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Evaluation of State Catchment Management System in Keku Kalo Kebele in Jima Rare District, Western Ethiopia

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ACRONYMS

CIDA	China International Developmental Agency
DA	Development Agent
FFW	Food for Work
HHS	House Holds
LLPPA	Local Level Participatory Planning Approach
MERET	Managing Environmental Resources to Enable Transition
SIDA	Sweden International Developmental Agency
SWC	Soil and water conservation
UN	United Nation
WFP	World Food Program

Abstract

Ethiopia initiated 'state catchment management' program to combat land degradation and to count its impact on sustainable development. This study was conducted on evaluation of state catchment management system in Keku Kalo Kebele in Jima Rare district, Western Ethiopia. The study was carried out from September 16 to July 2017. The objective of the study was to assess the difference between pre-existed (traditional) catchment management system and the improved state catchment management system, to identify factors that affect state catchment management of the area, to evaluate survived and non-survived planted trees and to give some recommendations about the management system of the area using systematic sampling method 40 households were selected as respondents. Development agents (DAs) were selected by non-probability sampling method. To determine survived and non-survived planted trees line transect method was used. Other data were also collected via both open and close ended questions, key informant interview focus group discussion, observation and by using secondary data like geographic information system based on agricultural statics office of both published and unpublished 'Catchment management system documents.' The data collected were analyzed using simple statistical methods such as ratio, percentages, cross tabulation and graphs. The result showed that there were factors that affected farmers' participation on catchment management such as indigenous knowledge, improved methods, biophysical and agro ecological practices and institutional factors. 47.5% of the farmers were not visited by local agents. Men and women did not participate equally; only 12.5% respondents sate that women have participation on catchment management activities. Of 4.5 hectare only 2.24 hectare was planted 2.26 hectare was remained uncovered. The 625 m² of sampled area of land holds 625 individual plants (trees) with the gap of one meter each. The 2.24 hectare of land at maximum can also hold more than or equal to 22400 total plants of which some might survived and while, others dried and the holes were empty. Therefore, based on the finding of this study, it is recommended that there was need of awareness creation for local farmers in order to develop ownership arranged. The planting system should not be interrupted and current care should be taken into consideration and additional guard with full facilities should be employed.

CHAPTER ONE

1 Introduction

In Ethiopia, weak “state catchment” adopted in the past with exploitive and non- participatory water and soil conservation had led to fast degradation of much of the fertility of soil in the country. Practices of poor land management coupled with the absence proper conservation measures of the community led to land degradation. The land degradation on its side forced the agricultural product to be reduced. Since soil and water are renewable natural resources it is possible to reclaim land and water resources in short period of time with implementation of strong “state catchment” management system, for that strong “state catchment” management system increases the capacity of community in conserving natural resources in general and water resources in particular (Mitchell.1990).

Considering the extended coverage of erosion to tackle the problem the Ethiopian government introduced soil and water and conservation (SWC) measures in the mid 1970’s by mobilizing rural labor Food For Work (FFW) scheme with the support of World Food program (Tamene Ararso, 2005).

Degradation of soil fertility, for instance is caused by soil erosion and poor land management practices. Soil erosion in turn caused by many other factors such as over stocking and over grazing, deforestation, cultivation of steep slopes, farming by using inappropriate techniques, inappropriate road drainage and unmanageable population growth which all are the result of poor management and catchment system and weak capacity and practice of the community in conserving natural resources in general and water and soil resources in particular (Tamene Ararso, 2005).

Regarding deforestation, there is absence of medals that encourage community participation in forest decision making, lack of productive alternatives and soil circumstances that surrounded smooth function of community based water and soil conservation (Hale Sharew, 1996).

Soil erosion and its association effects are recognized to be severing to natural economic of Ethiopia. Since more than 85% of the country’s population depends on agriculture for living, physical soil and nutrient losses lead to food insecurity. (Hurini. 1993) estimated that soil loss due to erosion in Ethiopia amount to 1, 493 million tons per year of which about 42 ton per hecter is estimated to have come from cultivate field. This is for the greater tolerant soil

loss as well as the annual soil formation in the country (Huron, 1993).The researcher additionally stated that the high lands of Ethiopia in general experiences sever soil erosion mainly due to steep terrains, poor surface cover, intensive cultivation of the sloppy area and degradation of grazing land, due to over population of livestock pressure in the country.

To improve soil and water catchments, soil and water conservation project have had long history in Africa, beginning in the 1930's when colonial governments became concern with the impact of soil erosion in the productivity of the land. By the 1980's however, researchers and development practitioner alike become increasingly aware that soil and water conservation had scored best record (Hudson, 1991).

Like in many developing countries, Ethiopia has initiate water and soil conservation program to combat land degradation and to count its impact on the sustainable development. In many cases, result from the activities where satisfactory and in some cases faield to achieve their targeted objective for various reasons (De.Graft, 1996).

Despite the above facts, the impacts of “state catchment” management measures implemented in Oromia Region in general and in “keku kalo” kebele in particular have not been documented and evaluated, therefore, the aim this study is to assess the “state catchment” management system of the study area on agricultural land of Jima Rare Woreda, Horo Guduru Wollega Zone, Oromia Regional State, Western Ethiopia.

The study will include the socio- institutional, economic, bio- physical, agro- ecological and gender gaps and other factors limiting participation of the community in soil and water and conservations of the study area which directly can limit the “state catchment” management system of the study area.

1.2 Statement of the problem

There are diverse views about the reason for the low participation of the community in the management of “state catchment” in the Ethiopian context. Among other things, it attributed to lack of empowerment of the community, topography, and heavy rain fall, insecurity of land tenure, sever soil erosion problems, deforestation, lack of efficient rural organizations and weak intuitional support to the system (Beshah. 2003).

Farmers were initially compelled to participate in the construction structures because the construction was under taken through Oromia Regional State of Ethiopia. Their participation was however, very low because farmers were not empowered to construct the structures individually on their farm land. The Ethiopian high lands have been experiencing declining

soil fertility and severe soil erosion due to intensive farming on steep and fragile land (Amsalu. and de Graft, 2006).The fact stated by researchers indicates that there was low “state catchment” management wise in Ethiopia.

So, it is very important to access the real factors that are determinant to limit the participation of the community in improving soil and water conservation practices.

Previous studies show that various agro- ecological, economic, socio- intuitional, Gender, indigenous knowledge and bio- physical attributes have influential roles in the community decisions to participate in catchment and its management through participation in SWC practices. Thus, appropriate understanding of these factors would assist in the formulation and implementation of the policy intervention to induce voluntary participation of the community in the catchment management practice. Because farmers have the ultimate say on the decision of participation, management, clear knowledge of the factors that determine farmers decision is an essential step in the effort of combating severe soil erosion which results from weak catchment management system.

Whether these factors, widely practiced throughout Ethiopia, have similar roles in area where there is no participatory water and soil conservation practice which are the result of low catchment management system needs to be investigated.

Besides low catchment management system partly the rain falls of high area which has high storm rain of intensity and high erosion power, there is also poor protective vegetation cover especially at the beginning of the rain season which requires strong “state catchment system management” wise.

To have and maintain better and improved catchment management system as one factor, maintaining the existence and managements of forests of different types is advisable, for that forests can catch and hold water and soil by their roots.

Shasta(1993), in contrary to the above facts, states that; population growth, rising demand for agricultural land, tourism, industrial use of fuel wood and the dependence of the rural poor on forest resources for their livelihood are major causes of forest depletion in most countries.

A hundred years ago Bedru Babalo, (2007), reviewed that about 40% of land of Ethiopia was covered by forests whereas; only less than 3% of land is covered by forest by the recent estimate. The proportion of lost forest cover in Ethiopia is almost the same with the land mass (size) of the Northern European country, Sweden. The major reason behind this is human interference in forests such as expansion of agricultural land, grazing, firewood and poverty.

To mitigate the above problems different “state catchment” measures has been implemented in Africa as well in Ethiopia. Principally, we need to know the study area state structure and the area’s perception towards the catchment management systems in order to have information about the attitude of farmers.

Therefore, the purpose of this study was to assess and contribute to the understanding of factors that influence “state catchment” management of the study area. “State catchment” management means the management of the state or its structure on any structure of land future which catches and holds water

Thus, this research is intended to investigate in order to narrow the researcher gap in assessing the effectiveness of “state catchment” management system perception towards both mechanical and agronomic conservation measures of Keku Kalo

1.3 Conceptual frame work/ purpose

The conceptual frame work of the study can be illustrated as follow,

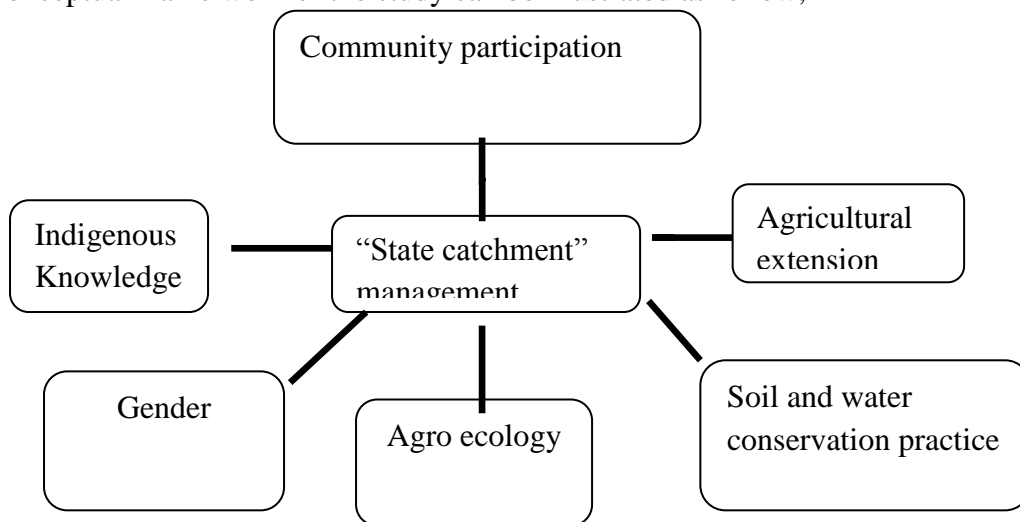


Figure 1: Conceptual frame work for factors affecting “state catchment” management System in Keku-Kalo

State catchment management: the management of state on any structure or land structure which catches and holds water. Total area from which surface runoff flows to a given point of concentration is called a catchment area, drainage basin, drainage area, or a watershed. Hence, a catchment area is always connected to a certain point of concentration, the lowest point of respective basin. Form of a watershed varies greatly, however, and is tied to many factors including climatic regime, underlying geology, morphology, soils, and vegetation.

Community participations: An active beneficiary that influences the decision and exclusion of development project rather than merely accepting of projects.

Indigenous knowledge: the idea, experiences, practices and information that either has been generated, locally or generated elsewhere but has been transformed and implemented by local people to be incorporated in to their way of life. It is not abstract like scientific knowledge; it is concrete and relies strongly on intuition, historical experience and directly perceivable evidence. Realizing that indigenous knowledge differs from the formal scientific knowledge system in that scientific knowledge is the starting point of participatory approach. Indigenous soil and water conservation practices have very often been ignored by the development agents, researchers, and soil conservationists' government staff (IFAD, 1992). Although the objectives of knowing indigenous soil and water conservation practice give us an understanding of farmer's way of thinking about the measures (Norman Hudson, 1992) In order to prevent the problem of soil erosion in the area farmers in Jima Rare used a number of indigenous soil and water conservation technologies. Among these are crop rotation, intercropping, mulching and tree planting.

Crop rotation: practice of planting different crops one after another on the piece of land year after year. Some crops restore the fertility of the soil while the others deplete its fertility and different crops vary in their response to different pests and a disease growing of legumes and oil crops after cereal crop are commonly practiced in the area.

Mulching: mulch farming system maintains surface residues on tilled land. Crop residues are useful in conserving soil, controlling water runoff and improving soil physical condition and increasing soil fertility. In the study area mulching is commonly practiced but by now the utilization of it by residues has been declined as a result of competitive use of crop residues for livestock feed, fuel and for building material (for covering roots).

Inter-cropping: is practice of growing two crops at the same time on the same piece of land to increase productivity of land and to protect the soil against erosion. As it observed in the study area cereals are intercropped with leguminous crops [maize/beans].

Agricultural extension service: is a service by which non-formal education is provided by extension personnel. This service has the tasks of bringing scientific knowledge to the farm families in the farmers and their homes. The mixture of public and private activities which exists in most country and their relation with surrounding communities, organization and institutional affairs (which are used to put extension in to practice)

Gender: is the social division of work which is bounded by local custom and religious practice. In some societies women are prohibited from converting directly with non- family

men. In other, customs forbids them to meet in public places. While in many; women are openly discouraged from participating non- domestic activities.

Agro- ecology: is the interaction of human activities with their surrounding activities.

Soil- water conservation (SWC): is the mechanism by which soil and water should be conserved for they are interlinked each other.

The main activity of developing countries manly -agriculture is dominated by ecology. Ecology composed of natural resources that make the environment suitable for progressive of agriculture (soil, water, biodiversity), climate conditions (temperature, rainfall, humidity, wind and light) and altitude are the element of ecology which directly or indirectly affects agricultural activities. Climate zone (Dega, Weina Dega and Kola) is categorized based on ecological elements (temperature, rainfall and altitude).

1.4 Objective of the study

1.4.1 General objective

The general objective of this study is to evaluate factors which influence “State catchment” management system in Jima Rare woreda, Horo Guduru Wollega Zone, Oromia Regional State, Western Ethiopia, particular area “Keku-Kalo”.

1.4.2 Specific objectives

The specific objectives of the study were:

- To assess the difference between pre-existed (traditional) catchment management system and the state catchment management system of the study area
- To identify Factors which affect “State catchment” management of study area
- To evaluate survived and none survived of plants.

1.5 Research Questions/ Hypothesis

The guiding questions of this research were:

- ❖ What are the most important and significant measures used and taken by the state, NGO's and individuals to maintain "State catchment" management system of the study area?
- ❖ What factors affect the "State catchment" management system of the study area and to what extent?
- ❖ How does the "State catchment" management system influence the physical, biological, social and economic diversity of the community of the study area and
- ❖ What measures should be taken to overcome these problems?

1.6 Significance of the study

The need for conducting this study on evaluation "State catchment" management in the study area is to understand the different factors affecting the roles and participation of the state in managing "catchment" area used by the farmers on their field like crop rotation, mulching, intercropping, soil bund cut off drains and etc. This may be a base line information to different private, government and non-government organizations those operates their duties in community based catchment; which ultimately help farmers to increase their utilization with some improvement and modification with improved and scientifically appropriate techniques of catchment practices. This build ownership among farmers for conservation practices which empowers and make farmers to have their own decisions that facilitates cost sharing between local community and the organizations there by creating effective, committed, sustainable groups which there can work together for the improvement of the livelihood of the local community as well as for the nation as a whole. This documentary evidence will show how to enhance the benefit of "State Catchment", socio- economic stability of the farmers and screening out different catchment practices concerned bodies to mitigating them and assists the country. Local, national and international agencies that may develop appropriate measures to evaluate "State catchment" management will benefit and also this study will provides base line data.

Chapter Two

Review of Related Literature

2.1 Approach to soil and water conservation measures

By the definition of soil erosion, it is well clear that the water intake capacity would increase, if soil is protected and covered. The various practice adapted to control soil erosion are based on this point .For the prescience of soil cover, dissipate the impact of rain drop and there by reduction in soil erosion also reduce accordingly. The widely accepted method to maintain the above are organic and mechanical conservation practice. To deciding the conservation measures to be employed, the preference is always given to the agronomic measures, because these are less expensive and easy to fit them into existing catchment system, the mechanical measures are ineffective for they cannot prevent the detachment of particles of soil. Their main role is in supplementing agronomic measures used to control the flow of and wind arises in other world, (William 1989).

2.2. Participation

Participation is popularly defined as involvement of people in issues that affects them, (Mitchell et.al., 1997).It is argued that participation of stake holders is crucial in several ways, first the process facilitates knowledge taping from a variety of sources, including informal manages acquired on a much longer time frame as compared to scientific knowledge particularly from the people closely linked to the resource, (Gadgil et.al., 1993).

Secondly it is considered vital in gaining a comprehensive picture of problem or issues in question, based on varying perspectives, (Hemmati 2002 in Hedelin, 2007). It is also maintained that participation helps in generating better decisions, based on critical analysis of all shades of opinions including scientific information by varies actors through the mechanism of discursive rationality, It is also argued that participatory process also facilitates generating of support from various stake holders including the politicians and community, critical for the success of integrated water shade management (Mitchell, 1990). It is farther suggested that effective development and management of water resources, can be realized by the level of government nearest the problems and most capable of effectively representing the vital interests involved as the traditional approach that was centralized and technocratic that failed to put in to consideration of socio-economic concerns (Bulkley. 1995).

While participation is considered as a way to enhance capacity for tackling complex water resource challenges, there various setbacks which undermine the process and hence render it ineffective, It is argued that involvement of stakeholders does not necessarily mean that their views will be taken in to consideration due to varying levels of influence (Hedelin, 2007).

At the same time varying and conflicting interests, pose difficulties in the efforts to reach on consensus. In order to overcome conflicts caused by diverse shades of opinions by various stake holders in water shade management and achieve integration, Mitchell, (1990) suggests two approaches that can be used. The first approach requires the identification of common social choices around which all efforts and agencies converge to implement .The other approach involves trying to reconcile individual goals of different stakeholders, He however prefers the first approach because of the difficulties in reconciling the different goals ,Headline , (2007) also adds for effective participation to be achieved there must be ways to create understanding of the complex environmental issues involved in water shade management system among stakeholders ,adequate mechanisms dealing with power differences. To achieve integration and effective participation in water shade management, Mitchell, (1990).Points out the need for structured coordination among various actors and institutions across spatial and temporal scales.

2.3 Community and conservation

While many of these believes, persist most of current idea about the community role in conservation have changed radically; communities are now the locus of conservation thinking. Intramural agencies such as World Bank, IDA, CIDA, World Wide Fund for Future, Conservation international nature conservancy, the ford foundation, Macarthur foundation and USAID have all “found” community. They direct enormous sum of money and effort toward community based and resource management programmers and policies. Several research findings indicate that conservation communities down the Millennia have developed elaborate rituals and practices to limit off- take levels restrict access to critical resources and distribution (Agrawal and Gidson 1961), Clugston and Rogers (1995), Dei (1992); Perry and Dioxed (1986), Raju.etal (1992) ,Robinson(1995).

Within community based conservation policy or practice, its generally assumed that local participation will empower the people involved with the skills and confidence to analyzed their situation, up to reach consensus, make decision and take action, so as to improve their circumstances (Western and Write,1991). At the same time, it is believed that, they will

conserve the natural resources, upon which they depend. However, despite the stated intention of social inclusion, it is clear from experience in the past that many participatory incentives have failed to deal with their complexity of community differences

2.4 Soil and water conservation practice

In a research “adoption” is identified as house hold variables, farming and economic variables and other external factors as the major determinants (Tenge.et.al, 2004). In Ethiopian case, several household and economic factors that influence the decision to accept soil and water conservation measures have been analyzed. Amsalu and de Graff (2006) found in their study area, age, farm size and livestock numbers are the most important factors with significant influence. Farmers decision to conserve natural resources generally and soil and water in a particular are largely determined by their knowledge of their problems and the perceived benefits of conservation. In their research on the adoption of soil and water conservation practices, Amsalu and de Graff (2006) made a distinction between the initial adoption and continued use of conservations measures.

2.5 Types of water and soil conservation practices

2.5.1 Agronomic practices

Many different types of control measures for handling different kind of problems have been developed over the last decades, even though effective conservation practices have not yet developed for all numerous problems relating to the conservation on constructing agriculture lands and practice. Therefore, necessary to seek constantly for cheaper and more efficient way of conserving soil and water. The specific land treatment used and recommended by soil conservation may vary from farm to farm, though the cheapest methods are agronomic practices, (Davidson 1976).

2.5.1.1 Crop rotation

Crop production as more or less refers the regularly recurrent succession of different crop on a given area of land. The crops used are commonly a cultivated crop, small grain, a grass, legumes and their mixture efficiently to control erosion during the period of their use in a given area. In addition to crop rotation system assists farming, save labor and help to control weeds, insect and plant diseases. Crop rotation varies with the land economic conditions, (Taffa Tullu, 2002).

2.5.1.2. Strip cropping

Strip cropping is the practice of growing alternative stripes of different crops in the same field. These practice of strip cropping, as a terracing devised along slope in to serious of shortest ones. As a result; the velocity of run-off decreasing by reducing its capacity both up peak soil particles and to carry them along the suspension, (Taffa Tullu, 2002).

2.5.1.3 Protective covers cropping

Protective cover cropping is very important in save guarding field from erosion. They add organic matter to the soil and thereby help observe plant nutrient that otherwise might be lost by leaching. They also have an important part in the economics of the land by adding organic matter. The choice of the cover crop will be depends on local conditions, lost, use to be made by crop or other fertilizers

2.5.2 Mechanical practices

Mechanical field practices are used to control the movement of wind and water over the soil surface. Where sheet or gully erosion exists, erosion control by vegetation means is not completely effective and mechanical controls becomes necessary. This measure protects and the decision on which to adopt depends on whether the object uses are to reduce the velocity of run-off and wind increased surface water storage capacity or safely dispose of excess water. Mechanical practices are normally employed in conjugated with organic soil and water conservation practice, (Unger, 1984).

2.5.2.1 Contouring

Carrying out ploughing, planting and cultivation on the causes can reduce soil loss from slopping by up to 50% compared with cultivation up and down the slope. The effectiveness of counter farming is various with the slope steepness and slope length. Moreover, this technique is only effective during storm of low rain fall intensity. Protection against more extreme storm is improved by supplementing contour farming with strip cropping.

2.5.2.2 Contour bounding

Contour to form water storage area on their up slope side and to break up slope in to segment in length bounds shorter are earth embarks; 1.5 to 2m wide thrown across the slope to act as barriers to run-off, is required to generate over land flow. They are suitable for slope 1' to 7' the bank spaced at 10 to 20m and are generally hand constructed, (Taffa Tullu, 2002).

2.5.2.3 Contour trenching

A trench is a wide furrow constructed for better infiltration of water on sloppy areas. It is practiced on slope greater than 15%. The main objectives of contour trenching are to have improved or stored run-off to increase soil moisture and to remove erosion. Contour trench are constructed on site with very shallow soil, low fertility and active soil erosion. It is usually practiced on soil not suitable for agricultural but kept as grass land, (Steven, 1974).

2.5.2.4 Terracing

A trace is Earth embankment with a channel constructed across the slope at fixed vertical interval and at an acceptable horizon slope. It is to reduce erosion of moisture for crop production. Terrace is most effective of several erosion of moisture control practice. For the best soil and water conservation practices of other combined measures such as grass, diversion channel , gully erosion structure, strip cropping and contour farming should be used along terracing. Farmers should be convinced of the benefit of terracing otherwise they not go to the excess labor of constructing of then by land, (Davidson, 1986).

2.5.2.4.1 Types of terracing

Terrace may be classified according to the purpose for which they are constructed and according to the method used to construction. They are classified as ridge channel and bench terrace, (Davidson, 1986).

2.5.2.4.1.1 Ridge terracing

Ridge terracing is moisture conservation and the secondary objective is for erosion control. In low and moderate rain fall region they trap and hold rain fall for infiltration in to the soil

profile. The embankment for those by us is usually constructed for soil taken from both sides of the ridge, (Taffa Tulu, 2002).

2.5.2.4.1.2 Channel terrace

Cannel terrace is constructed for the pur moving excess surface water from a field without causing erosion; it is built by excavation of cannels. The soil from the channels is placed down the hill of the channel, (Taffa Tulu, 2002).

2.5.2.4.1.3. Bench terrace

Bench terrace is constructed of earth plate from along a contour line, supported by steep river and separated from the not bench terrace by a vertical drops at suitable interval. It is used on very steep slope. It is constructed by leveling on area for a short width and then a vertical interval. Bench terrace are commonly used in Ethiopia, (Taffa Tullu, 2002).

2.6. Gender and Natural Resource Management in Ethiopia.

Ethiopians cultures and societies is heavenly biases towards benefiting Men and women experiencing even greater inequalities, for example in access to resource than most African countries (Tadele Ferede 1999), of Oxfam Ethiopia describes in comparison with many other African country statistics on Gender related issues lack bleak in Ethiopia. Despite their equal share with men in socio economic life, Ethiopia women have little decision making power and smaller share of resource and benefits.

87% of women in Ethiopia are engaged in agriculture contributing about 50% of income based on subsistence agriculture. However, little attention has been given to involving women in rural development effort and enabling them to benefit directly from agricultural extension.

In Ethiopian community based conservation project, it is a grain the men whole opinions have been voices in project planning and/or analysis and men are those playing a more active role on project implementation. There is little evidence of women perspective and needs being recognized or taken into an account, for example a study of community based in Tigray by (Admassie, 1997). Where efforts have been made to carry out studies to identify women problem, their need and priorities, there is little evidence to suggest that these make any difference to the outcome future direction of the project, (Akloglaike, 1997). In addition, Ethiopia has committed herself to implementing the Beijing plat form action, delivered at the fourth world conference on Women, stating that it aims to ensure respect for the human rights of women, including equal economic, social and political right with advisement of all aviating the problem inferiority and help women become decision maker at all level of government. (UN, 1997)

A national Action plan has been launched with primarily aims to institutionalize the political, economic and social right of women by creating appropriate structures in government office including (agriculture conservation and institutions work). So, that the public policy and intervention are gender sensitive and can ensure equitable development of all Ethiopian men and women. It is suggest that women's access to land, water, and forest resources together with new polices and programmers have been formulated and adopted with increased gender consideration and equity, it remains to be seen what effects this National Action plan will actually have. However, it is clear that conservation organization involved in projects, especially community based project will come under increasing pressure issues into account. In doing so, not only it is likely to benefit women and indeed the communities as a whole but also increase to the likelihood of project and biodiversity conservation success. (UN, 1997)

2.7. Community based participatory National resource conservation

Development thinking increasingly regards empowerment of poor people as crucial to the effectiveness and sustainability development intervention. In Ethiopia, the MERET (Managing Environmental Resources to Enable Transition) to more sustainable livelihood project utilizes a community based, participatory approach to natural resource conservation particularly (soil, water and reforestation) that benefit one million people annually in 600 communities.

Severe land degradation and deforestation in Ethiopia threatens the livelihood of over whelming rural populace. To tackle these problems, UN – World food programmed (WFP) has partnered for over 30 years with the Ethiopian government in reforestation, soil and water conservation.

Launched in its current form in 2002, MERET represents important step in the evolution of Ethiopian conservation activities away from the command and control methods of the 1970 and 1980's that approach proved very in effective. Community felt little sense of ownership due to their lack of participation in planning and management, and so did little to maintain conservation structures such as terraces and check dams.

Since 1991, soil and water conservation in selected communities has made use of the Local Level Participatory Planning Approach (LLPPA), through which district government officials collaborate with communities on planning, implementation, and evaluation. The federal and state governments provide policy guidance, funds and technical assistant.

Chapter Three

3 Methodology

3.1. Description of the study area

The present study was conducted in Keku Kalo Kebele, Jima Rare district which is located in Horo Guduru Wollega zone, Oromia Regional State, Western Ethiopia. It is located about 245km from Addis Ababa. The Geographical location of the Keku Kalo is surrounded by Wayu town in North, Dangago Kebele in South, Sochosa Gamachisa in East and Haro Guta in south West. The Keku Kalo is located at 1019521N⁰ altitude and 031950E⁰ Longitude in terms of absolute location and it has total area of 4.5 hectares. Has temperature of 18C⁰ to 25 °c during the moist and peak dry season respectively and has rain fall change from 900mm – 1400 mm,. The main occupation of the area is mixed farming agriculture. The district has the total area of 34,078 hectare. The population of the area is about 63, 464 of which male population is 30,986 and the female population is 32, 478. 18,334 hectare of land of the Woreda is found under cultivation, 4,350 hectare under pasture, 2690 hectare under forest, and 5800 hectare were covered by stone and water resources and others constitute 2894 hectare of land.

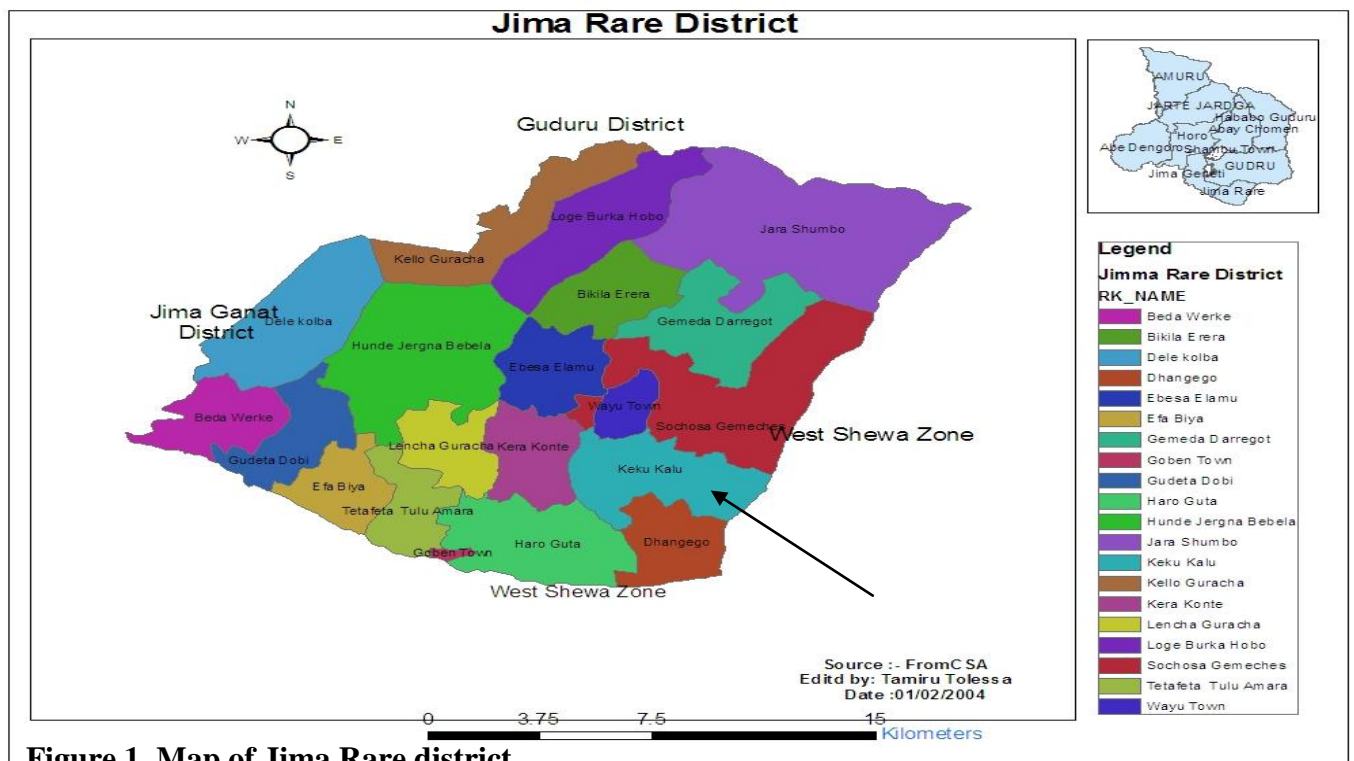


Figure 1 Map of Jima Rare district.

3.1.1 Climate

The altitude range of the district is 3047ms and 1700ms above sea level respectively. The mean annual rain fall of the Woreda is about 900mm- 1700mm and the mean daily temperature is oscillate between 18-25⁰C

3.1.2 Vegetation and Wild animals

There are many forest areas in Jima Rare Woreda that consist trees like, *Eucalyptus globules*, *Eucalyptu scamadwe*, *Cupressus lusitania*, *acacia absynica*, *Hyginia absynica*, *Albizia gummifera* , *Gravilia robusta* and other grasses, shrubs. Wildlife is found in the Woreda following the distribution of natural forest. The major wild animals found in the District are Hyena, Monkey, Pig, Ape, Fox, Wolf and different types of Birds.

3.1.3. Agro ecology

As indicated under the climate condition the temperature and amount of rainfall record showed that the Woreda is characterized fewer than two categories to illustrate in the terms of percentage is estimated to be 30% Dega and 70% Wainadega. Specifically the research site was moist Waina dega climatic zone. It receives two rains the main in summer (“Gena”) and short in spring (“Arfassa”) rains from April to September (District Agricultural office)

3.2. Research Design

Cross-sectional survey research design has been preferred and applied. With which both qualitative and quantitative research method were used and cross checked with what already observed through field observation and assessed through transects from the field of the study area. With quantitative method the numerical data of the study area which were typically structured and predetermined through research questions and conceptual frame work and design were used. In qualitative method non-numerical and unstructured data were used and interpreted using typical research questions and methods which are more general at start and become more focused as the study progresses.

3.3. Source of data

3.3.1. Primary Source of data

For this study primary data has been collected from the community of study area through survey questionnaires, Observation, key informant interview, focus group discussion and transect walk throughout ”Keku-Kalo”Kebele.

3.3.2. Secondary Data Collection Method

Secondary data would be collected from geographic information systems based on Developmental Agency and Woreda Agricultural Statistics Office of both published and unpublished “Catchment” Management System documents.

3.4 Sampling Methods and Sampling size

3.4.1 Sampling Method

Eighteen (18) Kebeles of the Woreda “Keku Kalo” were selected purposely where soil erosion of this area was assumed to be very serious and the catchment system where state structure of the area was practiced and implemented. A list of farmers in each farmers association were obtained from Development Agent Office and Agricultural Office of the Woreda a total of 425 farmers. 40 farmers were obtained from this farmer association and four from the Woreda’s agricultural concern.

To determine the planted, survived and non-survived of the overall catchment of the area first part of the catchment was mapped through measurement. By using this pre restricted land the survived, non-survived and totally planted each species of trees were identified by census purposeful and carefully by considering each vulnerable planted trees.

MAP OF KEKU KALO KEBELE CATCHMENT AREA

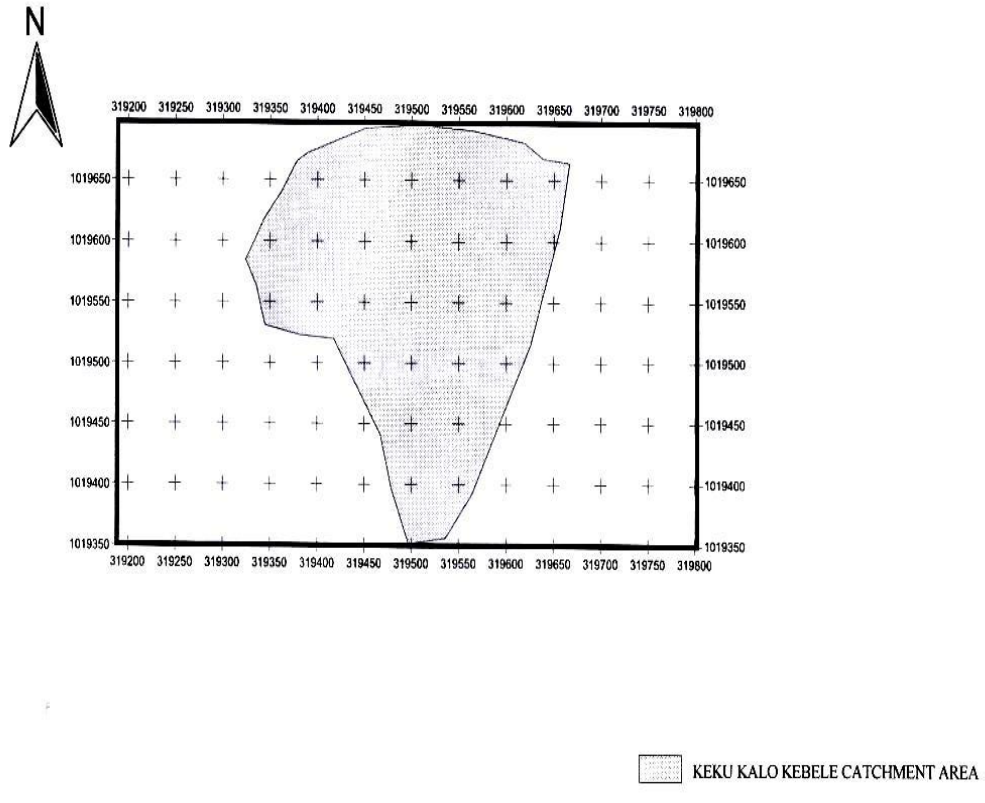


Figure 2 Map of Keku Kalo Catchment areas

3.4.2. Sampling Size

The total households of Keku Kalo were 349 male and 76 female, which is equal to 425. This study is purposely to include 9.41% of the Kebeles households in this study. Of the 425 households 40 households 9.41% of the households would to be taken to the sample by the systematic sampling method. With the K^{th} interval formula of the systematic sampling method

$$K = N/n$$

$$K = \frac{425}{40} = 10.6 \text{ [Every 11}^{\text{th}} \text{ element was selected].}$$

Whereas; K = sampling size, N = Total households (425) and n = required sample size from the total households (40). Therefore, every 11th elements was taken in the study, from the total population (Burns, 1994).

To select sample size of Developing Agents and the Woreda Agricultural Office concern workers, I have used none – probability sampling method. The reason for its selection was that the number of the given Development Agents and the Woreda's Agricultural concern workers were small. I.e. all of them were used.

3.4.3. Sampling techniques of the state catchment.

To determine the planted, survived and non-survived of the overall catchment of the area first part of the catchment was mapped through measurement. The measured area as a sample was the 25m * 25m (625m²) area of land. By using line transect method on this pre restricted land the survived, non-survived and totally planted each species of trees were identified by census purposeful and carefully by considering each vulnerable planted tree. This was exercised that to evaluate and cross check the result with that of totally planted, survived and non-survived number of planted species of the overall catchment area. The pre-restricted and sampled frame of the catchment of the area was the one that with twelve (12) different rows of different planted tree species.

3.5. Data Analysis and presentation Method

3.5.1. Data Analysis Method

In general the data obtained from respondent (Households, Development Agents (DA) and Woreda Agricultural office workers] was organized and analyzed by descriptive statistics such as mean, percentage and quantitative data also analyzed by using interpretation and content analysis.

The targeted data analysis methods for the study were the following:

3.5.1. 1. Survey Questionnaire

The survey questionnaire of the study includes both open and close ended questions which were pretested by administering it to selected respondents. Subsequently, on the basis of the results obtained from the present, necessary modifications were made on the questionnaire w/c was ultimately translated from English to the local language, Afan Oromo.

The interview was conducted in the local language. Data generated from the questionnaire include among other things measures taken by the structure of the government of the Keku

Kalo, community participation on natural resources conservation management system in general [indigenous and/or the introduced one] Enumerators were selected based on their level of understanding of the local language and their educational level.

3.5.1.2. Key Informant Interview

Community leaders, elders, women farmers, development Agents (DA's) and the concerned Woreda Agricultural Office Workers were interviewed to acquire useful and detailed information about biophysical factors affecting the state catchment management system and community participation in natural resource [soil, water and forest] conservation which is used to maintain the catchment management system and were difficult to collect through the survey questionnaire method.

3.5.1.3. Focus Group Discussion

To gather more in depth qualitative information regarding the role of community participation in catchment management system and to understand suggestion of the focused group from the community discussion was made on open ended questions with homogeneously segmented [male and female] farmers in the adolescent age group owning their own and] targeted to the study area. In the study area one focus group discussion would conducted with different groups of the community which consists the house hold, Development Agents and Woreda Agricultural Office Workers by which more in depth qualitative information regarding the role of the government structures of the study area in catchment management system. By the informal discussions were used to verify and supplement the quantitative results from the structured questionnaires.

3.5.1.4. Observation

Observation was used to visualize geographical settings and physical conditions of the study area, degraded lands, gullies, eroded soil and silt deposited at the bottom of the field.

3.5.1.5. Transect

Transect was the main tool of this study. It involves a cross-section or straight cut through the community and state catchment of the study area in order to capture the greatest diversity or ecosystems, land use and the like. For the purpose both the geographical and historical transects would be applied. By geographical transect the diagram of the state catchment which compares the main features, resources, uses and problems of the state catchment of the area would be tested. Similarly the historical transects (time lines cut across time) would be used for evaluating the time at which the area sited, the species of the vegetation cover in the state catchment and the like in order to visualize geographical settings and physical conditions of the state catchment.

During the conduction of transects walk map of the suitable transect line, careful observation and semi-structured interviews would be conducted to evaluate and identify the catchment vegetation cover, survived and non-survived seedlings, uncovered and degraded lands, and mechanism of soil and water conservation exercised.

The measured area as a sample for the catchment area was the 25m * 25m (625m²) area of land. By using this pre restricted land the survived, non-survived and totally planted each species of trees were identified by census purposeful and carefully by considering each vulnerable planted trees. This was exercised that to evaluate and cross check the result with that of totally planted, survived and non-survived number of planted species of the overall catchment area. The pre-restricted and sampled frame of the catchment of the area was the one that with twelve (12) different rows of different planted tree species.

3.6. Data Analysis

In general the data obtained from respondent (Households, Development Agents (DA) and Woreda Agricultural office workers] was organized and analyzed by descriptive statistics such as mean, percentage ,ratio cross tabulation and graphs and quantitative data also analyzed by using interpretation and content analysis.

During the conduction of transects walk map of the suitable transect line, careful observation and semi-structured interviews were conducted to evaluate and identify the catchment vegetation cover, survived and non-survived seedlings, uncovered and degraded lands, by tables and graphs.

Chapter Four

4. Result

4.1. Socio-economic characteristics of the respondents

4.1.1. Sex distribution

The result indicated that 90% of the heads of Households (HHs) were males. Those men group include most influential people who were village elders (“Jarsa biyya”), decision makers (local administrators), and younger people poor, and rich farmers. During planning of natural resource conservation [soil water conservation (SWC), planting trees and forest conservation and wildlife conservation] it was important to consider the influential groups but still care need to be taken so that other groups are not marginalized. Out of the total sample of households (HHs) in the Kebele (Keku-Kalo) 10% of the HHs were women, out of which 25% were divorced and 75% were widowed. Females constitute about 55% of the total family members who have limited participation on natural resource conservation and management system because of traditional social barriers and for they are involved in regular household activities

Table 1 Sex distribution of respondents

Description	Sex		Total
	Male	Female	
Respondents	36	4	40
Percentage	90	10	100

4.1.2. Age groups

Age groups were identified: young (20-40years) were 47.5%, middle (41-60 years) were 42.5% and old (aged) people (>60 years) were 10% of the total sample respectively. Most of the farmers in the area (90%) belong to the young and the middle age groups which indicate that there is sufficiently large labor force in the area. Young and middle aged group family have evolved in natural resource catchment management system program of the study area. On the contrary the aged groups have low level of participation to reduce the problem of natural resource catchment and management system. These aged farmers have less understanding of the problems due to less access to information in the area.

Table 2 Age group distribution of HHs

Description	Average groups (years)			Total
	20-40	41-60	>60	
Respondents	19	17	4	40
Percentage (%)	47.5	42.5	10	100

4.1.3. Education Level

Five education level groups were identified which include Illiterate, Grade 1-4, Grade 5-8, Grade 9-10, and above Grade 10. Not less than 47.5% of the HHs heads were illiterate, 20% were between grades 1-4, 27.5% were between grades 5-8, 0% was between grade 9-10 and 50% were above grade 10. Most of the farmers in the area were not educated and thus have little access to information about natural resource catchment and management system.

Generally, better educated HHs has a more realistic perception about Catchment and Management System of natural resources and problems related to it; have more knowledge related to participation in State Catchment Management Program and hence can more easily be involved in the activities. With respect to educational status of households (HHs) in relation to location of the state catchment area, farmers nearest to the catchment area are with better education than those far from the area.

Table 3 Educational status of household heads

Site(location)to the catchment area	Educational status of the respondent										Total House Holds
	Illiterate		Grade 1-4		Grade 5-8		Grade 9-10		Above grade 10		
	Number	%	Number	%	Number	%	Number	%	Number	%	
More near to the catchment area.	8	20	4	10	6	15	-	-	2	5	20
Far from the catchment area.	11	27.5	4	10	5	12.5	-	-	-	-	20
Total	19	47.5	8	20	11	27.5	-	-	2	5	40

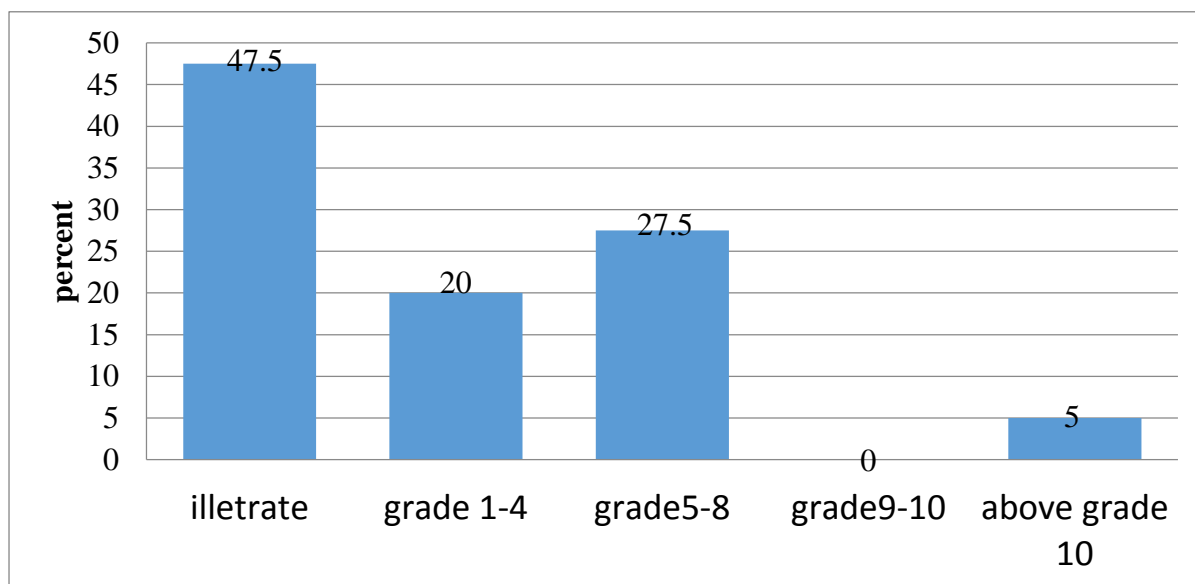


Figure 3 Graph of educational status of HHs

4.1.4. Religious distribution of sampled farmer HHs of the catchment area

Religious distribution of sampled farmer HHs of the catchment area (Keku-kalo) include 2 (5%) Muslim, 18 (45%) orthodox followers, and 20 (50%) of them were protestants. Some Christians of this area used trees as important culture and spiritual icons. They all together celebrate in this forest once in a year and protect trees from cutting.

Table 3 Religious distribution of sampled farmers (HHs)

Religious	Number of respondents in frequency	Percent (%)	Remark.
Muslim	2	5	
Orthodox	18	45	
Protestant	20	50	
Total	40	100	

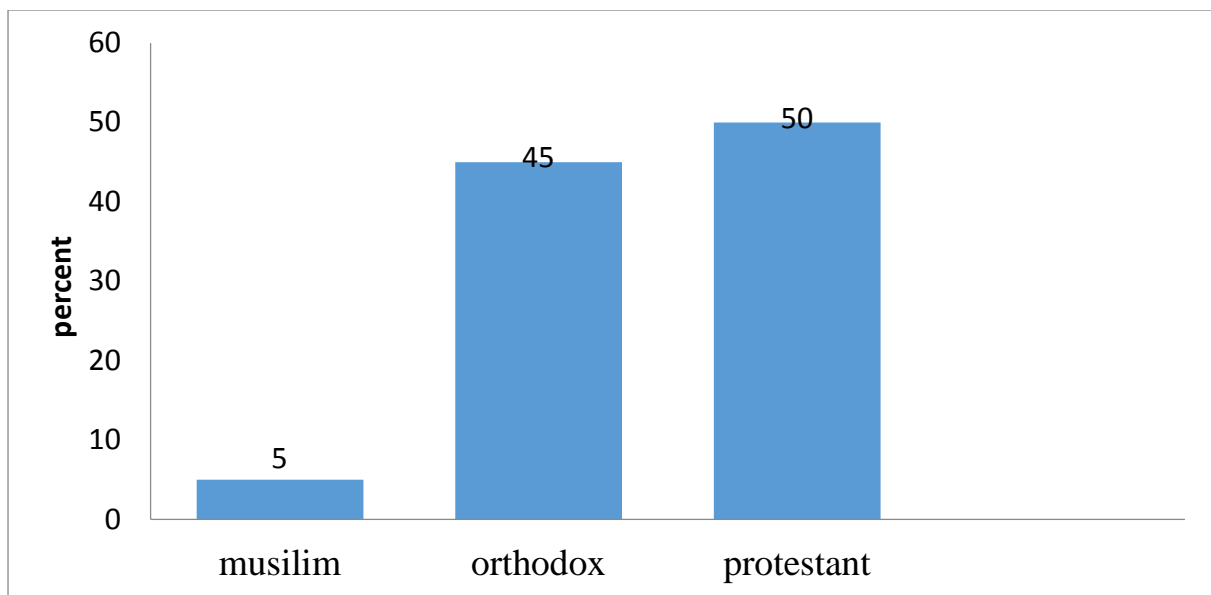


Figure 4 Graph of Religious distributions of respondents

4.1.5 Soil and water conservation practices in the area

Various SWC practices (indigenous and improved) were identified in the study area.

4.1.5.1 Indigenous method of soil and water conservation practices

As indicated in Table 5 the respondents answered that the member of HHs would exercise indigenous soil water conservation practices for that 20 (50%) Households responded as they used crop rotation, 7 (17.5%) exercised by HHs as Mulching, and 13 (32.5%) were responded as they were used Inter cropping.

Table 4 Indigenous SWC measures implemented by HHs.

Conservation methods	Households responses	
	Number	%
Crop rotation	20	50
Mulching	7	17.5
Inter cropping	13	32.5
Total	40	100

4.1.5.2 Improved methods of SWC practiced in the area.

Some improved methods of SWC practiced by the community of the study area include the following:-

Cut of drains: - locally known as “Bo’i”, and are one of the physical structure commonly constructed by digging the soil deep in order to divert the run off before reaching the farm land. The survey results and group discussion exercised showed that 20% of the farmer upstream used cut off drains with soil bund. Where another 40% used mixture of cut off-drains with soil bund. The farmers construct such structures in order to prevent loss of seeds, fertilizers, and soil due to excessive run off coming from uplands of terrain and dispose the excess water from the field. However, the farmer opinion that through time most of these structure are causing serious problems and enhance soil erosion. It could witness the scene during a transect walk with the key informants. Big gullies associated with the establishment of the conservation structure, especially between the farms boundaries, were commonly observed.

Thus farmers in the study area are reluctant about this structure. However, it is not due to failure of the structure but due to improper surveying work. At the upper side of the farm land are constructed mainly by oxen drawn plough, and reinforced by stones, wood blocks of soils with grass. Here the structures are maintained by local materials and are not causing serious problem in the area.

Tree plantation: it was very common to observe plantation of *Acacia albida*, *Cordia africana*, *Sesbaniya sesban* at the upper part of the farm planted along the contour. Such a measure is applied by itself and or together with other indigenous conservation practices (example contour-farming).

During the transect walk with the farmers I commonly recognized *Acacia albida* planted along the contour in order to minimize the runoff and conserve the soil around the root of the plant. The advantage of this plant, which farmers use, was in order to separate the border between the two boundaries of farm. In general the traditional soil and water conservation practices are efficient in some cases, but should be modified and further developed.

Soil bunds: It consists of permeable structures where the soil was thrown down wards across the slope. 40% of the farmers of the area used it. Since the selected area was hill and highland area the farmers practicing this structure believed to be benefited beyond protection of soil from erosion. Apart from this, it contributes to moisture retention capacity of the soil profile and thus water availability to plants increases the efficiency of fertilizer applications and it was less labor intensive. However, the disadvantage of this structure as explained by the farmer was that it requires a lot of maintenance in the short period due to being filled with soil plough. It was mainly implemented on cultivated land with slopes in the range of 3% to 15% but also on grazing land with gentle slopes at wide intervals. Generally, as indicated below 8 (20%) of the farmers used cut-off drains method, 16 (40%) of farmers were responded as they used soil bunds and 16 (40%) were used a mixture of both cut-off drains and soil bunds on their farm land

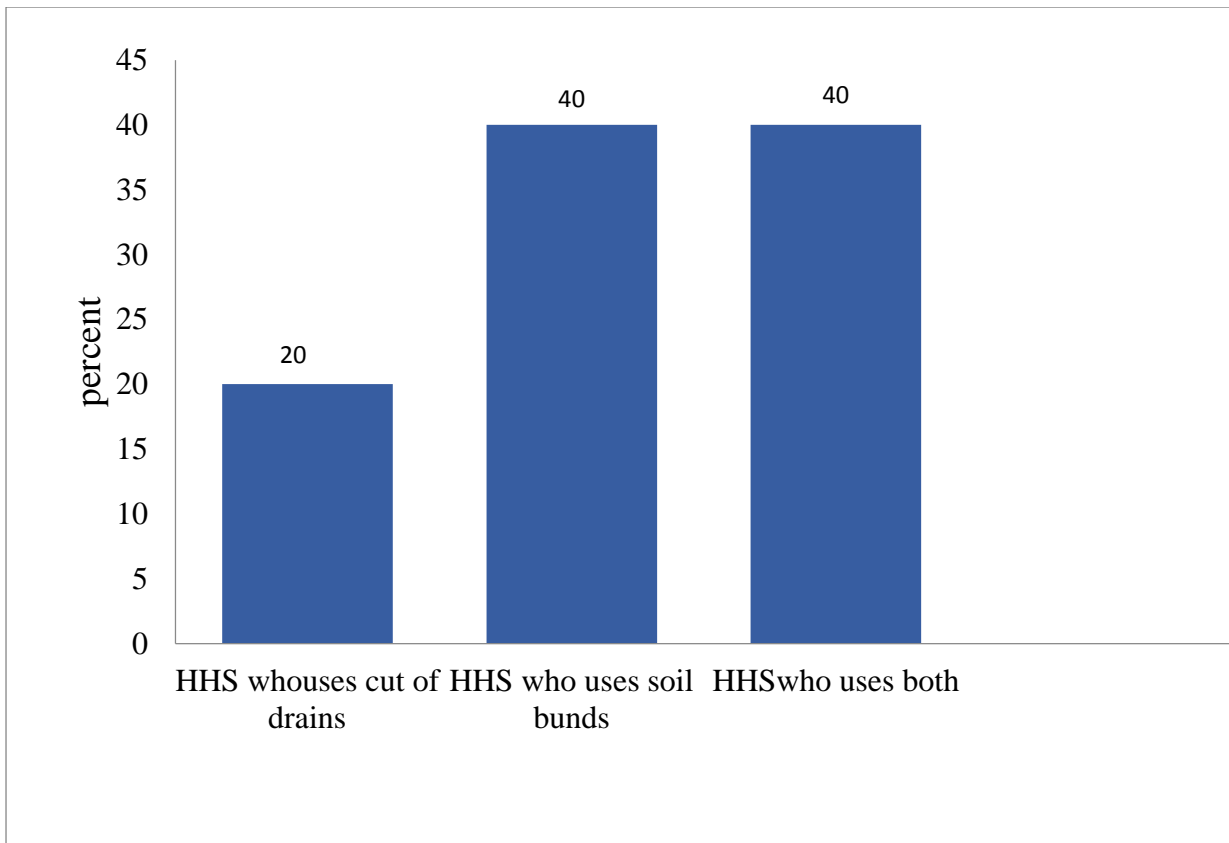


Figure 5 Improved methods of soil water conservation practices of HHS

4.1.6 Factors Affecting Community Participation in Natural Resources Conservation Practices

4.1.6.1 Biophysical and Agrological Factors

4.1.6.1.1 Biophysical Factors

In relation to community participation in natural resource (SWC, planting trees and forest conservation) and the type of erosion in the study area

The slope condition: is uncultivated plot is an important factor of farmers' decision on participation in soil water conservation which is the base of all natural resources conservation practices. Positive relationship was observed between the gradient of the slope and the willingness of the community to participate in soil and water conservation practices. Farmers with steep slope and very steep slope about 55% were more involved in conservation practice than those who own flat or gentle farm land. On steep slope farmers of the area are constructing soil bund to prevent soil erosion.

The soil fertility: condition of cultivated plots is an important factor of farmers' decisions on their participation of soil and water conservation practice which is the base for other natural

resource conservation practices. The level of soil fertility has a negative and/or significant relation with the degree of involvement in soil and water conservation practices.

Farmers with poor soil or with low and medium fertility (65%) were more involved in conservation work than those who have fertile land, due to the reason that they have an interest to improve the level of soil fertility and the productivity of the land at the plot level, Whereas, farmers who have very fertile land, possibly didn't see negative effects of erosion on their plots in the short term.

The type of erosion: The study area and site was characterized by three forms of erosion. Those were sheet, rill and gully erosion. 42.5% of respondents responded that gully erosion was the main problem in most of the farm plots and which additionally challenges the catchment of the area. It has positive relationship with the willingness of the community to participate in soil and water conservation activities which was the base for the catchment of the Keku Kalo area. Those farmers who suffer from sever gully erosion were more involved in the conservation work, because, they had to conserve the soil from erosion and to prevent the total loss of the land.



Plate 1 Gully erosion near the catchment area

Table 5 the relation between biophysical factors and willingness of the community to participate on soil water conservation.

Biophysical Factors	Type	Number of respondents(40)				Total	
		Farmers near to the Catchment area		farmers located at distant from the catchment			
		“No-	%	No-	%	N-	%
Slope	Flat	3	15	--	--	3	7.5
	Gentle	4	20	4	20	8	20
	Moderate	3	15	4	20	7	17.5
	Steep	4	20	5	25	9	22.5
	Very steep	6	30	7	35	13	32.5
	Total	20	100	20	100	40	100
Erosion	No- of erosion	3	15	2	10	5	12.5
	Sheet	2	10	6	30	8	20
	Rill	5	25	5	25	10	25
	Gully	10	50	7	35	17	42.5
	Total	20	100	20	100	40	100
Fertility of soil	Low	10	50	10	50	20	50
	Medium	8	40	4	20	12	30
	High	2	10	2	10	4	10
	Very high	--	--	4	20	4	10
	Total	20	100	20	100	40	100

4.1.6.1.2 Agro ecology

Regarding agro-ecological condition of the Keku Kalo area 70% is Woina Dega and 30% is Dega, in which densely populated human and animals lead to intensification of agricultural activities to satisfy high demand for food. This further exposes the forests to be cleared by the population and ultimately exposes to soil erosion. In addition to this rain falling in the high lands of the area destruct the SWC structures constructed by the farmers. The consequences of repetitive destruction of these structures are difficult to farmers in maintaining and replacing of these measures.

4.1.7 Institutional factors

Among the institutional organizations, in relation to community participation on natural resource conservation farmers of the area mostly visited by the agricultural extension development agents (DA's), the result of the research question showed that the existence of significant relationship between extension agents and the community participation in conservation of natural resources in general and SWC in particular. This is because the extension agent support provided is aimed at the promotion of conservation practices as well as crop production and other agricultural activities.

Extension system: the technical support provided for farm families more focused on crop production rather than promoting conservation practice. The extension service provided for farmers was only focused on replicating of SWC without considering its maintaining. Farmers being visited by local extension agents of the Keku Kalo were very weak, the result showed that 3(7.5%) were visited only once in a week, 12 (30 %) were responded as they were visited every fifteen days, 6 (15%) were responded as they visited once in a month and 19 (47.5%) were never visited by any technical support. Shortage of skilled professionals: Usually the sustainable of natural resources programs were depending on skilled professional available. Specialists who guided and advices the community about soil conservation were very few. According to the data recorded in the study area there were only two development agents who were not efficiently to support and advices the community.

Table 6 Farmers being visited by local Extension Agents in the' Keku Kalo'area.

Farmers response	Number of respondents(n=40)	Percent (%)
Once in a week	3	7.5
Every fifteen days	12	30
Once in a month	6	15
Never visited me	19	47.5
Total	40	100

4.1.8 Gender: despite the fact that gender is an integrated and inseparable part of rural lively hood and day to day interaction with natural environment. According to survey in the study area men and women have different access to resources and opportunities. Women rarely own lands ,may have lower education due to discriminatory practices access as children and their access to productive resource as well as decision making tend to occur through mediation of men. Women typically a narrow range of labor market than men and lower wage rate .Community based conservation project through their gender blind practices are in danger of supporting and aggravating such gender in equalities. For example, providing increased opportunities for men in conservation. Women provide more than half of labor needed for SWC (Ellis, 1998). They share responsibilities for land preparation, planting, fertilizing and weeding, harvesting, transporting, marketing and soil water conservation. Although women do much of the work, they are not always responsible for making decision.As the data depicted from the table among 40 respondents 50% of the respondents in their house respond both male and female have equal participation on soil water conservation, 37.5% of respondents in their house describe only males have participation and only 12.5% of respondents stated that females have participation in soil water conservation activities. This is not due to power given from the house members to control, but because of the households were females headed in which they were leaders of the households.

Table 7 Participation of Women and Men on soil and water conservation practices

Participation in SWC practice	Respondents					
	Households nearer to the catchment		Households at distant to the catchment area		Total Grand	
	No	%	No	%	No	%
Both male and female	10	50	10	50	20	50
Male	8	40	7	35	15	37.5
Female	2	10	3	15	5	12.5
Total	20	100	20	100	40	100

4.2 Evaluation of state catchment of Keku Kalo

The data taken from the agricultural office indicates that about 68500 seedlings of 12 tree species were planted in two years practice.

Table 8 Planted tree species in Keku-Kalo State Catchment site. (In year of 2000 and 2006)

Name of the planted trees			Total No of each planted trees	
Scientific name	Family name	Local name	Frequency	%
<i>Cuprus lustania</i>	Cupressaceae	Gaattiraa biyya keessaa	3705	5.41
<i>Hygenia abyssinia</i>		Heexoo	5716	8.34
<i>Ekubergia capenis</i>	Mliaceae	Somboo	5700	8.32
<i>Erythrina abyssinia</i>	Fabaceae	Walleensuu	5000	7.3
<i>Prunus africana</i>	Rosaceae	Hoomii	5708	8.33
<i>Dombeya torrid</i>	Sterculiaceae	Dannisaa	4120	6.01
<i>Albizia gummifera</i>	Fabaceae	Muka arbaa	6953	10.15
<i>Sasbania susban</i>	Fabaceae	Sasbaniyaa	1700	2.5
<i>Cordia africana</i>	Boraginaceae	Waddeessa	7100	10.37
<i>Jaceranda mimosifolia</i>	Bignoniaceae	Muka miimii	5700	8.32
<i>Gravillia robusta</i>	Proteaceae	Giraaviiliyaa	5300	7.73
<i>Cupressus lusitanica</i>	Cupressaceae	Gaattiraa biyya keessaa	11789	17.22
Total			68500	100

As observed during the transect walk, the sampled area of the catchment from the overall catchment was 25m*25m = 625m². The sampled area consists twelve (12) rows which planted trees of *cuprus lustania* (Gaattiraa biyya keessaa), *Hygenia abyssinia* (heexoo), *Ekubergia capenis* (sombo), *Erythrinaa byssinica* (waleensuu), *Prunus africana* (hoomii), *Domeya torrid* (dannisaa), *Albizia gummifera* (mukaarbaa), *Sasbania susban* (sasbaaniyaa), *Cordia africana* (waddeessa), *Jaceranda mimosifolia* (mukamiimii), *Gravilia robusta* (giraaviiliyaa) and *Juniperous prosera* (gaattiraa biyya keessaa) were respectively planted from bottom row to up row of the sampled area as a whole. Of the planted trees some of them were destroyed and only their empty holes were seen while the others survived. Accordingly, the following were identified as observed by during the observation and transect work.



Pate 2 Counting survived and non- survived planted trees

Line	Plants died and survived (♣= survived: ○=dead)	Total
1	♣○○○♣♣○○♣♣♣♣♣♣♣♣○○○○♣♣○○♣♣♣♣○○♣♣	34
2	♣○♣○○♣○○♣○○○○○○○○○○○○♣○○♣♣○○○○♣♣○○○○♣♣○♣○○○○♣♣○○○♣○○	52
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9	♣♣♣♣♣♣○○○○♣♣♣♣♣♣○○○○♣♣♣♣♣○○○○♣♣♣♣♣♣♣♣	65
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12	♣♣♣♣♣♣♣○○♣♣♣♣♣♣○○♣♣♣♣♣♣♣♣♣♣♣♣♣○○♣♣♣♣♣○○♣♣♣♣♣○○♣♣♣♣♣○○♣♣♣♣○○	108

Figure 6 The sampled areas with planted, survived, and non-survived tree species observed and censuses during the transect walk. 25mx25m; Scale: 1:1487; From the GPS 60 reading of the sampled area.

Table 9 Planted, survived and non-survived trees of the sampled area

S/ N ^o	Plant species			Total N ^o of planted trees	Survived plants		Non-survived plants	
	Scientific name	Family name	Local name		Frequen cy	%	Freque ncy	%
1	<i>Curpus lustania</i>	Cupressace ae	Gaattira biyya keessaa	34	20	6.3	14	4.5
2	<i>Hygenia abyssinia</i>		Heexoo	52	15	4.7	37	11.9
3	<i>Ekubergia capensis</i>	Mliaceae	Somboo	52	30	9.4	22	7.1
4	<i>Erythrina abyssinica</i>	Fabaceae	Waleensuu	46	22	6.96	24	7.76
5	<i>Prunus Africana</i>	Rosaceae	Hoomii	52	30	9.4	22	7.1
6	<i>Dombeya torrid</i>	Sterculiace ae	Daannisaa	37	20	6.3	17	5.5
7	<i>Albizia gummifera</i>	Fabaceae	Muka arbaa	63	30	9.4	33	10.6 7
8	<i>Susbania susban</i>	Fabaceae	Sasbaaniyaa	16	6	1.89	10	3.2
9	<i>Cordia Africana</i>	Boraginace ae	Waddeessa	65	20	6.3	45	14.5 6
10	<i>Jaceranda mimosifolia</i>	Bignoniace ae	Muka miimii	52	25	7.9	27	8.73
11	<i>Gravillia robusta</i>	Proteaceae	Giraaviiliyaa	48	18	5.69	30	9.7
12	<i>Cupressus lusitanica</i>	Cupressaac eae	Gaattiraa biyya alaa	108	80	25.3	28	9.06
			Total	625	316	100	309	100

Planted and yet non-planted land of the catchment

Through the transect walk with careful observation and semi-structured interviews it was observed that the total land of the Keku-Kalo state catchment is totally four and half hectare of land of which 2.24 hectare is planted and 2.26 hectare of it is yet non-planted.



Plate 3 Planted and non-planted area

To evaluate the overall planted species of trees whether they were mostly survived or no survived (dried) the pre sampled data were used and evaluated state catchment of the area in relative to the totally planted land of the catchment (i.e. the 625 m² of land in relative to the 22400 m² land). Accordingly, for that the 625 m² of sampled area of land holds 625 individual plants (trees) with the gap of one meter each the 22400 m² of land at maximum can also hold more than or equal to 22400 total plants of which some of them might be survived and while, the other exist dried and their hole might be seen empty. To evaluate the total of each planted trees in relative to the total catchment area, sampled data of each planted trees multiplied by the total area of the catchment (22400m²) and dividing by total sampled area.

Total of each planted= $X * 22400 / 625$, Where "X" is the total of each sampled trees

Table 10 Table of planted and yet non-planted land of the Keku-Kalo state catchment in hectare (m2)

S/N _o	Land type of the catchment	Unit of measurement
		Hectare
1	Planted land of the catchment	2.24 hectare
2	Still non planted land of the catchment	2.26 hectare
Total		4.5 hectare

The result illustrates that there were huge gaps between the overall planted trees obtained from the catchment list of the Woreda and that already derived by using the sampled area of the catchment. This may include the damage and destroy of the planted trees by animals of the area lack of care from the community, the two years plantation (i.e. the 2000 E.C and 2006 E.C) plantation for that there might be double counting and registration in the list of the planted trees.

Table 11 comparing the pre tested sample with the total number of planted, survived and none survived of the catchment.

S/N ^o	Name of the plant (tree)			Total No of each planted tree	Total No each sampled trees	Difference
	Scientific name	Family name	Local name			
1	<i>Curplustania</i>	Cupressaceae	Gaattiraa biyya keessaa	3705	1219	2486
2	<i>Hygenia abyssinica</i>		Heexoo	5716	1864	3852
3	<i>Ekubergia capenis</i>	Mliaceae	Somboo	5700	1864	3836
4	<i>Erythrina abysinnica</i>	Fabaceae	Waleensuu	5000	1649	3351
5	<i>Prunus Africana</i>	Rosaceae	Hoomii	5708	1864	3844
6	<i>Dombeya torrid</i>	Sterculiaceae	Dannisaa	4120	1326	2794
7	<i>Albizia gummifera</i>	Fabaceae	Muka arbaa	6953	2258	4695
8	<i>Susbania susban</i>	Fabaceae	Sasbaniyaa	1700	573	1127
9	<i>Cordia Africana</i>	Boraginaceae	Waddeessa	7100	2330	4770
10	<i>Jaceranda mimosifolia</i>	Bignoniaceae	Muka miimii	5700	1864	3836
11	<i>Gravillia robusta</i>	Proteaceae	Giraaviiliyaa	5300	1720	3580
12	<i>Cupressus lusitanica</i>	Cupressaaceae	Gaattiraa biyya alaa	11789	3871	8208
	Total			68500	22402	46098

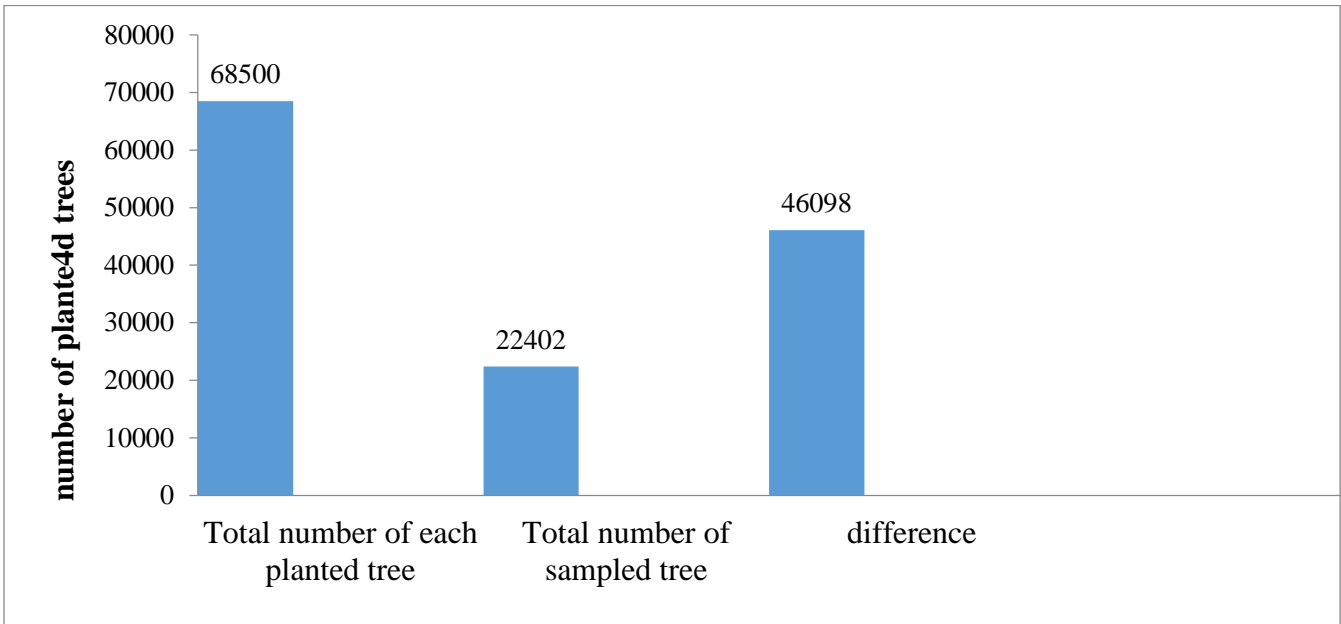


Figure 7 Comparison of total planted and total sampled

The total land area regarded for the catchment was 4500m² (4.5hec.) of which 22600m² (2.26hec) of it was uncovered while, the remaining 22400m² (2.24hec.) of it was covered with the plantation program of 2000 EC and 2006 EC plantation years. Using the sample area of the state catchment (the planted, the survived and no survived of it) in corresponding to that of the total area of the catchment (planted, survived and none survived) the final of the catchment can be evaluated. For this all from the catchment list, DA'S and agricultural experts of the Woreda, it was concluded as 68,500 totals seedlings of the twelve different planted trees were planted on the land area of 4500m² (4.5hec.) of land of which some of the planted trees were survived and some of them were dried and only their hole were left empty. In relative to the early sample area by which part of the planted, survived and non survived plants of the catchment were dictated the overall planted, survived and non survived of the catchment tested and concluded through estimating of the non censured area with the relatively censured area and its population.

Table 12 Total number of planted trees of each species, survived and non survived plants can be illustrated below based on the sampled size of the catchment.

S/no	Name of the plant			Total No of planted trees	Total No Survived trees		No non survived trees	
	Scientific name	Family name	Local name		frequency	%	Frequency	%
1	<i>Curpuslustania</i>	Cupressaceae	Gatira biyya keessaa	1219	717	6.33	502	4.51
2	<i>Hygenia abyssinica</i>		Heexoo	1864	538	4.75	1326	11.97
3	<i>Ekubergia capenis</i>	Mliaceae	Somboo	1864	1075	9.49	789	7.12
4	<i>Erythrina abyssinica</i>	Fabaceae	Walleensuu	1694	789	6.97	860	7.76
5	<i>Prunus Africana</i>	Rosaceae	Hoomii	1864	1075	9.49	789	7.12
6	<i>Dombeya torrid</i>	Sterculiaceae	Dannisaa	1326	714	6.30	612	5.52
7	<i>Albizia gummifera</i>	Fabaceae	Muka arbaa	2258	1075	9.49	1183	10.67
8	<i>Susbania susban</i>	Fabaceae	Susbaniyaa	573	215	1.89	358	3.23
9	<i>Cordia Africana</i>	Boraginaceae	Waddeessa	2330	717	6.33	1613	14.56
10	<i>Jaceranda mimosifolia</i>	Bignoniaceae	Muka miimii	1864	896	7.9	968	8.73
11	<i>Gravillia robusta</i>	Proteaceae	Giraaviliyaa	1720	645	5.69	1075	9.70
12	<i>Cupressus lusitanica</i>	Cupressaaceae	Gatiraa biyya alaa	3871	2868	25.32	1003	9.053
	Total			22402	11324	100	11078	100

Uncovered (not planted) land of the catchment

As observed from the community, DA and the agricultural experts of the state catchment of the area from totally bounded land for the catchment (four and half hectare of land), nearly two and half (2.26 hectare) is still uncovered and yet planted rather than covered with naturally sparsely populated local plants. The reason behind this was the interruption of the planting activities for that the planting activities once took place in 2000 E.C. and then later in 2006 E.C. this problem can be considered as one drawback of the catchment management system of the area.

Naturally existed plant species of the catchment

The naturally existed plant species of the catchment were existed along with planted trees.



Plate 3 .Naturally existing plants

As observed within the sampled area of the catchment there were naturally existed plants as *Acacia abyssinica*, *Vernonia amygdalina*, *Olea europea*, *Calpurinia*, *Croton macropsta*, *Podocarpus fluctus*, *Carisa spinatu*, *Buddleia polstachy*, *Ocimum grattissimu*, *Beucea antidysenteri*, *Ekubergia capeni*, and *Ficus*. And also many kinds of grasses were conserved along with planted trees.

Table 13 Table of naturally existed plant species in the catchment

S/No	Name of the plant		
	Scientific name	Family	Local name
1	<i>Acacia abyssinica</i>	<i>Fabaceae</i>	Laaftoo
2	<i>Vernonia amygdalina</i>	<i>Asteraceae</i>	Eebicha
3	<i>Olea europae</i>	<i>Oleaceae</i>	Ejeersa
4	<i>Calpurinia</i>	<i>Fabaceae</i>	Ceekaa
5	<i>Croton macrosta</i>	<i>Euphorbiaceae</i>	Bakkanniisa
6	<i>Podocarpus filuctus</i>		Birbirsa
7	<i>Carisa spinatum</i>	<i>Apocynaceae</i>	Agamsa
8	<i>Buddleia polstachya</i>	<i>Rosaceae</i>	Qaqawwii
9	<i>Ocimum grattissimum</i>	<i>Lamiaceae</i>	Ancabbii
10	<i>Beucea antidysenteria</i>	<i>Simaroubiaceae</i>	Qomanyoo
11	<i>Ekubergia capenis</i>	<i>Meliaceae</i>	Somboo
12	<i>Ficusur. Forssk</i>	<i>Moraceae</i>	Harbuu

4.3. Farmers perception towards conservation and state catchment practices

4.3.1 Positive attitudes:

First of all it is vital to know farmers awareness, acceptance and participation about natural resource conservation and catchment practice before any intervention. According to the respondents of the study area farmers were facing some erosion problems and deforestation mechanism which decreased farm production level and degraded the environment as a whole.

This survey interviewing result were indicated most of the farmers consider erosion and deforestation as major problem and so they have accepted the natural resource conservation and catchment practice system and are showing their voluntariness during construction of

conservation and catchment practices (soil and water conservations, planting trees and forest conservation and wild life conservation)and also are willing to provide free labour and accept actual design recommended by experts and aware about the impact of conservation and catchment practice.

Additionally they stated the benefit that they obtain from conservation and catchment practices includes: Reducing erosion problems in and around the catchment area, Maintaining the species diversity of wild plants and animals, Ameliorating climatic conditions and reducing deforestation, Fulfilling the needs of the community around the area of the study, and Creating job opportunity for urban and rural peoples of the area ,And they mention as the state catchment of Keku-Kalo should be rehabilitated.

4.3.2 Negative attitude of the farmers

Though it is clear that natural resource conservation and catchment practices plays important roles to increase farmers livelihood stand, some of them stated that it had its own disadvantages, these drawbacks include increase conflict by land tenure and diverting water from one farmer to the other, time consuming during practicing the conservation and catchment and keeping animals from the construction and planted trees in order not to destroy it and area coverage and also free labor which causes economic crises. However, most farmers mentioned the problems as a minor thing which could be eliminated and they all supported the benefits rather than its draw backs.

Table 14 Positive and negative attitudes of farmers

Reaction	Responses	No of respondent	%
Do you have totally positive attitude towards natural resource conservation and catchment practices in your area?	Yes	36	90
	No	4	10
Total		40	100

4.4 Problems identified and solutions suggested by the community of the study area

4.4.1 Problems identified

According to the data gained from respondents in their group discussion that take place in the Kebele and with the development agents and the Woreda agricultural experts they identify the following major problems

Increase soil erosion-majority of the interviewed and participated in group discussion of the study area community identified as the trace of catchment of Keku-Kalo seriously and rapidly filled with the run of water and the force of the existed erosion during the rainy season. They mention as still technical and material support from a body that can help the catchment besides the government and its structure is mandatory.

Low regards and consideration provided to the catchment.

They mentioned as the catchment is:

Without fence for a long period of time for that; it's some parts even fenced with non durable material and destroyed within a short period time and the catchment even at the time when this research was conducted is bare and repeatedly attacked by cattle, goats and sheep of the area.

In addition to the above there is only one guard who employed for keeping the catchment from physical damage and hazards who by himself expresses as his wage/salary is not enough loneliness is forcing him to leave that guarding of the catchment



Plate 4 State catchment protected by guard

Boundaries problem: Even though the catchment area was purposely selected and tried to be sited in 2000E.C with the name of <<meless zenawi park>> for that previously parts of the state catchment belongs to farmers of the area and compensation would not be properly paid for them until now, they mentioned as there was boundaries problem of catchment.

Poor planning and management system:

The respondents expressly mentioned as there were poor planning and management system regarding the catchment itself. For instance, they mention as the tree planting system only exercised in 2000E.C and 2006E.C after the gap of six years.

4.4.2 Suggested solutions by the respondents

The respondents with their responses of open ended questions and in their meeting after they identified the problems they also suggests the following solutions:

Increase the skill of planning and management activities of the overall organizations and communities of the area for maintaining the state catchment of Keku-Kalo.

Community agreement and by law to maintain and protect investment measures on farm lands and keeping livestock away from free grazing and build farmers capacity training, demonstration and material support. They also suggested that government organizations, NGOS and community of the area should work together to manage the overall identified problems of the study area.

5. Discussion

Indigenous catchment management systems have been ignored by the development agents and extension services. In order to prevent the problem of soil erosion in the state catchment of Jima Rare, farmers used a number of indigenous soil and water conservation practices. The result of the study showed that 50% used crop rotation; 32.5 % inter cropping and 17.5% used mulching.

This result was similar with that of Hudson, (1992) who reported that objectives of knowing indigenous soil and water conservation practice give good understanding of farmers' way of thinking about the measures.

To maintain better and modify the catchment area, households should use improved catchment management systems. The result of the study area showed that 20% of the farmers used cut-off drains, 40% used soil bunds and 40% were used a mixture of cut-off drains and soil bunds. This result had correlation with the study of Mitchell (1990) who reported that since soil and water are renewable natural resources, it is possible to reclaim land and water resources within short period of time by increasing the capacity of the community in conserving natural resources.

There were some factors, which affected community participation in state catchment conservation. Among these the biophysical factors (slope condition, soil fertility and type of erosion) have relation with the willingness of community to participate in catchment management system. The result of the study showed that farmers near the catchment area with steep slope were more involved in conservation practice than those who owned flat or gentle farm land. Farmers with poor soil or with low and medium fertility (about 65%) were involved in conservation work than those who had fertile land. Farmers who suffered from gully erosion about 42.5% were more involved in natural resource management system. This result was similar with Tamene Ararsa (2005) who reported that to tackle extended coverage of erosion problem the Ethiopian government introduced soil and water conservation practices measures by mobilizing Rural Labor Food for Work (FFW) scheme.

Regarding agro-ecology the study area (70% Woina Dega and 30% Dega); the study result showed that there was densely populated human and animals, which exposed the forests to be cleared? Farmers of the Keku Kalo Kebele were forced to cultivate virgin lands of the area. In addition heavy rain fall destroyed the soil and water conservation structures constructed by the farmers like soil bunds, terraces and cut-off drains. The consequences of repetitive destruction of this structure were severe and damaging to the Keku Kalo farmers. This result

is also supported by Shasta(1993) who reported that population growth; raising demand for agricultural land, tourism, use of fuel wood and the dependence of rural poor are major cause of deforestation.

Farmers of the study area were mostly visited by Development Agents (DAs) from the institutional organizations. The result of the study showed that 7.5% respondents as farmers were visited once in a week, 30% were visited every fifteen days and 15% were visited once in a month while 47.5% farmers were never visited. Shortage of skilled professionals was observed in the area. This result has similarity with (Mitchell ,1990) who reported that effective development and management of catchment resources can be realized by the level of government nearest to the problem like DAs.

According to survey result in the study area men and women have different access to resources and opportunities. The result showed that only 12.5% respondents state that women have participation in catchment management system, 37.5% responded that only males were participants and 50% responded that both male and females participated. This result was similar with Ellis (1999) who reported that women typically, a narrow range of labor market than men and lower wage rate.

The result of the study showed that the Keku Kalo catchment management area consists of planted and naturally existing plants. From total planted trees only 50.56% survived and 49.44% dried and only empty holes remained. This is due to lack of care from community, over grazing by animals and only the two year plantation. The result had similarity with Sucoff (2003) who reported that deforestation in Ethiopia is due to locals clearing of forests for their personal needs, such as for fuel, hunting, agriculture, and at times for religious reasons. The main causes of deforestation in Ethiopia are shifting agriculture, livestock production and fuel in drier areas.

6. CONCLUSIONS AND RECOMMENDATIONS

6.1 CONCLUSIONS

In the study area mixed farming system which involved crop production and livestock production was carried out at subsistence level. The major problems that the community faced that discouraged participation in state catchment management of the area were identified and prioritized in discussion with focused groups. Increased soil erosion, low regards and consideration provided to the catchment, boundary problems, poor planning and management system were the overall state catchment management problems of the area identified in the final result by this study.

Farmers were already using different types of indigenous, improved SWC practice which includes the application of cut off drains, soil bunds, crop rotation, inter cropping, mulching, to some extent terrace and tree plantation and their decision on natural conservation practices determined by bio-physical factors, such as the slope of land feature, the level of soil fertility and the type of erosion.

Institutional organizations in relation to community participation on natural resource conservation farmers of the area mostly visited by the agricultural extension development agents. The technical support provided for farm families more focused on crop production rather than promoting conservation practice. The extension service provided for farmers was only focused on replicating of SWC without considering its maintaining.

Gender is an integrated and inseparable part of rural lively hood and day to day interaction with natural environment. Men and Women have different access to resources and opportunities in the study area.

Huge gap between the overall planted trees obtained from the catchment list of the Woreda and that already derived by using the sampled area of the catchment. This is due to the damage and destroys of the planted trees by animals of the area and lack of care from the community.

6.2. Recommendation

The following recommendation were suggested by the community and the observed results

- The farmer's negative attitudes towards natural resource conservation (SWC, planting trees and forest conservation and wild life) conservation need to be eliminated.
- Awareness creation for local farmers in order to be feel ownership and also perceive the importance of the sustainability of state catchment measures. Farmers should care for the planted and naturally existed plants to maintain their integrated biodiversity and care should be provided for the trace of the area in order to recover the catchment from loss.
- Government should give practical and moral as well as financial support to the farmers of the catchment area in order to make them motivated to the implementation and rehabilitation of the catchment, the boundary problem should be obscured, the state catchment area should be fenced.
- The planting system would not be interrupted; it should be exercised continuously until the catchment will rehabilitate.
- The mechanical natural resource conservation structure which mostly dominates the study area conservation practice should be integrated with biological structures of natural resource conservation.
- There should be participatory implementation and maintenance of the whole natural resource conservation and state catchment of the area in particular for that the activities cannot be addressed by single organization; rather than with various actors including researchers planners, extension services, decision makers, input suppliers involvements, though communities of the area, government organizations, NGOs and individuals should perform the activities of the state catchment of the area
- The current care which is provided only by one ordinary guard should be taken into consideration and additional guards with full and maintained facilities should be employed for the peace and security of the catchment.

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APPENDICES

Appendix:I Questionnaire to be answered by the communities of Keku Kalo

My name is- Firdisa Mekonnen. I am a post graduate student from University of Addis Ababa Department of zoological Science and carrying out a research study on Evaluation of “state catchment” management in “Keku Kalo”.

The questionnaires are designed for this research only. You are kindly requested to contribute and fill in the questionnaire which will be used in the study. I assure you that the information gathered will be used for the purpose of this research only, and will be treated with strict confidentiality. Thank you in advance for your cooperation.

General information for family members

Please note that:

You are not required to write your name.

To those questionnaires with alternatives, make your response on the space provided by making tick (v) or encircle the letter of your appropriate answer your level best.

For any additional opinion or explanation you are kindly requested to write briefly on the space provided. Thank you in advance for your cooperation.

Part – I: Background and personal information of the respondents

Instruction 1: please! Fill the required information by making (√) in the box provided, or giving an answer.

Sex: male female

Region	Zone	Woreda	Town	Kebele	village (“ Gare”)

For how long have you been living in this area?

< 5years 6 – 15 years 16 – 25 years > 25 years

Marital status: married Unmarried (single) divorced

Ethnic group: Oromo Amhara other

Educational background: unable to read and write Elementary school, cycle (1-4)
primary school (5-8) High school (9-12)

Higher school [Diploma, Degree]

Position in households: Head members

What is your origin in indigenous? Settler moved in

Part- II Evaluation of “state catchment” system

2.1. Do you have any idea about “state catchment” management system? A. yes No

2. 2. Is there any “state Catchment” management system in your area? If yes, please list down all the dominants?

2.3. From the soil and water conservation practices you listed above, which is commonly practiced in the area?

A. mechanical soil and water conservation practices .

B. Agronomic soil and water conservation practices

C. Both D. Specify if others

2.4. What is your role in ‘keku kalo’ state catchment activities?

A. Team leader of the kebele B. Problem identifiers.

C. Other roles

2.5. Do you think that you obtain benefit from ‘state catchment’ management practices?

A. yes B. No

If your answer is “Yes” please, list down the benefits that you obtained

2.6. Is there any drawback that you face from the 'state catchment' management system of Keku Kalo?

A. Yes B. No

If yes, please list down the drawbacks.

2.7. On what situation is the "Keku Kalo "state catchment" management system found in the area? It found on that it:

- A. needs reconstruction C. needs other treatments
B. doesn't need reconstruction D. unknown.

2.8. What kind of support do you contribute to the state catchment of the area?

- A moral support C. financial support
B. practical support D. Other supports

2.9. If your answer for the above question is D (other supports) please list them.

2.10. As a general what is your attitude towards "state catchment" management system of 'Keku Kalo?'

2.11. How do you scale up the support that you get from the “Keku Kalo” ‘state catchment’ management system?

A. good B. fair C. not appropriate

2.12. Does the ‘state Catchment’ management system of the area favorable for the conservation of natural resources of the area? A. No NB. Yes

2. 13. If your answer is ‘yes’ for the above question please, list down the counter able measures exercised by the government towards the practice.

2.14. Do you have your own farm land? Yes No

2.14.1. How do you maintain the catchment of your own form land?

A. Through soil and water conservation B. Through planting trees

C. Through planting grasses D. Through all

2.14.2. How do you rate your own farm land catchment system with the state catchment of Keku Kalo area?

A. low B. Medium C. High D. Very high

2.14.3. If your rate for the above relation is low what are the reasons? List them.

2.14.4. What are your main issues during your meeting? A. Conducting soil and water conservation

B discussing how to protect and planting trees C Wild life conservation in the state catchment of the keku kalo D All E Other catchment system

Qajeelfama waliigalaa Qonnaan bulootaa

Deebii gaaffii isiniif dhiyaate deebisuuf:

Maqaa keesan barreessuun hin barbaachisu,

Gaaffilee filannoon dhiyaataniif deebii keessan mallatto ($\sqrt{\quad}$) bakka duwwaa kenname keessa gochuun ykn qubee deebii sirrii qabate jettan itti maruun deebisa

Yaada dabalataa fi ibsa gaaffilee gaafatamaniif yoo qabaattan ifaa fi gabaabinaan bakka duwwaa isiniif kenname barreessuun akka deebifan gamanumaan kabajaan gaafatamniittu. Deeggarsaa fi gumaacha naaf taasiftaniif guddaan isin galateeffadha.

Kutaa 1^{ffaa} Odeeffannoo waa'ee ibsitootaa ibsu/gaafatu.

Saala : Dhiira Dubara

Teessoo :

Naannoo	Godina	Aanaa	Magaala	Ganda	Tuuta/Garee/

Hammamiif nannoo kana jiraattan?

Waggaa 5 ii gadi Waggaa 6-15 Waggaa 16-25 Waggaa 25 ol

Haala gaa'elaa: Kan fuudhe Kan hin fuune Kan hiike Yeroof adda kan ba'e

Qomoo: Oromoo Amaara Biraa

Haala barnootaa : Kan barreessuu fi dubbisuu hin dandeenye Marsaa jalqabaa barnoota sad. 1^{ffaa} (Kutaa 1-4) Marsaa 2ffaa barnoota sad. 1^{ffaa} (Kutaa 5-8)

Barnoota sad. 2^{ffaa} Barnoota sad. Ol-aanaa (dip. + dig.)

Gahee gsggeessummaa maatii : Bulchaa maatii Miseensa maatii Biraa

Haala bu'uura qubannaa: Qubataa hundee Itti dhufaa (lixaa)

Kutaa 2^{ffaa}: Gaaffilee “Madaallii mala qabiyyee qabinsa bishaanii bal’isan irratti

mootummaan hojjetaman” ibsan:

2.1. Yaada “Mala qabiyyee qabinsa bishaanii bal’isan irratti mootummaan hojjetamaa

jiran” irratti qabdu? A/ Eeyyee B/ Lakki

2.2. Mala ittiin mootummaan “Mala qabiyyee qabinsa bishaanii bal’isu” naannoo keetti ittiin hooganaa jiru jiraa? A/ Eeyyee B/ Lakki ,
Deebiikeessaneeyyeyoota’e,malleenhangafootajettantarreessaa.

2.3. Malleen kunuunsa qabeenya uumamaa (biyyee, bishaan fi bosona) naannoo keessanitti amaleeffaman keessaa kanneen biyyee fi bishaan kunuunsuuf irra jireessaan oolan isaan gadii keessaa kami?

A/ Mala makaanikaalaa B/ Mala agroonoomii C / Lachuu D/ Biroo

2.4. Gaaffii “2.3” f deebiin keessan ‘D’ ykn mala biraa kan jedhu yoo ta’e, mala biraa jettan tarreessaa.

2.5. Gaheen keessan “Piroojektii Qabiinsa bishaanii babal’isuuf” mootummaan Keekkuu - Qaallootti biqiltuu dhaabuun hojjechaa jiru keessatti maaliin ibsama?

A/ Hoogganaa gartuu B/Rakkoo addaa baasuu C/Biraa D/ Gahee hin qabu

2.6. Piroojektii qabiyyee Qabiinsa bishaanii babal’isuuf” mootummaan Keekkuu

Qaallootti mootummaan biqiltuu dhaabuun hojjechaa jiru irraa bu’aa akka dhuunfaat

ti argattan qabduu? A/ Eeyyee B/ Lakki

Deebiin keessan “eeyyee” yoo ta’e bu’aawwan argadhe jettan tarreessaa.

Oyiruu dhuunfaa keessanii qabduu? A/ Eeyyee B/ Lakki

Deebiin keessan gaaffii ‘a’ irraa ‘Eeyyee’ kan jedhu yoo ta’e; “qabiyyee qabqchuu bishaanii” oyiruu keesani mala maaliin cimsitu?

A/ mala kunuunsa biyyee fi bishaaniitti fayyadamuun

B/ Biqiloota adda addaa oyiruu keessa dhaabuun

C/ Marga dhaabuun D/ Malleen ibsaman hundattuu fayyadamuun

Piroojektii Keekkuu – Qaalloo fi “Mala qabiyyee qabqchuu bishaanii oyiruu keessatti wal bira qabuun yeroo madaaltan maaliin sadarkeessitu?

A/ Gadi-aanaa B/ G/galeessa C/ Guddaa D/ Baay’ee ol’aanaa

Gaaffii ‘c’ irrattideebiinkeessan “A” ykn Gadi-aanaayoota’e; sababni maali? Tarreessaa

2.7. Piroojektii Keekkuu fi Qaalloo irratti mootummaan adeemsifamaa jiru keessatti hanqinoonni jiru jettanii yaadduu? A/ Eeyyee B/ Lakki

Deebiin keessan Eeyyee kan jedhu yoo ta’e proojektii kanaaf hanqinoota ykn rakkoolee hangafaati kan jettan tarreessaa/ ibsaa.

2.8. Sadarkaan piroojektii biqiltuu dhaabuu mootummaan keekkuu- Qaalloo irratti argamu Maaliin ibsatu? Deebi’ee haarromuu A/ kan barbaadu B/ kan hin barbaanne

Part II. Check lists for focus Group Discussion.

My name is Firdisa Mekonnen. I am a post graduate student from University of Addis Ababa Department of zoological Science and carrying out a research study on Evaluation of “state catchment” management in “Keku Kalo”.

The questionnaires are designed for this research only. You are kindly requested to contribute and fill in the questionnaire which will be used in the study. I assure you that the information gathered will be used for the purpose of this research only, and will be treated with strict confidentiality. Thank you in advance for your cooperation.

Discuss the following points in context to your form plot or locality.

Which catchment type is common in Keku Kalo area?

Are there any soil water conservation activities that exercised well in Keku Kalo for being supporting state catchment?

Is there well organized government follow- up in catchment activities of the Keku Kalo?
How?

How farmers of the Keku Kalo can protect soil erosion and maintains water drainage system of this area?

What are the main factors which hinder the catchment of this area?

Is there any government organization participate on solving the problem of state catchment?
How?

7 What types of seedlings were planted in the Keku Kalo state catchment management system? And Why?

Appendix II Interview Guide for DA's & the woreda Agricultural Office Experts.

My name is Firdisa Mekonnen. I am a post graduate student from University of Addis Ababa Department of zoological Science and carrying out a research study on Evaluation of “state catchment” management System in “Keku Kalo”.

The purposes of this interview is to collect data for evaluating the “state Catchment” management system in Jimma Rare Woreda, ‘Keku – Kalo’ kebele. So, confirming that the information you provide will be used only for this research purpose; you are kindly asked to contribute your own opinion concerning the questions provided to you. Thank you a lot for your cooperation.

Background and personal information of the respondents

Sex: male female

Educational background: A/ Diploma B/Degree C/ M Sc D/ PhD

What type of activities does you conducting in Keku – Kalo Keble for maintaining ‘state catchment practice?

Would you tell us the size of the land on which the state catchment is being exercised?

What are the major activities of Households, DA's and government agents in maintaining the “state catchment” activities of Keku Kalo area?

For how many days you may contact the households of the study area for the activities of catchments of the area?

Who coordinates the activities of ‘state catchments’ of ‘Keku – Kalo’ as a whole?

Do you think your effort is effective on “state catchment” management system keku kalo?
How?

In your opinion what measures should be taken to overcome the problem for effective implementation of the “state catchment” of the Keku Kalo?

III. Data collection sheet for direct observation of evaluation of “State Catchment” Management System in Jima Rare “Keku Kalo” Kebele.

Name of data collector _____

Kebele _____

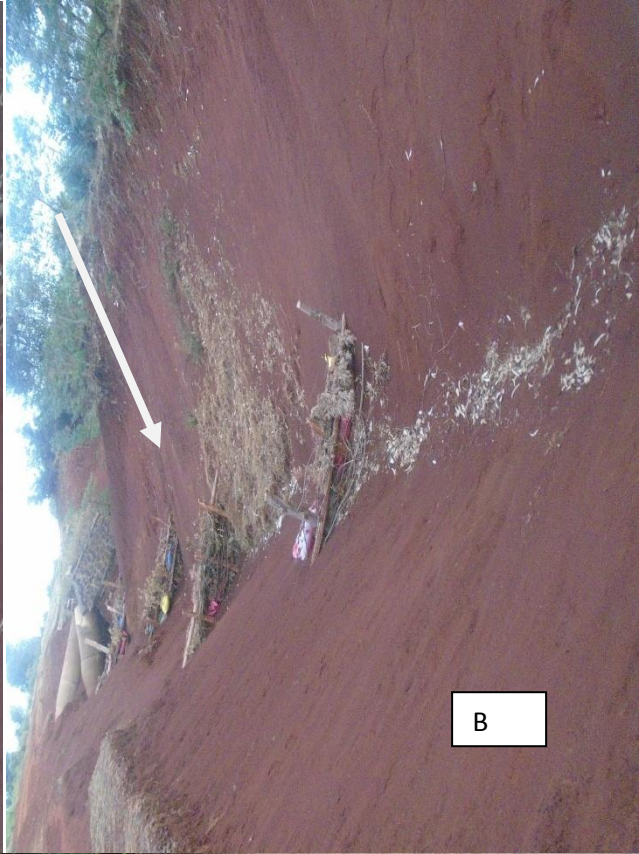
Site (“Got” or Gare”) of w/c the data has been collected _____

s/n	data & the year on w/c it collected	types of the catchment	Areal coverage in km ²	participants									Rem
				Household			DA’s			Other gov’t agents			
				M	F	T	M	F	T	M	F	T	
1		Agronomic practices.											
		crop rotation											
		- strip cropping.											
		-Protective cover cropping											
2		mechanical practice											
2.1		Contouring											
2.2		Contour bounding											
2.3		Contour trenching											
3		tracing											
3.1		Ridge terrace											
3.2		Channel terrace											
3.3		Bench terrace											
4		planting											
4.1		Planted trees											
4.2		Planted grasses											

APPENDIX-II PLATES



Catchment area of Keku Kalo



Practice to protect gully erosion

Counting survived and non-survived trees by censuses



Declaration

I, the undersigned, declare that this thesis Evaluation of state catchment management system in Keku Kalo kebele, Jimma Rare district , western Ethiopia is my original work and has not been presented for a degree in any other university and all that sources of materials used for the thesis have been fully acknowledged.

Student name

Signature

Date

FIRDISSA MEKONNEN

Advisor's name

Signature

Date

Dr. HABTE JEBESSA
