Final Report

BASELINE ASSESSMENT AND SURVEY IN THE KOGA LANDSCAPE

CONSULTANCY SERVICES UNDER THE PROJECT "INTEGRATED WATER RESOURCES MANAGEMENT AND ENVIRONMENTAL SUSTAINABILITY TO ENHANCE WATER AVAILABILITY AND LIVELIHOODS IN THE TANA SUBBASIN"

Ref: WAE/BLA/OB/22/00013

PROPONENT: WaterAid Ethiopia

Address: Addis Ababa, Bole Sub-city, Kebele 03

Prepared By: BMTK Environmental Consultancy

Address: Addis Ababa, Nifas-Silk Lafto Sub-city, Woreda 01

Phone No: +251-911755945/910454507

E-mail: temeliku@gmail.com, temesgen_eliku@yahoo.com

Skype: Temesgen.eliku12

January/2023

Team composition of BMTK Environmental Consultancy

No	Staff Name	Qualification	Assignment
1	Dr. Temesgen Eliku	PhD in Environmental Science	Team Leader, Senior Environmentalist
2	Dr. Gashaw Mulu	PhD in Environmental Science	Watershed Management expert, experience in SWAT analysis, Senior Environmentalist
3	Dr. Tadesse Alemu	PhD in Environmental Science	Environmentalist

PROJECT PROFILE

Country: Ethiopia

Assignment name: Consultancy Service for Baseline Assessment and Survey in the Koga Landscape for Integrated Water Resources Management and Environmental Sustainability to Enhance Water Availability and Livelihoods

Project area: Minzir 01 micro-watershed

Duration of project: 3 years

Total Estimated Cost: 2,581,938 Birr

Contents

List of Figures

1. Introduction

1.1 Project Background

Studying the natural resource and livelihood conditions in a targeted context prior to the entrance of a project is an indispensable approach to garner insights that helps plan the appropriate management and evaluation of development activities. WaterAid intends to study the baseline of a project intervention at Minzir 01 micro-watershed on estimated 400ha area for the period 2022-2024, focused on integrated watershed management activities, mainly land and watershed resources to improve local livelihoods and water supplies. The aim is to also mobilize and increase community participation from planning to monitoring and evaluation of the project. The development of this baseline study guides the project's land and watershed management activities to design appropriate conservation structures, livelihood strategies, and climate resilient water safety plan development, and understand how different stakeholders can take part for the successful accomplishment and sustainability of the project.

Downstream of the Minzir 01 micro-watershed lies the Koga irrigation dam project which is under the Federal Democratic Republic of Ethiopia (FDRE), Ministry of Irrigation and Lowlands, Ministry of Water and Energy, Integrated Watershed Management and River Training Directorate. This agency can play a key role as a supporting government institution given related assignments, although resource limitations continue to limit activity on the site. The proposed integrated watershed management intervention at Minzir 01 micro-watershed is intended to address problems related to severe soil, water and vegetation degradation, particularly in the upstream areas where there is formation of large gullies that are inevitably affecting cultivated and grazing land in the downstream areas of the micro-watershed. The project will attempt various watershed development works, however, participation of the community is necessary for successful implementation. The project is anticipated not only to reduce the problem of resource degradation and sedimentation of water resources infrastructure, but also to improve the livelihoods of the communities residing within the micro-watershed with full involvement of the community in planning, implementation, monitoring and delivering feedback together with development stakeholders for modifications and improvements so as to achieve sustainable livelihoods and overcome the problems.

1.2 Project Origin

WaterAid is leading implementation of a project component in coordination with project consortium partners World Resources Institute (WRI), Millennium Water Alliance (MWA), and Abbay Basin Administration Office (ABAO).

WRI, as project lead, and its project partners are implementing a 3-year program (2022 to 2024) aimed at strengthening data systems, building capacities, facilitating knowledge sharing, and improving cross-sectoral coordination toward enhanced basin and sub-basin planning processes, and promoting IWRM and watershed protection. The geographic focus is the Tana Subbasin and the woredas of North Mecha, Farta, and Dera in the Amhara Region. The work is undertaken for the purpose of reducing water risk, increasing climate resilience, and protecting watershed health in order to better secure water supply systems and bolster sustainable development. The project embraces the underlying principles of IWRM, including the coordinated development and management of water and other natural resources, and the linkage between IWRM and WASH that recognizes water, human wellbeing and the environment as interconnected.

The project centers on four core objectives/components: 1) building capacity to make water- and climate-wise decisions by supporting cross-sectoral data gathering, analysis, and planning; 2) supporting institutionalization and implementation of IWRM to ensure sustainable water management and use at different scales, 3) promoting watershed management and restoration to improve water supply and livelihoods, working in one micro-watershed of the Koga, and 4) elevating learning from the project and advocating for promising water security solutions.

WaterAid Ethiopia is leading the planning and execution of component #3 through an agreement with MWA that has received a subgrant from WRI for the execution of specified activities. During implementation, WaterAid is working on the development of the selected Minzir 01 watershed to improve quality and quantity of water, in addition to livelihood conditions under a defined boundary of the micro-watershed. In Ethiopia, the problems surrounding land use, access and supply of quality water, land conservation, and watershed management are so diverse that large-scale investment and expertise are required to realize contributions to the development and rational utilization of natural resources, particularly the water resources.

The aim of this consultancy service has been to study the baseline conditions of the landscape according to socio-economic and biophysical information and to support the design of interventions and better estimation of costs and budget preparation to inform WaterAid's workplan going forward. This would then allow the project to assess and document impact in the watershed by examining impact on land rehabilitation, water supplies and the livelihoods of participating households.

This project baseline was formulated based on field and household surveys carried out on the project site/intervention landscape in November 2022. The task intended to address problems identified during the surveys, and in line with the national strategy of Ethiopia that delineates priority goals for enhancing water and improving the livelihoods of people. The study aims to advance a multi-perspective and multi-scale investigations through an integrated watershed management approach, with full participation of stakeholders and experts from various disciplines. Coordination amongst country, regional and Woreda level staff and project focal persons for WaterAid together with project consortium partners and the relevant government offices at different levels also plays an indispensable role in the effectiveness of the project. The total project cost in the pilot Minzir 01 micro-watershed over the 3-year period is estimated at 2,581,938.00 Birr.

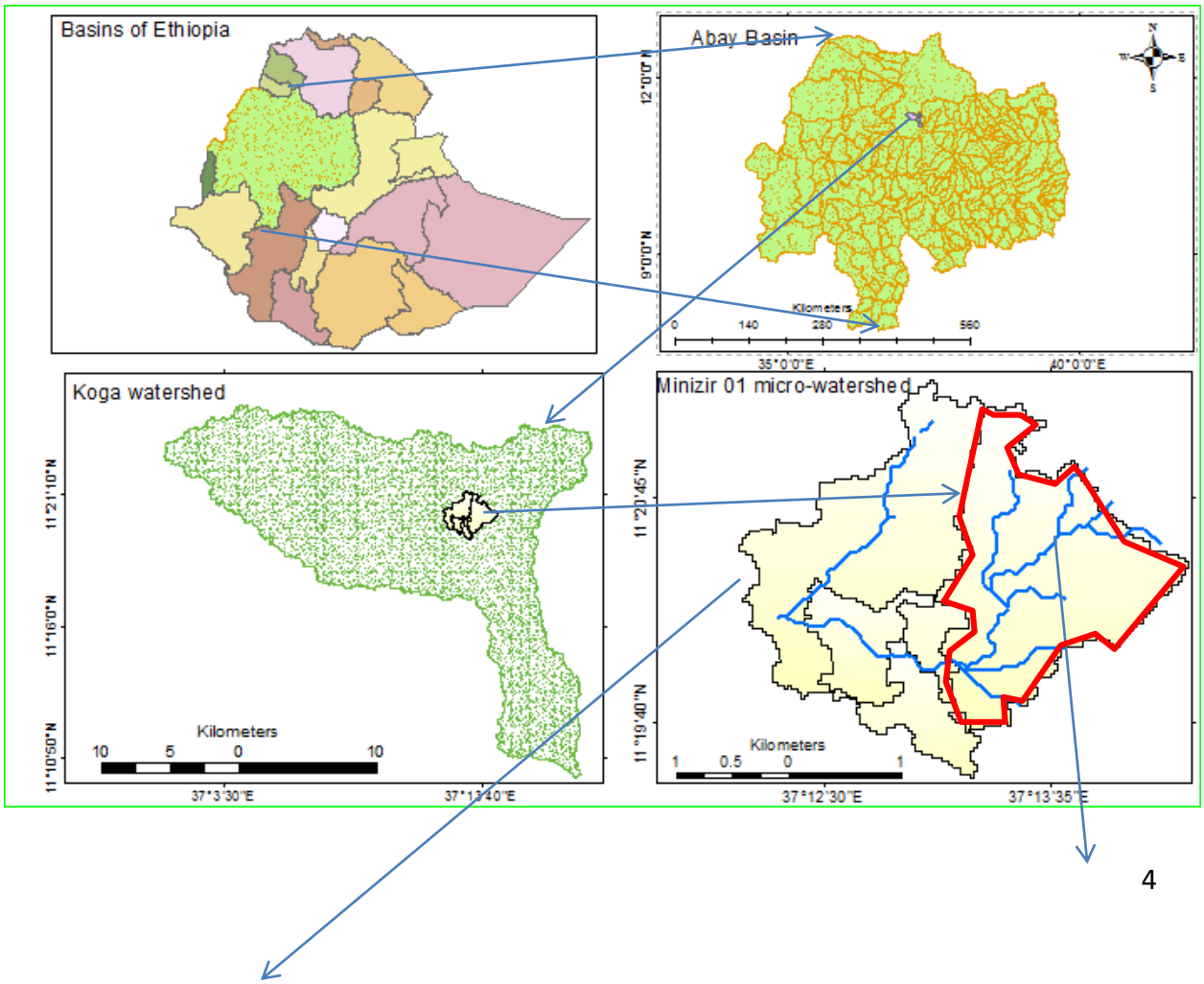
2. Project Area: Biophysical Data of Minzir 01

The project is intended to incorporate 710 ha, considering the location of outlet coordinate (11°19'55.18"N and 37°12'36.98"E) points where the regional water directorate already marked (11.3319463, 37.2104262). Based on this assumption, the overall pilot watershed activity is already determined in the 400 ha, which will be part of the 710 ha and this is found at headstream of the Minzir 01 micro-watershed.

The critically damaged and more severely degraded sections of the bigger watershed (710 ha) can be strategically captured in its headstream area where the pilot micro-watershed (400 ha) is located. Even though the long-term watershed development activities are expected to advance stepwise into other parts of the watershed (710 ha), the current intervention priority is mainly focused and prioritized to the pilot micro-watershed (400 ha). The area is limited to 400ha, due to the available resource to implement the required intervention. Once the intervention demonstrated in the pilot Minzir 01 micowatershed the scale up to the 710ha area will precede.

Based on the aforementioned assumptions and socio-economic, biophysical, and geo-morphological study needs, which consist of different physical measurements and SWC (Soil and Water Conservation surveys. experimental soil and water sampling activities were carried out in the pilot micro-watershed (400 ha) for the period 2022-2024 period. This will further inform experience and best practices for the remaining section of the watershed (710 ha) and anticipated long-term scale-up desires.

Minzir 01 micro-watershed is nested within the larger Koga watershed. Hydrologically, it is part of upper Blue Nile basin and constituent of the Lake Tana subbasin (Figure 1 below). The area of the micro-watershed drains to Minzir River, which flows into the southern upper part of Koga irrigation dam. Minzir 01 is approximately 2 km upstream from the dam. The micro-watershed (indicated by the red highlighted part) covers an area of 400 ha. As regards administrative boundary, the microwatershed falls in Kurit Bahir Kebele of North Mecha Woreda, Amhara Region. The Minzir 01 micro-watershed is one of six sub-basins lying under Kurit Bahir Kebele. For the sake of management purposes, the Minzir micro-watershed is divided into Minzir 01 (Southwestern part) and Minzir 02 (Southeastern part) micro-watersheds.



Minzir 01 watershed (710 ha)

Pilot Minzir 01 micro-watershed (sketch) – 400 ha

Re-delineated Pilot Minzir 01 micro-watershed (400 ha) after the bigger watershed (710 ha) coverage.

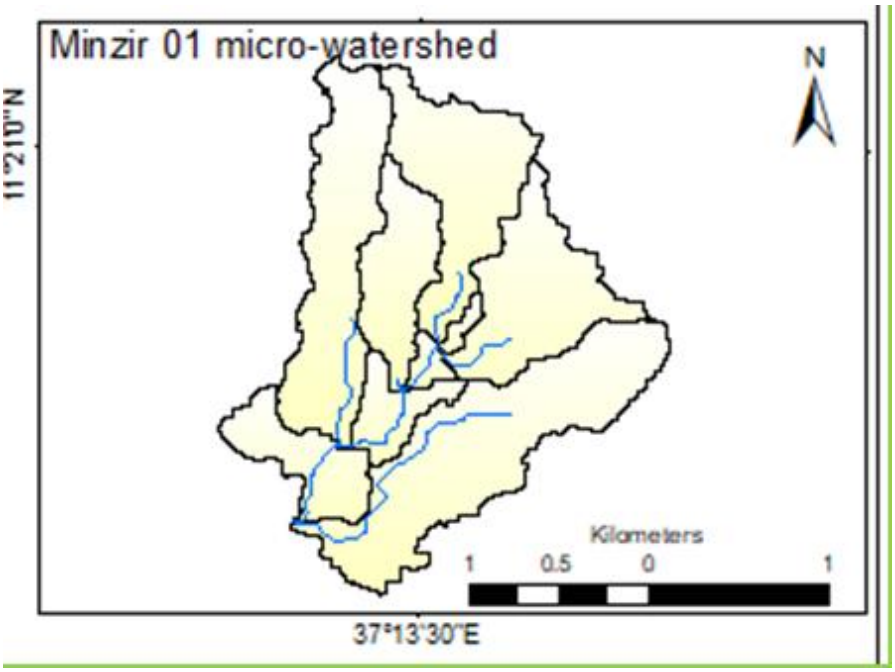


Figure 1 Location of Minzir 01 micro-watershed (400 ha)

Topography and climate

The catchment is part of Kurt Bahir Kebele and falls under the Koga watershed. The micro-watershed is in the upper part of the Koga watershed. The digital elevation model of 10m was used to delineate Minzir-01 micro-watershed. The outlet Minzir River coordinate point was taken using GPS during the field survey. The micro watershed covers total area of 400ha, and the elevation ranges 2038 – 2112 m.a.s.l with an average elevation of 2071 m. The micro-watershed is a relatively plain area, and the river is only seasonal, meaning that it dries out in the dry season (October to May). The highest elevation source area of the micro-watershed is at 2113m.a.s.l. and the lowest is at the outlet of the micro-watershed is 2038m.a.s.l. The average topographic condition is a plain area (gentle slope). The average slope of the micro watershed ranges from 3 to 12%.

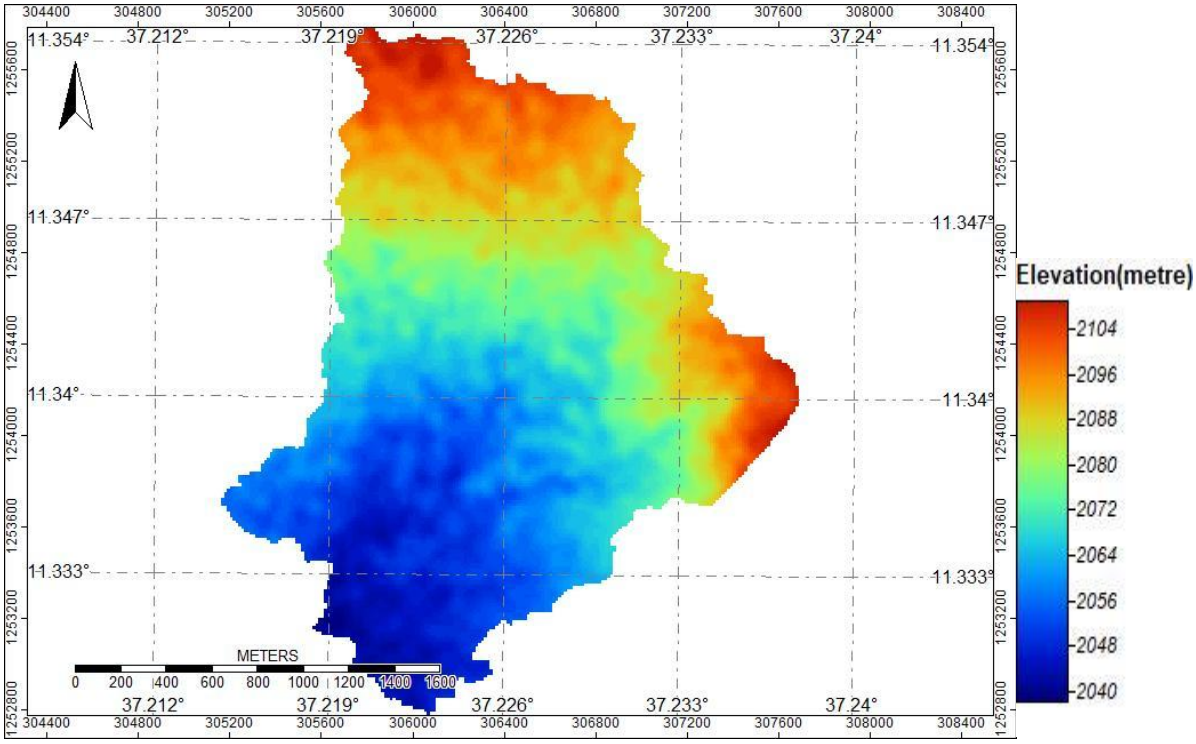


Figure 2 Elevation map of Minzir 01 micro-watershed

Landform

The landform of Minzir micro-watershed is largely of plain area. However, there are few sites where valley and hill areas are found. These are the areas, most vulnerable to erosion.

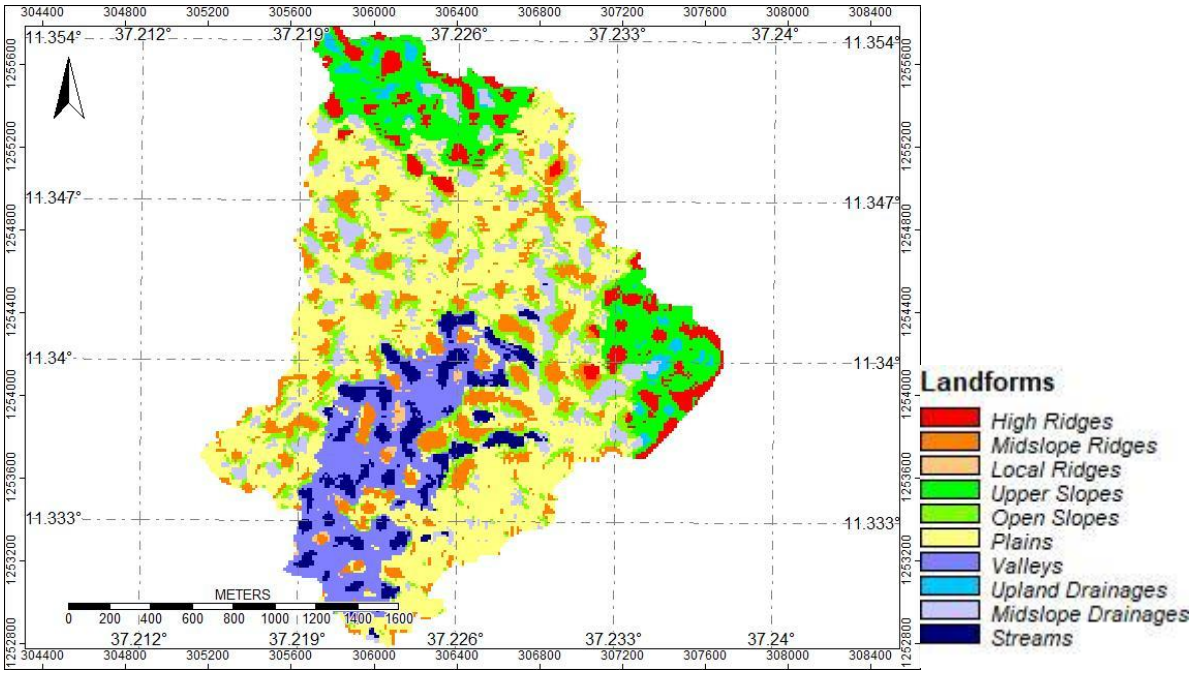


Figure 3 Landform of Minzir 01 micro-watershed

Potential erosion sites of Minzir 01 micro-watershed

The slope length and steepness factor (LS-factor) factor map dictates the potential erosion sites of the Minzir 01 micro-watershed. The highest potential erosion sites are in the pocket areas and largely in the upper parts of the watershed that are brown in color. The highest estimated LS factor is (2.6) and the lowest is 0.

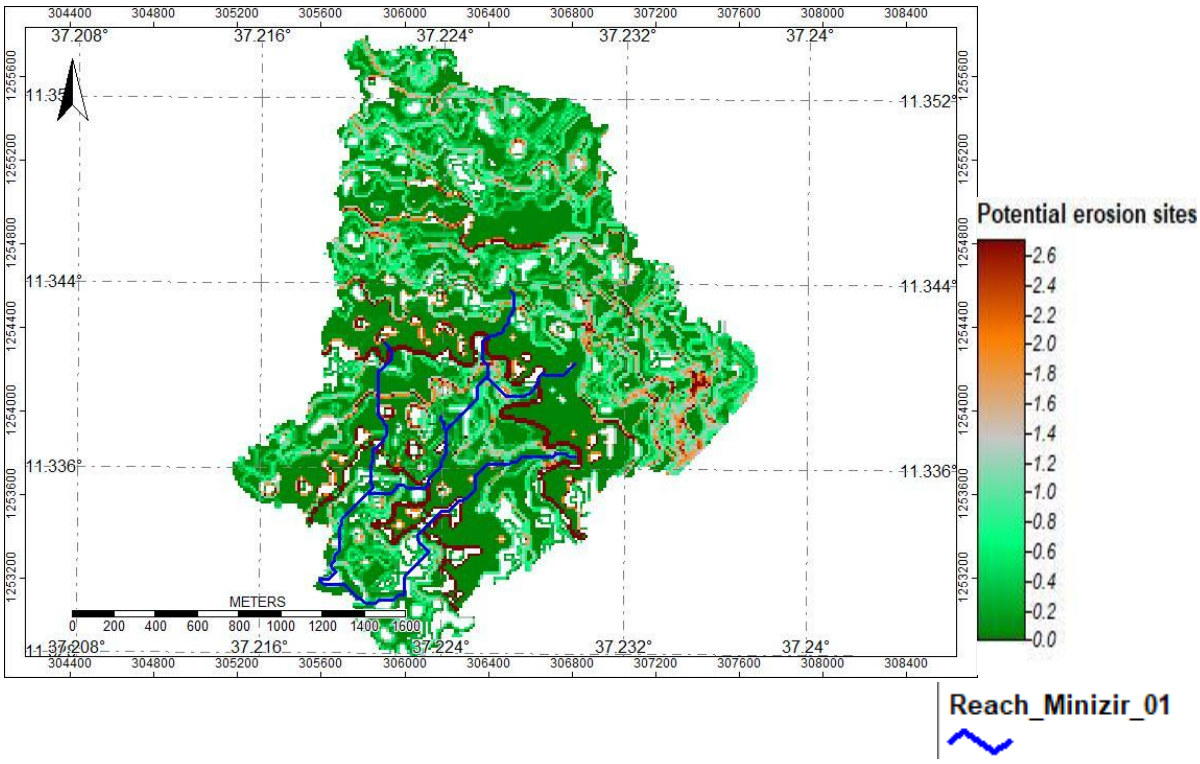


Figure 4 Potential erosion sites of Minzir 01 micro-watershed

Climate conditions of Minzir 01 micro-watershed

Temperature and rainfall

As for the larger Koga watershed, Minzir 01 micro-watershed falls under the subtropical climate zone (Yeshaneh, Salinas, and Blöschl, 2017). Due to unavailability of adequate meteorological data within the micro-watershed, climatic parameters were recorded in an adjacent meteorological station at Merawi. The mean annual rainfall and temperature are 1480 mm and 25°C respectively (Mihret, 2019).

2.1 Physical Features of the Minzir 01 Watershed

2.1.1 Catchment Delineation

The catchment delineation used DEM (digital elevation model data) which has 10m resolution. First the boundary of bigger watershed was determined, in order to do this, the outlet of the watershed which was already marked. Based on the slope map, the flow direction and flow accumulation were derived from DEM. The pilot Minizir 01 micro watershed was further delineated after identifying the intervention sites in the upper part of the big watershed.

2.1.2 Forest Resources

The ecology of Minzir 01 micro-watershed is covered with natural shrub and trees. During the field visit the team observed tree species such as *Acacia* deccurence, *Croton macrostachys, Acacia abyssinica, Cordia african, Eucalyptus camaldulnesis, Albilizia Schimperiana, Sesbania sesban, Vernonia amygdalina, Ficus vasta, Gravillea robusta, Solamm gigantium.* Even though there is poor experience of area closures to reduce overgrazing and allow regeneration of vegetation, there was evidence at one site that the area closure was effective in restoring the degraded lands.

2.1.3 Soils

The Minzir 01 micro-watershed is largely covered by *Haplic Luvisols on* 203.5 ha (50.8%), *Haplic Alisosls* on 81.9 ha (20.5%) and black *Eutric Vertisols* on 115 ha (28.7%) (Figure 5). These soil types have good potential for crop production.

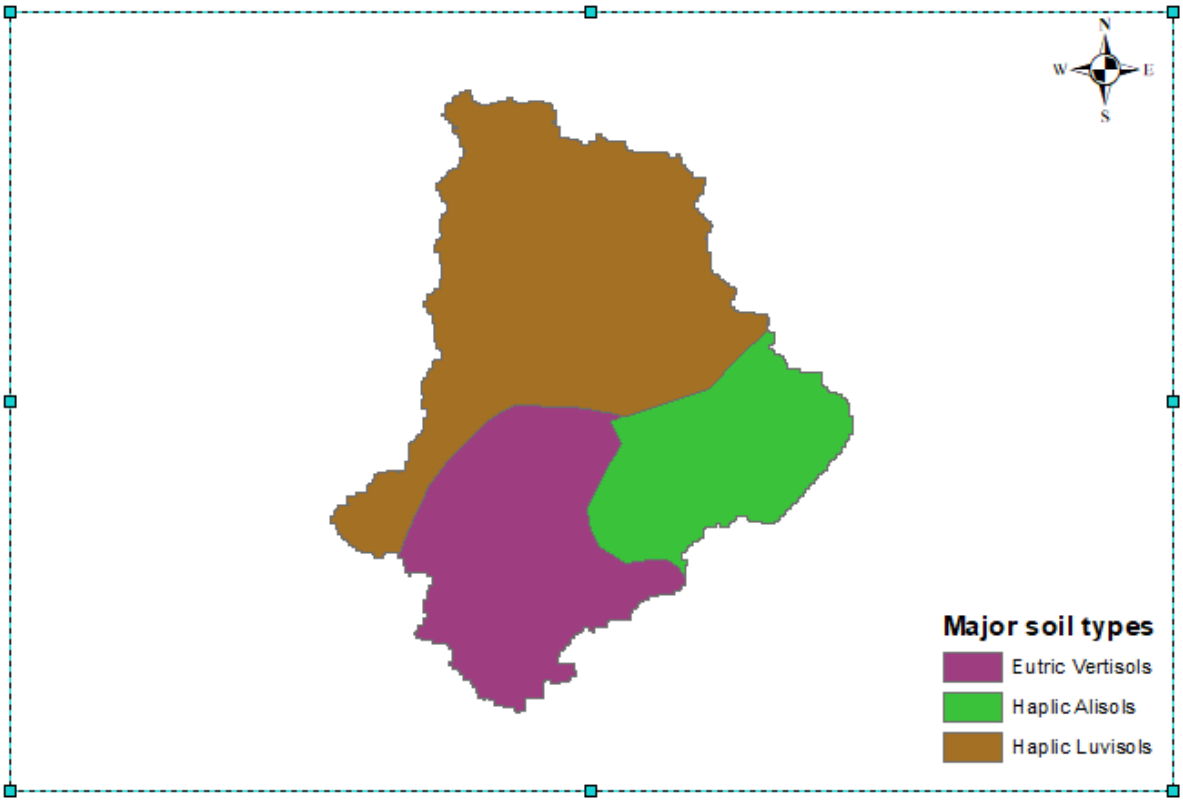


Figure 5 Soil type of the Minzir 01 micro-watershed

Land Cover

As is illustrated in Figure 6, the major land type and cover in Minzir watershed consists of agriculture on 280 ha (70%), wetland on 63 ha (15.8%), grassland on 55 ha (13.7%), forest on 2 ha (0.5%), , and

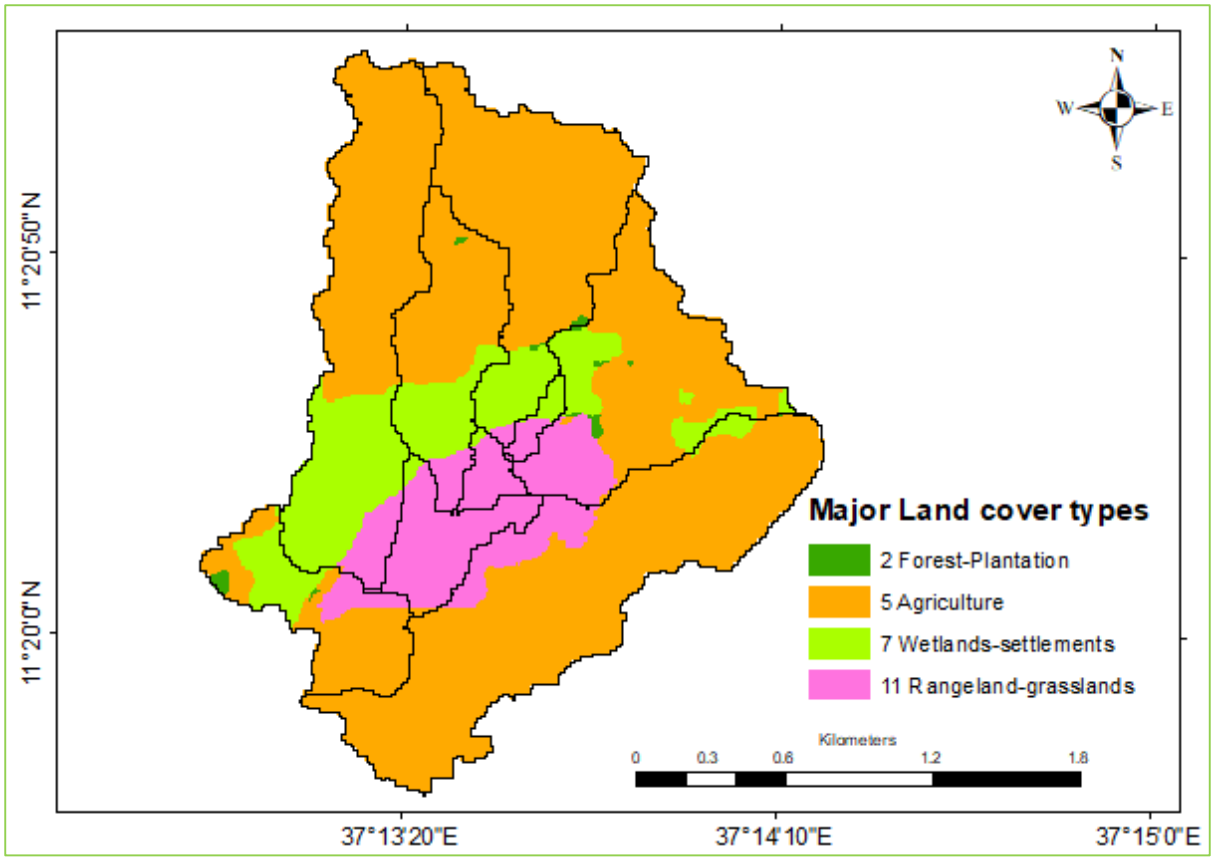


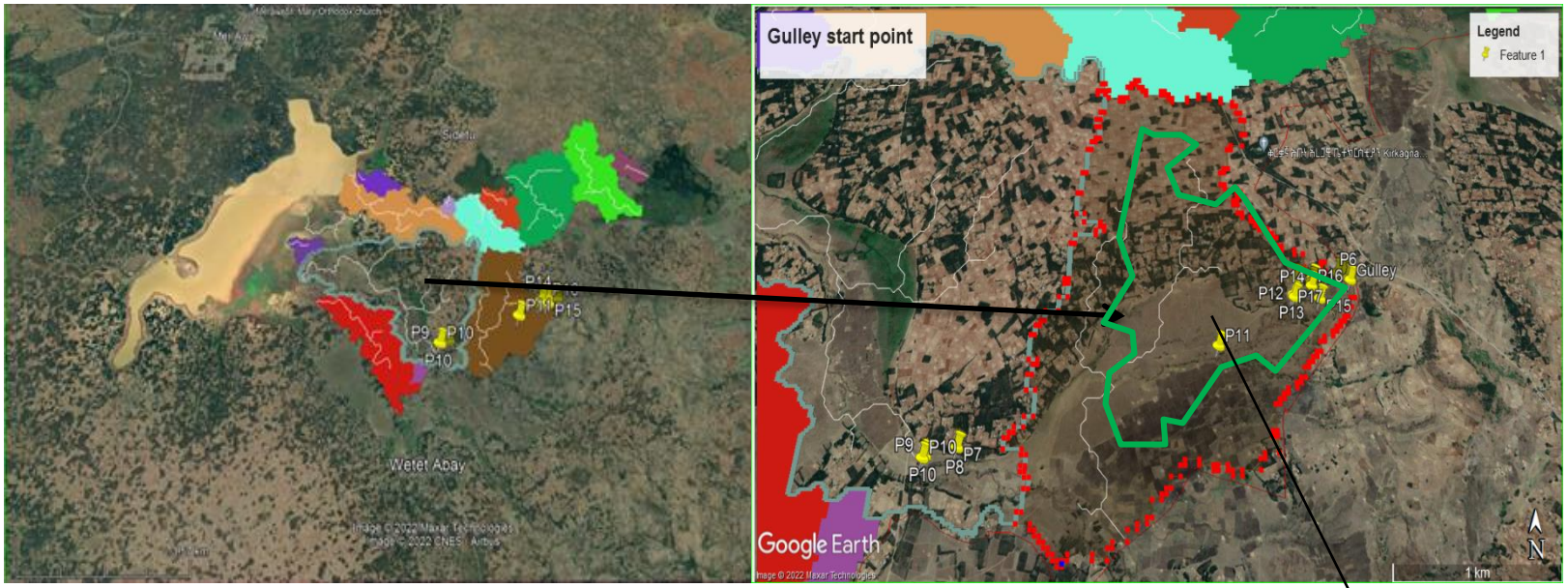
Figure 6 Land cover map of Minzir 01 micro-watershed

2.1.4 Soil Erosion and SWC Activities

Land degradation is a major problem in the micro-watershed. The severity of erosion ranges from the formation of rill and sheet erosion to large gullies. Minor soil and water conservation works have been carried out previously with support from the Kurit Bahir Kebele Natural Resources Department, mainly through the distribution of seedlings, area closure, farm level terraces and soil bunds. Improvements on land rehabilitation were evident in some parts of the micro-watershed. However, the field visit witnessed that efforts to restore degradation of gully sites through the planting of *Accacia deccurence* and *Gravillea robusta* failed to succeed. This is due to the lack of physical soil and water conservation structures such as cut off drains; check dams prior to planting of seedlings, and the selection of shallow rooted seedlings species that are inappropriate for fragile *vertisoil* on sliding land of the gully.

Upper Watershed

The uplands of the micro-watershed are affected by a greater force of runoff which in turn forms bigger gullies. In the headstream area the Minzir river initiates (Figure 6) minor rills on the fragile *vertisol* which can easily denudate the sides of the river course. These very minor and small rills in the upstream area are widening and forming very large gullies reaching a length of 40 to 50 in the downward side of the micro-watershed.



Pilot Minzir 01 micro-watershed

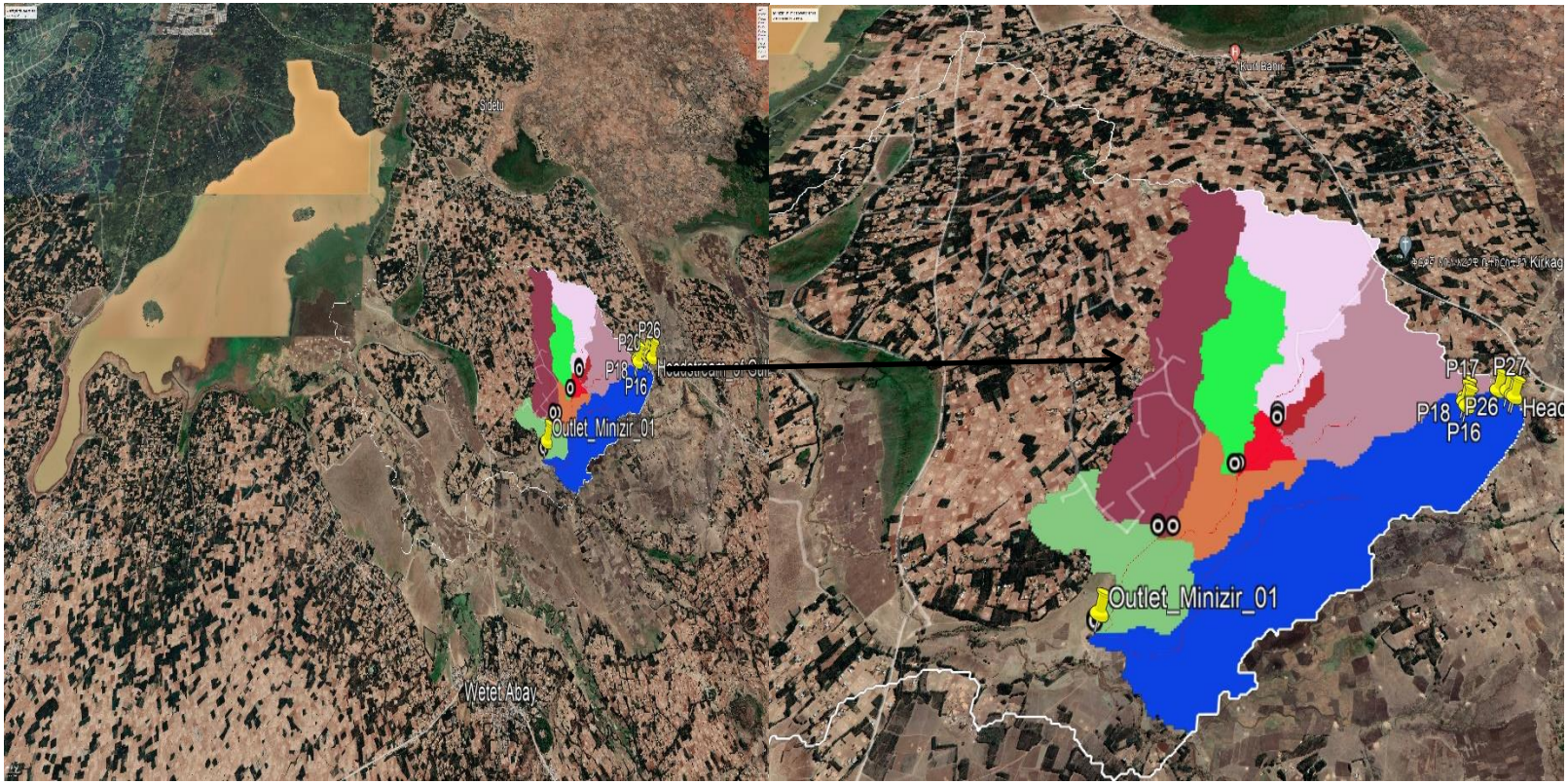


Figure 7 Areal view of Pilot Minzir 01 micro-watershed and neighboring sub-basins (Google earth view)

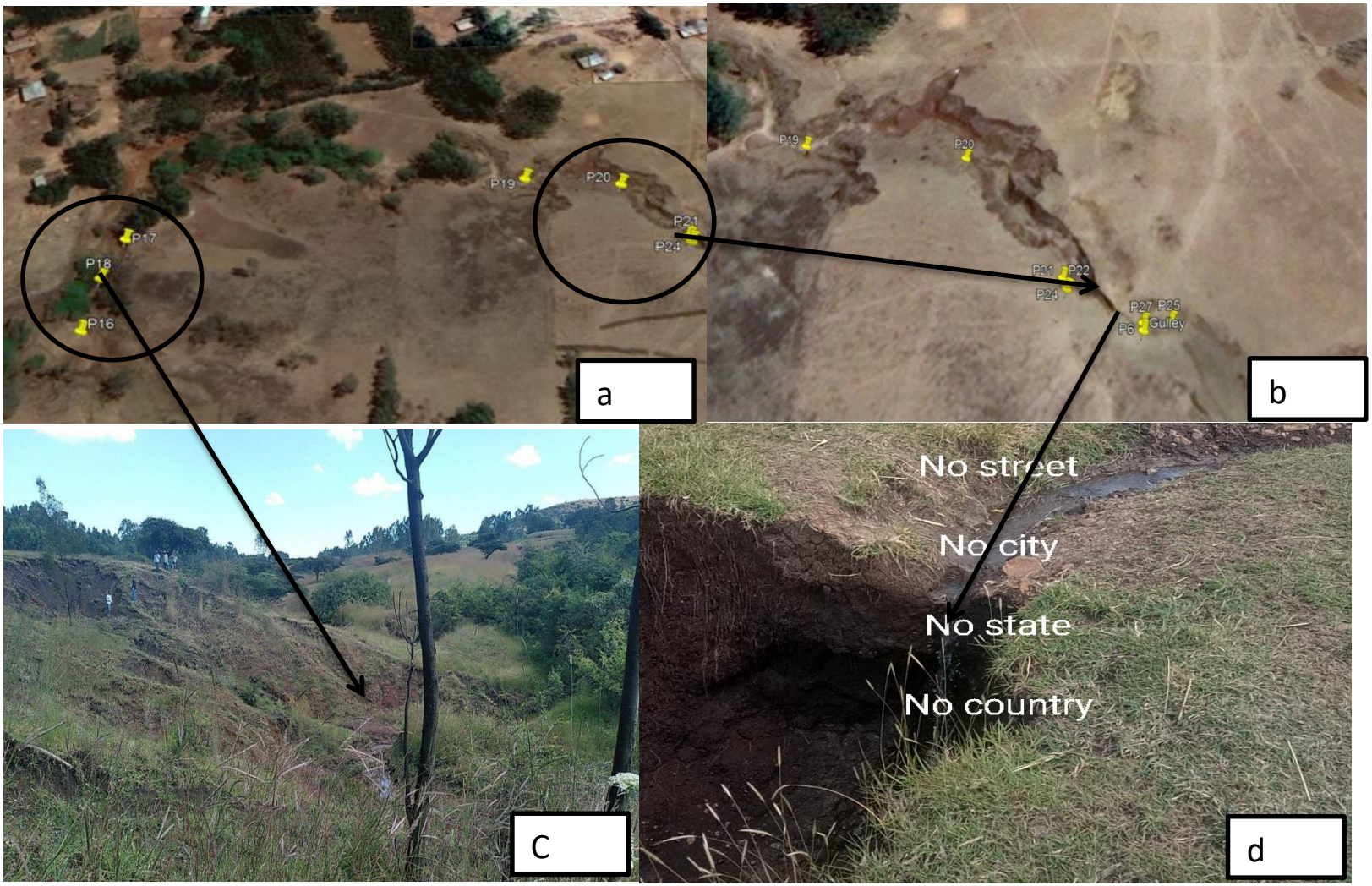


Figure 8 Gullies in upper Minzir 01 micro-watershed: two bigger gullies (a and c), gully starting point and headstream of Minzir 01 (b and d)

Figure 9 Selected gullies of Minzir 01 micro-watershed for SWC intervention in the upper part of the watershed

It is evident that that the widening of the bigger gully is destroying farmlands and grasslands to its sides. Moreover, the finger gullies from the left and right side of Minzir river join at a point where it can cause even larger destruction of cultivated areas and grasslands. The nature of the degraded land consists of *vertisol* and *nitosols* which are easily sliding soil types, susceptible particularly in the rainy season. As a result, the cumulative effect of these factors leads to retreating grasslands and cultivated lands.

The field observation showed that there was planting of *Accacia deccurence* and *Gravillea robusta* seedlings since 2021 in the degraded area where gullies were formed. However, the planting activity was not supported concurrently with physical soil and water conservation structures in the degraded sites of the micro-watershed, and therefore this should be remedied. There are two sites in the micro-watershed that are significantly affected by erosion and bigger gullies. Both sites have experiences the creation of wider gully spaces. Due to the widening of the gullies, grassland and cultivated land has been lost due to landslides, which has been estimated to cover 50m (length) x 70m (width) x 8m (depth) (Figure 7). Particularly, the lower, second gulley which is further reinforced on one side by the finger gully, will degrade further areas unless intervention measures are implemented immediately.

Lower Watershed

As massive of the area is largely wetland which suits for grassland, the local community is restricted to encroach the site for further agriculture cultivation purpose. The grass land management of the micro-watershed has its own associations and implemented carefully and sustainability is considered.

This baseline study used field based soil and water investigation. To measure the possible impact of the project on Minzir micro-watershed soil fertility, the team took six soil samples to test seven key important soil parameters (Table 1). The soil samples were taken near the intervention places where the soil fertility conditions can be detected and from different lands of various farmers. Table 1 displays the baseline parameters and that will be monitored following the implementation of the expected SWC activities over the course of the three year project. These key soil parameters are sensitive to different soil and water conservation activities in the upper catchment of the micro-watershed.

Table 1 Soil sample tests on selected locations of the Minzir 01 micro-watershed

Name of farm plot owner	pH (H_2O)	EC	Av.P	OC%	TN%	CEC	B.D
1. Tesema Girma	4.63	0.055	8.39	2.01	0.15	20.6	1.02
2. Andarge Teserah	4.73	0.19	9.7	3.72	0.25	16.6	0.94
3. Wassie Girma	5.25	0.044	1.2	0.77	0.1	16.8	1.21
4. Mola Arega	4.74	0.022	2.1	1.8	0.16	34.2	1
5. Mulat Taye	4.71	0.033	1.62	1.19	0.13	40.6	1.21
6. Babey Tesfa	4.9	0.022	1.27	0.47	0.06	39.8	1.25

pH (H2O), electrical conductivity (EC), available phosphorous (Av.P ppm), and cation exchange capacity (CEC meq/100 g), organic carbon (OC%), total nitrogen (TN%), Bulk Density (BD).

2.1.5 Land Cover and Land Use

Land Cover

The land cover system of Minzir 01 micro-watershed is characterized as largely covered by *Eucaluptus camaldulensis* vegetation cover. Many woodlot areas are also common in the micro-watershed. Previously the area was productive of Eucalyptus wood lot production due to the increased demand for construction purpose before 4-5 years ago.

The micro-watershed covers an area of 400 ha. Of this 281 ha are covered by cultivated land. The grass land is properly managed and community uses cut and carry system through well-organized community-based associations.

Forest: few sites of the micro-watershed support patches of forest in pocket areas. Encroached natural forest covers only 2 ha (0.5%) of land, Eucalyptus plantation forest is common particularly in the downstream areas of the micro-watershed in cultivated fields. Futhermore, there are homestead fences and eucalyptus plantations. Following the river Minzir, there is also riparian vegetation. The forest area of the micro-watershed is dominated by Eucalyptus plantation, commercially oriented woodlots production, remnant trees, and riparian vegetation following the course of river. There are also patches of forest areas protected by the kebele administrative.

Grassland: Grassland is widespread throughout the micro-watershed area with a relatively extensive area cover. It occurs mainly on low-lying areas in the downstream part of the micro-watershed. 55 ha are covered by grassland. It is found in all parts of the micro-watershed. Farmers treat grassland areas through organized and integrated community based grassland

committees. Farmers use cut and carry system. Livestock are treated at home (preparing fodder locally).

Wetland: There are also some planted Eucalyptus trees around settlements which totally cover 64ha. The wetland is characterized by grass and scrub vegetation; more or less grazing land. However, during wet periods, parts of the wetland are submerged.

Land Use

Cultivation of annual and perennial crops, settlement, grazing, browsing, tree planting, fire, construction wood collection, tree planting for soil/water conservation and shade, nature conservation, and grass harvesting/collection for roof thatching/hay, as major and minor land uses in the watershed area.

3 Socio-economic Features of the Minzir 01 Watershed

3.1. Social Features

Population

Minzir 01 micro-watershed is part of the administrative Kurit Bahir Kebele. The total number of households in the micro-watershed is estimated to be 321, of which 36 are women headed and the remaining 285 are male headed. About 180 households are organized in an association to adopt and work on fruit and vegetable production. The total population of the micro-watershed is estimated to be 1069: of these 545 male and 524 female, according to Kurt Bahir kebele counts in 2022. Amharan is the dominant ethnic distribution in the micro-watershed and Christianity is the main religious faith, while few are Muslims.

3.1.1 Description of Surveyed Households in Minzir 01 Micro-watershed

The baseline study categorizes the watershed in upper and lower parts. For this reason, households (HH) in the micro-watershed were also systematically divided into upper and lower. A household survey was organized to collect socio-economic information. A total of 94 respondents took part in the survey to collect the household survey data, with 88 being male and 6 being female (Table 2). Furthermore, three focus group discussions and 5 key informant interviews were organized. Out of the total 94 household respondents, 57.45% were from the upper and 42.6% from the lower parts of Minzir 01 micro-watershed. . The marital status of HH showed that 87 (92.6%) were married while the remaining were single or divorced. The marital status of HH plays an important role encouraging different soil and water conservation activities in a watershed.

Table 2 Distribution of respondent households between upper and lower Minzir 01 micro-watershed

Category of micro-watershed	Frequency	Percent
Upper of Minzir 01	54	57.4
Lower of Minzir 01	40	42.6
Total	94	100.0

Source: Household survey (November, 2022)

A total of 51.15% of HH respondents can be considered educated (read and write and Grade). The better education status of a household may ensure stronger understanding and uptake of different SWC skills and technologies (Table 3).

Table 3 Education status of Household heads

Education status of HH	Frequency	Percent
Valid	48	51.1
Illiterate	29	30.9
Read & Write	16	17.0
Grade	93	98.9
System	1	1.1
Total	94	100.0

Source: Household survey (November, 2022)

The average family size of respondents is 5.7 and active labour age of respondent HH was 3.3 (Table 4). The greater the family size and higher number of HH members in active labour age is encouraged to optimize workloads imposed at household level.

Table 4 Family size and active labour age of HH

	N	Minimum	Maximum	Mean
Family size of HH	94	1.00	10.00	5.7340
Number of family members in the active labor age (15-64 years)	88	1.00	8.00	3.3182
Valid N (list wise)	88			

Source: Household survey November 2022

Rural Infrastructure

Water Supply

Water supply coverage data was obtained from the North Mecha woreda Rural and Agricultural Development Office. This data indicates that about 56.1% of the Minzir 01 population has access to a potable water supply system, in contrast to spring development. There were totally 321 dugwell water users of these 285 women and 36 men.

Surface water discharges to wetland areas during the rainy season and ground water (small springs) at edges are used as water sources mainly in the northeastern parts of wetland areas during the dry season, when they are the main source of water for wetland areas (personal observation). There is a small seasonal stream which flows to the Koga dam on the downstream sides of the wetland, which plays an important role in the lifespan of the dam (Legesse, Bogale, and Likisa, 2018).

There are a total of 8 deep water wells that the North Mecha woreda dug for communities residing in the micro-watershed area. Of these, one is currently not operational currently, possibly due to lack of maintenance and follow-up. There are a total of 321 hand dug wells in Minzir 01 micro-watershed (Household survey, 2022).

Issues related to spring water and/ meter of ground water sources

Improving the quality and quantity of Minzir 01 micro-watershed is one of the objectives of the project in particular, by rehabilitating lands in ways that reduce runoff and erosion, decrease sedimentation, and promote practices that enhance moisture retention, groundwater recharge and water safety. Understanding the available sources of water and current activities in the intervention area are important contextual conditions and were explored through the HH survey, field visits, water sampling and laboratory investigation.

Based on HH responses, the source of drinking water during the wet season for 93% of HH is hand dug wells, while during the dry season, 80.9% get water from hand dug wells and 17% from river/streams. The response of HHs about how often they fetch water per week indicated that 49% fetch it once within 24hrs, and 23% fetch it more than three times per week. The survey also sought farmer perceptions about the benefits of watershed management. 85% of HHs agreed that watershed management has the potential to improve the supply of domestic water by increasing the quantity of available water (Table 5).

Respondents were also asked about their view on the project. Over 90% shared hopes that the project will improvement the quality and quantity of water.

Table 5 Perception of watershed management activities in terms of improving supply of domestic water

Perception of farmers on benefits of WM activities	Frequency	Percent
Prolonged duration of water supply from source	4	4.3
Increased quantity of water availability	85	90.4
Constructed water points	3	3.2
No positive or negative contribution	1	1.1
Total	93	98.9
System	1	1.1
Total	94	100.0

The household survey of fetch water for household consumption largely fall on the shoulder of women.

In the past, the quality of water in Minzir 01 micro-watershed was improved by adding dispensable chemicals (chlorine) in a jar/jerican to the collected water. This activity improved the quality of water between 2020 and 2021; however, these services was interrupted before a year.

The field team collected about 6 water samples during field survey and 7 parameters were tested to detect the current status of the water quality in the intervention micro-watershed (Table 6). From these, three water samples were taken from hand dug wells, two from boreholes and one at the outlet of Minzir River. The discharge rate of each samples at hand dug well and borehole points was recorded as depth variable.

Table 6 Water sample test at hand dug wells and boreholes

No	Water source owners	Latitude	Longitude	Type	Depth	PO4 Mg/l	NO3 Mg/l	TDS	TSS	Turb NTU	pH
1	Tesema Girma	N1120292424	E37131401024	Hand dug well	22.5	0.15	8.9	70.2		0.84	5.74
2	Babey Tesfa	N1120291426	E37131385796	Hand dug well	13	0.09	15.3	73.4		0.73	5.56
3	Atirise Gela	N11203144228	E37131543548	Hand dug well	22	0.05	9.9	70.6		0.55	5.79
4	Neno Got school	N11203106968	E37131529004	Borehole	65	0.02	0.72	126.4		7.24	6.4
5	Mola Arega	N11195140632	E37132210736	Borehole	65	0.02	16.5	114.7		0.19	6.24
6	River outlet		River outlet			0.05	5.8		0.04	5.67	6.8

phosphate, nitrate,Total Dissolved Solids (TDS), nitrates (NO3-), and phosphates (PO43-),otal Suspended Solids (TSS), turbidity, and pH (H2O)

Rural Roads

The rural road network access across the micro-watershed consistes mainly of dry season access trails. However, the micro-watershed is largely accessible and each section can be reached as large parts of the micro-watershed are near to the main road from/to Merawi, roughly 3 Km. Therefore, even the inner areas of the micro-watershed can be easily reached both in the dry and wet seasons.

Land Tenure

Farmers are given certificates of "deed rights" and have a land use right under Ethiopia's land use rules. Land is a shared asset of the State and the people, according to the federal government's Constitution. Except for properties on the land, land users are not permitted to sell or mortgage land in their possession. The land use law does permit households headed by men and women to own land.

Institutions and Resident Areas of the Micro-watershed

The watershed sees sparsely distributed residential houses, elementary schools, and local level administrative (kebele) offices. Expertise at kebele level includes agriculture and natural resource, livestock and extension service provision center, health and sanitation center, and administrative office of the kebele. The main livelihood of the community is agriculture, and to supplement this community members are involved in different activities, in particular the rearing and fattening of livestock.

The micro-watershed is in the upper parts of the Koga watershed and bounded by elevated terrain area which is used as a divide line from the neighboring sub-basins. The terrain is supposed to divide the Koga watershed too.

4. Overall Project Rationale

The results of the biophysical assessment indicate that the natural resource base of the project area has been degraded and the landscape much denuded. The reasons are primarily due to high livestock and human population pressures, climate changes, poor management, and lack of appropriate technologies and practices. Encroachment into forest and grazing areas especially in the upper watershed, depletion of soil fertility due to continuous cultivation, and land scarcity are major factors driving natural resource degradation and unsustainable resource management in the Minzir 01 micro-watershed watershed.

To address the root causes of poverty and resource degradation, the multi-faceted effects of environmental and human interactions must be considered. Watershed-based development planning therefore needs to focus on the preparation of an integrated program that efficiently utilizes and conserves the available natural resources and enhances the socio-economic potential of the area.

In some past development interventions, human and natural factors have been treated separately during the planning process which has resulted in poor project performance. However, the existing development problems in the Minzir 01 micro-watershed are multidimensional and this requires an integrated development approach. Emphasis should be given to the conservation of the natural resources within the natural river catchment boundaries, including the headwaters. This approach will help to conserve and utilize the water resource which is regarded as one of the most important determinants of development. In addition, integrated planning encourages the community to intensively participate in the preparation, implementation, monitoring, and evaluation of project interventions.

In line with the basic principles of integrated watershed management, all potential development constraints (such as resource depletion, low agricultural productivity as well as socio-economic problems) need to be addressed in order to identify appropriate solutions for the Minzir 01 micro-watershed communities.

5. Development Opportunities in the Area

5.1 Upper Watershed

The upper part of the micro-watershed sees large gully formations. It is largely covered with grassland which is supportive or provide conducive to livestock reproduction. Besides, the black *vertisol* entails a good potential crop production area. The micro-watershed has relatively steeper slopes which helps water flow to cultivated areas, though extraction of ground water is still necessary. Generally, the upland area of the micro-watershed is suitable to irrigation, livestock production for fattening, diary, poultry and honey production.

5.2 Lower Watershed

The lower part of the micro-watershed is a low-lying area similarly dominated by grassland and wetlands. The low-lying nature of the area means it is less affected by erosion. The area is also suitable for livestock production due available communal grassland, however, the

wetland area inhibits the growth of commonly grown crops. On the other hand, the edges of the wetland area are more fertile and have stronger potential for crop production, in addition to being suitable for rice cultivation. There are good experiences by some farmers engaged in livestock fattening and dairy farming, however, the scale up of such practices and experiences should be supported by access to or introduction of improved and locally adapted breeds and facilitated by credit and saving services. Doing so could enhance farmer incomes and generally improve the livelihood of the target community. The use of improved crop varieties and adoption of fruit trees, vegetables through agroforestry is also strongly recommended to improve the livelihood of the community.

5.3 Participation of Community in Sustainable Land and Watershed Management Practices

Effective watershed management requires participation of relevant stakeholders from the planning phases to monitoring and evaluation. As illustrated in Table 7 below, 97.9% of the respondent HHs have participated in different watershed management practices. More than 50% of the respondent HHs participated by contributing labour for preparation of seedlings and structures for improving infiltration of water to the ground (trench eyebrows check-dam terrace).

Type of participation of HHs	Responses	
	N	Percent
Labour: planting seedlings	56	39.2%
Labour: pitting	5	3.5%
Labour: trench eyebrows, check dam terrace	59	41.3%
Labour: soil stone bunds	23	16.1%
Total	143	100.0%

HH responses to questions about their contribution during project implementation, either in the form of cash or labour, indicate that farmers prefer labour (81.9%) over cash, and about 17% of respondents are willing to participate both by cash and labour (Table 8).

Table 8 shows the response of HH on the proportion of land holding allocated for different land use types. 76 HH allocated the maximum portion their land to agriculture followed by wood lots (56) and planting of fruit tree for commercial purpose (39).

Table 7 Estimated share of each land use area cover from HH's land possession

Land cover	N	Minimum	Maximum	Mean
Agriculture	76	.025	0.75	1.86053
Grazing	19	.125	.500	.20526
Forest	56	.063	.500	.19866
Fruit trees	39	.063	.625	.15224
Valid N (list wise)	7			

6. Project Goal and Impact

6.1 Project Goal

Contribute to improved community livelihood opportunities and enhanced quantity and quality of water following improvement of sustainable land and watershed services in Minzir 01 micro-watershed.

6.2 Project Impact

The project aims for communities and the environment to benefit from the intervention. Since environmentally and socially sound natural resources management activities (including water and livelihood improvements), small scale and micro irrigation, water resources development and management, water development for rural water supply and for livestock, livelihood development, pasture rehabilitation and incorporation of forage crops into pastures, development and compliance with grazing land management rules, etc. will be implemented. If all of these are implemented and managed properly, they will bring environmental, social and economic benefits to the community.

7.0 Project Financing

The input requirements for the project activities will be met as follows:

- WaterAid will cover staff salaries and make available its existing office and farm facilities, with funding via the subgrant from MWA/WRI
- The stakeholders, particularly farmers, will contribute part of the project cost in the form of labor, land, and other material support.

8.0 Project Components

8.1 Natural Resource Base Conservation and Rehabilitation

Soil and Water Conservation

In most parts of Ethiopia, soil erosion is a critical threat to agricultural production and ecological conservation. In Minzir 02, due to the lack of environmentally sustainable agriculture production practices, soil erosion in the form of land degradation is a priority problem. This has an effect on e Koga irrigation by increasing deposition of sediment. The geo-spatial distribution of land degradation indicates that, particularly in certain pockets of upper Minzir 01 micro-watershed, gully erosion and landslides are evident. The SWC component mainly focuses on the lower and middle parts of the pilot Minzir 01 micro-watershed where gully formation is prominent and is now affecting the river course, cultivated land and grassland. Based on field observation and an assessment the factors influencing land degradation, two major categories physical and biological SWC interventions are proposed:

Physical SWC

The physical SWC technologies and practices that should be considered include: soil bunds, stone bunds, Fanayajju, water ways, cutoff drains, Gabion check dams, loose stone CD(cut of drains), brush wood CD, Gabion + plastic + soil filled dams, sand bug CD, gully side reshaping, compost preparation, bench terracing, hillside terracing, maintenance of bunds, and hand dug wells. The recommended biological SWC are: gully vegetation, area closures, afforestation, bund plantation, grass strips, enrichment planting under existing natural vegetation, alley cropping, wood lots, protecting natural bush and shrub land. Among these, rehabilitation of gully and degraded lands, conservation and maintenance of boreholes and hand dug wells to improve water quality and quantity, and promotion of agriculture conservation are the priority.

8.1.1 Adoption of SWC, Awareness of Watershed Development & Sustainability

The importance of SWC structures to rehabilitate the degraded watershed requires understanding the existing physical and biological conditions of the area. Moreover, the consideration of stakeholders, particularly their knowledge, skill, and willingness to participate plays an important part in the sustainability of watershed development activities.

The perception of farmers about major environmental problems suggests that almost all HH perceived soil erosion to be a common problem in Minzir01 micro-watershed, particularly in the upper parts of the watershed.

On the other hand, the response of HHs, whether they have been practicing SWC indicated that most of the respondents noticed that they were practicing conservation measures in the watershed previously. However, farmers might not have equal exposure and experience in terms of different types of SWC practices. There were totally 46% who agreed to already practiced soil bund and Fanayajuu on their farm previously and others were also involved both in physical and biological conservation measures.

Table 8 Type of conservation measures already adopted by farmers

Conservation measures	Responses	
	N	Percent
Soil bund funyajju	72	46.2%
Cut off drain	9	5.8%
Check dam	13	8.3%
Artificial waterways	16	10.3%
Planting bunds gully	26	16.7%
Planting area closure	14	9.0%
Grassland management	6	3.8%
Total	156	100.0%

a. Dichotomy group tabulated at value

HHs were asked whether they perceive the benefits of different types of SWC practices. 95.7% of HH respondents expressed they do understand different SWC measures and do believe in their benefits.

The responses of farmers about whether HHs are able to maintain and conserve SWC measure on their own, indicates that 76.6% of the respondents believe there are limited resources and capacity to invest and maintain these conservation activities.

The HH survey (Table 10) asked about engagement in soil fertility practices.91.4% of the HH confirmed that they were already engaged and practiced soil fertility improvement measures on their farm and in the watershed.

Soil fertility improvement activities	Responses	
	N	Percent
Compost	85	91.4%
Manure	7	7.5%
Mulching	1	1.1%
Total	93	100.0%

15 HH in the downstream area also use irrigation given that their lands are close to Minizir River and only used limited seasons of the year.

Rehabilitation of Gullies and Degraded Land

Active gullies up to 8 meter deep and 50 meter wide are observable in the upper parts of the micro-watershed. The area affected by gully erosion is mainly on communal grazing land, uncultivated and cultivated land. According to the field study results, at least 2.1 km of gullies formed on the course of Minizir 01 river (where 1.3km located along Minzir 01 River and 0.8km length of gully along the course of tributary river) needs to be rehabilitated. The activities to be undertaken are upper catchment treatment, gully plugging, planting of fruit trees and perennial crops, construction of different check dams, reshaping and filling of gullies, re-vegetation, diversion of heavy run off and temporary area closure.

There were different SWC and water harvesting works proposed; Soil bund, stone bund, Fanya juu, water way, cutoff drain, Gabion check dams, loose stone CD, brush wood CD, Gabion + plastic + soil filled dams, sand bug CD, gully side reshaping, compost preparation, bench terrace, hillside terrace, maintenance of bunds and hand dug wells.

This sub-component will provide social, economic and environmental benefits such as: (i) increased area of cultivated land, (ii) improved forage resources and increased livestock production, (iii) high value perennial cash crops; and (iv) restoration of environmental assets. The project requires an estimated 2,581,938.00Birr which includes farmer training.

Promotion of Conservation Agriculture

This component should have multi-dimensional interventions that incorporate physical and biological conservation measures as well as water harvesting structures. The component could be implemented in all sub-catchments, including the upper watershed, bearing in mind the future potential for land degradation due to increasing population pressures. Moreover, substantial attention should also be given to the moisture stressed areas of the lower of the micro-watershed. Bench terraces and Fanya Juu structures should be implemented on two selected sites and on land slopes of between 10% and 16% across all sub-catchments, including about 1.2 km of terracing with annual/perennial croplands. Fanya Juu should be applied on 8%-15% sloped land to retain moisture, particularly between upper and lower of the micro-watershed.

Water harvesting and run-off management measures are suggested for the lower micro-watershed. Low cost micro-ponds can serve as supplementary water sources for high value backyard crops, as well as for livestock. This structure will be constructed around homesteads.

Biological conservation measures and soil fertility management should be part of the soil and water conservation interventions. These activities can include grass strips on flat to 15% sloped land, multi-cropping (intercropping and alley cropping), mulching, compost making, and area closure.

As the results of these interventions, the community will benefit from: (i) reduced soil erosion and sedimentation; (ii) retained soil moisture and improved fertilizer response which will increase crop productivity; (iii) increased cropland areas; (iv) improved microclimates, (v) improved soil fertility rates; and (vi) enriched water sources through the construction of storage facilities.

The outcome of the Focused Group Discussions (FGD) also revealed that the watershed development project in Minzir 01 watershed is timely as it has the potential to enhance the local economy of the watershed community by improving crop and livestock production and protecting environment resources from further degradation. Furthermore, community members also noted that watershed development will improve the infiltration of rainwater and enrich the ground water through increasing recharge of rainwater. In so doing, it has the potential to impact the livelihood of the community very positively. The watershed development activities including different soil and water conservation practices should be promoted based on different levels of knowledge and skill and on the value of indigenous soil and water conservation practices. Positive traditional practices should be improved also through the adoption of new lessons.

8.2 Capacity Building

8.2.1 Type of Capacity Building Activities Suggested by HHs

The household survey also asked about previously obtained capacity building trainings. 31 of the HHs have never received previous training. Of the remaining 63 HHs, most respondents explained that they received previous training in crop production (42.6%), while a significant number of respondents has been exposed both to natural resource management (42.6%) and livestock production (27.7%) training. The 31 HHs that have never received training before suggested a need for training be on fruit production, crop production and natural resource management.

Type of training received	Responses	
	N	Percent
Natural resource management	28	29.8%
Crop production	40	42.6%
Livestock production	26	27.7%
Total	94	100.0%

The survey also assessed training needs to be considered by the project. 43.3% and 38.1% of respondents expressed still needing crop production and natural resource management training respectively. In addition, the households suggested other more specific types of training such as on bee keeping and livestock fattening.

Types of trainings required in the future	Responses	
	N	Percent
Natural resource management	23	17.2%
Crop production	58	43.3%
Livestock production	51	38.1%
Train water resource management	2	1.5%
Total	134	100.0%

It is also crucial that farmers in the micro-watershed be engaged in different income generating activities to support and diversify their livelihood. So that, the maximum number of (67.3%) HHs planned to participate in fattening, while 14.3% and 16.3% were to participate in dairy farming and fruit production respectively. Poultry, fattening and off farm activities were also suggested means of income generating activities suggested by respondents.

Type of livelihood activities	Responses	
	N	Percent
Fattening	66	67.3%
Dairy farming	14	14.3%
Fruit production	16	16.3%
Off farm activity	2	2.0%
Total	98	100.0%

8.3 Estimated Costs

The table below displays an estimation of labor and material cost for sustainable land and water resources management practices in Minzir 01 micro-watershed.

Table 1. Labor cost estimation

S/N	Activities by component	unit	Implemented till 2022 (baseline)	Remaining work (future plan 2023-2024)
1.	**Physical SWC measures**			
1.1	Soil bund	km	120	25
1.2	Stone bund	km	100	20
1.3	Fanya jju	km	-	6
1.4	Water way	M3	175	200
1.5	Gabion check dam	M3	-	160
1.6	Loose stone CD	M3		160
1.7	Brush wood Cd	M		320
1.8	Gabion+ plastic+ soil Filled CD	M3		160
1.9	Sand bag CD	M3	-	50
1.10	Gully side reshaping	M3		180
1.11	Compost preparation	M3	1000	1830
1.12	Maintenance of bunds	km	-	20
1.13	Hand dug well	NO	7	30
2.	**Biological SWC Measures**			
2.1	Gully vegetation	ha	2	8
2.2	Area closure	ha	6	6
2.3	Afforestation	ha	3	4
2.4	On bund plantation	ha	-	56
2.5	Grass strip	km	-	50
2.6	Enrichment planting under existing natural vegetation	ha	2	2
2.7	Alley cropping	Km/ha	-	30
2.8	Wood lots	ha	10	10
2.9	Protecting natural bush and shrub land	ha	2	2
3.	**Livestock production**			
3.1	Fattening	No	50	75
3.2	Dairy farming	No	10	150
3.3	Bee keeping	No	25	50
3.4	Poultry production	No	55	90
4.	**Crop and fruit production**			
4.1	Provision of vegetable seed	Kg	-	5
4.2	Provision of mango fruit	No	-	400
4.3	Provision of Avocado	No	-	400
4.4	Provision coffee seedling	No	-	400

Table 2 Material cost estimation

No	Item	Unit	Amount	Unit cost	Total cost
1	Gabion (3*1*1)	No	120	6600	792,000
	2*1*1	No	100	4768	476,800
	1*1*1	No	32	2680	85,760
	2*1*0.5	No	24	3570	85,680
	1*1*0.5	No	24	1937	46,488
2	Gabion wire	meter	160	30	4,800
3	plastic	meter	660	150	99,000
4	Bags	No	50	30	1500
5	Stone	M3	320	733	234,560
6	Avocado fruit	No	400	80	32,000
7	Mango	No	400	80	32,000
8	coffee	No	400	100	40,000
9	Rodess grass	kg	5	-	-
11	Rhumnus	No	30000	-	30,000
12	Forest seedling transportation cost	No	750000	-	2,000
13	Vegetable seed	kg	5	1000	5,000
14	Sapde	No	25	500	12,500
15	Shovel	No	30	450	13,500
16	Hummer	No	5	900	4,500
17	Digino	No	5	450	2,250
18	Clinometer	No	3	1200	3,600
19	GPS	No	2	25000	50,000
	Subtotal				**2,053,938**

Table3. Capacity building plan

Type of training required	Participants by type	No of trainees	Per dime	No of days	Total cost	Remark
Natural resource management	Experts	5	500	10	5000	
Crop production	Experts	5	500	10	5000	

Livestock production	Experts	5	500	10	5000	
Water resources management	Experts	5	500	10	5000	
Natural resource management	Farmers	10	300	10	3000	
Crop production	Farmers	10	300	10	3000	
Livestock production	Farmers	10	300	10	3000	
Water resources management	Farmers	10	300	10	3000	
Alternative energy sources	Farmers	25	300	10	3000	
IGAs	Farmers	25	300	10	3000	
Experience sharing	Experts +farmers	110	400	10	440000	
Subtotal					**478,000**	

Table 4. Operational cost

S/N	Item	Total (Birr)
1	Office materials	50,000
2.	Per diem	478,000
	Sub total	**528,000**
	Grand total	**2,581,938 ETB**

N.B The cost of labour for farmers is omitted after comments and feedbacks forwarded during presentation at Regional Office (Bahir Dar).

9.0 Beneficiaries

The farming communities within the Minzir 01 micro-watershed will directly benefit from the project interventions and outputs. Furthermore, downstream communities beyond the watershed areas are likely also to benefit from the soil and conservation interventions. The project will also be beneficial to local communities who are experienced in different income generating activities like petty trades and micro business activities. .

Water resource development projects downstream of the intervention (including Koga Dam) will benefit from better water quality, reduced sediment load, more regular flows and better flood control.

Benefits

Communities in Kurt Bahir Kebele and the Koga watershed that reside within the boundary of the basin will be the main beneficiaries of this project.

Economic Benefits

- Short-term job opportunity from nursery site activities, gabion meshing, etc.(income generation)
- Long term job opportunity by organizing the local youth, women and the unemployed to oversee the area closures (income generation)
- High production and productivity
- Accessibility of quality water for domestic and livestock consumption in their vicinity
- Extra land for agricultural activities from rehabilitated gullies

Social Benefits

- Accessibility to markets delivers agricultural products to the market.
- There will be a decrease in distance to fetch water, access of quality water will be improved

Environmental Benefits

- Reduced erosion
- Increase vegetation cover through planting degraded areas
- Reduced silt load in water bodies and dams
- Increased spring potential
- Improved pasture for livestock

10.0 Implementation Plan

10.1. Sub-Project Cycle for Micro-Watershed Development

The design process for the intervention in Minzir watershed (approximately 710 ha) should be at a micro-watershed level (Minzir 01 micro-watershed~400ha) which covers an area between 200 and 400ha. The project design process should select sub-basin areas categorized under micro-watershed levels which will follow the following processes:

- ✓ Planning and implementation following the Community Based Participatory Watershed Development National guideline;
- ✓ Integration of all activities considering environmental, economic and social issues;
- ✓ Enhancing government development strategies and work within the available development structures;
- ✓ Enhanced community participation at all stages of project implementation, i.e. planning to monitoring and evaluation;
- ✓ Implementation following ridge to valley watershed development logic, where land treatment starts at the water divide and ends at the watershed outlet;
- ✓ Micro-watersheds organized in a manageable size (average 200-500ha);
- ✓ Organize a watershed committee of 10-12 people for each micro-watershed;
- ✓ Develop and implement community action plans to be led by the elected community watershed community.

The measures for prevention, mitigation and rehabilitation of land degradation and restoration of ecosystems services that could be used in the watershed depend on the biophysical and socioeconomic contexts. These fall into the following four categories (WOCAT, 2007):

1. Agronomic measures: measures that improve productivity (e.g. improved seed, crop rotation); measures that improve soil cover (e.g. green cover, mulch); measures that enhance organic matter / soil fertility (e.g. manuring); soil surface treatment (e.g. conservation tillage); subsurface treatment (e.g. deep ripping).
2. Vegetative measures: plantation / reseeding of tree and shrub species (e.g. live fences; tree crows), grasses and perennial herbaceous plants (e.g. grass strips).
3. Structural measures: terraces (bench, forward / backward sloping); check dams, cut off drains, bunds banks / level, graded); dams, pans; ditches (level, graded); walls, barriers.

4. Management measures: change of land use type (e.g. area enclosure); change of management / intensity level (e.g. from grazing to cut-and-carry); major change in timing of activities; control / change of species composition.

Any combinations of the above measures could be possible depending on the biophysical and socio-economic situations of the Minzir 01 micro-watershed. The choice of technical options relevant to each micro-watersheds will be made during the process of micro-watershed planning and implementation in consultation with the sector experts, farming communities and local administrations taking into consideration the available traditional knowledge, resources availability and the ecosystem context.

In each micro-watershed, a multidisciplinary planning team should hold participatory consultations with the target communities to identify the actions to implement in the target area as well as the delivery mechanisms to employ, based on the available 'basket of options'. The basket of options covers a broad range of measures under diverse themes, e.g., agriculture, livestock, forestry, and renewable energy. The consultations will be thorough and inclusive to maximize ownership by communities. Consultations will be conducted for women and men separately.

Given these aims and the importance of achieving sustainable solutions, the project has been designed with the following considerations:

Community and individual assets are sustained where they are sufficiently valued by the community and individuals and there is the technological and financial capacity to maintain them.

Asset value reflects both a sense of ownership (either legal and/or having been involved in the development of the asset) and the returns of that asset on investment (cash or kind).

Most improvements to the landscape require some degree of cooperation amongst the community and sustainability hinges also on the institutional capacity within the community to manage and maintain a shared asset.

Households have too little cash to consider anything beyond meeting their most immediate needs and the reality is that their labor is the only investment that is practically available to them. However, under prevailing cultural and socio-economic conditions, labor is a scarce resource and household and community investment choices will be primarily determined based on the returns to their labor.

Given the significance of labor, measures to increase labor availability and productivity through improved health will contribute to the overall project aims (with obvious wider impacts on the communities' well-being as well).

The communities, individually or collectively, have the greatest stake in developing their own livelihoods and must be in the driving seat from the outset in determining what should be done to improve their lot (aided by sound advice and within the project's mandate).

Notwithstanding this central role of community, replicability will hinge on the public sector's ability to manage the investment program and transfer the processes and lessons learnt from one watershed to the next.

Table 14 Summary of proposed Watershed Implementation Plan

		2022	2023	2024
1	**Project establishment**			
	Awareness creation and training program			
2	**Agricultural Services**			
	Tropical fruit production			
	Follow up/monitoring			
3	**Forestry**			
	Transporting seedling			
	Planting			
4	**Soil and Water Conservation**			
	Survey and studies			
	Upper catchment treatment			
	Area closure			
	Gully rehabilitation			
	Gully re-shaping			
	Different check-dams construction			
	Planting			
5	**Potable Water Supply Improvement**			
	Small hand dug wells			
	Water harvesting & runoff management			
	Development of springs			

11.0 KEY PROJECT ASSUMPTIONS AND RISKS

11.1 Specific Assumptions and Risks

There are various assumptions and risks that may affect the efficient and timely implementation of the project:

The critical assumptions include the following:

- Stakeholders remain supportive and willing to support and implement the project;
- The project provides adequate provisions for capacity building activities for all levels of stakeholders;
- The project makes available adequate and timely financial and technological support;
- The project provides adequate institutional development activities for all levels of the hierarchy including farmers, Kebele personnel;
- Effective participation of prospective beneficiaries.

Risks:

- Unwillingness of the beneficiaries to participate in project activities and provide contributions (labor or cash) for the construction of soil and water conservation measures and other rural infrastructure.
- Inadequate capacity and shortage of funds for program implementation.
- The lack of collaboration and cooperation between the relevant government and non-government organizations engaged in project activities which would seriously impede the delivery of equipment, materials and services.
- Poor/ineffective participation of prospective beneficiaries therefore holds one of the keys to project success.

During KII, the interviewees also pointed out that there needs to be increased participation of woman, poor and youths in various capacity building and skills and knowledge related to watershed management and so that equity of participation of different segments of the watershed community can be assured. This will help the sustainability of the watershed development intervention and develop trust and worthiness of development works in the watershed.

11.2 Institutional

A major institutional challenge is the limited technical support and training provided to the farmers on the planning, choice of technologies, implementation and maintenance. This is firstly due to the limited number and capacity of the experts in the respective sector offices(agriculture, natural resource and water resource). The physical soil and water conservation activities should be complemented with technologies that improves the productivity of their lands and improve their livelihoods. A menu of alternative technologies that could be easily learned and adopted by farmers needs to be identified, demonstrated and made available.

11.3 Environmental

Possible negative environmental impacts also pose a risk. To ensure program sustainability, measures mitigating negative environmental impacts should be introduced, once the problem has been identified and quantified. Above all, training and raising awareness on preventive measures need to be given early, before situations get out of control.

12.0 Institutional and Implementation Arrangements

The micro-watershed is found in upstream of the Koga dam, located to the north-west of the Lake Tana. The Minzir 01 micro-watershed is shared between Minzir 02 micro-watershed and neighboring sub-basins in Kurit Bahir kebele.

Implementation of the programm will take place within existing framework and management structures, including the extension system of the Ministry of Agriculture and the Regional Bureau of Agriculture. The program should consider federal, regional, zonal, woreda (district) and kebele (peasant association) systems.

At Federal Level:

The project consortium includes WRI, MWA, and ABDO, and WaterAid will need to cooperate with these organizations during implementation. Moreover, cooperation must be sought with the Basin Development Authority, the Directorate of Integrated watershed management and River Training cooperate as to ensure alignment. Within WaterAid's national coordination, a team will be established for oversight and major decision making. This team will review and approve annual work plans, performance monitoring plans and quarterly and annual progress reports; oversee bi-annual joint review and implementation support missions, identify and promote implementation and adoption of best practices, ensure that activities are well coordinated with

other development programs, and ensure that interventions are carried out and measures taken that will result in program sustainability. WaterAid will be responsible for overall coordination, planning, monitoring, and reporting on implementation performance.

Regional Level:

At the regional level, WaterAid should coordinator together with Abay Basin/Tana sub-basin administration offices, and the Amhara regional bureaus. These, along with the North Mecha Woredas officials, will play an important role in monitoring and evaluation of Woreda level activities.

Woreda Project Steering Committee:

The North Mecha Woreda Agriculture Office will be the key Agency to work with the executive WaterAid focal person at the woreda level (ABDO, and WRI). Woreda level expertise from the agriculture, natural resource extension service, and water department are key committee members to work with during the project implementation. The members will be all relevant offices in the woreda (agriculture, water, environment, health, education, women affairs, etc.). The main responsibility of the Committee will be to effectively implement and oversee the project activities within Minzir 01 micro-watershed. Subject Matter Specialists will also be assigned from the sector departments, including micro-watershed expert, agronomist, livestock expert, water resources expert, and forester. The teams will be responsible for day-to-day implementation of the project at individual watershed level.

Kebele Watershed Committee:

To ensure proper coordination and supervision Minizir 01 micro-watersheds located within the boundaries of the Kurit Bahir Kebele, a Kebele Watershed Committee need to be established as the main focal point for the project support. To ensure that the Kebele watershed committee is established as an effective and representative institution with sufficient authority, the Kebele Watershed Committee will be chaired by the Chairman of the Kebele Council with wide representation from the community and local government bodies.

Community Watershed Committee:

A Community Watershed Committee will be established at sub-watershed level. This committee will be important to ensure effective project planning and successful implementation and sustainability of outcomes. The project recognizes that user groups are the fundamental

institutional building block. Religious leaders, male and female representatives, and your representative from each micro-watershed will be included in the Community Watershed Committee.

Other Important Institutions:

Other important institutions that are relevant to the success of the project are the following:

- ❖ Bahir Dar University and Injibara University: Both universities can play a role as a source of training and provide a wide range of researchers. The researchers could provide expertise, identify relevant technologies and conduct baseline and endline studies.

13.0 Monitoring and Evaluation

13.1 Monitoring

During the implementation stage, progress of activities will be monitored continuously so as to take timely corrective action when there is any deviation between the plan and actual accomplishment. It mainly focuses to ensure if the project resources/inputs need changing to planned outputs as efficiently as possible in addition to monitoring project results. The project staff and the intended beneficiary community will take the leading role to follow up the day to day progress of the project.

13.2 Evaluation

Project evaluation will be undertaken periodically in a participatory manner to ensure the achievement of the set objectives. In terms of time frame, a mid-term evaluation, end line/terminal evaluation and impact evaluation will be conducted for the proposed project based on the maturity of the project intervention results.

The need for effective participatory monitoring and evaluation is increasingly recognized as an indispensable tool for effective program/project management. Participatory monitoring and evaluation also provide a basis for accountability in the use of development resources. Given the greater transparency now expected from the development community, governments and agencies assisting them need to respond to calls for more "success on the ground" with examples of development impact. When used carefully at all stages of the project cycle, participatory monitoring and evaluation can help to strengthen project design and implementation, stimulates partnership with project stakeholders, and incorporate views of stakeholders. Participation by project beneficiaries in design, implementation and monitoring and evaluation brings greater

"ownership" of project objectives and encourages the sustainability of project benefits. Ownership brings accountability. Objectives should be set and indicators selected in consultation with stakeholders, so that objectives and targets are jointly "owned". In general, the active involvement of key stakeholders with special emphasis to beneficiary community has utmost importance for efficient and effective management of the project.

13.3 Reporting

Project progress will be communicated to key stakeholders through periodic reports. Monthly, quarterly, midyear and annual reports will be prepared by WaterAid to MWA and WRI based on the agreed reporting formats. While monthly and quarterly reports will focus mainly on processes or activities, midyear and annual reports focus on results. In each periodic report, both physical and financial progress will be prepared on the basis of the approved work plan and budget. On top of this, mid-term, end line/terminal evaluations and impact assessment reports will be produced and communicated timely to key stakeholders of the project.

14.0 MEASURABLE INDICATORS

- Crop production and productivity increased
- Soil erosion minimized
- Water quality and quantity improved
- Household energy consumption from cow dung replaced by fuel wood
- Household income and living standard improved
- Extent of rehabilitated land increased
- Areas under soil conservation measures increased
- On-farm tree density increased
- Burden on women for fetching water decreased
- Risk of total siltation of dams minimized

- Risk of extinction of forest species minimized
- Crop intensity increased

15. EXPECTED OUTPUT

- Soil and Water conservation structures constructed and maintained.
- Community maintenance and protection bylaws developed to SWC structures.
- Individual/ communal woodlots and alternative energy sources established
- Community watershed committee established and micro-watershed plan prepared
- Improved forestry and agro-forestry practices introduced
- Communal area closure practiced
- Water quality improvement practices will be trained
- Improved grassland management practice introduced
- Efficient seed supply system established
- Improved livestock species and crop varieties introduced
- Appropriate on-farm and off-farm technologies adaptable to Minzir 01 micro-watershed area introduced
- Irrigation and potable water supply schemes constructed
- Watershed management experts, development agents and farmers trained on integrated watershed management practices
- Farmers trained on improved agricultural management practices
- Women and Youth trained on alternative income sources
- Material support provided strengthen integrated watershed management practices
- Exchange visits organized for officials, experts and selected farmers.

Expected outcomes and impact

1. Increase ground water table
2. Increase stream discharge or increase Minzir and other stream flow period

3. Change in water quality
4. Reduced soil erosion and increase agricultural productivity
5. Reappearance of lost/new springs
6. Regeneration of endemic trees

15.1 Perception of Households on the Expected Benefits and Outcome of the Project Intervention

The household survey aimed also to assess the expected benefits of the project intervention on different livelihood and income opportunities for the concerned households. 46%, 15.5, 24.4% of respondents believed that NRM activities have the potential to protect their lands from erosion,15.5% believe the interventions could improve infiltration of water to the ground, and 24.4% to increase crop production on their farmlands.

Table 15 what benefits is your household getting due to these NRM activities on own (or rented) lands?

Benefits from NRM activities	Responses	
	N	Percent
Erosion protection	90	46.6%
Water infiltration	30	15.5%
Prolonged increased stream flow	7	3.6%
Increased wood, fodder	15	7.8%
Increased crop productivity own land	47	24.4%
Increased HH income	4	2.1%
Total	193	100.0%

The household survey also traced previously implemented SWC activities. The households have been involved in multiple SWC works: about 44.4% practiced both physical and biological conservation, while 26.2% and 11.5% practiced area closure and gully hillside treatment activities.

Natural Resource conservation activities	Responses	
	N	Percent
Implement SWC physical and Biological	81	44.3%
Gullies hillsides treated	21	11.5%
Plantations fodder hedges	17	9.3%
Area closures	48	26.2%
Grassland management	16	8.7%
Total	183	100.0%

REFERENCES

Legesse, Abiyot, Misikir Bogale, and Dereje Likisa. 2018. "Impacts of Community Based Watershed Management on Land Use/Cover Change at Elemo Micro-Watershed, Southern Ethiopia." *American Journal of Environmental Protection* 6(3): 59–67.

Mihret, Tenagne. 2019. "Assessment of Knowledge, Attitude, Practice and Retrospective Prevalence of Malaria among Individuals Visiting Merawi Primary Hospital, Northwest Ethiopia." PhD Thesis.

Yeshaneh, Eleni, Jose Luis Salinas, and Günter Blöschl. 2017. "Decadal Trends of Soil Loss and Runoff in the Koga Catchment, Northwestern Ethiopia." *Land Degradation & Development* 28(6): 1806–19.

Annex 1

Questionnaire

CONSULTANCY SERVICE FOR BASELINE ASSESSMENT AND SURVEY IN THE KOGA LANDSCAPE

Issue: Consultancy Service of Baseline Assessment and Survey in the Minzir 01 micro-watershed under the consent of WaterAid/WRI Sustainable land and watershed management to Enhance landscape biophysical conservation and improve livelihood diversification.

Good morning/afternoon! My name is_____, and I am working for B.M.TK Environmental Consultancy Plc. to study the Minzir 01 micro-watershed of WaterAid project. We are conducting a baseline study to understand the current situation of the area in relation to the DFSA/IWM project. You are being asked to participate in this survey because of your important role as a participant/beneficiary of the project or resident of the project area. I will ask you a series of questions that would take about 1 hr. Your name and responses will remain confidential and be analyzed together with the responses of others, solely for the purpose of this study. We expect you to answer all questions truthfully. It is your choice whether or not to take part in this interview and if you choose to participate, you have the right not to answer any question or to stop the interview at any time. If you don't choose to participate, it will in no way impact your relationship with the project. Before we begin; do you want to ask me any questions about the survey?

I continue in asking you each question.

Questionnaire for the Household Survey

Household Identification

1. Woreda_____Kebele: _____Village: _____HH ____
   Code_____(Upper or Lower of Minzir 01 micro-watershed)
2. Date of interview _____, Enumerator _____, Mobile No._____
3. Name of the household head: _____
4. Sex of the HH head: 1) Male 2) Female
5. Age of the household head: _____
6. Marital status of the HH head: 1) Single 2) Married 3) divorced 4) widowed
7. The educational level of the HH head: 1) Illiterate 2) Read & Write 3) Grade____
8. Family size: Male_____ Female _____Total_____
9. Number of family members in the active labor age (15-64 years):_____

I. Participation of Community and sustainable land and watershed management practices

1. Do you participate in practices concerned with the watershed management?

   1. Yes 2. No

2. If yes in the above question in which of the following watershed management activities do you participate

   1. Labour; planting of seedlings
   2. Labour; pitting
   3. Labour; trench, eyebrows, check dam, terrace
   4. Labour; soil and stone bund construction
   5. Money contribution(rent labour)

3. What will be the community contribution in the project implementation?

   (a) Labour ( ) (b) Cash ( ) (c) Both ( )

4. If in cash how much per household?

   (a) 500/= ( ) (b) 1,000/= ( ) (c) 5,000/= ( ), if more State…….

5. Is there women's/youths participation in the watershed committees (CWCs) during planning and identification of activities? _____

II. Issues related to spring water and/ meter of ground water sources

1. What is the main source of drinking water for members of your household during the wet season? 1) hand dug wells, 2) borehole, 3) spring, 4) river/stream, 5) tape water
2. How long does it take to fetch domestic water (including queue and a round trip in minutes) during wet season in minutes?
3. Where do you get water for domestic use in dry season?

   1) hand dug wells, 2) borehole, 3) spring, 4) river/stream, 5) tape water

4. How long do you travel to fetch water during the dry season? (in hour)

4. Most of the time who is fetching water for domestic use in the family?

   1) Women 2) Girls 3) Boys 4) Men

5. How often do you get domestic water from the source for your household?

   1) 24 hours in a day 2) certain hours in a day

   3) every other day 4) every three or more days 5) irregular

6. How many liters of water do you bring to home per day for domestic use? _____ (1 jerican =20 lt) (drinking, cooking, bathing, cloth washing and utensil washing in Lt/day)

7. Do you expect that, the quantity of your domestic water supply improve from what will be after the project? 1) Yes 2) No
8. Do you expect that, quality of your domestic water supply improve from what will be after the project? 1) Yes 2) No
9. How do you see the contribution of watershed management activities in terms of improving the supply of domestic water? (Multiple responses possible)

   1) No watershed management activities in the area

   2) Prolonged the duration water supply from source 3) increased quantity of water available

   4) Constructed water points 5) depleted the water resource of the watershed

   6) No positive or negative contribution

10. Is the streams in Minzir 01 watershed perennial (flow constantly), intermittent (may dry up) or ephemeral (flow only during or shortly after a rainfall event)?

III. Adoption of SWC, awareness of watershed devt and sustainability issues

1. What is the total hectare of land targeted for the intervention; where different soil and water conservation activities will be applied out of the whole micro-watershed?_____

3. Is soil erosion a major problem on this micro-watershed?
   1) Yes 2) No
4. Have you been practicing soil conservation activities on your land within the watershed?
   1) Yes 2) No
5. If yes, tell us which of the following conservation measures you accomplished previously **(**Multiple answers):

1) Soil and fanaju bund 2) Cut off drain 3) Check dam
4) Artificial waterways 5) Planting on bunds and gully sides
6) Planting on area closure 7) Grass land management 8. Other (Specify)_____

6. Do you believe on the benefits of implementing integrated SWC measures to rehabilitate degraded watersheds?
   1) Yes 2) No

13. Do you have the capacity to maintain this Conservation works especially after sponsors or donors phase out?

(a) Yes ( ) (b) No ( )

14. If you do not have the capacity where do you get assistance in case there is break down of the system……

15. Does the community contribute any user fees to cover operations and maintenance services?

a) Yes ( ) b) No ( )

16. If yes how much ……

17. Do all people contribute the same amount? (a) Yes ( ) (b) No ( )

18. Is the amount collected enough to cover the operations and maintenance services?

(a) Yes ( ) (b) No ( )

19. If not where do you get extra money to cover the operations and maintenance of the system …….

20. Soil fertility improvement technologies and practices:

1 Compost __, __, __
2 Manure __, __, __
3 Mulching __, __, __
4 Others (specify) _____ __, __, __

21. Is there any irrigation facilities or irrigable land owned by the HH? 1) Yes 0) No

22. If yes in question 21, what is the size of land under irrigation? _____

V. Expected benefits and outcomes

22. What benefits is your household getting due to these NRM activities on own (or rented) lands?

1) Erosion protection
2) Water infiltration
3) Prolonged/increased stream flow and spring discharge
4) Increased wood & fodder production
5) Increased crop productivity of own land
6) Increased HH income; 7) nothing; 8) other specify

23. What are the benefits you get from watershed management activities (multiple responses are allowed);

1) Erosion protection 2) Water infiltration
3) Increased wood & fodder production 4) Prolonged stream flow and spring discharge
5) Increased crop productivity of own land 6) Increased HH income
7) Convert waste land to productive land; 8) Nothing; 9) Other specify

29. Which of the following natural resources conservation activities are implemented/ constructed on communal lands in your village or watershed? (These works can be done through cash for work, labour, community free labour or by other agency)

1. SWC measures (physical & biological)	1= Yes 0=No
2. Gullies and hillsides treated	1= Yes 0=No
3. Plantations and fodder hedges	1= Yes 0=No
4. Area closures	1= Yes 0=No
5. Grass land management	1= Yes 0=No
6. Community level water-harvesting /irrigation structures	1= Yes 0=No

30. What type of training do you receive before?
    1) Natural resource management 2) Crop production 3) Livestock production 4) others
31. What type of training do you need in the future
    1) Natural resource management 2) Crop production 3) Livestock production 4) water resource management 5) alternative energy source 6) others(specify)
32. What type of livelihood/income generating activity do you participate before
    2) Fattening 2) Diary farming 3) fruit production 4) off farm activity 5) others(specify)
33. What type of livelihood activity do you plan to participate
    1) Fattening 2) Diary farming 3) fruit production 4) off farm activity 5) others(specify)
34. What is the average annual income of the household from on-farm?_____ and off-farm activities?_____

VI. Key informant interview: Woreda/Kebele/watershed Expertise (KII)

1. Is there any capacity building /training done to the community/project leaders (woreda/ watershed actors) to enable them sustains project interventions? 1=Yes 0=No
2. What kind of training? _____, _____ _____, _____, _____
    1) What kind of training do you need?
    _____
    _____
    _____
    2) Do you think the community have been empowered enough to carry on the project activities? Give reasons.
    _____

_____

_____

3) Why some of the development projects fail after the expiry period of funding?
4) Who in your household participated in most of the trainings provided by the project?

1) Husband 2) Wife 3) both

5. Does the project contribute to improve women participation, resource ownership and decision making role in the household and the community? 1) Yes 2) No

Focused group discussion

1. What will be the relevance of the project to Minzir-01 micro watershed?

_____

_____

_____

2. What are the activities proposed or already implemented for successfully managed the watershed?

_____

_____

_____

3. Is there activities proposed strategies for the proper utilization of water resource for irrigation, livestock and domestic consumption?

_____

_____

_____

4. What are the strategies designed on water resource utilization to cope climate change?

_____

_____

_____

5. What are the opportunities that the community consider to diversify its livelihood through the use of the watershed's resources?

_____

_____

_____

Annex 2 Focus group discussion of HHs and enumerators