farmers. One FGD in each of the three *kebeles*totally three FGD were conducted. And check list was prepared to guide the open ended discussion with identified FGD members. To mitigate recall bias and social desirability bias survey repose the researcher prioritize carefully survey design, used objective measures & ensured anonymities & confidentiality of the respondents.

3.8. Validity and Reliability of the Data Collection Instruments

3.8.1. Validity Test

Checking the validity and reliability of data collecting instruments before providing to the actual study subject is the core to assure the quality of the data. Validity is the ability of an instrument to measure the variable it is intended to measure (Kimberlin & Winterstein, 2008). Every measuring instrument is designed for a specific measurement. If it is correctly designed, it measures what it is supposed to measure. As Considine et al. (2005)validity refer to the degree to which an instrument measures what it is supposed to measure. Accordingly, to ensure validity, experienced teachers from MaddaWalabuUniversity and the advisor were requested to provide their remark on instrument employed. Based on their feedback the instrument was modified before administered to the main participants of the study so that irrelevant items were removed, relevant items were included, lengthy items were shortened and many unclear items were made clear. ensuring validity, include face validity of research instrument like questionnaires, interview guide, etc. is curtail part of both qualitative and quantitative research. This can be achieved by expert review, cognitive interviews, pilot statistical testing, refinement based on feedback, documentation & etc. to evaluate the quality of pilot test respondents & make necessary revisions to the instruments the researcher typically used several specific criteria such as technical function and time & flow, response pattern & etc.

3.8.2. Reliability Test

Reliability is the extent to which measurement of the test are repeated. This implies that measuring instrument results should be consistent when the instrument is repeated. A researcher who designs a measuring instrument must ensure that the instrument gives similar or the same results if the study to which the instrument is applied is replicated (Cresswell, 2008). The most common measure of reliability of a research instrument is the Cronbach Alpha. The Cronbach's Alpha tests the internal uniformity among the study items. Items with Cronbach's alpha value greater than 0.7 indicate there is higher internal reliability of the research items (Rovai, 2002). Thus, research items that have Cronbach's Alpha value greater than or equal to 0.7 were accepted since they deem to have been measured consistently while all items whose Cronbach alpha values less than 0.7 were rejected as they regarded as unreliable.

Thus, to ensure reliability of instruments, the questionnaire items were adapted and piloted in this study. A sample size between 10% and 20% of the larger sample size for the main study is a practical number of respondents to take part in the pilot study(Kothari, 2004). Mugenda and Mugenda (2006) also argue that a sample of 10 to 20% respondents chosen from the desired population is sufficient for piloting the research instrument. Accordingly, pilot study was carried out using 34(15%) respondents who are out of the sample households for the pilot test before the research instruments were administered the respective Cronbach's alpha results are shown in Table 2 below.

Table 2: Summary of Cronbach's Alpha Reliability Coefficients

Variable	Cronbach's Alpha	Number of items	Decision
Community participation in planning phase	.893	3	Reliable
Community participation in implementation phase	.947	5	Reliable
Community participation in monitoring and evaluation phase	.936	3	Reliable
Factors that influences farmers' decisions to participate in WMA	.967	8	Reliable
Over all	0.913	19	Reliable

Source: SPSS output, 2023

3.9.Methods of Data Analysisand Presentation

Both quantitative and qualitative methods were used in analyzing the information collected usingdifferent instruments. Qualitative data obtained using semistructured question and FGD were analyzed& coded qualitatively using appropriate words. The coding involves assigning levels or categories to segments of data, while analysis focused on interpreting these coded segments to draw meaningful conclusions. To account for potential confounding variables in

analysis researcher used several strategies such as randomization, statistical control stratification and restriction(John W. Creswell 2018).For quantitative data, descriptive statistics such aspercentages and frequency and inferential statistics such as chi-square were employed to analyze the data gathered and presented by using tables.Moreover, theextent of people's participation in watershed development program was measured with help of People'sParticipation Index (PPI) developed by Bagdi (2002) as given below:

People's Participation Index

$$\text{PPI} = \frac{Mean\ Participation\ score}{Maximum\ participation\ score} \text{ x } 100$$

Where,

$$\text{P} = \frac{\sum_{i=1}^{N} Pi}{N}$$

Where;

N = the total number of respondents

$$\text{Pi} = \sum_{i=1}^{k} (PPj + PIj \ + PMj)$$

Where:

PPj= Total scores obtained by a respondent due to participation in program planning; *PIj*= Total scores obtained by a respondent due to participation in program implementation; *PMj*= Total scores obtained by a respondent due to participation in program monitoring and evaluation;

K = Total number of statements on which responses of the respondents were recorded; *Pi* = Total participation scores obtained by individual respondent in planning, implementation and maintenance.

The PPI value calculated in a particular watershed development program was categorized into three categories as suggested by the author based on the normal distribution curve values as given below (Table 3).

Table 3: Categorization of people's participation according to normal distribution curve values

Normal distribution curve range	PPI value range category	People's participation
< Mean – S.D.	0 to 34.13	Low level
Mean – S.D. to Mean + S.D.	34.14 to 68.26	moderate level
> Mean + S.D.	68.27 to100	High levels

3.10. Ethical Consideration

In research, ethical consideration is one of the most important points that deserve attention. This is mainly due to the necessity to strictly respect the consent of the participant whether they are willing to participate in the research or not. Likewise, it is to assure to the subjects of the study that they are free to withdraw from participating in the study whenever they found it necessary; the necessity to protect subjects of the study from possible dangers that may be encountered; Confidentiality, the actual names of participants in the study were kept secret while the sex or age of respondents may be used where it seems appropriate. Thus, the researcher assured that the research is strictly governed by the above ethical principles and they had also agreed. To ensure voluntarily participation and minimize harm in the research, the researcher address power imbalance by implementing strategies like informed consent, involving participants in the research process and fostering open communication.This strategies aim to empowers participants promote trust and respect their autonomy throughout the study.

CHAPTER FOUR

4. RESULTS AND DISCUSSION

This chapter deals with presentation, analysis and interpretation of data gathered from the respondents through questionnaires, interviews and FGD. Through these tools, both quantitative and qualitative data were gathered. The quantitative data were analyzed through statistical measures and the qualitative were analyzed through organizing and giving shape to the responses of interviews and by selecting words of expressions. In general, this chapter organized the characteristics of respondents, levels of community participation and its socio-economic and environmental contributions.

4.1.Levels of Community Participation in Watershed Development

4.1.1. Levels of community participation at the planning phase

Community participationsuch as socio-cultural, technical, indigenous knowledge, economic and ecological support are expected in the planning phase. Moreover, ensuring consistency between objectives of development and community valuesand preferences is very important for sustainability of the project even after outsiders financial and technical supports are withdrawn.The local community may participate in the form of materials, cash, labor, managerial talent and political support which are critical to program success. In this study, level of community participation in planning phase was analyzed in relation to community based watershed development guideline developed by Lakew et al. (2015), in the guideline the major activities to be implemented during the planning phase are identifying & prioritizing theirproblems, formulating by-laws or norms, time scheduling and deciding for the distribution of benefits.

Table 4: Farmer's participation at the planning phase

Activities	Degree of participation in planning phase				N = 316
	Never	Rarely	Sometimes	Always	
Time scheduling	164(51.9%)	51(16.1%)	41(13%)	60(19%)	152(48.1%)
Identification & prioritization of problems	171(54.1%)	82(25.9%)	47(14.9%)	16(5.1%)	145(45.9%)

Formulation of by-laws or norms	203(64.2%)	60(19%)	38(12%)	15(4.8%)	113(35.8%)
Decisions on distribution of benefits	215(68%)	41(13%)	32(10.1%)	28(8.9%)	101(32%)
PPI(%)	59.5%	18.5%	12.5%	9.5%	40.5%

Source: Own survey result, 2024

The results of the survey displayed in Table 4, for time scheduling 48.1% of the respondents were participated. From these participants 19% were participated always while 13% & 16.1% were participated sometimes and rarely, respectively. The result also indicated the level of community participation in problem identification and prioritization. From the total respondents 45.9% of them were participated in problem identification and prioritization of watershed management activities in their respective *kebeles*. Among these 25.9%, 14.9% and 5.1% participated rarely, sometimes andalways,respectively. The remaining 54.1% of the respondents were never participated in problem identificationand prioritization. Community participation during formulation of by-laws/norms is 35.8%. This indicates thatcommunity participation throughout by-laws formulation is at moderate level. For time of decisions making in distribution of benefits only 32% of samplehousehold were participated. Generally,less than half (40.5%) of the sample households were participate in the planning phase. This low community participation in planning phase may make them insufficient benefit from the watershed management.In addition, low level of their participation in planning phase have an impact on their participation in implementation and evaluation phase (Tyagi, 1998). According to Daniel Jaleta(2020)several barriers hinder higher level of participation in the planning phases of watershed management practices. These include lack of participatory guidelines, top-down decision making, economic disparities & in adequate community ownership. Also overlooking the benefits of local knowledge & indigenous practice as well ass neglecting the diverse viewpoint & needs of different community members can further limit participation.

In addition to the descriptive analysis, the overall People's Participation Index (PPI) of the local peoples during the planning phase ofwatershed development was calculated as 46% indicated that the PPI of the studyarea was categorized within moderate level of participation.

4.1.2. Levels of community participation at implementation phase

In implementation phase the local communities' involvements in watershed management activities through mobilizing local resources in the form of cash and labor which are critical to program success(Lakew et al. ,2015). Inthe forms of labor, activities such as terrace construction, planting of seedlings,pitting and soil and stone bund were mostly implemented in the study area(NWAO, 2022/23). Therefore, the researcher gathered the necessary data to analyze the level of community participation in implementation phase by using these variables (Table 5) below.

Table 5: Farmer's participation at the implementation phase

Activities	Degree of participation in planning phase				N = 316
	Never	Rarely	Sometimes	Always	
Labor on terrace construction	251(79.4%)	10(3.1%)	55(17.5%)	0	65(20.6%)
Labor on planting of seedlings	0	15(4.7%)	259(81.9%)	42(13.4%)	316(100%)
Labor on pitting	0	47(14.9%)	265(83.8%)	4(1.3%)	316(100%)
Labor on soil and stone bund construction	31(9.8%)	66(20.9%)	114(36%)	105(33.3%)	285(90.2%)
Contribution of money	242(76.6%)	29(9.2%)	45(14.2%)	0	74(23.4%)
PPI(%)	33.2%	10.5%	46.7%	9.6%	66.8%

Source: Own survey result, 2023

As shown in Table 5, 100% of the respondents were participated on planting of seedling and pitting. Concerning Labor contribution for terrace construction, only 20.6% of the respondents were participated. This survey result also showed that, 90.2% of the respondents were participated during construction soiland stone bunds. These indicate that farmer's awareness and experience about these structures is underconsiderable level. However,participation of farmers' in the form of money contribution is very low (23.4%).The overall PPI of the respondent during implementation phase was summarized as 66.8% which is moderate level of community participation in watershed management activities in implementation phase..

Moreover, the result obtained from interview and group discussion also showed that most of the community are unwilling to participate in such activities unless the government body enforce or punish them. However, the values developed by Bagdi (2002), indicated people's participation index in implementationphase was categorized under high levels. To move watershed

management participation from enforcement to intrinsic motivation strategies should focus on empowering communities through knowledge sharing, collective design making & recognitions of their contribution. This includes promoting a sense of ownership & pride in the outcomes & ensuring that watershed management aligns with local priorities and values(DejeneTeressa 2024)

4.1.3. Levels of community participation at Monitoring and Evaluation phase

If the implementedpractices are not adequately effective the milestones and targets set for natural resource degradation reductions,implementation adjustments and/or additional management measures become necessary. The implemented activities need to be periodicallyreviewed and compared with those outlined in the work plan. The implemented results collected throughmonitoring programs need to be evaluated against the objective and aim of the program. Monitoring and Evaluation during and after implementation of watershed management practices are anindispensable component of watershed management. During Monitoring andEvaluation phase activities such as sharing information and consultation, assessment of results and assessment ofdeficiencies are expected to be considered (Lakew et al.,2005). Therefore, in the study area the level of community participation in monitoring and evaluation phase was considered sharing information and consultation, assessment of results and assessment of deficiencies as the variables.

Table 6: Farmer's participation at the implementation phase

Activities	Degree of participation in planning phase				N = 316
	Never	Rarely	Sometimes	Always	
Sharing information and Consultation	265(83.8%)	31(9.8%)	20(6.4%)	0	51(16.2%)
Assessment of results	303(95.9%)	13(4.1%)	0	0	13(4.1%)
Assessment of deficiencies	284(89.8%)	32(10.2%)	0	0	32(10.2%)
PPI(%)	89.9%	8%	2.1%	0	10.1%

Source: Own survey result, 2023

This value indicates that, communityparticipation on information sharing and consultation is very low 16.2%. Failure to participate community oninformation sharing and consultation may reduce consistency of information for decision making (Lakew et al., 2005).Additionally, on an

assessment of results and deficiencies only 4.1% & 10.2% of the respondents were participated, respectively.

The overall people's participation index throughout monitoring and evaluation phase was calculated as10.1%. According to People's Participation Index (PPI) categories developed by Bagdi (2002), the level ofcommunity participation during this phase was categorized as low level participation. Such low levelinvolvement of landowners and other stakeholders may discourage learning, utilization of local knowledge andskills and also confidence of local peopleon watershed development and management program. According to DejeneTerressa the low level of monitoring & evolution in watershed management practices can stem from varies factors including resource constraints, lack of clear objective, inadequate data collection & analysis furthermore failure to utilize collective data for evidence based decision making can hinder the effectiveness of monitoring and evolution process. To actively involve community members in monitoring & evolution, implement mechanisms like participatory data collection methods feedback loops & capacity building. These approaches ensures community voices are heard & used to inform decision making and improved programs(FAO 2023).

4.1.4. The overall community participation index of watershed development phases

Table 7: Farmers participation at the implementation phase

Participation phase	PPIs values at each participation phase(N = 316)
Planning	40.5%
Implementation	66.8%
Monitoring and Evaluation	10.1%
Overall PPI (%)	39.13%

Source: Own survey result, 2023

Table 7 showed that the communities in the study were participated at highest level in implementation phase (66.8%) and lowest level during the monitoring and evaluation phase which is only 10.1% relatively. This indicates that there was more enforcementby the government for labor contribution in the implementation phase than others.The data obtained from FGD also indicated that the government was more committed to participate community in

the implementation phase. The community were invited more in the form of campaign in Watershed management activities. However, the overall community participation index on watershed development activities in thestudy area was computed as 39.13%. This showed that the level of community participation onwatershed development activities in the study area fall within moderate level category.Concerning the overall participation index of watershed there was a common finding between different researcher & this research. For instance Dejene 2018 stated that there was high participation during implementation & low participation during planning & post implementation, usually due to lack of awareness, technical knowledge or perceived ownership & also Tedesse et.al 2013 stated that participation was highest during implementation due to limited participation in decision making & planning.

4.2. Contribution of Community Participation In Watershed Program

To analyze the contribution of community participation in watershed activities in improving income of the household; household were categorized into two adopters and non-adopters . Their income is compared for two categories in each agro-ecologies.Income is one of the indicators for the household to stand some hard environmental problem like drought and food shortage(Pretty, 2008). In order to link the effect of land management practices on household income, comparison of mean annual income in 2023/24 between adopters and non-adopters of land management practices were used as shown on Table 8 below

Table 8: Linkage between land management and mean annual income in Birr

Agro-Ecology	Household Category	Mean Income	St. deviation	t - value	P- value
Dega	Adopter	71256	22054	5.3	0.01**
	Non- Adopters	55209	11518		
Woinadega	Adopter	43566	12358	3.2	0.00
	Non- Adopters	42226	9394		
Kolla	Adopter	31091	13890	6.6	0.00**
	Non- Adopters	28358	10258		

Source: Own survey result 2023 Not significant at 5% level (P>0.5)

The income was significantly different between adopters and non- adopters and this might be due to the adoption of watershed management by households. This suggests that households who have adopted watershed management practices were in better-off position to improve their livelihood than those who have not adopted. It also shows that adopters can be able to afford expensive synthetic fertilizers, improved seeds, keeping livestock and thus uphold their livelihood sustainable. Similar to this idea, Parwadaet al. *(*2010) reported that the adoption of land management technologies offer opportunities of improving the quality of the resource for poor farmers.

Considerable variation in income between adopters and non-adopters in the *dega* of the agro-ecology were might be due to the advantage that the watershed management practices have increasedthe income of household through increasing crop productivity and livestock feed availability.

The above results also reveal that watershed management practices has significantly contributed to the improvement of income for adopters in the *kolla* agro-ecology. In particular watershed management practices useful for addressing challenges of livestock feed scarcity; combating soil erosion and moisture stress have played important roles in improving crop and livestock productivity for improved local livelihoods in the agro-ecology. In the same way, income difference between adopters and non- adopters in *woinadega* were might be rising from the contribution of significant adoption of watershed management practices like traditional terracing and agro-forestry practices are helping household to increase production. Community participation plays a vital role enhancing varies aspects of household wellbeing, particularly food security, access to water & social cohesion. When households engage in community activities, they benefit from collective action such as communal farming, food sharing initiatives, & the exchange of agricultural knowledge, all of which contribute to improved food availability & nutrition. Similarly participation in community lead-water projects facilitate the development & maintenance of local water infrastructure, ensuring more equitable sustainable access to water resources. It also fosters social ties(FAO 2023). Several factors can contribute to income differences between adopters & non adopters of a new technology, practice or innovation(such as agricultural techniques, financial services, clean energy, education & information, market access, risk tolerance &etc)(world bank 2008). While a positive correlation between adopting watershed management practices & household income suggests a relation correlation alone does not imply

causation. Here is why causality can not be automatically established.These are because of confounding variable, reverse causality, selection bias &etc(world bank 2007).

4.3.Socio-Demographic FactorsThat Influences Farmers' Decisions To Participate In Watershed Programs

Why farmers' watershed management decision vary from one place to another or from one farm household to another have been a matter of constant concern for researchers, policy makers and planners. There are different determinant factors such as economic, psychological and socio demographic factors that influences farmers' decision to participate in watershed management activities. It is difficult to analyze all these factors. Therefore, the researcher focused on the demographic and socio- economic related factors only**.**Getachew (2005) stated that the demographic and socio- economic characteristics of the household and other institutional factors were responsible for the difference in the current status of land degradation. Farmers' adoption behaviour, especially in low-income countries, is influenced by a complex set of socio-economic and demographic factors (Getachew,2005). Hence, modelling farmers' response to agricultural adaptations has become important in identifying major determinants of adoption of the various adaptation measures.

There are different demographic and socio- economic factors that have affected adoption decision of farmer's in watershed management activities in the study area. From demographic related factors, this study was focused on respondents' age, sex and family size while educational status, land size, livestock holding and access to information were the variables considered under socio-economic related factors.

Table 9:Demographic related factors that influences farmers' decisions to participate in WMA

Variables		Adaptors N(%)	Non Adaptors N(%)	$\chi 2$	P- value
Age	19-64	156(82.5%)	101(79.5)	3.577	0.056
	> 64	33(17.5)	26(20.5)		
Sex	Male	177(93.6)	120(94.5)	0.092	0.762
	Female	12(6.4)	7(5.5)		
Family size	1-3	15(7.9)	7(5.5)	6.709	0.002
	4-6	79(41.8)	31(24.4)		

	7-9	85(44.9)	68(53.5)		
	10 and above	10(5.4)	21(16.6)		

Source: Own survey result, 2023 Not significant at 5% level (P>0.5)

As presented in Table 9, 82.5% of farmers participatedin WM activities were 19–64 yearsold while 17.5% were over 64 years old. The chi-square analysis indicated that the relationship between age of sample households and adoption of watershed management found to be no significant at 5% level of significant (x^2 = 3.577, p-value = 0.056).The statistical analysis showed no significant difference in the age of adopters and non- adopters. The result is consistent with the finding of Amsalu& De Graaff (2007).

Out of the total adopters 93.6% were male and 6.4% were females, whereas, out of the total non-adopters male households 94.5% and were female households 5.5% were non adopters. The chi-square test result has shown that there were no significant relationship between sex and adoption of soil conservation measures (x^2=0.092,p-value > 5%).This result is the same with Benin (2006) women are also sometimes inhibited from making decisions about land management practices while their husbands are away. This indicated that males and females where have no different idea to adopt watershed management practices. Unlike to this study the findings of Fikru (2009), explained that women have low participation in adoption decision of water conservation than males because women take most of the household responsibilities such as, child care, food preparing, fetching water from long distance.

The survey result revealed that 7.9% of the sample households had family size between 1 and 3, 41.8% of the sample household had a family size between 4 and 6, 44.9% of the sample household had a family size between 7and 10 and 5.4% of the sample household had a family size 10 and above. 50.3% of the adopter households and 70% of non-adopter households had family size of seven and above, and 49.7% of adopter households and 30 % of non-adopter households have family size of one to six. The statistical analysis showed a significant difference in the family size of adopters and non- adopters (chi-square value=6.709) and p - value > 5% significant level. Because family size influences on watershed management practice either positively or negatively. Large family size can support labour for constructing

watershedstructures on one hand, and on the other hand farmers do not apply watershed structures, as they think it decreases their farm plot to support large family. Similar studies conducted by Debebe et al. (2013) stated that because farmers who have (4-6) household size are largely poor, and have low income to modify and maintained conservation technologies. Like this finding a study conducted by Chomba (2004) stated that family size of the household has significant relationship with soil conservation practices.

Table 10:Socio economic related factors that influences farmers' decisions to participate in WMA

Variables		Adaptors N(%)	Non Adaptors N(%)	$\chi 2$	
Educational Status	Illiterate	111(58.7)	48(37.8)	1.353	0.552
	Able to read and write	47(24.8)	58(45.6)		
	Elementary school	28(14.8)	7(5.5)		
	Secondary school	3(1.7)	14(11.1)		
Land size (ha)	≤ 1	164(86.7)	80(63)	6.553	0.001
	1.1 – 2	9(4.7)	16(12.6)		
	> 2	16(8.6)	31(24.4)		
Access to training	No access	2(1.1)	13(10.2)		
	DA	143(75.6)	70(55.1)	17.239	0.000
	NGO	21(11.1)	17(13.4)		
	Media	2(1.1)	12(9.4)		
	Neighbors	21(11.1)	15(11.9)		
Labor availability	Yes	109(57.6)	88(69)	1.191	0.275
	No	80(42.4)	39(31)		
Livestock holding	Yes	121(64)	84(66)	1.568	0.211
	No	68(36)	43(34)		

Source: Own survey result 2023 Not significant at 5% level (P>0.5)

Education is one of the most influential factors in determining farmers in the adoption decision of watershed management activities. The literacy status of farmers is useful to know their perception about the current situation of environmental problems. According to the survey result, literate households have more understanding and perceptions about the problem of soil erosion and they are easily introduced in watershed management activities. As the survey result indicated in the study area 37.8% of the non-adopters and 58.7%ofadopters are illiterate (cannot read and write).

The chi-square analysis indicated that the relationship between educational status of sample households and adoption of soil conservation found to be no significant at 5% level of significant (x^2 = 0.353, p-value = 0.552).The statistical analysis showed no significant difference in the educational status of adopters and non- adopters. According to study Abera(2003:36),significant difference was not found in the education level in the conservation practices.

The lowest landholding size in thestudy area was below 1 ha and the highest was above 2ha; only 8.6% of farmers using watershed managementhad above two ha cropland. This implies participations offarmers with relatively smaller land holding size are betterthan the larger size. The chi-squaretest statistics indicated; household land holding size was significantly ($P < .05$) influence the participation of farmers in watershed management activities.Previous studies indicate, farmershaving larger farm sizes are interest to implement conservation technologies in their cropland than the others(Abebe and Sewnet2014; Sinore et al.,2018).

Access to information can play a significance role in the participation of watershed management practices. Different ways; they might have obtained information from development agents, NGO, Mass media, Neighbour farmers and inherited information from family. However, the degree of acceptability and prefer ability of the community could be differing. In this regard, sampled farmer household were asked about their source of information in related to Soil and water Conservation practices. The statistical analysis showed a significant difference in the information access on soil conservation practices of adopters and non- adopters (chi-square value=17.239, P= 0.000).

Labour is an important resource in the farming community. In the study area farmers depend on mainly family labour for their farm activities and social purposes. The sample households of the study area were asked to respond, whether they have enough labour or not, 31% of non-adopters

and 42.4% of adopter households had shortage of labour whereas, 57.6% of adopter household and 69% of non-adopter household heads had not shortage of labour force to perform soil conservation activities.

The chi-square test analysis indicated that there is no significant relationship between labour availability and adoption of soil conservation measures at 5% level of significance(x^2 = 1.191,P=0.275).The statistical analysis showed no significant difference in the labour usage for soil conservation practices of adopters and non- adopters. This implies that farmers that have shortage of labour and large labour similarly participate in WMA.

Farmers' livestock holding size can be considered as one indicator for better availability of resources or resource endowment. On the other hand, better availability of resources is assumed to have positive impact in farmers' land management practices. Hence greater livestock holding is expected to have positive influence in farmers' behaviour to improve their watershed management practices. In the study area the sample respondents were asked to respond whether they have enough livestock to perform watershed management activities or not, 64 % of adopters and only 66% of non-adopters were mentioned that they have enough animals to perform soil conservation work and other farm activities, where as 36% of adopters and 34% of non-adopter household heads were responded that there was no enough animals to perform soil conservation work and other farm activities.

The statistical analysis showed no significant difference in the availability of livestock for watershed management practices of adopters and non- adopters (chi-square value=1.568 and P =0.211).Unlike to this study Desta (2012), suggested that farmers with more livestock have better availability of manure which could be more than what they need for cooking fuel. Family size can significantly influence watershed management practices though not always in simple linear way. Large families may face challenges in maintain & adopting soil & water conservation practices due to increased labour demands & resource constraints. Especially, in areas with limited land. However, large family might also have labour available for construction and maintenance of such practices potentially leading to greater adoption(FAO 2223).

CHAPTER FIVE

5. CONCLUSIONS AND RECOMMENDATIONS

5.1. Conclusions

After the government of Ethiopia declared a 30 days public massive program of watershed development in 2011/12 GC variousintervention activities were implemented in different parts of the country including the study area. However, thelevel of community participation particularly in planning and monitoring and evaluation were still below theexpectation. The people participation index during implementation phase was computed as 66.8% (high level ofparticipation) while the least/low level (10.1%) of participation was recorded during monitoring and evaluation.Besides, the people participation index throughout planning phase which was calculated as 40.5% (moderatelevel of participation). This indicates that there was more enforcement of the people by the government forlabor contribution during implementation phase. Generally, the overall community participation index onwatershed development and management in the study area was computed as 39.13%. This showed that thelevel of community participation in the study area fall within moderate level category.

The finding of the study also revealed that watershed management practices have a significant role in improving the livelihood and their income. According to survey result, due to the introducing of watershed management practice the income of farmers was improved in the three agro ecology.

Finally, in attempt to identify the demographic and socio economic determinant factors through the result of chi square results revealed thatdemographic related factors such as sex and age respondents have no significant difference with the adoption of watershed management while the statistical analysis showed a significant difference in the family size of adopters and non-adopters (chi-square value=6.709) and p - value > 5% significant level. This implies family size influences on watershed management practice either positively or negatively. However, the level of participation varied across different community segments, influenced by socio-economic

status awareness level and institutional support, a key challenges identified include technical support adequate incentives & weak co-ordination between stake holders. Implication for policy and practice include strengthening institutional framework, capacity building &awareness, incentive mechanisms & inclusive participation. By aligning watershed management policies with this insights, decision makers can promote sustainable& community driven approaches to natural resource management ultimately contributing to environmental resilience& improved rural livelihood.

5.2. Recommendations

Stating from the above conclusions the following recommendations are forwarded:

- Establishing community based monitoring committees or providing incentives for participation in planning methods.
- Training farmers is important variable that affect the adoption decision farmers significantly. As indicated in the finding, when farmers trained about the causes and consequence of soil erosion and importance of watershed management, the ability to adopt and practice watershed management measures increases.
- Capacitating the community through practical based training and scaling up strategies of effective watershed management practices were need emphasis of the regional, zonal and districts government and NGOs.
- Ensuring, youth & marginalized groups are actively include in decision making process.
- Local government & NGOs should provide technical & financial support to community watershed committees.
- To conclude that every watershed management intervention should critically consider the community's socio-economic factors for effective implementation and sustainability of conservation structures.

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APPENDIXES

MADDA WALABU UNIVERSITY

FACULTY OF SOCIAL SCIENCES DEPARTMENT OF GEOGRAPHY AND ENVIRONMENTAL STUDIES

Questioner for households

Dear respondents

GisheSinbiru is currently studying at MaddaWalabu University in partial fulfillment of the requirements for the degree of master of art in environmental and developmental studies. This research questionnaire is prepared to identify Level of community participation in watershed management activities, the contributions of community participation in watershed management activities and factors that determine farmers' decisions to participate in watershed management activities. I thoughtfully request you to read all the questions in this questionnaire and give your response clearly. I assure you that your response will be used for academic purpose.

I. General information

Questionnaire code: _____

Name of the kebele: _____

II. Households Information

1. Sex of the household head: A. Male B. Female

2. Age of the household head: _____

3. Educational Level of the household: A. Illiterate B. Able to read and write C. Elementary school D. Secondary school

4. Family size _____

5. Land size in hactar _____

6. Have you access to training on Watershed management? A. yes B. no

7. Labor availability A. Yes B. No

8. Livestock holding A. Yes B. No

9. Annual income in Birr _____

III. Levels of Community Participation in Watershed Development

Activities	Degree of participation in planning phase			
	Never	Rarely	Sometimes	Always
Planning Phase				
Time scheduling				
Identification & prioritization of problems				
Formulation of by-laws or norms				
Decisions on distribution of benefits				
Implementation Phase				
Labour on terrace construction				
Labour on planting of seedlings				
Labour on pitting				
Labour on soil and stone bund construction				
Contribution of money				
Monitoring and Evaluation phase				
Sharing information and Consultation				
Assessment of results				
Assessment of deficiencies				

Checklist for Key Informants Interview

1) Position_____
2) Educational status_____
3) How long have you stayed in this position?
4) How do you perceive about the following in your woreda at large and the study area in particular?
5) Community participation in watershed management activities in the three phases(planning, implementation and evaluation)
6) What do you think the major factors affecting the farmers' participation in community based watershed management activities?
7) How do you evaluate the participation of farmers in CBWMP works in individual farm lands as well as communal lands?
8) How does community participation in watershed management contributing to income of households in the study area?
9) What are the demographic related factors that influence farmers' decisions to participate in watershed management activities in the study area?

Checklist for Focus Group Discussion

1. What is the level of community participation in watershed management activities at planning phase?
2. How does community participate in watershed management activities at implementation phase?
3. What is the level of community participation in watershed management activities at planning phase?
4. What is/are factors that affect community participation in watershed management activities in the study area?
5. How does community participation in watershed management contributing to income of households in the study area?
6. What are the demographic related factors that influence farmers' decisions to participate in watershed management activities in the study area?