

Identification and Prioritization of Natural Resources Management Constraints for Research Interventions, Case Study of Dita, Mirab Abaya, Konso and Derashe Woredas, Southern Ethiopia

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Abstract

Securing food and a livelihood is inextricably linked to the exploitation of the natural resources base (land, water and forest) in Ethiopia, where over 85 percent of the population lives in rural areas and depend on smallholder agriculture. The pressure of intense human activity and improper farming and management practices pose serious threats to the sustainability of the natural resources and maintaining ecological balance. There is a widespread problem related to intensive cultivation, overgrazing and deforestation, soil erosion, soil fertility decline and irrigation water scarcity. In Dita woreda there is high soil acidity problem due to intensive erosion. The continuous loss of soil rich in plant nutrients depresses the productive capacity of soils. But in Mirab Abaya woreda there is high salinity problem due to sediment deposition at kola parts of farm land. Both Konso and Derashe woreda has their own good skill of conserving and maintaining natural resources in sustainable manner in southern Ethiopia. Konso has indigenous knowledge of conserving soil and water by making terraces from long time. But Derashe has own originated knowledge of soil and water conservation by targa from crop residue which is also used as biological humus. Targa conserves in situ rain water for long period of time especially arid and semi-arid areas. Conserving natural resource has great value on sustainability of production and productivity of the country. Therefore this study identified constraints of natural resource management and prioritizes constraints for research intervention to enhance production and productivity.

Keywords: Small Scale Irrigation; Soil and Water Conservation; Soil Fertility and Agro Forestry

Introduction

Ethiopia's natural resources base, its land, water, forests, wildlife and biodiversity are the foundation of any economic development, food security and other basic necessities of its people. Smallholder agriculture is the dominant sector that provides over 85 percent of the total employment and foreign exchange earnings and approximately 47 percent of the Gross Domestic Product (GDP) [1]. The country's population is estimated at around 77 million and well over 85 percent live in rural areas. The average population growth rate peaked to slightly over 3 percent in the 1990s and the population is expected to reach 83 million by 2110 [2]. The rate of population growth is expected to decline close to 2 percent by 2030 when the country's population is estimated to reach anywhere between 120 million to 130 million, depending on the rate of urbanization. This has strong implication on the sustainability of the natural resources base and the efforts to attain national food security. Ethiopia has diverse agro-climatic Zones. It has 18 major agro-ecological zones (AEZs) and 49 sub-agro-ecological Zones that are grouped under six major categories [3]. These agro-ecological classifications have important implications for strategies in development of appropriate technologies for agricultural and rural development and natural resources management (NRM).

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The effective soil depth in Ethiopia is estimated anywhere between 20 to 59 cm (depending on the area), and if such a loss of soil depth continues unabated, Ethiopia could lose nearly all of its top soil in about 100 to 150 years [4] and Sonneveld, [5]. This long-term affect of soil loss (unless effectively controlled) on the ecological balance and survival of a society is often not captured by cost estimates of soil erosion based only on production value for certain years. Ethiopian soils are fertile but are undergoing severe mining of nutrients due to intensive pressure on arable land in past decades. A recent study on the two important plant growth-limiting nutrients - Nitrogen (N) and Phosphorus (P) - shows that, acid soils dominate most of the southern and southwestern parts of the country and generally have low P content. Cambisols are more fertile than acid and Vertisols and are fairly distributed in the highlands and used in cereal production. Vertisols are the dark clay soil found in the highlands and some parts of the lowland and suffer from water logging and poor drainage and have very low N content (National Soil Survey, 1994). The top soil of Ethiopia is undergoing at a faster rate of erosion. The rate of soil loss for Ethiopia varies considerably from place to place. The densely settled areas of Northern Ethiopia are among those with the highest rate of soil loss since the environment is highly degraded as compared to the Southern part of the country. At present, the forest reserves of the country are estimated to be 2.5 - 3% of the total land, and about 100,000 hectares of forest are lost annually. About 1 billion tons of topsoil also believed to be eroded annually [6]. In line with this, Zemenfes [7] asserts that the average soil erosion is 42 tones/hectare/ year in the crop lands. It is clear that soils with low fertility are unable to allow sufficient crop cover to sustain life. Erosion and low humus content of such soil decrease infiltration and moisture holding capacity of the soil. Therefore this base line survey was conducted to identify and prioritize constraints on small scale irrigation, soil fertility, soil and water conservation and agro forestry in each of woredas.

Objectives of the Study

- To identify existing natural resources management constraints.
- To prioritize the researchable issues of at different agro-ecologies of the target areas.
- To conduct appropriate researches for major natural resources management problems.
- To document prioritized constraints of research for further study.

Methods and Materials

Description of study area

The study was conducted in four woreda of Dita, mirab abaya, Konso and Derashe woredas in southern Ethiopia. Dita and Mirab abaya woreda are found in Gamo Gofa zone and Konso and Derashe woreda are found in Segan Area people's zone. Geographically, Konso located in South West part of the country and within the circle of rift valley. The woreda has shared common boundary with Oromia region in the South, Weyito River in the West which separates it from the Debub Omo Zone, the Dirashe special woreda in the North, Amaro special woreda in the Northeast, and Burji special woreda in the East. The administrative center is Karat; other towns in Konso include Fasha and Sagan (Source: Konso woreda agricultural office). Konso woreda comprises two major agro climate zones, the dry land with semi arid climatic conditions supporting the majority of the population (between 60 - 70 percent); and agricultural uplands in the middle altitude supporting the rest of the primarily cultivating population. Based on the Konso woreda agricultural office information, the main agro ecological divisions of Konso, i.e. 70% accounts arid (Kola) and 30% account tropical sub-humid (weina-dega). The soil of the area varies from place to place. The Konso woreda agricultural office studied and estimated that, 35% of the soil is sandy, 30% is clay and the rest, 35% is loamy soil. The native Konso indigenous practice in a distinct is sustainable form of agriculture that involves the building and maintaining of stone terraces and fertilizing the fields with manure. A central feature of their fields is the endemic tree crop, *Moringa stenopetala*. The main crop is sorghum, along with some tuber and root crops are (yam, cassava, sweet potato and taro) and cotton. Indigenous techniques of soil conservation identified in the woreda (district) are varied and at times demonstrated considerably sophisticated.

Dita is one of the woredas in the Southern Nations, Nationalities, and Peoples' Region of Ethiopia. Part of the Gamo Gofa Zone, Dita is bordered on the south by Arba Minch Zuria and Bonke, on the west by Deramalo, on the north by Kucha and on the east by Chencha. Towns

in Dita include Zeda. Dita was part of former Dita Dermallo woreda.

Derashe is bordered on the south by Konso special woreda, on the west by the Weito River which separates it from the Debub Omo Zone, on the north by the Gamo Gofa Zone, on the northeast by Lake Chamo and on the east by Amaro special woreda. The administrative center of Dirashe is Gidole. According to a 2004 report, Dirashe had 57 kilometers of all weather roads and 44 kilometers of dry weather roads, for an average road density of 66 kilometers per 1000 square kilometers. High points in Derashe include Mount Gardolla (2545 meters).

Mirab Abaya is one of the woredas in the Southern Nations, Nationalities, and Peoples' Region of Ethiopia. Part of the Gamo Zone, Mirab Abaya is bordered on the east and south by Lake Abaya which separates it from the Oromia Region on the east and Arba Minch Zuria on the south, on the west by Chench, on the northwest by Borena, and on the north by the Wolayita Zone. Towns in Mirab Abaya include Birbir. Mirab Abaya was part of former Boreda Abaya woreda

Methods of data collection

The survey work included both a review of the literature on smallholder, agricultural and natural resources management, water and mine and energy offices of government field research. Both secondary and primary data were collected and used in this study as references.

Secondary data collection

The study started with brief review of the woredas, Region and National policies, the policy and legal rights frameworks regarding irrigation, natural resources management, soil fertility and agro forestry practices. The main sources of secondary data were published and unpublished documents. These included policy statements, proclamations, regulations, project appraisal documents, reports and past case study papers on natural resources management and constraints.

Primary data collection

Primary data were collected using various instruments such as key informant interview using semi-structured checklist, focus group discussion, expert interview, unstructured questionnaire and field observation of events in the different concerns of natural resources management. Key informant interview was conducted to generate general understanding of the natural resources management, the major technical, institutional and natural challenges of natural resources management in the each woreda. The key informant and open ended interview was done by arranging cluster of female headed, male headed and youth of different agro ecologies. Finally, after the completion of primary and secondary data collection, the validation work shop was prepared.

Results and Discussion

Constraints and measurements taken in each woreda

The specific constraints identified recently include declining soil fertility, intensive soil erosion, drought, land shortage, deforestation, soil acidity especially in Dita woreda, soil salinity especially in Mirab Abaya woreda, inaccessible topography for irrigation water, lack of adequate knowledge on Natural Resource Management are prominent among constraints. The continuous loss of soil rich in plant nutrients depresses the productive capacity of soils.

Constraints of soil fertility management in Dita woreda

- No crop rotation and fallowing due to shortage of farm land.
- The use of DAP and Urea is minimum because farmers have little knowledge about inorganic fertilizers.

- Plough of farm land along the slope due to inaccessibility of topography for oxen.
- Maximum top soil erosion due to severe steep slope and soil acidity.
- Use of nitrogen fixing crop is not familiar.

Measurements taken to alleviate the problems by the society

- Soil and stone bund construction.
- Terraces by cut and fill method.
- Micro basin and hydro basins.
- Use of desho grasses.
- Check dams to control gully.

A climate change has been seen from year to year like shortage of rain fall or rain fall fluctuation i.e. rain same times come soon and come late, excess or under fall.

Problem prioritizations on soil fertility management during interview

- Land slide due to over rain.
- Unbalanced cost of DAP and Urea with our production.
- Climate change.

Constraints of small scale irrigation in Dita woreda

- Available irrigation water source but no habit of using irrigation.
- No habit of water harvesting ponds due to think of children and cattle enter into.
- Ground water is available with shallow water table but farmers are aware to use of irrigation.

Constraints of agro forestry in Dita woreda

- Reduction of natural forest amount by deforestation in high rate like (behir zafi, koso zafi, tid, korch, bamboo, wolkefa, chachole, bisana, chanko and etc). Trees already disappearing at Dita woreda are like chchole, wolikefa, tid (yeferenji), chanko etc and koso zafi and bamboo are affected by insects disease.
- Deforestation and a forestation are not equal.

Constraints of soil fertility management in Mirab Abaya woreda

- Soil salinity.
- Low habit of using compost.

Problem priority on soil fertility management

- Use of inorganic fertilizer.
- Soil salinity.
- Use of agronomic practice in available.

Constraints of soil and water conservation in Mirab Abaya woreda

- Use of unavailable lands for farm.

- Low practice of using biological conservation methods.
- Low maintenance and operation of irrigation canals and hydraulic structures.
- Constructing irrigation structures inappropriate place for water source and command area.

Constraints of small scale irrigation in Mirab Abaya woreda

- Soil and water salinity problem.
- Shortage of canal design to bring irrigation water from the source.
- Most of ground water holes dig in summer season at summer season ground water rises to the surface and draw down at the winter season; at the time loss of ground water is happening.
- Most of Designed irrigation schemes are not functional due sedimentation and cracking's.
- Conflict was happening among irrigation users due to water competition.
- Selling of irrigation water to other farmers instead of using irrigation water for his/her own farm.
- No irrigation water treatment from lake abaya.
- Unfair irrigation water distribution from upper head of canal to tail end of irrigation canal.
- Water logging specially upper head of irrigation scheme due to lack of drainage system.
- Extra or over use of irrigation water at upper and middle parts of most irrigation schemes.

Problem prioritization on small scale irrigation

- Extra use of irrigation water on only some part of irrigation scheme due to unfair distribution.
- Irrigation schemes constructed by government or non-governmental organizations become non-functional soon.
- Soil salinity.
- Water logging problem specially at upper and middle part of irrigation scheme.

Constraints of Agro-forestry in Mirab Abaya woreda

- Deforestation at high rate.
- Perceiving natural forest as constant resource or non a forestation.
- Thinking natural forest as income source.
- Shortage of multipurpose seed.
- No access of seed generation.
- Seasonal fluctuation natural rain fall.

Problem prioritization on small scale irrigation

- Seining natural forest as a constant resource.
- deforestation at high rate.
- use of charcoal for economic purpose.
- shortage multipurpose seed.
- no access of seed generation.
- thinking natural resource as income source.

Measurements taken by the woreda to minimize listed problem

In each kebele, water shed works has been designed like soil bund, stone bund, bench terrace, trenches, micro and hydro basin, tack of drains, gully stabilization, making water ways, biological soil and water conservation methods like planting juniferous (tid), koso zafi, graveli, acacia, and etc.

Making area closure and sending model farmers to excellence areas for experience sharing.

Preparing water association committees for fair distribution of irrigation water.

Comments and feedback from respondents for which problem solved first

- Crop production (crop variety).
- Irrigation technology dissemination like drip, and sprinkler irrigation.
- Proper functioning of constructed irrigation schemes.
- Seed bank preparation.

Constraints of soil fertility management at Konso woreda

- Little crop shifting due to farm land shortage.
- Planting Woyibeta tree on farm land for cattle feeding that turn affect soil fertility.

Measurements taken to maintain soil fertility by Konso woreda

- Terrace construction and maintenance.
- Using crop residue for mulching.
- Soil bunds.
- Stone bunds.
- Intercropping.

Constraints of small scale irrigation in Konso woreda

- Farmers are not volunteer to use pond water.
- Thinking all crop production produced is for only feeding rather than market use.
- There is no accessible water for irrigation only segan lake is used around 50000 peoples in konso woreda.

Measurements taken to create awareness about the use of small scale irrigation at Konso woreda

- Conducting at least one water source per family program.
- Producing some garden crops irrigating by cans as a sample.
- Preparing experience sharing program (scaling up).

Parameters that indicate severe climatic change at konso woreda are: rain fall fluctuation, production reduction, disappearance of lakes, distribution of malaria, and maximum increase of temperature and etc. efforts taken to alleviate problems happening were running proper water shade, constructing physical structures like bench terrace, oil bund, stone bund, hilly side terraces, fanajuu, and biological methods like planting gravel, *podocarpus*, *juniferous*, *eucalyptus*, and etc. Soil types based on their soil fertility around konso woreda local name are: Kalikalayita, qirata and biyulamayita.

Ranking of natural resource management problems that should be solved by research first:

- Climate change.
- Agro forestry.
- Soil fertility.
- Soil and water conservation.
- Small scale irrigation.

Constraints of natural resource management at Derashe woreda

- Moring (halako) tree planting at farm land that turn affect soil fertility.
- Fast deforestation due to shortage of farm land.
- Use of DAP and Urea are not familiar because of imbalance cost of inorganic fertilizer with production.
- Low habit of using crop residue or mulching.
- No irrigation trial has been done.
- Same trials failed (irrigation scheme).
- Deforestation problem due to charcoal for income source.

Parameters that indicate severe climate change at Derashe woreda are total disappearance of some crops, and drought due to rainfall fluctuation. Measurements taken to all interrelated problems are conducting proper water shade management program, constructing stone bund, soil bund, trenches, micro basin, hydro basin, and biological conservation methods like planting wanza, gravel, shoal, elephant grass and bench terrace. Local names of the soil types around Derashe are Pusqa, kalikalayita, qeshiqasha, kaluna and qalixa.

Ranking of problems on natural resource management that should be solved by research first at Derashe woreda are

- Small scale irrigation.
- Soil fertility management.
- Climate change.
- Agro forestry.
- Natural forest.
- Soil and water conservation.

Conclusion and Recommendations

This survey study was conducted at four woredas of Dita, Mirab Abaya, Konso and Derashe woreda on major constraints of natural resource management and prioritization of problems that should be solved first by research. Natural Resource Management has great value on sustainability of countries production and productivity. Respondents list out problems they have faced and ranked which problem should get solution first in each woreda. Baseline survey for any research activity is basic and necessary in other thematic areas of the study. Because doing any research without baseline survey has negative value on research output. Therefore it was recommended that this study has great value for conducting any research and used as a document for further studies in the same agro-ecology. So such kind of need assessment study must be conducted on other woreda before any research interventions as baseline survey.

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