german cooperation
DEUTSCHE ZUSAMMENARBEIT

Implemented by

giz Deutsche Gesellschaft für Internationale Zusammenarbeit (GIZ) GmbH

ግብርና ሚኒስቴር
MINISTRY OF AGRICULTURE

Ethiopia:

Experiences and Lessons in Sustainable Land Management (1980–2020)

Ethiopia: Experiences and Lessons in Sustainable Land Management (1980–2020)

Published by the
Deutsche Gesellschaft für Internationale Zusammenarbeit (GIZ) GmbH

Registered offices
Bonn and Eschborn, Germany

Climate Sensitive Innovations for Land Management (CLM) Programme
Addis Ababa, Ethiopia
P.O. Box 100009
T +251-(0)11-5180 200
F +251-(0)11-5540 764

giz-aethiopien@giz.de
www.giz.de/ethiopia

As at September 2022

Editing, design and layout
Scriptoria Ltd

Photo credits
© GIZ

On behalf of the German Federal Ministry for Economic Cooperation
and Development (BMZ)

Contents

Preface xi
Acknowledgements xv

Chapter Overview xvii

1. Executive Summary 1

2. Natural Resources Management in Ethiopia: History and Dynamisms 9

2.1. Indigenous NRM in Ethiopia 10
2.1.1. Local practices 10
2.1.2. Traditional/informal institutions 11
2.2. Natural Resources Degradation and Project-based Interventions 11
2.2.1. Major focus and scale of interventions 11
2.2.2. Approaches to community mobilisation and resource use 14
2.2.3. Key development actors and their experiences 15
2.3. From Soil and Water Conservation to Integrated Watershed Management: The Role of Development Support Programmes 16
2.3.1. German Development Cooperation (GDC) and its support to NRM 16
2.3.2. WFP's MERET project 18
2.3.3. Farm Africa – SOS Sahel and participatory forest management 19
2.3.4. Experiences of USAID-funded Amhara Micro-enterprise development, Agricultural Research, Extension and Watershed management (AMAREW) project 20
2.3.5. REST and its soil and water conservation interventions 21
2.4. Community Participation and Resource Mobilisation 22
2.5. Standardisation of Participatory Planning Methods and Processes 24
2.6. Dynamism of SLM 26
2.6.1. Ethiopia Strategic Investment Framework for Sustainable Land Management (ESIF) 26

2.6.2. SLMP coordination mechanism: interagency and development partners 27
2.6.3. Partnership among stakeholders: technical and financial cooperation 29
2.6.4. Role of community participation and legalisation of watershed user associations (WUAs) 31
2.6.5. Towards scaling up through Climate Action and Landscape Management Performance for Results 32

3. Land Management: Critical Planning Steps and Processes 35
3.1. Selection and Prioritisation of Intervention Watersheds 36
3.1.1. Key considerations during selection and prioritisation of intervention watersheds 37
3.1.2. Role of stakeholders in selection of intervention watersheds 39
3.2. Technical Characterisation of Watersheds: Participatory Assessment of Biophysical Conditions 42
3.2.1. Delineate watershed boundary and estimate size of the watershed for intervention 43
3.2.2. Identify and describe the major natural resources and their uses 44
3.2.3. Determine the conditions of the natural resources base: qualitative and quantitative assessments 46
3.3. Understand the Social and Economic Contexts of the Watershed 49
3.3.1. Identify major farming practices and their seasonality 50
3.3.2. Identify relevant social practices: population, labour availability and gender 52
3.4. Identify and Prioritise the Major Problems and Respective Solutions 53
3.5. Preparation of the Watershed Development Plan: Its Components 55
3.5.1. Preparation of watershed vision map 55
3.5.2. Action plans: possible land management measures 56
3.5.3. Financial and non-financial resource mobilisation strategy 57

3.6. Quality Assurance Through M&E in SLM 71
3.6.1. Overview of developments in the concept and practices over time 71
3.6.2. Quality assurance approaches and tools adopted 73
3.6.3. Use of planning and reporting tools 75
3.6.4. JMM and guidelines for quantity and quality management 76
3.6.5. Technical review and steering of project by MoA and development partners 77

4. Land Management Measures: Technologies, Practices and Approaches 85
4.1. Degraded Land Restoration: Structural Measures 86
4.1.1. Bund, terrace and trench construction 88
4.1.2. Gully erosion control 95
4.1.3. Flood water harvesting and sediment storage 102
4.2. Degraded Land Restoration: Biological Measures 104
4.2.1. Nursery establishment and identification of input sources 105
4.2.2. Bund and terrace stabilisation 107
4.2.3. Gully revegetation 109
4.2.4. Forestry and agroforestry 110
4.3. Degraded Land Restoration: Agronomic Measures 114
4.3.1. Composting 114
4.3.2. Rapid composting: vermiculture and vermicompost 114
4.3.3. Green manures and cover crops 117
4.3.4. Reclamation and sustainable use of acidic soils 119
4.4. Land Management Measures: Adoption, Benefits and Lessons 122
4.4.1. Adoption of land management technologies and practices 122
4.4.2. Benefits gained from implementation of land management measures 123
4.4.3. Lessons learned during implementation 130

5. Enabling Environment for Sustainable Land Management 133
5.1. Farmland Productivity Enhancement Interventions 135
5.1.1. ISFM for improved productivity 135
5.1.2. Selecting ISFM technologies 136

5.2. SSI Development for More Benefits 137
5.2.1. SSI development techniques 138
5.2.2. Practices to enhance water use efficiency 141
5.2.3. Lessons learnt and recommendations 143
5.3. Adding Value to Rehabilitated Watersheds 144
5.3.1. Value addition in rehabilitated gullies 144
5.3.2. Income-generating activities 146
5.3.3. High-value crop production: avocado production and management 152
5.4. Backyard Livestock Management System 158
5.4.1. Natural resources protection and development 160
5.4.2. Improving forage development/supply 163
5.4.3. Improving soil fertility and productivity 167
5.4.4. Improving soil moisture and ground water 169
5.4.5. Improving crop production and productivity 169
5.4.6. Improvements in livestock resource development 170
5.4.7. Improving livestock health 171
5.4.8. Improving reproductive potential of livestock 171
5.4.9. Destocking and creating equity in the use of grazing land 172
5.4.10. Social benefits of backyard livestock farming: reducing conflict 172
5.5. Participatory Forest and Woodland Management 172
5.5.1. Resource targeting 174
5.5.2. Stakeholder analysis and beneficiary targeting 175
5.5.3. Resource survey and establishing benchmarks 175
5.5.4. Forest management and its benefits 175
5.6. Strengthening Local Institutions for Watershed Governance 182
5.6.1. Key roles of watershed-level institutions 182
5.6.2. Community bylaws for sustainable watershed development 182
5.7. Land Administration and PLUP for Watershed Development 183
6. Scaling Up of SLM: Experiences 185
6.1. Piloting Innovative Approaches and Practice 187
6.2. Documentation of Proven Practices 190

6.3. Capacity Development 194
6.3.1. Strengthen the capacity of local organisations 196
6.3.2. Strengthening technical competence of extension workers through training and the training delivery system 199
6.4. Scheduling and Budgeting 205
6.4.1. Financing scaling up of SLM practices 206
6.5. Learning and Networking 208
6.6. Success Factors for Scaling Up 212
6.6.1. Lessons learnt 213
6.6.2. Issues for future consideration 214
7. Emerging Issues in Sustainable Land Management 215
7.1. Digitalisation of Agricultural Extension Advisory Services 217
7.1.1. National Digital Agricultural Extension Advisory Stakeholders' Forum 218
7.1.2. Mobile app-based training management system 219
7.1.3. Natural resource podcast 220
7.1.4. Video-based extension services 221
7.1.5. Agricultural performance tracking tool 224
7.2. Management Information System in the Agriculture Sector 226
7.2.1. Woreda information centres 226
7.2.2. Codification of watersheds for standardised communication 227
7.3. Sustainable Financing 229
7.3.1. Payments for ecosystem services (PES) 230
7.3.2. Managing rehabilitated areas through income and livelihood development 232
7.4. Improving Framework Conditions for Community Resource Governance 251
7.4.1. Need to address grazing management 251
7.4.2. Key features of the proclamation for WUAs 252
7.4.3. Key achievements and lessons learnt 254

Preface

It is an honour and a privilege for me to write the preface to this book, as the work is crucially important for the Ethiopia Natural Resources Management Sector.

In the Ethiopian Highlands, a combination of climate factors, rugged terrain and the removal of the vegetation cover results in soil erosion and surface runoff. This has become a real problem as it reduces the productive capacity of the land. The Ministry of Agriculture (MoA) has realised this and is actively engaged in sustainable land management (SLM) to curb the effects of soil and nutrient loss. To date, most land management activities have been based on MoA-initiated interventions, with technical and financial support from development partners and with the active participation of local communities. I would like to take this opportunity to appreciate and acknowledge these development partners, including the World Bank, the International Fund for Agricultural Development, the European Union, the German Federal Ministry for Economic Cooperation and Development and the governments of Canada, Finland, Germany and Norway for their unreserved assistance in the implementation of SLM in Ethiopia.

The main problem with reversing land degradation in Ethiopia has not been the lack of land management technologies, but the failure to motivate and engage farmers and communities to actively embrace SLM activities. A different, more farmer-centred approach, with a more participatory method of developing technically, socially and financially appropriate watershed management approaches, is crucially needed.

This book elaborates the advances in implementing SLM in Ethiopia since the start of the soil and water conservation programmes in the 1970s. The book provides insights into the evolution of SLM, the implementation processes, institutional arrangements and the practices and approaches followed over the past 50 years. Furthermore, it highlights the lessons learned and experiences gained in pilot SLM watersheds that can be scaled out to landscape and basin level in the future.

This compendium of SLM implementation in the Ethiopian Highlands allows for a better understanding of how to integrate land management into the sustainable management and use of natural resources. The practical SLM experiences

documented in this book are relevant to the MoA's extension services as well as specialists working in research and academia. In addition, the natural resources management sector of the MoA will evaluate the experiences and lessons here for further scaling up during the implementation of its ten-year (2021–2030) strategic development plan. By 2030, the Natural Resources Management Sector of the Ministry of Agriculture (MoA-NRS) aims to significantly reduce soil erosion and increase biomass production, a goal which requires the mainstreaming of SLM in more than 10,000 watersheds throughout the country.

It is important to acknowledge the efforts of the writing group, who have carried out a lengthy process of consultation of the many years of SLM practice throughout the country. The team have reviewed relevant literature, including national and regional natural resource management strategies, guidelines and progress reports of the SLM projects. Moreover, the team conducted various consultations with senior experts and advisors, and compiled experiences and success stories. A range of case studies and previously documented best practices have also been used extensively in the production of this book.

The writing team have more than 20 years' professional experience in natural resource management and economic development in Ethiopia. The team is composed of senior experts from the MoA-NRS: Mr Abenet Mengesha, Mr Habtamu Hailu and Mr Hailu Hundie and senior experts from the Deutsche Gesellschaft für Internationale Zusammenarbeit (GIZ): Mr Melaku Tadesse, Mr Tewodros Gebreegziabher, Dr Zewdu Wuletaw, Dr Gebremedhin Weldewahid, Britta Carola Petersen, Mr Aregawi Gebrekidan, Mrs Ametemariam Gebremichael, Mr Ayehu Legesse, Mr Getachew Tamiru, Mr Girma Gebrehawariat, Dr Girum Alemu, Mr Hailemariam Teffera, Mrs Leonore Gruenberg, Ms Merhawit Tsegay, Mr Tesfay Halefom, Mr Teshome Demissie, Mr Workneh Fisseha, Mr Wuletaw Belayneh, Mr Yohannes Alene and Mr Zelalem Behailu. This team has been led by Mr Tewodros Gebreegziabher (Senior Natural Resource Management Advisor) and Dr Girum Alemu (Senior Institutional Development Advisor) of GIZ.

In this connection, I am very grateful for the leading role that GIZ Climate-Sensitive Innovations in Land Management and the MoA-NRS senior experts have played in the preparation of this book.

This SLM compendium will serve as a reference to advance the implementation of SLM, which has been limited to watershed level, to the level of landscapes and entire basins. The MoA-NRS will mainstream the relevant experiences and lessons through training of extension workers and communities for landscape- and basin-level SLM implementation.

This book's main recommendations for the future design and application of SLM at landscape and basin level are:

1. Strengthen community ownership and the capacity of community-based institutions to plan and implement SLM activities. These are key factors for the success of landscape restoration activities and the sustainable management of agroecosystems.
2. Ensure sustainable financing and cost-effectiveness of SLM initiatives. Land management is knowledge- and capital-intensive and requires a continuous flow of investment in order to restore and productively use land resources. Largescale implementation of SLM throughout Ethiopia demands the development of a sustainable financing mechanism and the efficient use of limited financial resources.
3. Foster sustainable livestock grazing management. Although livestock are a social and economic mainstay of rural livelihoods, improper and excessive grazing management systems have threatened the sustainable use of natural resources in particular and the rural economy in general. SLM programmes must integrate comprehensive and context-specific livestock grazing management into their intervention plans.
4. Regionalise SLM planning and implementation. Ethiopia is diverse in biophysical and socio-cultural settings, and the selection and prioritisation of SLM technologies, practices and approaches should reflect regional contexts.
5. Realise both short- and long-term economic benefits from natural resource management. Communities are willing to invest in the management of natural resources when they get group- and individual-level tenure security and sustainable incomes from natural resources.

Sincerely yours,

Professor Eyasu Elias

Ministry of Agriculture, State Minister for Natural Resource Sector

Acknowledgements

The writing team has more than 20 years' professional experience in natural resource management and economic development in Ethiopia.

The team is composed of senior experts from the Ministry of Agriculture Natural Resources Management Sector:

- Mr Abenet Mengesha
- Mr Habtamu Hailu
- Mr Hailu Hundie

Along with senior experts from the Deutsche Gesellschaft für Internationale Zusammenarbeit (GIZ):

- Mr Melaku Tadesse
- Mr Tewodros Gebreegziabher
- Dr Zewdu Wuletaw
- Dr Gebremedhin Weldewahid
- Britta Carola Petersen
- Mr Aregawi Gebrekidan
- Mrs Ametemariam Gebremichael
- Mr Ayehu Legesse
- Mr Getachew Tamiru
- Mr Girma Gebrehawariat
- Dr Girum Alemu
- Mr Hailemariam Teffera
- Mrs Leonore Gruenberg
- Ms Merhawit Tsegay
- Mr Tesfay Halefom
- Mr Teshome Demissie
- Mr Workneh Fisseha
- Mr Wuletaw Belayneh
- Mr Yohannes Alene
- Mr Zelalem Behailu

This team has been led by Mr Tewodros Gebreegziabher (Senior Natural Resource Management Advisor) and Dr Girum Alemu (Senior Institutional Development Advisor) of GIZ.

Development partners include the World Bank, the International Fund for Agricultural Development, the European Union, the German Federal Ministry for Economic Cooperation and Development and the governments of Canada, Finland, Germany and Norway.

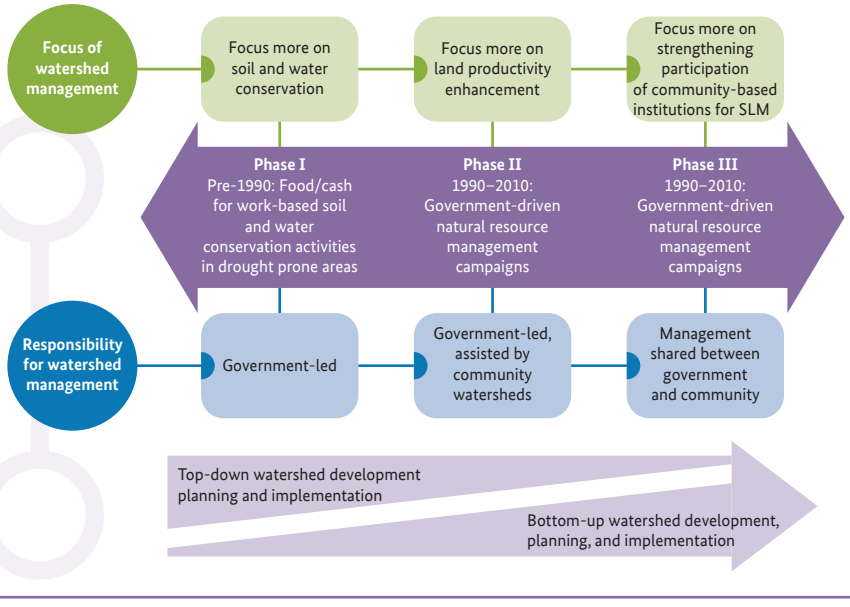
Chapter Overview

Chapter 1

Gives an overview of SLM development in Ethiopia and a summary of the content in this book.

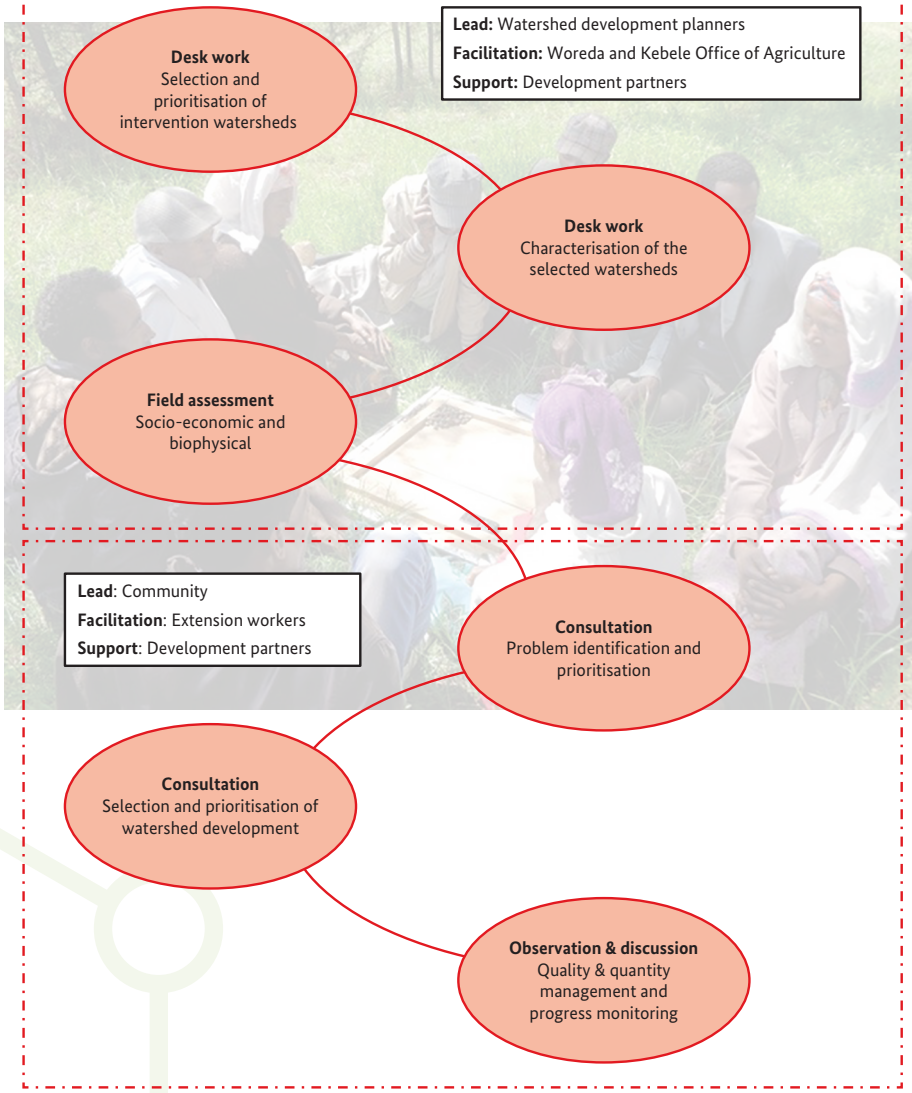
Chapter 2

Walks you through the context and history of SLM in Ethiopia and how it has evolved from a top-down approach to the bottom-up approach we see today.



Chapter 3

Examines the planning and implementation processes that are critical to SLM and the important role of the extension workers, communities and development partners.

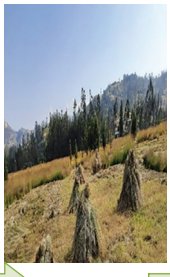


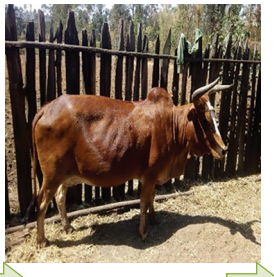
Chapter 4

Explains technologies, approaches and practices that are implemented to avoid land degradation, improve productivity and food security and mitigate climate change.

Unpacks how land management becomes sustainable. Land rehabilitation, improved productivity, income generation through products such as honey and appropriate backyard livestock management have to go hand in hand.

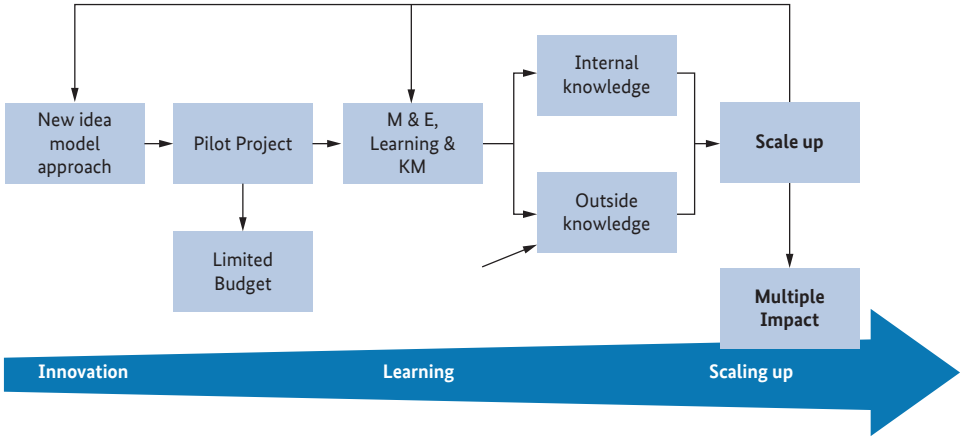
Chapter 5





Demonstrates how to scale up best practices through capacity development and cooperation.

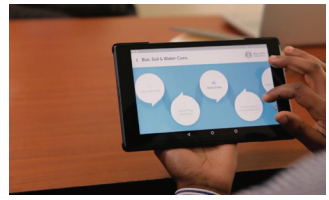
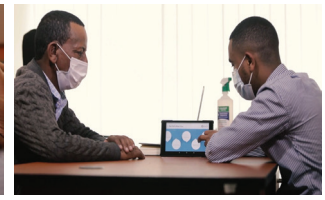
Chapter 6

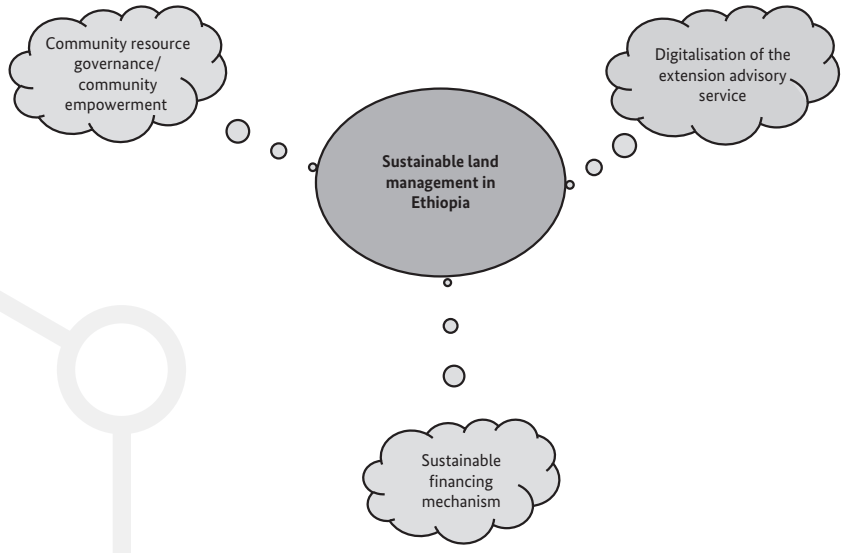


Chapter 7

Discusses how SLM will continue to evolve with the development of new technology, especially digitalisation of the extension system, community empowerment and sustainable financing mechanisms.





1

Executive Summary

For countries like Ethiopia, where more than 85% of the population heavily rely on agriculture, the need for sustainable management and use of natural resources is of utmost importance. The deterioration of Ethiopia's land, water and biodiversity resources presents a serious challenge to the country's food and nutrition security. Various studies have concluded that the number of food insecure households in Ethiopia is directly correlated to the land, water and biodiversity conditions of the area. In the Ethiopian Highlands, these conditions are threatened by soil erosion, frequent droughts and deforestation, which in turn undermine agricultural production in more than half of the Highlands. To overcome these challenges facing food production and sustainable development, the Ethiopian government and local communities are engaged in landscape restoration and the sustainable management of natural resources.

1.1. The Evolution of Sustainable Land Management in Ethiopia

The wide range of natural resource management (NRM) projects in Ethiopia can be traced back to the 1970s and 1980s, when parts of the country were gripped by severe droughts and acute food insecurity. At that time, unsustainable farming practices were accelerating land degradation and threatening agricultural productivity. As discussed in Chapter 2 of this book, these challenges triggered the Government of Ethiopia (GoE), in conjunction with various donors, to design a range of projects aimed at curbing land degradation, mitigating moisture depletion and enhancing food production in watersheds through natural resource rehabilitation.

Some of these projects achieved considerable successes. The 'grain food for work' programme that began in the early 1980s, for instance, restored more than 70,000

ha of degraded forests and reduced soil erosion in more than 150,000 ha of farmland through terrace construction over the course of 10 years. Communities were provided with grain food for their participation in the construction of soil and water conservation structures in private and communal land and reafforestation of degraded forest lands. However, the top-down planning of these projects failed to instil a sense of community ownership and commitment to NRM.

In response, in the mid-1990s the GoE, with support from development partners, initiated watershed management projects integrating NRM, soil and water conservation and livelihood objectives to enhance community engagement in the development and maintenance of natural resources. The watershed management projects were supported by, among others, the UN World Food Programme, SOS Sahel, USAID through local NGOs such as the Relief Society of Tigray, and the German Federal Ministry for Economic Cooperation (BMZ) through KfW and GIZ. These projects emphasised the systematic engagement and participation of communities, enabling them to assess their needs within watersheds, develop plans, mobilise resources and implement and monitor project activities.

Despite a shared focus on community engagement, these various land restoration projects each followed their own approach to sustainable land management (SLM). To standardise these approaches, in 2005 the Ministry of Agriculture and Natural Resources (MoA) developed a national guideline for community-based participatory watershed development planning. Furthermore, in 2010 the GoE established the Ethiopian Strategic Investment Framework and an interagency steering committee to avoid duplication of efforts and harmonise SLM investments and implementation processes throughout the country.

1.2. SLM Implementation Processes

As detailed in Chapter 3, SLM implementation comprises a wide range of interconnected measures to address the various causes of land resource degradation. Prioritisation and selection of the intervention watersheds is the first critical step in the implementation of SLM. Given the rampant land degradation and limited financial and human resources, decisions on SLM intervention landscapes are made based on national and regional priorities and long-term development plans. Watersheds within and/or adjacent to eco-regions, national parks, lakes, dams and road infrastructure have been some of the GoE's priority areas for SLM interventions over the past 15 years. Prioritisation and selection of specific intervention watersheds within the landscape is made by woredas and kebeles (the lowest administrative units) and is based on a set of criteria developed at the national level with slight modification by the regional agricultural bureaus. Watersheds with severe land degradation, high potential for ground and surface

water collection, accessibility for technical supervision and transportation of input materials, moderate to high population density and diverse agro-ecologies are generally considered eligible for SLM intervention.

Once a watershed is selected for SLM intervention, its biophysical, institutional and socio-economic conditions are studied to understand its potential and limitations for sustainable food production and to identify appropriate SLM intervention measures. The Sustainable Land Management Program (SLMP) experience indicated that successful SLM implementation requires a good understanding of the soil type and depth, vegetation type and coverage, topographic features, watershed size and climate. Furthermore, data on population and gender, livestock numbers and management practices, types of crops, cropping calendar, land holdings, local institutions, source of household energy and local infrastructure are important institutional and socio-economic parameters for watershed development planning. These biophysical, institutional and socio-economic features are captured using remote sensing, transect walks and community consultations in the watersheds. Experience shows that equal representation of men and women in this process, as well as the inclusion of the elderly and youth, is crucial for a comprehensive understanding of the watershed's features and for the design of appropriate sustainable solutions.

All the biophysical and socio-economic information generated using the above approaches are used to design context-specific and sustainable land management measures that serve as blueprints for action at the watershed level. Validation of the proposed land management measures by the community, followed by agreements among the community members on the use and management of the watershed resources, are important steps in watershed development planning.

The SLMP experience shows that the preparation of a fully elaborated annual and multi-year (in most cases five years) watershed plans, developed with full participation of the target community's different social groups (youth, women, elderly and farmers), forms the basis for the mobilisation of local, regional and national resources required for implementing the planned measures. To help communities clarify and express their needs and objectives, and to take collective action to meet their own needs, community facilitators and woreda watershed teams lead awareness raising events, arrange experience exchange visits and encourage communities to organise themselves into user groups to create community agreements and bylaws.

1.3. SLM Measures and Practices Applied in the Ethiopian Highlands

Following the creation of a multi-year and annual watershed development plan, a range of structural, biological and agronomic measures are implemented to restore

the degraded watershed and enhance agricultural production as intended in the development plans. As described in Chapter 4, the most common physical soil and water conservation measures to reduce soil erosion and increase moisture retention include bunds or banks created from earth and/or stone. Terraces, made from stone or wood, brush and soil, are constructed by cutting a sloped plane into a series of platforms that resemble steps.

Gully erosion is a growing concern in Ethiopia, where it is causing significant losses of productive lands. The stabilisation of active gullies expanding into farmland and pasture areas is consequently one of the top priorities for SLM projects in the Ethiopian Highlands. Physical measures include dams and check dams, which are made from gabions, loose stones, brush wood and sandbags, and are constructed across the floor of gullies to reduce water flow and gradually build up the gully floor to the original ground level. Sediment storage dams also trap significant amounts of sediment within gullies and convert unproductive gullies to land suitable for crop or forage production.

Grass strips, shrubs and trees are planted along terraces, bunds and the sides of gullies to reinforce these physical structures and reduce the effects of rainfall, runoff and animal trampling on them. In most cases, a mixture of woody species and grass effectively reduced gully expansion into productive lands.

1.4. Sustainability of Land Management Interventions

As described in Chapter 5, the restoration of degraded areas using soil and water conservation measures is necessary, but not sufficient to ensure sustainable development. To achieve this, farmers must organise themselves, develop management and utilisation plans and acquire increased economic benefit from the rehabilitated area to maintain and protect it beyond the SLM project implementation period. In this regard, the SLMP has promoted different productivity enhancement practices and approaches over the past 15 years, such as integrated soil fertility management, small-scale irrigation (SSI), honey production and backyard livestock management to add value to rehabilitated areas. Multipurpose tree planting on farmland is a commonly implemented practice in SLM projects to improve soil fertility and increase access to fuel wood and livestock feed. Woodlot plantations on agricultural land, where the production and productivity of annual crops is minimal, is now also being widely promoted as a SLM measure to enhance land productivity. Composting, green manures and acidic soil reclamation are other agronomic measures implemented to enhance land productivity and thus the economic gains of the farmers.

The SLM program has also proven that redistributing rehabilitated gullies to youth groups organised for sheep and oxen fattening, milk production and beekeeping adds value to, and ensures the maintenance of, the soil and water conservation structures.

SLMP experience also shows that creating access to SSI through the development of infrastructure such as diversion weirs, irrigation canals, ponds and wells, together with the provision of water lifting technologies, helps ensure watershed sustainability by enabling farmers to cope with periods of inadequate rainfall. As a result, SSI development opens new opportunities for farmers to build resilience to climate variability and ensure food and nutrition security.

Although the adoption of SLM by watershed communities has enhanced farmland productivity, communities can only fully realise SLM benefits through the productive use of the entire watershed, which includes not just farmland but non-cultivable lands such as bushland, forest and pasture. In the Ethiopian Highlands, these non-cultivable lands can account for more than 50% of a watershed. Adding value to non-cultivable watershed areas through integrated economic and livelihood development measures is important for the sustainable use and management of watershed resources. Forage development, woodlot and fruit production and beekeeping have proven to be some of the most promising economic activities suitable for the sustainable management of rehabilitated watershed areas.

As important as these activities are, however, the successful implementation of economic activities in rehabilitated areas largely depends on the community's adoption of an appropriate livestock grazing management system. SLM experience in Amhara Region indicates that communities who adopt a backyard livestock farming system, which replaces free livestock grazing with stall feeding in backyards, have substantially reduced the maintenance and protection costs of rehabilitated areas. Its adoption has also enhanced watershed productivity and ecosystem services and increased crop–livestock productivity. The implementation of a backyard livestock management system has been applied by local communities after rigorous consultation and agreements among community members and the local administrations.

The promotion of a backyard livestock management system in watersheds has also fostered the conservation and sustainable management of the forests and open woodlands which cover large portions of many watersheds. Participatory management of these forests resources has been piloted as part of SLM approaches to ensure their ecological, economic and social benefits. An important first step towards the conservation and management of threatened forest is the establishment of forest users' cooperatives, which requires the GoE to transfer management responsibility and use rights to the local communities. The growing demand from various communities for limited forest resources, and a lack of harmonised approaches on

the sustainable use of these resources, urged the GoE and stakeholders to develop a standardised participatory forest management (PFM) implementation procedure. Accordingly, the SLMP has facilitated the preparation of a National PFM Guideline for wider implementation of PFM in Ethiopia.

The SLMP has piloted PFM in selected forests areas within or adjacent to watersheds in Amhara, Oromia and Tigray regions. Results of the pilot PFM projects have highlighted that communities benefitted from the PFM and forest conservation. The sense of ownership among communities has increased and the coverage and diversity of the forest resources has grown in forests that were previously deteriorating. Communities in these PFM pilots have also benefitted from improved ecological services in restored forest areas, including reduced flooding and increased access to fuel wood, wild fruits and livestock feed.

The successes of PFM have paved the way for the development of a holistic approach to participatory local resource governance, whereby local communities play an active role in the planning, management and use of watershed resources. The GoE, based on successful pilots in Amhara Region, has endorsed a national proclamation which provides a mandate for community-based institutions to develop, manage and use watershed resources. The proclamation enables community-based institutions to regulate benefit sharing among community members based on agreed community bylaws, and to mobilise financial and technical resources for the protection and sustainable management of the watershed's resources.

1.5. Scaling Up Successful SLM Practices and Approaches Beyond Pilots

Chapter 6 addresses the scaling up and institutionalisation of land management successes beyond pilot areas, a major challenge to ensuring sustainable food production and reversing natural resource degradation. Despite the progress made in restoring severely degraded landscapes, the risk of natural resource degradation remains the critical challenge to Ethiopia's food security efforts. In light of this, and aware of the positive ecological, social and economic impacts of SLM, communities and local institutions have called for the GoE to introduce successful SLM practices to larger areas of the country. These growing demands led to the development of a national framework – the Ethiopian Strategic Investment Framework – for the scaling up of best practices through the mobilisation of public and private investments in SLM. The framework encourages collaboration between research, extension and development partners to scale up

innovative SLM practices and approaches beyond pilot areas so that they can reach more communities, increase extension workers' efficiency and ensure the maintenance of implemented SLM measures.

To date, the MoA, with support from development partners and other sector offices, has documented a total of 35 technologies and 7 approaches tested in different localities for further scaling up beyond pilot areas. Lessons from SLM implementation indicate that successful scaling up of the tested SLM innovations largely depends on identifying multipliers – both institutions and individuals – within the extension system. These multipliers train local adopters, provide them with timely, quality advice and guidance on the application of the best practices and approaches. The MoA, with support from development partners, provides grants to create leeway for the communities to learn from possible failures.

In this regard, SLM projects have played an important role, not only by providing financial support, but by establishing model and learning farms and watersheds, by encouraging networking and partnerships between different SLM actors at the regional, national and international level, and by promoting capacity development in local and regional agricultural offices.

1.6. Emerging Issues for Consideration When Designing SLM

Chapter 7 highlights emerging issues in the implementation of largescale SLM. Despite the significant progress in scaling up to meet the growing demands for SLM over the past 10 years, its expansion into larger areas has faced significant challenges in terms of the quality and sustainability of the land management measures. This has mainly been due to inconsistent extension advisory outreach services and a lack of sustainable financing.

With the COVID-19 pandemic and increased internal conflicts, the extension service providers could not deliver the required knowledge through traditional face-to-face meetings and training sessions in a timely manner. This forced the agriculture sector and development partners to find alternative ways to transfer quality and timely knowledge. Foremost among these has been the digitalisation of the extension system. In 2021, the MoA established the National Digital Agricultural Extension Advisory Stakeholders' Forum, in which different stakeholders can come together to identify and develop strategic information and communications technology (ICT) interventions for agricultural extension services, foster harmonisation among those engaged in the digitalisation of agricultural extension advisor services, and establish networking and knowledge exchange in ICT. By the end of 2021, the MoA, with

support from development partners, had developed a 10-year strategic road map for digitalising extension service delivery, harmonising the different initiatives in this process, and mobilising resources for broader impacts.

As part of the new digitalisation initiative, the GIZ Sustainable Use of Rehabilitated Land for Economic Development/Climate Innovations for Land Management (SURED/CLM) Project, in consultation with the SLMP, has supported the MoA by testing an app-based training management system in seven project regions. The GIZ SURED/CLM Project has also established a podcast to provide detailed and interactive debate about NRM programmes and activities in light of the above needs and challenges.

Another project, the Digital Green Foundation, has launched a video-based extension approach in collaboration with the MoA. Development agents and experts are trained in video production, screening and discussion facilitation with farmers, who are encouraged to adopt featured practices. This video-based system is used by the public extension system to better reach farmers and increase adoption rates of improved practices and technologies.

The other critical impediment to the sustainability of SLM is a lack sustainable financing. SLM is a continuous process requiring ongoing investment for maintenance, productive use and management. Considering the growing demand to address land degradation challenges and ensure the continuation of SLM investment throughout the country, innovative financial mechanisms to support the promotion and scaling up of SLM are crucial. To this effect, sustainable development programmes and the GoE have recently been exploring different approaches to ensure sustainable financing for country-wide SLM implementation, including Payment for Ecosystem Service (PES). However, despite a range of initiatives by different organisations, and the potential to acquire finance in Ethiopia, PES has not greatly advanced due to the lack of national guidelines and implementation modalities for payment systems and standards. In response, in 2018 the Commission for Forest and Climate Change prepared a national strategy and road map for PES. This was piloted in four sites recognised globally for their high biodiversity value but also at very high risk of degradation.

2

Natural Resources Management in Ethiopia: History and Dynamisms

Key messages

- The severe drought in Ethiopia in the early 1970s triggered extensive implementation of soil and water conservation measures to conserve moisture and reduce land degradation
- Experiences from land management projects have played an important role in establishing learning sites, pilot testing innovative approaches and dissemination to wide areas
- Soliciting technical and financial support from development actors has facilitated the design and implementation of land management at communal and individual farm levels
- Community-based participatory watershed development has enhanced community engagement and mobilisation of local resources
- Legal provision to watershed users' associations or cooperatives strengthens community ownership and sustainable development of the watersheds
- Implementation of a large-scale land management programme requires effective coordination among stakeholders and management of resources

In Ethiopia, natural resource management (NRM) is central to the predominantly agrarian economy of the country in general and to the millions of households who depend on the natural resources base for their livelihoods. However, the natural resource base is susceptible to degradation due to various human and non-human factors, which increase rural communities' vulnerability to drought and resultant food insecurity. Cognisant of this, NRM has received the utmost attention by government, non-government organisations and rural communities as it is the foundation of all development efforts in Ethiopia. In this chapter we briefly highlight the role of indigenous NRM practices in Ethiopia before presenting the history of NRM in regard to the various actors involved, the approaches followed and the actual experiences of implementation, which dynamically resulted in the current framework that guides the sustainable management of natural resources in Ethiopia.

2.1. Indigenous NRM in Ethiopia

For millennia, rural communities in Ethiopia have been conserving and managing the natural resources base on which their livelihood depends. In this regard, rural communities have accumulated locally relevant, robust and dynamic knowledge of dealing with the challenges of land degradation and associated decline in production.

The management and use of natural resources are as diverse as the ecological and social heterogeneity of rural communities in Ethiopia. These centuries-old practices can broadly be categorised as local practices that deal with specific land degradation and productivity decline problems and sets of context specific norms, rules and regulations that govern local communities' relations with their natural environment – generally termed 'informal institutions'.

2.1.1. Local practices

Indigenous practices of NRM are diverse and are influenced by the specific agro-climatic conditions of local areas as well as the general social organisation of communities. At household level, these practices are also mainly influenced by endowment of and access to productive assets such as land and livestock ownership. For example, the well-recognised practice of terracing by the Konso people (Figure 1) is a result of the communities' adaptation to the environment, the generational transfer of skills in terracing and the social rules and regulations around community mobilisation for putting the necessary resources in place. This similarly applies to farm management practices, such as soil fertility management and productivity enhancement practices like mulching, fallowing and application of animal manure.

Figure 1: Construction of soil and water conservation terraces by a Konso community.

2.1.2. Traditional/informal institutions

Arrangements that facilitate the collective and appropriate management and use of natural resources among community members. Some widely practised arrangements include managing communal grazing areas and hillsides and protecting natural forests. The enforcement of rules and regulations regarding the management of these resources is guided by a culturally accepted understanding of who has the rights and obligations to use and care for the resources. Accordingly, the customary institutions that mediate rural people's relationship to national resources vary from place to place.

The effectiveness of local knowledge of NRM, however, has been challenged by various factors such as successive drought periods, population pressure and the concomitant scarcity of resources. In times of scarcity, effective application of social norms that govern the use of natural resources is increasingly difficult. These disruptions, compounded by the decline of informal NRM institutions as well as chronic food shortages, necessitated donor-initiated projects to step in and devise new ways of tackling land degradation and food insecurity in parallel. In the following section we briefly present the approaches introduced by donors to address these challenges.

2.2. Natural Resources Degradation and Project-based Interventions

2.2.1. Major focus and scale of interventions

The origins of NRM, with its emphasis on physical soil and water conservation measures, dates to the early 1970s. Initially, the focus areas were soil and stone bunds, trench construction and tree planting. Area enclosure on steep slopes in which natural vegetation was protected from humans and livestock, although at limited scale, was also practised (Figure 2). However, the efforts were very localised and insignificant on a national scale.

Figure 2: Areas protected from humans and livestock by soil and water conservation structures in Raya Azebo, Tigray (left) and Hintalo Wajirat (right).

Following the droughts of the 1970s and 1980s and associated food shortages, land restoration was piloted in some parts of Ethiopia with the aim of reducing land degradation and increasing land productivity. During those periods the major focus of the interventions was to reverse land degradation in the moisture-deficit highlands of Ethiopia while reaching chronically food-insecure households.

Given the frequent occurrence of drought and the subsequent disruptions in rural livelihoods, various donors and the Government of Ethiopia (GoE) designed individual projects to curb land degradation, mitigate moisture depletion and achieve food self-sufficiency through natural resource rehabilitation (Figure 3).

Figure 3: Improved crop performance around soil and water conservation terraces in a drought-affected area in Tigray, northern Ethiopia.

The Federal Ministry of Agriculture (MoA) and the World Food Programme (WFP) began to exchange relief 'food aid for work' with skill development support from FAO/UNDP.[1] Food aid for work has been implemented in drought-impacted areas, focusing on rural land rehabilitation including hillside terracing. This project had three components:

[1] FAO, 1982. *The impact of WFP food aid in Ethiopia: A study of the effects of the sales of WFP wheat under the experimental sales procedures and WFP food-for-Work*. Project for erosion control and reforestation (ETH 2488). Rome, Italy: FAO.

1. Provision of relief food aid for work: the project provided each worker with some grain and vegetable oil for each day worked.
2. Training support on land restoration provided: FAO/UNDP provided land restoration training support for experts and kebele heads. The project successfully trained the heads of 18,000 kebeles in land restoration techniques.
3. Introduced community organisation and mobilisation: one success of the project was the existence of village-level organised peasant associations or kebeles – local-level organisations of farmers which command strong loyalties. About 18,000 kebeles were included in the food aid for work project. Since each association comprises hundreds of households, the project managed to mobilise a vast workforce in Ethiopia.

The interventions were project-based and linked food aid with NRM activities. The focus was spurred by the rampant land degradation in drought-affected areas. Two contrasting approaches were piloted using the extension-assisted interventions: community-based participation and expert-based land restoration in the form of food aid for work.

There has been no clear monitoring report on the magnitude of the coverage, although some figures are known. In 1980, for instance, about 34 million working days were implemented. By the end of 1982, about 150,000 ha of farmland had been terraced (Figure 4).

Figure 4: Terraced farmland in the Ethiopian Highlands of Tigray (left) and Amhara (right).

In total, 70,000 ha of land were reforested, 30,000 fruit seedlings planted and 4,200 km of roads and 400 irrigations ponds constructed in Ethiopia in the 1970s and 1980s.[2] As indicated in Figure 5, early successes included afforestation, increased access to livestock watering points, reduced soil and water erosion and improved agricultural productivity.

[2] FAO, 1993. *Forest Resource Assessment 1990: Tropical countries*. FAO Forestry paper series 112. Rome, Italy: FAO. 59 p.

Figure 5: Watershed collection ponds constructed for reforestation and livestock watering in Tigray.

The major driver of the rehabilitation and conservation of natural resources was drought and the concomitant acute food insecurity in some parts of Ethiopia. To address the intermittent problem of moisture deficiency in these areas, a plausible solution proposed by donors and the GoE was to link the food aid with natural resource conservation measures through mass mobilisation.

2.2.2. Approaches to community mobilisation and resource use

The soil and water conservation activities implemented until the mid-1980s were characterised by top-down interventions and a lack of farmer participation in technology selection and use. In general, there was a lack of awareness and commitment among farmers regarding the soil and water conservation efforts.

The mobilisation of available human labour through mass campaigns was the major operational modality behind land rehabilitation interventions in the 1970s and 1980s. Accordingly, food aid interventions by the major donors which otherwise could have been used for humanitarian purposes were framed and linked with the rehabilitation

of natural resources. Accordingly, food aid for work was introduced as payment for the involvement of able-bodied adults in land rehabilitation activities. The contribution of the food aid for work project was to support the construction of soil and water conservation structures on arable land and hillsides, and included afforestation and reforestation initiatives. The food aid for work project was further augmented by cash for work schemes to mobilise community labour. The implementation of soil and water conservation programmes was further intensified following the drought in Wollo and Tigray. People mainly participated in these programmes to receive food for survival.

2.2.3. Key development actors and their experiences

Given the context in which the project-based natural resources restoration efforts started, the key actors who pioneered the projects were those associated with humanitarian aid intervention such as the WFP and USAID. In 1971, USAID started afforestation and bench terracing activities in Tigray through the food aid for work project. From 1974, the WFP was the sole supporter of the project under the administration of the State Forest Development Agency. During 1988–1990, the Relief Society of Tigray (REST) took over the soil and water conservation programmes in Tigray and followed similar approaches to mobilise communities in natural resource restoration efforts.

Considering the rampant land degradation and frequency of drought, the initial relief food aid for work project turned into a multi-agency, multi-donor effort in which the physical landscape was altered on a massive scale. Considering the level of land degradation, various nationwide soil and water conservation initiatives were undertaken, which by the late 1980s were supported by multiple donors (Figure 6).

Figure 6: Community campaigns for soil and watershed conservation in Tigray (left) and Southern Nations Nationalities and Peoples' Region (SNNPR) (right).

2.3. From Soil and Water Conservation to Integrated Watershed Management: The Role of Development Support Programmes

Since the mid-1990s, watershed management approaches that integrate soil and water conservation, natural resource use and livelihood objectives have been implemented in several watersheds. These initiatives include Food-for-Work (1983–2002), Managing Environmental Resources to Enable Transition to More Sustainable Livelihoods (MERET, 2003–2015), the Integrated Food Security Program (IFSP, 1996–2007, supported by the German government) and community mobilisation through free labour days (2002–present). In the following sections, we present the major sustainable natural resource interventions supported by main development partners, as well as the focus and scales of these interventions.

2.3.1. German Development Cooperation (GDC) and its support to NRM

Since 1994, the sustainable management and use of natural resources has been one of GDC's key areas of support to the GoE. In this regard, Deutsche Gesellschaft für Internationale Zusammenarbeit GmbH (GIZ, formerly GTZ), in close collaboration with the regional Bureau of Agriculture, pilot tested the following major NRM projects (among others):

- IFSP, Tigray, Mekelle;
- Land Use Planning in Oromia;
- Support to Forest Genetic Resources in Adaba Dodola, Oromia.

Land Use Planning in Oromia (LUPO): unlike previous initiatives, LUPO was implemented in food-secure/high potential woredas of Oromia. Accordingly, emphasis was on conserving potential areas to realise their natural resource endowments while working with better-off farmers in the project intervention areas. Initially LUPO was piloted in five woredas of the region for 6–8 years with an annual estimated operational cost of two million birr. The project was initiated with joint consultation with experts from the region, zone and woreda levels.

A detailed plan of operations was prepared to intensively train farmers and extension workers. Following this, communities were engaged through consultations using various participatory rural appraisal tools during the planning processes. During the preparation of community action plans, different members of the village were consulted to identify the pertinent problems within their watersheds and prioritise the solutions. In parallel, individuals representing various groups within the village were elected to serve in community and kebele watershed teams.

These community action plans, which were aligned with the multiyear plan commitments signed with the communities, were followed by technical plans detailing the size of the area that needed various soil and water conservation measures as well as income-generating livelihood activities such as beekeeping. As part of project implementation, intensive training sessions were provided on various topics such as beekeeping and apple production. In addition, exchange visits were used as a major extension approach to share experiences and promote learning. Farmers were taken to exemplary woredas both within and outside of the project's operational areas, including Konso, Illubabor and Merhabete.

The Adaba Dodola project: This was initiated in Oromia and followed similar approaches to those of the LUPO project. This project was implemented by the Oromia Forest Enterprise with technical support by GIZ. Participatory forest management was followed, in which cluster-based farmer groups were organised to rehabilitate and conserve the forest while making use of the services from the vast natural forest.

IFSP in Amhara and Tigray: During the same period, GIZ, in collaboration with the Bureau of Agriculture, implemented the IFSP in Debre Tabor, in Amhara, and Mekelle, in Tigray. The project in Debre Tabor followed a participatory and community-based approach in highly degraded areas and was engaged mainly in the rehabilitating huge gullies for production of fodder for livestock. Similarly, a community forestry project was pilot tested in Shire.

Sustainable Utilisation of Natural Resources for Improved Food Security (SUN): After the identification and recognition of inappropriate land use as a major underlying cause of food insecurity, as well as the linkages between natural resources use and livelihoods, Ethiopian–German cooperation agreed on a strategy for the priority area, known as SUN. Accordingly, based on the mid-term review of the above pilot projects, the SUN programme was developed in 2005. It drew heavily on the results and experiences of previous technical assistance interventions in different parts of the country. Guided by the German development assistance instruments, the programme pursued a strategic approach based on the principles of watershed management.

Accordingly, the areas of operation were expanded in all three regions: Amhara, Oromia and Tigray. In Oromia alone, the programme increased its operation from two to ten zones covering around 13 woredas.

During the mid-term review of the SUN programme, the idea of multiyear financing was born. Initially plans were prepared based on a three-year time frame, which guided GIZ's technical cooperation support despite the push by GIZ's experienced national staff for a multiyear planning approach with a seven-year time frame. During the review of the SUN programme, GIZ engaged a consultant and out of that the Sustainable Land Management Program (SLMP) design idea was born. Accordingly, a five-year planning approach was introduced to the government system by donors such as KfW (German Development Bank) and the World Bank.

2.3.2. WFP's MERET project

Meret means 'land' in Amharic. This project was implemented jointly by the WFP and the Ministry of Agriculture and Rural Development (now the MoA) in three phases from 2003 to 2015. MERET was part of the WFP country office development programme, which had aimed to enhance development. The project operated under varying themes in its different phases. The MERET project has a long history of food aid for work, starting from the early 1980s. With some failures, successes and lessons learned, the project adopted the local-level participatory planning approach in 1993. In the meantime, the MERET project emphasised livelihoods, partnerships and high technical standards. Since 2000, the project has expanded its focus to include income generation activities, policy dialogue and synergies and education.

The MERET project recognised the interlinkages between causes and effects of food insecurity and hence identified its entry points for intervention: land degradation, increased drought frequency and intensity, low incomes, low knowledge base, fragile ecosystems, unwise resource use and unconducive local socio-economic situations.

The project objective was to improve livelihoods and food security opportunities for the most vulnerable and women-led households through sustainable use of the natural resource base. The major outcomes of the project interventions were improved participation, enhanced capacity, productive assets created, improved natural resource base, income-generating activities implemented and improved land husbandry.

The strategies pursued to achieve outcomes were participatory planning, quality technical standards, applying productive NRM systems, establishing results-based management systems, and launching homestead production intensification activities and intensified training.

Over more than a decade of implementation, MERET has focused on the following key areas of support:

- participatory planning and watershed development;
- improved work norms and technical standards for a wide range of community- and household-based soil and water conservation measures;

- introduction of new technologies, particularly for moisture stressed areas;
- income-generating activities and experience sharing;
- capacity building for community-based participatory watershed development (CBPWD);
- dialogue with government and partners on SLM, capacity building and food security.

One of the major departures of MERET from WFP's earlier projects was its emphasis on bottom-up and participatory planning processes. Accordingly, in its second (2007–2011) and third (2012–2015) phases, the project supported community-driven creation of biophysical and social assets targeted at the poorest, as well as technical innovation, diversification and income-generating activities, empowerment (including of women), capacity building and support to SLM in food security programmes.

2.3.3. Farm Africa – SOS Sahel and participatory forest management

Farm Africa – SOS Sahel's support to NRM – has mainly focused on participatory forest management. Funded by the European Union (EU) tropical forestry budget line and match funded by the UK Department for International Development (now the Foreign, Commonwealth & Development Office), Farm Africa implemented participatory forest management in three different representative forest ecologies and social situations from 2002 to 2006: Bonga (moist tropical forest), Borana (dryland evergreen forest; see Figure 7) and Chilimo (highland montane forest).

Figure 7: Forest areas managed by communities through participatory forest management in the Bale eco-region of Oromia.

The programme objectives were to conserve the natural and planted forests through the establishment of sustainable forest management systems, help the communities adopt complementary NRM and tropical forest technologies, and develop the capacity

of partner organisations, government and community in developing new forest policy, networking and dissemination of experiences. The programme also aimed to promote learning from experiences during implementation.

Worldwide experience proved beyond doubt that community-based forest management systems have positively addressed the problems experienced in achieving sustainable forest management. Food security and sustainable livelihoods are the two major objectives in sustainable development in Ethiopia. Social equity and rights-based approaches, which are the core objectives in global sustainable development, help achieve sustainable development in forests and are instruments for achieving food security and sustainable livelihoods.

The programme was guided by an operation system involving three stages and eight steps, starting with stakeholder analysis of forest uses and users and ending with participatory monitoring and evaluation. It had the vision of enabling communities to manage their natural resources, observe sustainability within forest management systems, promote communal land management systems and get such areas recognised in policy, reduce resource-based conflict and improve development collaboration.

During its implementation, programme achievements included incorporating around 40,000 ha of land in participatory forest management, developing community-based monitoring and evaluation systems and developing effective tools for rapid participatory forest resource assessment.

2.3.4. Experiences of USAID-funded Amhara Micro-enterprise development, Agricultural Research, Extension and Watershed management (AMAREW) project

The AMAREW project was funded by the USAID-Ethiopia Mission and implemented from 2002 to 2007. The Food Security and Disaster Prevention Office of Amhara coordinated the project. Other regional offices such as the Bureau of Agriculture and Rural Development, Amhara Agricultural Research Institute and the Environmental Protection, Land Administration and Use Authority also partnered in implementing the project.

The AMAREW project was implemented in three pilot watersheds: Lenche Dima watershed in Gubalafto Woreda of North Wollo Zone, Yeku watershed in Sekota Woreda of Wag Himra Zone and Gumet watershed in Sekela Woreda of West Gojjam Zone. The project objectives were to empower local communities through the formation of community watershed management organisations, design integrated watershed management activities, rehabilitate the degraded natural resource base of

the watershed, facilitate the implementation and sustainability of community-based watershed management through testing and promotion of improved agricultural and rural development technologies, and help communities generate income.

The project actively promoted natural resources management, livestock production, crop production, income generation activities and the establishment of community organisations using an integrated watershed development approach. The specific NRM activities were soil and water conservation, closed area management, gully rehabilitation, tree planting and water harvesting. The specific activities in livestock management included livestock development, forage development, husbandry of small ruminants and promoting improved poultry, honey production and grazing-land management (Figure 8). Introduction and promotion of improved varieties and improved agronomic and crop protection practices were among the crop production activities. The project also actively promoted formation of community organisations, self-help groups and small business groups.

Figure 8: Community forage development, harvesting and use for cattle fattening.

2.3.5 REST and its soil and water conservation interventions

Since 1998, in close collaboration with the woreda-level Departments of Agriculture, REST has pursued the participatory planning and integrated watershed management approach in its operational areas. Implementation of REST development activities was guided by the watershed planning and development approach as much as possible. Accordingly, well-organised watershed committees were established at various levels. Members of the watershed committee at the regional office represented different disciplines, whereas the woreda watershed committee consisted of the various woreda government sectors, the woreda REST coordination office and social associations. The committee at the watershed level usually consisted of 10–15 farmers from different age and wealth groups, who were assigned by the community. These watershed committee members played crucial roles in the preparation and execution of watershed development plans.

The land management activities undertaken by REST were broadly classified as soil and water conservation and reforestation interventions. The soil and water conservation activities of REST were catchment treatment by applying bunds and terraces, gully reclamation using loose-rock check dams, biological measures for gully treatment and catchment rehabilitation, gabion check dams in big gullies for water harvesting, trenches, tie ridge furrows, check dams to divert runoff water, check dams to divert stream water, percolation structures and improving soil fertility by composting. Activities undertaken in the reforestation programme included nursery management, seedling production, seedling planting, agroforestry, area enclosure and management, hillside partitioning for tree plantations for landless people, woodlot establishment and redistribution of rehabilitated gully sites.

The activities in soil and water conservation and reforestation aimed at reducing soil erosion and land degradation, improving soil moisture on communal as well as cultivated land, increasing land productivity, controlling expansion of gullies and making them productive, harvesting runoff water on gully beds to use it for supplemental irrigation and domestic uses, and promoting community awareness of land degradation and control measures.

The above key actors' experiences in NRM show that (i) there were multiple donor-funded projects with different thematic and geographical focus, (ii) different approaches for planning and implementation were applied and (iii) community participation was one of the guiding principles of these projects.

2.4. Community Participation and Resource Mobilisation

The experiences from the above projects show the emphasis on systematic engagement of communities in the operational areas. Communities were mobilised in the following sequence:

1. assessing needs within the watershed;
2. developing plans;
3. mobilising resources;
4. implementing and monitoring activities – ideally involving different social groups in the community at every stage of the planning process.

The crucial factor in successful community mobilisation is the extent to which communities take ownership of the problems stemming from the impacts of land degradation and take responsibility for finding solutions. The process of mobilisation starts with any concerns that a community has regarding their interest in using the

production potential of their land, and its resources for maintaining this potential, as the basis for their livelihood and survival.

The experiences from GIZ-supported implementation areas showed that, although technical advisors and experts from the regional agricultural offices used different participatory tools (e.g. participatory rural appraisal and focus group discussions), and the issues around which they mobilised communities varied, the mobilisation process was similar in each community. Regardless of the techniques, facilitators must observe rigorous standards of excellence in participatory methodology. For example, the following were critical steps in the process of genuine community mobilisation in GIZ-supported NRM intervention sites:

1. Recognition on the part of community members that they were already dealing with the impacts of land degradation (taking up soil conservation, tree plantation and other biophysical measures on their farms) and that they can be more effective if they work together (i.e. community members need to support each other to deal with this).
2. A sense of responsibility and ownership that comes with this recognition was the starting point for identifying what appropriate mitigation measures were possible under the local conditions.
3. Identification of priority needs (i.e. the community members' concerns).
4. Community members planning and managing activities by combining internal and external resources and sustaining their effort over the long term.

These processes did not happen all at once or necessarily in this order. Some of the more challenging tasks for a facilitator were to recognise when a community was ready for certain kinds of training and external support, when to link with outside groups and what resources to tap. A fundamental tenet of community mobilisation was that the impetus for action emerges from the community level and formulates its agenda around community priorities, concerns, capacities and commitments (Figure 9).

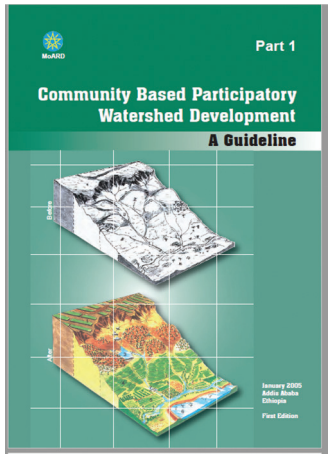
Figure 9: Community dialogues on NRM and priority setting following soil and water conservation work in Oromia, southern Ethiopia.

As a matter of principle, successful NRM requires – and implementers actively promote – the participation of community members in all matters that affect their lives. This can be seen in the experiences of different donor-supported projects highlighted in Section 2.3. However, the different organisations followed their own approaches to community participation; for instance, GIZ initially promoted the participatory land use planning method whereas WFP was a pioneer in the woreda-level participatory planning approach. Despite the good intention of engaging communities at different stages of planning processes, the lack of a harmonised approach to guide watershed-level planning was one of the biggest challenges.

2.5. Standardisation of Participatory Planning Methods and Processes

As shown above, government organisations, non-government organisations and multilateral and bilateral agencies have relentlessly popularised participation in general and the involvement of the people in developing, protecting and managing their own natural resources.

To harmonise the different community engagement approaches followed by development partners, in 2005 the Ministry of Agriculture and Natural Resources (MoANR; now the MoA), with support from donors, developed a general guideline for CBPWD (Figure 10). In 2019 the CBPWD was updated to accommodate new developments in land management approaches, technologies and practices, both in the highlands and lowlands of the country. The guideline for CBPWD was the culmination of the lessons drawn from the experiences of actions taken in hundreds of communities in rural Ethiopia, with close collaboration of the organisations that facilitated successful participation.



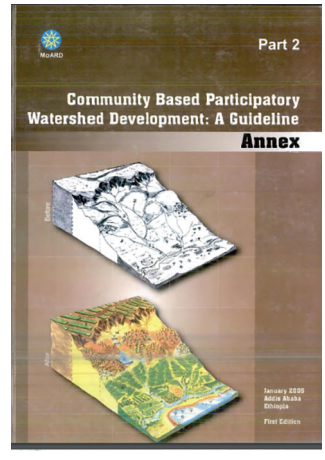


Figure 10: National CBPWD guideline.

The CBPWD guideline is an important piece of work that became more profound and practical as it was enriched and progressively adapted through practical application. This guideline, which promoted grassroots participation in SLM, provided the following important innovations:

- The role and influence of local knowledge on land management could be enhanced by promoting a decentralised and participatory approach to which ample space has been given in the guideline as a top priority concern.
- The opportunity to apply the concept of the participatory approach in the early planning stages. This participatory approach integrates the technical perspectives of land users with their socio-economic concerns, such as food security, poverty alleviation, income opportunities and cultural values.
- Because it aims at promoting participatory watershed development planning, the guideline provides a way of learning from and with community members about their life and community as an integrated system.
- It aims to investigate, analyse and evaluate constraints and opportunities, and to make informed and timely decisions regarding their environment, the resources it contains and the critical features associated with it. It therefore enables local people to make realistic economic decisions that often correspond to their own milieu and specific circumstances.
- An emphasis on participatory group methods, especially methods such as community mapping. These maps allow groups to draw their community as they see it, locating social groupings, social services, roads and degraded/ problem locations.
- It gives equal emphasis to the attitudes and behaviours necessary for implementing these methods in a way that is fundamentally participatory and holistic. This holistic approach can provide insight into complex problems of a community, thus adding impetus in techniques of conversation, information, interviews and focus groups, as well as the importance of attitudes, behaviours, rapport and acknowledging the locals' point of view.
- It emphasises building the capacity of communities to thrive principally on their own but with some assistance of key stakeholders. This not only has a profound effect on resource management but also advances local control over the amount, quality and especially the distribution of benefits, helping local communities become self-sustaining.
- Conducting formal conversations with the community (as opposed to a scheduled interview) and with disadvantaged groups (e.g. women and the marginalised), and acknowledging that their active participation facilitates assessment, identification of priorities, establishment of responsibilities and institutionalisation of platforms for dialogue and negotiation. This promotes the awareness and confidence of disadvantaged groups, empowering their ability to exert control over the resources and decisions affecting their lives.

2.6. Dynamism of SLM

Building on decades of experiences of NRM activities, and following the Paris Declaration on Aid Effectiveness, the GoE expressed its commitment towards developing a country-wide programmatic framework for SLM and has undertaken important steps in this direction.

2.6.1. Ethiopia Strategic Investment Framework for Sustainable Land Management (ESIF)

The ESIF is planned to be implemented in three phases over a fifteen-year period (phase 1: 2009–2013, phase 2: 2014–2018, and phase 3: 2019–2023). The SLMP is one of the interventions designed under the long-term (2009–2023) ESIF and the agricultural sector Policy and Investment Framework (PIF). The ESIF was formulated within the framework of the TerrAfrica partnership, part of the New Partnership for Africa's Development, and the PIF was formulated within the framework of the Comprehensive Africa Agricultural Development Programme. Together with the MoA's National Agricultural Investment Plan, the ESIF and PIF are frameworks that underpin domestic and foreign support for addressing issues related to the pervasive challenges to land and water resources.

The other recently developed investment plan, which is embedded within Ethiopia's national system, and is reflective of and responsive to the goals of the Ten-Year Perspective Plan of MoA (2021–2030) for the agriculture sector, is the Ethiopia National Agricultural Investment Plan or NAIP (2021–2030). This investment plan is comprehensive in terms of combining national and regional elements of the Comprehensive African Agriculture Development Programme (CAADP) with the global Sustainable Development Goals commitments.

The overall development objective of ESIF is to improve the livelihoods and economic wellbeing of the country's farmers, herders and forest resource users by scaling up SLM practices with the proven potential to restore, sustain and enhance the productivity of Ethiopia's land resources. The framework underpins domestic and foreign support for addressing issues related to the pervasive challenges to land and water resources.

The agricultural sector PIF aimed to contribute to Ethiopia's achievement of middle-income status by 2025 by sustainably increasing rural income and national food security by increasing agricultural productivity and production, accelerating agricultural commercialisation and agro-industrial development, reducing degradation and improving productivity of natural resources, and achieving universal food security and protecting vulnerable households from natural disasters.

Sustainable land management is also one of the priorities outlined in Ethiopia's Growth and Transformation Plan of 2010 and the Climate Resilient and Green Economy (CRGE) strategy of 2011. The ESIF and other strategic documents of the country such as CRGE advocate harmonisation of approaches and efforts among donors, result orientation, mutual accountability and local ownership so that good land management practices are scaled up and sustained, resulting in economic development, reduced poverty and improved ecosystem functions.

2.6.2. SLMP coordination mechanism: interagency and development partners

To avoid duplication and promote synergies, the GoE in 2006 established a mechanism to coordinate all SLM investments in Ethiopia. This mechanism comprises a national interagency steering committee chaired by the State Minister for the MoA – a national technical committee comprising representatives from government, civil society and development agencies – and a SLM Coordination Unit in the MoA to provide administrative and technical support to the steering committee and the technical committee. Similar SLM platforms are replicated at regional level.

Through its Natural Resource Management Directorate, the MoA has the overall responsibility for project implementation, systematic learning and consequent up-scaling of SLM practices, using its existing institutional arrangements at the federal, regional and woreda levels and using previously established processes for integrated watershed management. It also takes into consideration the GoE's decentralisation and regionalisation policy, which further devolves decision-making processes, planning and implementation of social and economic activities down to the local levels.

The regional bureaux (region, zone and woreda structures) are implementing the SLM up-scaling measures through the woreda- and kebele-level offices, which in turn work closely with the community through watershed planning and organising units using the CBPWD guidelines (Figure 11).

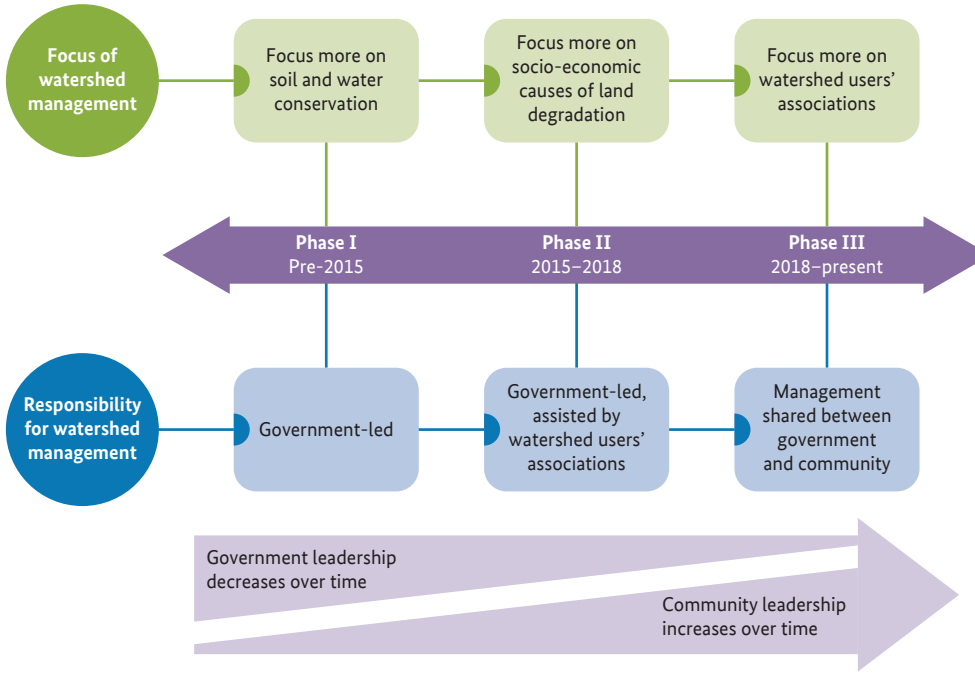


Figure 11: Evolution of community empowerment in watershed development. During phase I, more focus was given to biophysical conservation. In phase II, due emphasis was given to the socio-economic factors of land degradation, and community participation was enhanced by providing opportunities for communities to organise themselves. Phase III now emphasises community empowerment. ***Source:*** *SURED archive, 2021.*

The SLMP encompasses SLM projects that help to identify and learn from best SLM approaches and practices for scaling up (i.e. horizontal and vertical) in Ethiopia on one hand, and local adaptation of best-fit SLM approaches and practices in non-SLMP areas on the other. The pilot projects include the following:

- The SLMP is financed by the World Bank, GDC, Finland, Norway and Canada, with technical support provided by GIZ through its federal and regional advisors and experts. The first phase of the flagship programme (2009–2013) supported 140 watersheds with four development partners. In the second phase (2014–2018) this was increased to support 225 watersheds with five development partners. Currently the programme is in its third phase (2019–2023) with about 297 watersheds being implemented by the SLMP with the support of ten development partners. The watersheds are located in the regional states of Amhara, Tigray, Oromia, Southern Nations Nationalities and Peoples' Region (SNNPR), Gambella and Benishangul-Gumuz. The programme is implemented through four components: (i) integrated watershed and landscape management;

(ii) institutional strengthening, capacity development, knowledge generation and management; (iii) rural land administration, certification and land use; and (iv) project management.

- LAND (USAID). This project is implemented with and through the Land Administration and Use Directorate of the MoA at the national level and the regional land use and administration bureaux of Afar, Amhara, Oromia, SNNPR, Somali and Tigray. On a minor scale, training support in rural land administration is provided to Harari and Dire Dawa City Administration Councils. Activities of LAND are implemented to achieve four objectives: (i) improved legal and policy frameworks at national and local levels; (ii) strengthened capacity in national, regional and local land administration and use planning; (iii) strengthened capacity of Ethiopian universities to engage in policy analysis and research related to land tenure and train land administration and land use professionals; and (iv) strengthened community land rights in pastoral and agro-pastoral areas to facilitate market linkages and economic growth.
- Tana Beles Integrated Watershed Management Project.

SLMP phase I was expected to cover a total area of about 250,000 ha, benefiting about 500,000 people[3] and the direct and indirect beneficiaries of the SLMP phase II were estimated to be 1,850,000 people.[4]

The currently implemented SLM projects explore how to foster scaling up of SLM in the different landscapes of Ethiopia. The ongoing projects also deliver scientific evidence and new insights that can support multiscale approaches to promote SLM, trigger behavioural changes, foster multilevel collaboration and lead to formulation of supportive policies for SLM.

2.6.3. Partnership among stakeholders: technical and financial cooperation

Current funding for SLMP comes from the International Development Association, Global Environment Facility, GDC represented by GIZ and KfW, the World Bank, Global Alliance Canada, the EU, Finland, Norway and the GoE.

At a higher level, a GoE–Donor Platform was provided by the Rural Economic Development and Food Security Sector Working Group (RED&FS SWG), in alignment with the Paris Declaration on Aid Effectiveness principles of local ownership, improved donor coordination, results-based approach and mutual accountability.

[3] World Bank, 2008. *Project Appraisal Document for SLMP I*. Washington, DC, USA: World Bank.
[4] World Bank, 2013. *Project Appraisal Document for SLMP II*. Washington, DC, USA: World Bank.

The RED&FS SWG is mandated by the GoE to share information on GoE policies, strategies and programmes based on the Five-Year National Development Plan objectives and targets; to coordinate and harmonise the efforts of various development partners supporting the sector; to review sector level implementation status and other ongoing efforts of the GoE and requirements of the sector; and to interact with and mobilise partners to provide additional support for scaling up of SLM practices so as to achieve national and global development goals at country level.

The RED&FS SWG organisational set-up includes a GoE donor platform, an executive committee and five technical committees: the Natural Resources, Climate Change and Food Security Technical Committee; the Agriculture System Transformation Technical Committee; the Agriculture Input Output and Marketing System Development Technical Committee; the Livestock System Transformation Technical Committee; and the Policy and Governance Technical Committee. There are also two cross-cutting themes under the RED&FS architecture: the Nutrition Sensitive Agriculture Task Force and the Private Sector Development Task Force. The GoE's major flagship programmes in the food security and agricultural growth sectors constitute a significant portion of the investments that support the four sectoral pillars of the RED&FS.

In Ethiopia, a range of SLM initiatives were launched with the assistance of a consortium of donors in various parts of the highlands to curb land degradation, enhance soil fertility and ultimately improve crop productivity. Significant efforts have also been made to create an enabling policy environment conducive for scaling up SLM interventions. Notable policy initiatives concerning SLM include the formulation of environmental policies and strategies, establishing institutions pertaining to SLM, financing pilot SLM projects and investing in infrastructure. Besides formulating policies, various institutions at federal and local levels were established to spearhead the promotion of SLM practices with the active participation of communities. At the federal level, the MoANR were tasked to lead and coordinate the implementation of SLM interventions by providing procedures and guidelines. One popular guideline provided by MoANR was the CBPWD guideline, which outlines the procedures for participating local communities to scale up SLM interventions. Along with MoANR, regional bureaux of agriculture extending down to district and kebele levels are involved in implementing SLM interventions.

Now in its third phase of implementation, ESIF seeks to achieve its objectives through multisector partnerships in which the investments and development efforts of many stakeholders, including bilateral, multilateral development partners and the GoE, are effectively harmonised and coordinated.

2.6.4. Role of community participation and legalisation of watershed user associations (WUAs)

In general, the policy and NRM strategies place trust in the participatory integrated watershed development approach when implementing SLM practices at micro-watershed level. This approach involves the collective action and community participation of various stakeholders, including primary stakeholders, government and non-government organisations, and other institutions, in the implementation of SLM practices. Very recently, the GoE stepped up its watershed management efforts by mobilising communities (millions of labour days per year) for integrated watershed management throughout the country. The Amhara Region alone mobilised 4.5 million people to develop community-based watersheds in 2017 and 2018. It also created new institutional arrangements at all levels to streamline the community mobilisation efforts.

Originally, SLMP was focused more on physical interventions with little or no consideration for socio-economic factors of land degradation. As a result, the project and mass mobilisation efforts suffered from a lack of sustainability of the investment (both in terms of finance and labour) made on the land. In response, and with significant support from GIZ, SLM now requires reconsideration of the most pertinent factors of land degradation causes, generally termed 'socio-economic factors'. In this regard, through the World Bank-supported SLMP phase II Investment Project Financing, in collaboration with technical assistance from GIZ, the functionality of WUAs was piloted in Amhara with encouraging results. The Amhara region launched the first initiative in Ethiopia to legalise WUAs at community watershed level by issuing a regional proclamation and subsequent directives on WUA formation and functions. In February 2018, the World Bank assessed the pilot WUAs in Amhara, noting strong community support and the WUAs' role in building long-term community commitment to sustainable watershed management. Drawing on this experience, MoA prioritised approval of the Community Watershed Management and Use Proclamation as a national regulatory framework to promote the large-scale creation of WUAs as durable institutions for watershed management, building on the community watershed committees previously formed on an ad hoc basis for watershed management activities.

The purpose of the Community Watershed Management and Use Proclamation is to (i) ensure active participation of users in management and use of watersheds, (ii) create a conducive legal environment for the sustainable and continuous use and management

of the natural resources on private or public property and (iii) increase the capacity of WUAs to manage and use assets created by themselves.

Accordingly, the third phase of ESIF emphasises establishing legally recognised WUAs so that local communities can have an increased mandate in the preparation of watershed management plans and participate fully in the development of annual work-plans for their implementation (Figure 12). This change in approach requires a shift in the role and capacity of officials charged with NRM responsibilities at the woreda and kebele levels, to focus more on building local community ownership of the targets and initiatives agreed in the watershed management plans.

The creation of legally recognised WUAs is also given more weight by the newly endorsed Ten-Year Development Plan of Ethiopia, which targets the establishment of WUAs vested with legal responsibility for 10,000 catchment areas to enhance sustainable natural resources development, management and conservation.

Figure 12: Certified watershed users' cooperatives in Amhara Region.

2.6.5. Towards scaling up through Climate Action and Landscape Management Performance for Results

The implementation of SLM during phases I and II of ESIF resulted in the development and adoption of innovative approaches for watershed management and land administration. Over the past ten years, different technologies and approaches were tested and capacities at regional and woreda levels to mobilise communities and implement SLM interventions created. A decade of investment in SLM has resulted in restoring the productive capacity and building the resilience of rural livelihoods in 135 major watersheds.

Through soil and water conservation structures, enclosures to limit free grazing and afforestation or reforestation of more than 80,000 ha, these activities have led to an average 9% increase in vegetation cover in treated watersheds. Financing from the International Development Association for the SLMP also strengthened MoA's support for land rights through the issuance of landholding certificates to over 300,000 households, including more than 200,000 women who received titles either individually or jointly with their husbands, and more than 7,000 landless youth who received titles to communal holdings in exchange for restoring land.

However, it is acknowledged that the achievements registered thus far have limited geographic reach. To deal with this challenge, the World Bank introduced, as part of the Climate Action through Landscape Management, an instrument called Performance for Results to enable scaling up of SLM support at a transformative national scale and to incentivise the roll-out of institutional reforms for participatory watershed management and land administration that are proposed by the MoA as a basis for the third phase of ESIF (2020–2024). The Performance for Results instrument also incentivises the achievement of results in national efforts to address land degradation which, unlike previous instruments, shifts focus for SLM from inputs to scalable results (Figure 13).

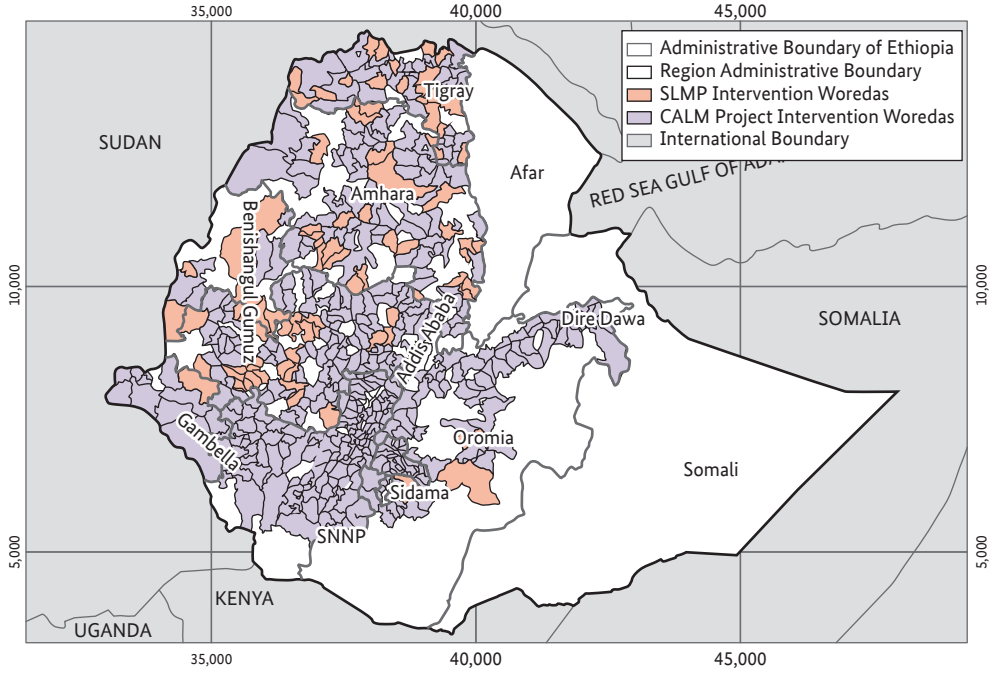


Figure 13: Overview SLMP and Climate Action through Landscape Management intervention woredas.
Source: *Archives of MoA-NRMD directorate and SURED, 2021.*

The history of NRM presented in this chapter represents more than five decades of effort to deal with the challenges of natural resource degradation in Ethiopia. This long history of NRM efforts is marked by a multitude of actors, approaches and emphases that have evolved over the years. The changes in approaches and focus of NRM interventions have been dynamic and resulted from reflections concerning actual experience. In other words, the current SLM approaches and principles followed winding paths and developed incrementality, drawing from success as well as failures of earlier projects.

Chapter 3 discusses the key processes and success factors pertaining to the planning of SLM activities in Ethiopia. This chapter draws on the experiences of watershed development plan preparation from the regions, which is a fundamental part of SLM implementation.

3

Land Management: Critical Planning Steps and Processes

Key messages

- Land management is a long-term iterative process which requires active engagement of stakeholders at national, regional and local levels
- Prioritisation of intervention watersheds is an important first step in land management to ensure effective use of financial and technical resources
- Understanding the biophysical and socio-cultural conditions of the watershed helps to develop context-specific intervention measures
- Size of watersheds is determined by settlement pattern of the community and the topography and restoration requirements of the watershed
- Community ownership of the development processes is key to sustainable use and management of the watersheds
- Implementation of land management intervention must be preceded by community agreements on the use and management of resources
- Joint monitoring of performance by relevant stakeholders from national to community level improves the quality of implemented measures and learning among stakeholders

As described in the previous chapter, since the adoption of the national Community-Based Participatory Watershed Development (CBPWD) Guideline by the Ministry of Agriculture (MoA) in 2005, community watersheds are considered the central sustainable land management (SLM) planning and implementation units. Furthermore, communities are to be actively engaged in decision-making regarding the use and management of the local resources. With this critical involvement of farmers and rural households in the local steering process on the rise, the range of the experiences, challenges and implementation success stories are also increasing.

In other words, SLM implementation is a dynamic and continuous process, comprising a wide range of interconnected measures to address the multidimensional causes of land resource degradation. The latter include factors such as social, economic, ecological/environmental and overall resource governance. Practical experience from the implementation of the national flagship SLM Programme (SLMP) over the past 15 years has seen several important activities and sequencings emerge. The major steps and processes can broadly be categorised into the following major sections:

- selecting and prioritising intervention watersheds;
- participatory assessment of biophysical conditions of the watersheds;
- understanding the social and economic contexts;
- identifying and prioritising the major watershed problems and respective solutions;
- preparing the watershed development plan;
- quality management, progress monitoring and evaluation.

The following section describes the critical planning steps and processes which are important aspects of SLM execution at the watershed level, and provides the reader with valuable insights from the field.

3.1. Selection and Prioritisation of Intervention Watersheds

Despite the different land restoration initiatives in Ethiopia, soil erosion continues to be a critical challenge to agricultural food production in the country. The MoA reports that nearly 50% of agricultural land is eroded and at least 30,000 ha of fertile land is lost annually across the highland regions (MoA, 2010).[5] Sedimentation and the associated drying-up of Rift Valley lakes, as well as the encroachment upon eco-regions and

[5] Ministry of Agriculture and Rural Development, 2010. *Ethiopian Strategic Investment Framework for Sustainable Land Management*. Addis Ababa, Ethiopia: MoA.

adjoining protected areas, have become potential and, in some cases, real risks. However, resources (financial, human and material) are limited and do not allow comprehensive simultaneous treatment of all affected areas across the country. Accordingly, priority is given to certain watersheds every year or for a specific project period for federal, regional, zone and woreda support based on a set of selection criteria at different levels.

While national- and regional-level actors provide strategic decisions on the selection of intervention watersheds landscapes based on pre-defined national and region long-term development plans, the selection of a specific intervention watershed is made at the local level. Protection of eco-regions (Figure 14), water bodies and large national projects (e.g. hydro dams for industrial zones and urban centres) has received special attention from the federal government over the past ten years to ensure sustainable development and use of ecosystem services.

Figure 14: The Bale ecoregion in Oromia, protected through participatory resource management.

Regions, in consultation with woreda and zonal offices, propose a cluster of high-priority intervention watersheds for support from the federal government. Details of the prioritisation criteria and roles of actors are described below.

3.1.1. Key considerations during selection and prioritisation of intervention watersheds

Because reversing land degradation and enhancing land productivity are the intended objectives of SLM, watersheds where productive lands are severely degraded are prioritised for restoration (Figure 15). However, degradation is widespread and significant portions of Ethiopia's ecosystems (forest, wet land, dry land, lowlands and highlands) require protection from erosion. The MoA reported that 80% of the landscapes require rehabilitation for which the limited human and financial resources will not allow simultaneous restoration.

Figure 15: Severely degraded farmland in Arbaminch, Southern Nations, Nationalities and Peoples' Region (left), and Adwa, Tigray (right).

Thus, additional parameters are required to select priority intervention watersheds. There have been no nationally accepted criteria and so different programmes have applied different approaches for targeting intervention watersheds. The national flagship SLMP, for example, developed both a set of criteria and a structured order of intervention. The programme set the first broad criterion for selection of watersheds in the highlands and midland regions of the country that are considered food secure but increasingly vulnerable to food insecurity due to reducing land productivity. Further detailed criteria for the selection are given in Table 1.

Table 1: Criteria developed at national level to guide selection of watersheds for SLM projects.

Criterion	Description
Rural relatively 'food secure' area	Project would focus on rural 'food secure' areas with high risk of land degradation.
Agro-ecological representativeness	As the SLM projects are designed to demonstrate innovative approaches on the restoration of degraded areas for further upscaling by the regular extension system, the intervention areas should represent the agro-ecological variability and associated diverse farming systems and possibilities for enhancing agricultural production.
Land degradation	Watersheds with high rates of soil erosion reflected by the intensity of gullies, deforestation, flooding and sedimentation are considered as priority intervention areas.
Population density	High population density tends to indicate land fragmentation, which is a problem for SLM. Conversely, labour is required for implementation of the various physical and biological works required to address land degradation. High population areas are also often associated with poverty and the need for improved management systems to increase food security. Taken together, areas with moderate population density – limited fragmentation and sufficient labour – are prioritised.

Criterion	Description
Accessibility	Transportation of construction materials, hand tools, seedlings and watershed products are important factors for effective and sustainable implementation of SLM. Furthermore, technical supervision by experts is required to ensure high standards. Hence, the ease of physical movement/accessibility of watersheds for the above services are to be considered.
Availability or potential for surface and ground water	Because availability of water, including spring recovery and/or shallow wells, contributes significantly to rapid and visible benefits for agricultural productivity, these are to be considered. The area to be brought under irrigation facilities also needs to be assessed. Availability of surface water and aquifer recharge were important benefits previously seen from watershed management in Ethiopia.

Source: *MoA, 2011. SLM Programme Implementation Manual (PIM). Ministry of Agriculture.*

The weight given for each of the above criteria varies from time to time and region to region depending on the strategic objectives set at national and region level. However, severity of land degradation and population density usually get the highest weight.

Apart from the above, specific targets of the SLM financing organisation are also considered in the prioritisation of intervention watersheds. For example, the SLM interventions in the Yayu and Bale eco-regions were made based on agreed priorities of the European Union and the Government of Ethiopia to protect the endangered biosphere reserve. The same priority was made for the International Fund for Agricultural Development (IFAD) and German Development Bank (KfW) SLM V project interventions to protect the Lake Tana and Chamo ecosystems, respectively. Furthermore, political and strategic decisions in line with the Federal Ministry of Finance budgeting is applied at the national level to the distribution of the project-financed intervention watersheds among the regions.

In practice, this means that annual targets are set at national and regional levels, with woredas and kebeles (the lowest administrative units) responsible for the selection of intervention watersheds based on local situations and capacities for watershed development through project support and/or regular soil and water conservation campaigns. As a rule, upstream catchments are treated first to reduce concentration of runoff and flooding to downstream catchments. However, in exceptional cases, downstream catchments could be restored first to rescue endangered community resources such as forests, pastureland, community access roads, settlement areas and other communal assets.

3.1.2. Role of stakeholders in selection of intervention watersheds

The selection and prioritisation of SLM intervention watersheds require engagement and decision-making of actors at different levels, partly due to the need to accommodate and satisfy the interest of different stakeholders whose objectives might not always be aligned. Considering the challenge to ensure continued stakeholder participation in both decision-making and implementation, a conscious effort had

to be made under the current participatory watershed development approach – from selection of intervention sites to monitoring and evaluation (M&E) – to fully consider the diversity of knowledge and values of the actors. This is not only because participation of the different actors in decision-making is crucial for the sustainability of development, but because this has also proven a well-adapted operational tool to ensure synergy and harmonisation of approaches by all parties involved.

At the local level, community elders and influential personalities submit their appeals to their kebeles for necessary support and attention. Kebeles review the cases through technical committees composed of the Development Agent (DA), kebele administrators or a deputy, representatives of community elders, religious leaders, women and youth. Upon confirmation of the kebele technical committee on the need and urgency of rehabilitation, the kebele organises available local resources and responds to the request. At the same time this is taken to the woreda council for necessary technical and financial support. With primary facilitation undertaken by the woreda Office of Agriculture (OoA), the appeals from kebeles are shared and reviewed at woreda council level. The woreda OoA Head is then assigned by the council to further collate basic information allowing for prioritisation. The woreda watershed team (WWT), led by the Natural Resource Management (NRM) process owner, organises this information qualitatively and quantitatively before target watersheds are selected for support. Based on secondary information, and after rounds of deliberations with woreda extension officers, the WWT outlines and screens priority watersheds. Respective kebeles and watersheds are listed and primary data are collected, in discussion with DAs, kebele administration and the communities.

Once important information has been collated, members of the woreda council and the WWT participate in a meeting (Figure 16). The head of the OoA or the WWT team leader presents background information proposed by the WWT, and the watershed or cluster of watersheds are jointly prioritised for necessary support. This process can take more than ten days.

Figure 16: Woreda and community watershed development teams conducting a survey (left) and an evaluation of proposed development measures (right) in Bale ecoregion, Oromia.

The woreda could also transfer the highly degraded watershed to the zonal Department of Agriculture office for consideration of necessary support. Zones

endorse the seriousness of the issues, emphasise their agreement and then either formally or informally discuss a repeated public petition with their regional heads and sectors to hasten a response.

There are some yardsticks that administrative offices, sectors and respective councils at all levels use as criteria for prioritising enquiries – for instance, seriousness of the natural resource degradation, future dangers if not rehabilitated in time, analysis of the past chances of success in project intervention and repeated appeals by local people.

Informed by the above steps and bottom-up decision-making processes, MoA starts communication with development partners as well as the respective regions for necessary financial and technical support in the restoration and development of the selected watersheds.

The national SLM Steering and Technical Committee, which is composed of the MoA/Natural Resource Development Sector (NRDS), the SLMP Coordination Unit and Regional Bureau of Agriculture Heads, as well as representatives from different development partners supporting SLM, defines annual and multi-year targets for technical and financial support. This committee develops a national framework for the selection of SLM intervention and the technical team provides guidance and training to the regions during the selection/prioritisation of intervention watersheds. The steering committee also proposes national priority locations based partly on a set of criteria in line with the national and global sustainable development goals. The national technical team reviews and provides feedback to the regions on proposed intervention areas. Approval of the number and size of intervention watersheds in the regions to be financed through grants or loans is given by the national steering committee. Development partners, both for financial and technical cooperation, are involved in appraisal of the proposed intervention watershed (Figure 17).

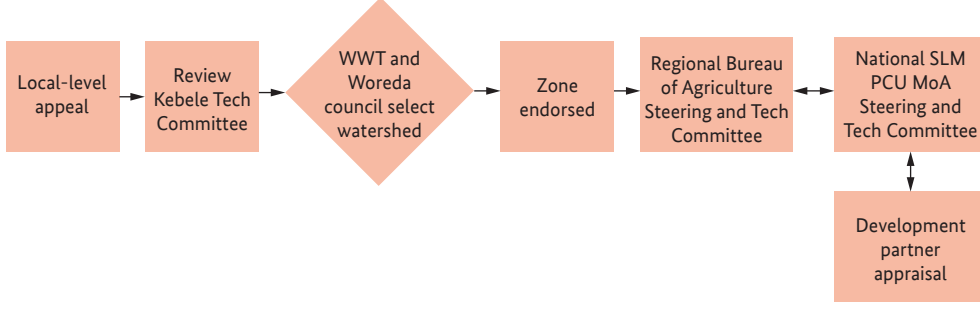


Figure 17: Flow chart of watershed selection.

The regional steering and technical committees are equally responsible for the selection and prioritisation of SLM intervention watersheds to be financed through grants and/or loans from the federal government and their own resources. Regional priority watersheds are defined based on the national framework but adjusted/modified according to the local context in consultation with the woredas and

zones. As far as the regions manage to mobilise their own resources and efficiently use the resources allocated from the federal ministry, regions are not restricted to the proposed number and size of intervention watersheds by the federal ministry.

The regional technical team defines and prioritises the intervention watersheds based on the regional NRM and agricultural development strategies. The regional technical team also provides guidance and training to the woreda/district and zonal offices in the selection and prioritisation of intervention watersheds.

Zone, woreda and community watershed teams are also responsible for the identification and selection of intervention watersheds in their respective areas and conduct reconnaissance on the extent of land degradation and required internal and external resources to restore watersheds. The woreda experts provide technical advice including the following:

- delineation and mapping of watershed boundaries and estimation of watershed area;
- analysis and verification of socio-economic and biophysical data of watersheds;
- technical designs and estimation of volume of work and budget.

Local communities, represented by village leaders and different social groups, are actively engaged in the prioritisation and sequencing of intervention community watersheds within the major watersheds based on local experience and knowledge. Community watersheds with greater significance in the protection of communal pasture lands, watering points, farm fields and settlement areas from flooding and sedimentation are prioritised for rehabilitation.

Proposed restoration and development measures of the target watersheds are translated into the long-term NRM development plans of the woredas. Approval of the community's annual and multi-year plans is performed by the woreda steering committee. Requests for technical and financial support from regional and federal ministries for the restoration of degraded watersheds/landscapes are made by the woreda OoA.

3.2. Technical Characterisation of Watersheds: Participatory Assessment of Biophysical Conditions

Successful implementation of SLM measures requires proper understanding of the biophysical resources of the watershed, such as size of the watershed, soil type and depth, vegetation type and coverage, topographic features (slope length, gradient and drainage pattern) and climate (rainfall amount and distribution). Accordingly, once the intervention watershed is defined, and technical and financial support are secured as per the request

of the regional bureaux and/or the federal MoA, detailed reconnaissance of biophysical and socio-economic conditions of the selected watershed continue. The inventory of biophysical resources of a watershed is as an important input for the preparation of watershed development and management planning. The biophysical features of watersheds considered for development planning, and the approaches/methodologies followed for the documentation and analysis of the features, are described below.

3.2.1. Delineate watershed boundary and estimate size of the watershed for intervention

Size of the watershed is an important factor which determines the amount of resources and time required to restore the watershed. Furthermore, complexity of the watershed development planning increases proportionally with watershed size. The optimum sizes for major and micro-watersheds are defined in the Community-Based Participatory Watershed Development Guideline (CBPWDG) as areas of 5,000–10,000 ha and 200–500 ha, respectively. However, experience from the SLMP implementation has shown that the area of most micro-watersheds exceeds the upper limit of 500 ha. This is an acceptable practice as far as the watersheds can be managed within a reasonable timeframe. The main factors for determining the upper limit of a watershed size are (1) the proportion of the area that needs treatment, (2) settlement patterns, (3) available resources for support, (4) the timeframe for support and (5) the diversity of land use and its potential. For example, in areas of high diversity the investment costs and types of activities to be carried out are greater. Similarly, the reverse is true for less diverse areas. It is assumed that the maximum time required to treat a micro-watershed does not exceed 5 years, but 3–4 years is a desirable target. Note also that some areas have already been treated, and additional support from other organisations, as well as regular extension and self-maintenance activities by community members, may be underway.

Once the watershed outlet is defined by the community watershed team (CWT), the size of the intervention watershed is measured using different GIS software. Alternatively, Google Earth 3D view is applied to delineate the watershed and measure the area manually (Figure 18).

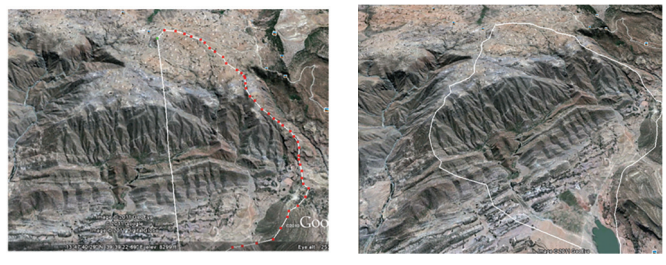


Figure 18: Watershed delineation and measurement using Google Earth 3D view.

3.2.2. Identify and describe the major natural resources and their uses

The biophysical and socio-economic situation of a given watershed is considered an important basis for the planning land management measures. Community and WWTs are engaged in the assessment and mapping of watershed resources, including watershed boundaries and characterising major landform changes and associated social and biophysical conditions (Figure 19).

Figure 19: Participatory delineation of watershed boundary and resource mapping using locally available materials.
Source: *GIZ SURED Oromia.*

Land use and land cover: Land use type and land cover significantly determine the requirement for protection and management measures. Frequently cultivated and intensively grazed lands are prone to water and wind erosion. Farmers cultivate some marginal land such as hillsides, wetland and bushland more frequently than is desirable in order to adequately feed their family. Sustainable use of the cultivated and grazing land largely depends on the land management practices adopted by farmers at individual and group levels. Different land management practices have been applied for different land uses and vegetation cover in the SLMP intervention watersheds.

Further visits to the watershed are organised with the CWT to verify the land uses and land cover indicated in the community/village map and the GIS map of the woreda experts. The woreda and community watershed development and planning team identify an appropriate place to view part or all of the watershed to validate the land use and cover map drawn by the community and the Deutsche Gesellschaft für Internationale Zusammenarbeit (GIZ) team in regard to the land units (Figure 20).

Figure 20: Ground verification of the watershed boundary by the planning team.

The land use and land cover status of the watershed is assessed using GIS software combined with field verification and consultation with local communities. The woreda planning team, with the technical support of GIS and remote-sensing experts from the woreda and regions, download the satellite/Google images of the watersheds and classify the land use and land cover of the area. In fact, the presence of high-resolution satellite images significantly eases the identification of the land use and cover and other features such as erosion areas. The map produced in the woreda offices is verified in the field through transect walking and community consultation. The support and facilitation of the local DAs/extension workers allow the mapping of the local resources, including the type of land use and land cover in the respective watersheds, using available local materials such as soil, stones, leaves and sticks of branches. Depending on the type of map required (social or natural resource map), the villagers and the facilitator draw a detailed description of their watershed on the ground using locally available materials. The facilitators help the CWTs as required but let them draw the map themselves, to encourage assertiveness among the community.

The CWT first delineates the watershed boundary and important landmarks. This helps them to fix the scale of the map on the given drawing ground. During this process, the facilitator sits at the back and watches the drawing exercise carefully while the team discusses where to place the symbols representing existing features on the map, and only provokes discussion to allow the team to reach a consensus.

When the map is completed, the facilitator asks the participants to describe what they have drawn and may ask questions for clarification. The facilitators keep a permanent record of all the information, including the names of features, and encourage community participation. Topographic features such as mountains, valleys and planes, and their relative positions and coverage in the watershed, are indicated in the community maps. The maps also show the available natural resources and the current land situation, as well as degraded areas and protected forest areas. The map reflects the visual understanding of the community about the set-up of their village.

The participatory resource mapping is also used as an ‘ice breaker’ process to identify and analyse the potential and constraints for the development and sustainable use of the watershed resources. Community members, such as the elderly and those knowledgeable concerning the watershed area, and who are willing to share their knowledge, are identified and included in the resource mapping process. The perspectives and understanding of the different social groups such as men, women and youth are considered in the community resource mapping exercise. Sometimes separate maps are prepared by a men’s group and a women’s group to analyse/interpret the different perspectives, and a combined map is produced after a consensus is reached among the different groups.

3.2.3. Determine the conditions of the natural resources base: qualitative and quantitative assessments

Besides identifying and describing the major natural resource endowments of the selected watersheds, the watershed team further conducts quantitative and qualitative assessments of the status of the natural resource base. These assessments usually focus on the following elements:

Soil type and depth: The type and depth of soil are important factors that determine the type and volume of land management measures. Sandy soils are very fragile and sensitive to erosion compared to clay soil. Hence, land units dominated by sandy soil require both in-situ and ex-situ soil erosion control measures. Furthermore, the water holding and infiltration capacity of deep soils are greater than for shallow soils, which dictate the type of land management measures required, including plant species for biological restoration.

Soil type and depth are assessed by the WWTs and CWTs through transect walking across the watershed combined with the village mapping exercise of the community. Field observations and measurements are taken from gullies, riverbanks and pits to estimate the soil depth of the different land units. Water infiltration capacity of the soil is estimated in the field, based on the community's knowledge and field testing of the soil texture using hand feel.

Slope length and gradient: Slope length and gradient, coupled with the land use and cover of the watershed, determine the type and intensity of land management measures. The soil type and depth can also vary along the slope of a watershed. Coarser and shallow-profile soils are found on steep slopes and rolling land while alluvial and deep-profile soils are mostly found in valleys or flat land. Soil erosion both on the hillsides and valley bottoms is greater with the increase in slope length and gradient of the watershed. Hence, erosion control measures should take into account reducing the slope length by constructing physical and biological structures at intervals across the slope. Slope maps of the different land units in the watershed are generated using clinometers and topographical maps. However, with advances in digital mapping, slope maps are now generated from a Digital Elevation Model (DEM 30 m spatial resolution) using the ArcMap software slope tool. The area extent of land under each slope class is determined using GIS software, calculated with the geometry tool.

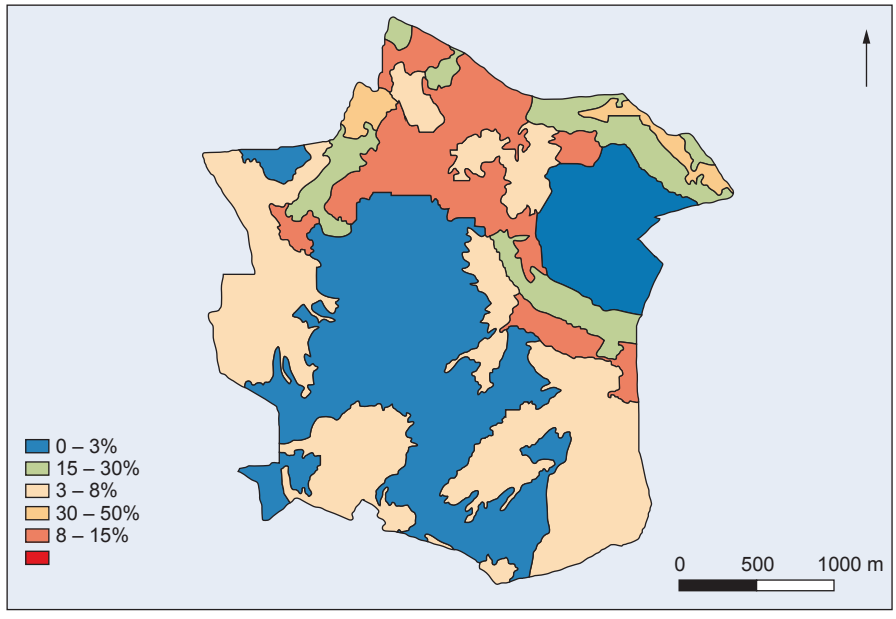


Figure 21: Slope map of Weleshe micro-watershed in Mana.

Once the slope map (Figure 21) and land use/land cover map are prepared, the analysis of land use by slope is done by overlaying the two maps using GIS analysis software. The combined map of slope, land use and land cover (Figure 22) is important for identifying potential erosion risk areas. It is also useful in identifying land management practices suitable for the different land uses.

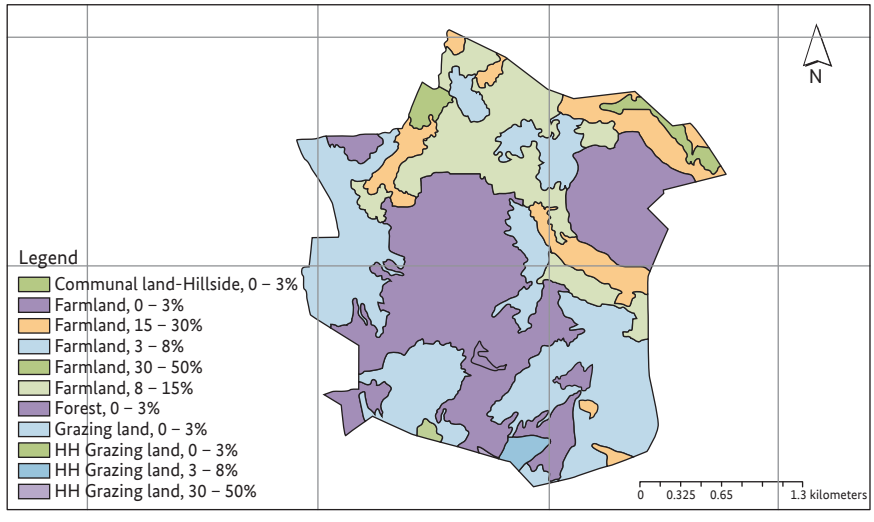


Figure 22: Land use, land cover and slope of land units in Weleshe micro-watershed in Mana major watershed.

Although the advancement and contribution of GIS and remote-sensing technologies in watershed development are great, the use of these tools at woreda and local levels is very low. This is mainly due to lack of access to GIS software, computers and updated topographic maps as well as a lack of dedication to these tools among woreda experts. So far, support of regional GIS experts has been crucial. However, building local capacities through providing access to software, computers and topographic maps, combined with appropriate training and dedication of the woreda and community-level extension workers, is essential to enhance quality and timely production of the different maps for large-scale watershed development planning.

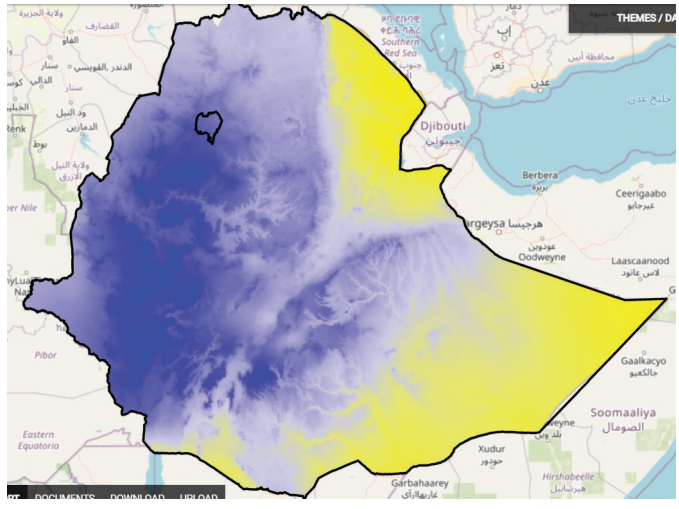
Drainage pattern: Drainage patterns indicate the direction and concentration of water flow in a watershed. The drainage patterns are also reflections of the slope length and gradient of the watershed land units. In unprotected watersheds, the drainage network increases through time because rain can easily become runoff that crosses land units and forms gullies (Figure 23). Hence, assessment of the drainage pattern, both active and permanent, is important for land management planning. Global Mapper software coupled with GIS is used to generate drainage patterns. Spatial data layers are used to identify sensitive areas (erosion hotspots) and analyse the proportion of the area requiring rehabilitation. Further field observations and community consultations in the watershed are conducted by the woreda watershed development planning team to assess the depth, width and activeness of drainage.

Figure 23: Drainage patterns affected by watershed slope and gradient: dense and active drainage network in Endamokhoni, Tigray (left) and sparce and stable drainage in Amhara (right).

Rainfall amount and distribution: rainfall amount and distribution are critical biophysical parameters in watershed development planning. The rainfall intensity, amount and distribution in a year not only affect the design but also implementation of land management measures. The design of water harvesting and conveyance structures, flood control measures, the selection of trees for reforestation and afforestation, and selection of crop and forage species should take into account the amount of rainfall in the watershed. Distribution of rainfall is also an important factor in preparing an implementation calendar for biophysical land management measures.

Check dams, water harvesting structures, terraces and seedling production are implemented during the dry season, whereas biological land management measures such as forage planting, reforestation, afforestation and crop planting are implemented during the rainy season.

Average annual rainfall and its distribution over the years of the specific watershed are estimated based on data from nearby meteorological stations (Figure 24). Depending on availability, ten-year rainfall data are used to estimate the average annual rainfall and distribution. However, meteorological stations are sparse and long-term data are often missing. Hence, data from regional meteorological stations, combined with community interviews during the watershed transect walk, are applied to determine the rainfall distribution over a year for the specific watershed.



>250mm	250 – 600mm	600 – 1000mm	1000 – 1500mm	1500 – 2000mm

Figure 24: Annual average rainfall distribution map of Ethiopia. ***Source:*** *Tapestries project.*

3.3. Understand the Social and Economic Contexts of the Watershed

Information and data on social and economic features of the watershed are also critical for development planning. Numbers of population and gender, livestock numbers and management practices, types of crops and cropping calendar, land holdings, local institutions, sources of household energy, crop and livestock production and market and local infrastructure are important socio-economic parameters for watershed development planning.

3.3.1. Identify major farming practices and their seasonality

Agricultural crop production calendar: Lists of the main crops in both the main rainy season (Meher crops) and small rainy season (Belg crops) are recorded with their coverage in the micro-watersheds. The cropping calendar for major agricultural activities (Table 2) such as sowing, weeding and harvesting labour requirements, frequency of ploughing by crop and weeding time are recorded during the focus group discussion. The production amount, productivity of each crop and the purpose of cropping (whether the product is for market, consumption or both) are identified through interviewing the producers and recorded. Crop coverage, crop varieties and yield in good and bad seasons are also recorded. Frequency and cyclic occurrence of drought and other climatic hazards are determined along with the coping mechanisms and community experiences of coping. Pest and disease situations in the community are also recorded, including the most prevalent crop diseases and the magnitude of their influence on crop production.

Table 2: Cropping calendar for major agricultural activities.

	Particulars	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	Total	%
1	Ploughing cropland				x	x	x				x	x		5	41.7
2	Planting crops				x					x				2	16.7
3	Weeding crops					x					x	x		3	25.0
4	Harvesting crops	x	x					x	x					4	33.3
5	Coffee harvesting														
6	Hay/grass harvesting	x	x					x	x					4	33.3
7	Physical Soil and Water Conservation (SWC)		x	x								x	x	4	33.3
8	Biological SWC				x					x				2	16.7
9	Honey harvesting						x					x	x	3	25.0
10	Bee colony development		x	x								x	x	4	33.3
	Total	**2**	**3**	**1**	**3**	**2**	**1**	**2**	**2**	**2**	**2**	**3**	**1**	**24**	

Livestock population and management: In the mixed crop–livestock farming system of the highlands and midland regions of Ethiopia, livestock are the main source of traction power, dung for household energy and manure. However, with inappropriate grazing management and land use systems, livestock aggravate land degradation through deforestation, overgrazing and even destruction of soil and water conservation measures (Figure 25). The SLMP has been promoting social transformation through the adoption of controlled livestock grazing systems and improved forage development. The total number of livestock in the watershed is estimated from woreda and kebele administration offices. However, documentation is rarely available and so rough estimates based on sample households are used for planning. Feed sources are assessed based on interviews and community discussion at watershed level. Furthermore, the size and productive capacity of the pasture lands are estimated using GIS and field assessments.

Figure 25: Soil and water conservation structures and plantations destroyed by livestock grazing.

Land holding: Average size of land per household, land productivity and land use are determined by the WWTs through facilitation of the community-based extension workers to understand socio-economic conditions such as the number of landless households. Information on land holding and land productivity, combined with the size of households, highlight the number of food-secure households in the watershed.

Analysis of landholdings and food security is critical for planning land management measures, including alternative income-generating activities. The landholding data

are also important for use and management planning, including target beneficiaries of communal land.

Average landholding and number of landless households are collected from kebele land administration offices and woreda offices (Figure 26). Currently, the SLMP is supporting the programme to target woredas in the establishment of a woreda Rural Land Administration Information System.

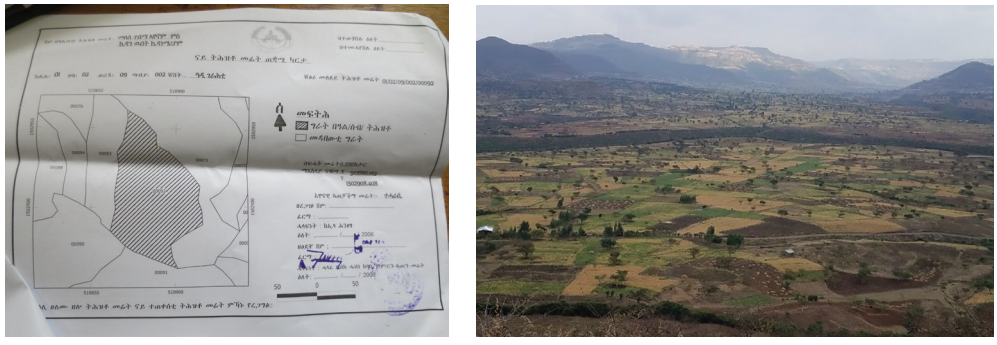


Figure 26: Demarcation of a land holding and number of parcels of an individual holding in a watershed in Tigray.

3.3.2. Identify relevant social practices: population, labour availability and gender

Population and gender: The population size and number of households are important social inputs that are considered in watershed development planning. The implementation period of land management is determined based on the available community workforce and is estimated on average to be 30% of the total population. Both men and women participate in the watershed development activities required for the restoration and maintenance of watersheds, and contribute their labour during the implementation of biological and physical land management measures. Equal representation of men and women in the community watershed development executive committee is crucial for sustainable management and benefit sharing among the social groups. Population and household data of the watershed by gender are extrapolated from kebele administration offices.

Seasonally available labour for land management is estimated based on analysis of the agricultural season and number of households who have farmland. The main rainy season in large parts of the highlands and midland areas of Ethiopia is from June to September with short rain in March and April. The peak of agricultural activity, including ploughing, crop planting, weeding, harvesting and threshing is from May to November. Although cultivation and threshing are mainly men's work, women actively

participate during crop planting, weeding and harvesting. Labour for land management is limited during the peak agricultural season (May–November) and the available workforce for land management including grass and tree planting and maintenance of damaged structures during these months is estimated in most cases at 10%. Public and religious holidays including weekends account for 10–12 days per month and are non-working days for land management activities. The seasonal calendar for different farm activities of the community is recorded and analysed to determine the period when farmers are not busy with farm activities.

3.4. Identify and Prioritise the Major Problems and Respective Solutions

Following the biophysical and socio-economic assessment of the community watersheds, the CWT and the WWT carry out a problem and risk identification exercise to identify the most important problems and associated risks that affect community wellbeing. Corresponding to each problem, the community also discusses and indicates possible solutions. Two or more problem and risk identification exercises can be undertaken based on gender or following the interests of different land-user groups.

The watershed teams identify and rank the main problems in their respective watersheds according to level of severity and impact on community livelihoods. Perspectives of different social groups, such as women, landless youth and the elderly within the community are considered in the identification and ranking of the problems. The CWT attempts to prioritise the most urgent needs and risks, particularly those related to agricultural, natural and water resources. No promises are given at this stage and the priority is identifying solutions that can be handled by the farmers and community members themselves.

The problem identification process starts in a positive setting with the discussion of the people's vision for change, or how the community would like to see the development of their area (Figure 27). This then proceeds to discussing the constraints to achieving their vision. In this manner, participatory watershed management becomes a solution-oriented approach. It is very important that the problems and risks are carefully defined in the first step of the planning process and that they are accompanied by a set of workable solutions/options.

In this process, a CWT or kebele watershed team (KWT) can be assisted to achieve a consensus in prioritising the order in which problems are addressed or development options are entertained. The following steps are applied in the identification and ranking of the problem in a given watershed.

Figure 27: A CWT discusses key challenges facing their watershed and setting priorities in Oromia.

Step 1. Preliminary problem identification exercise: The CWT representing the different social groups defines the problems and reaches a consensus on the problems to be addressed or, depending on the situation, agrees on actions to maximise local development opportunities.

Step 2. Ranking problems using a pair-wise ranking method: Once a consensus is reached among the group on the problems or opportunities to be prioritised, they are listed in a table (see, for example, Table 3). The problems are placed in the same order along the rows and columns. For demonstration purposes we show seven problems; however, there may be more or fewer problems to be considered. The table should thus be expanded or reduced as appropriate.

Table 3: Example of problem ranking.

Problems/ opportunities	Fuel wood (2)	Soil fertility (3)	Moisture stress (4)	Soil erosion (5)	Plant disease (6)	Soil acidity (7)	Score	Rank
Forage (1)	½	1	4	1/5	6	7	2	5
Fuel wood (2)		2	2/4	2	6	7	2.5	4
Soil fertility (3)			4	5	6	7	0	7
Moisture stress (4)				4	6/4	7	4	3
Soil erosion (5)					6	7	1.5	6
Plant disease (6)						7	4.5	2
Soil acidity (7)							6	1

Step 3. Comparison of relative importance: After inserting the problems along the columns and rows, the community representatives compare the relative importance of each problem with every other problem. For instance, starting with the row for the first problem (1), the group assesses whether it is more or less important in relation to land degradation than the problem in the first column (2). In this example, the decision was that (1) and (2) are equally important (how to deal with equal priorities is further explained in Step 4). The same procedure is then applied for the other problems listed (here (1) takes priority). In the next comparison, problem (4) takes priority. The same process is then followed horizontally in relation to problems (5), (6) and (7), and then repeated for all rows.

Step 4. Scoring: The next task is filling in the score column by noting the number of times a problem appears as a priority in the ranking table. Where problems are considered to have equal priority, they may be assigned half a point. In this example, for instance, problem (1) is considered to have equal priority with (2) and (5). Problem (1) thus has a total priority of two times, problem (2) has priority 2.5 times, (3) never, (4) four times, (5) 1.5 times and so on.

Step 5. Ranking: The problem that appears the most times in the score column is ranked first, and the others follow accordingly. If two problems have the same ranking it is essential to look at each one individually and for the committee or community involved to make a consensual decision on which one of the two should be handled on a priority basis.

3.5. Preparation of the Watershed Development Plan: Its Components

All the biophysical and socio-economic information generated using the above steps and processes are used as input to the preparation of development plan that serves as blueprint for action at watershed level.

3.5.1. Preparation of watershed vision map

Following approval of the proposed measures by the general assembly, a development map or vision map of the watershed is prepared by the woreda technical team in consultation with the CWTs. The land management measures proposed for each land unit and slope classes based on community preferences and agreed objectives are located in the watershed map. Woreda leaders and experts, DAs, kebele leaders and community watershed development executive committee members finally endorse the map. Community agreements on the required contributions and management

requirements including livestock grazing are documented as part of the development map. Group and individual community member commitments to the development of the watershed are documented at local and woreda level.

Finally, the information in the community's map is transferred to paper and digitised so that it is documented for future reference (Figures 28 and 29). The discourse among the farmers/planning team during the mapping exercise also helps revitalise understanding of the potential and scarce resources, analyse the challenges and define the land management measures.

Figure 28: Resource map by men's group, Kelbo Tonisha.

Figure 29: Resource map by women's group, Kelbo Tonisha.

3.5.2. Action plans: possible land management measures

Identification and ranking of major problems of the community were dealt with in the preceding stage. The problems associated with land management are listed one by one and the root causes of the problems are studied, distinguishing cause from effect, and anticipated solutions to the problem are discussed separately. Problems related to natural resources and crop and livestock production are listed and major causes analysed and solutions suggested by the community. In the same manner, problems associated with social service and infrastructure are also discussed and analysed and appropriate solutions suggested for another sector to address. However, since different social group members can have different perspectives or levels of understanding on the cause and effect of a problem, it is important to allow sufficient time and thorough discussion and debate for a consensus to be reached.

Based on the problem analysis and prioritisation, and the communities' major priorities, the focus areas for development intervention are discussed by the WWT and the community-based DA. Accordingly, the type and quantity of land management measures by land unit and required resources, including labour to address the problem, are quantified by the woreda technical team and annual and multi-year

implementation calendars are developed. Measuring the area and slope class of the land is important when estimating the volume and type of land management measures in each watershed (see Table 4 for an example for Weleshe watershed, Oromia). Final approval of the proposed measures is by the general assembly of the community watershed.

Table 4: Area extent by land use/land cover and slope in Weleshe major watershed, Mana.

	Slope range (%) and area extent (ha) in Weleshe major watershed, Mana District, Oromia						
Land use/land cover type	0–3%	3–8%	8–15%	15–30%	30–50%	>50%	Total
Communal land – hillside	0	9.7	19.1	22.1	79.7	5.9	136.4
Farmland	16.1	432.7	236.3	67.7	81.1	10.1	844.1
Forest	0	0.4	0.5	0.5	0.1	0	1.6
Grazing land	0	9.1	3.7	1.8	3.2	0	17.9
Household grazing land	0.1	12.6	0.9	0	0.1	0	13.7
Homestead	0.1	6.1	1.0	0.0	0	0	7.3
Grand total	16.4	470.7	261.6	92.1	164.2	16.0	1021.0

Source: *SLM-III biophysical baseline survey report, 2020.*

3.5.3. Financial and non-financial resource mobilisation strategy

While the annual and multi-year watershed development plans are elaborated and endorsed, local, regional and national resources required for implementing the planned measures are mobilised. Communities are assisted in clarifying and expressing their needs and objectives and in taking collective action to meet their own needs. Community mobilisation and organisation is a critical first step in translating the watershed development plan into action and ensuring the active participation and engagement of communities. Different approaches are applied to mobilise community resources required for the implementation and maintenance of land management measures. The following approaches are applied to motivate the communities for the work and mobilise required resources at the local level.

3.5.3.1. Sensitisation/awareness raising of the community

Sensitisation of and awareness raising in the local community are crucial approaches during the preparation and implementation of an integrated watershed development plan (Figure 30). Locally available social platforms such as Idir and Eqube as well as church gatherings are used by community facilitators, WWTs and DAs to encourage

community attendance for an awareness raising event. The following tools are applied by the SLMP to inspire communities and prepare them for land management.

Figure 30: Local community sensitisation and awareness raising events.

Audio-visual materials: Starting from the time of the initial Land Use Project for Oromia, the Integrated Food Security programme for South Gonder in Amhara and the Integrated Food Security programme for Shire in Tigray, audio-visual materials have been used for sensitisation. Overhead projectors for microfilm or microfiche use, generators and white boards and/or a white fabric screen are taken by car to the watershed. People gather under trees, in kebele halls or any other meeting areas to see the slide shows.

Short videos and photos from the local best-performing community watershed, model farmers and SLM projects are shown in the gathering for the community to learn from others how land management can improve livelihoods. International experiences,

including documentaries on the Loess Plateau of China and of Korean SLM, have also been shown to motivate local communities on possibilities for restoration and the sustainable use of degraded land. The documentaries shown to local communities as part of the sensitisation process have been instrumental in triggering action and adoption of SLM practice.

Advocacy through community members who are trusted and influential speakers: Early adopters and influential personalities within the community can convincingly describe innovative ideas to others during the sensitisation once they themselves are convinced of the relevance of the land management practices to their locality. Special attention is given to such personalities through pre-sensitisation meetings and discussions on the importance of land management practice, because they may feel it is inappropriate and may assume that the proposed action will threaten their social status, entail land confiscation, make the government levy additional tax or distort peoples' cultures, values and norms due to being unsuited to local conditions.

Gebremichael Gidey, known locally by his nickname 'Abba hawi', of Abreha-we-Atsbeha watershed in Tigray, northern Ethiopia, is a good example of the impact local personalities can have in the promotion of SLM in the region and the country. Gebremichael is a charismatic community leader in his village. He teaches others on the importance of land management by doing this in his own village, farm plot and back yard. His village, Abreha-we-Atsbeha, was abandoned 30 years ago due to land degradation and drought. However, Gebremichael tried to keep his community together and revitalise his village. Within two years, he and his community realised that the land can change and produce food through conservation of the soil and water resources. As a local leader, Gebremichael Gidey has successfully mobilised his community towards the sustainable management of land resources in his village. The community has consistently been engaged in restoring the 6,766-ha catchment area of the village for the past 20 years (Figure 31). The community currently uses the catchment, including the waste/barren land, for forage, fruit, crop and fuel wood production. The community obtained access to irrigation water and the village is now supplying drinking water to the nearby municipality of Wukro. Gebremichael and his village were awarded the UN Equator Prize in 2012 for best performance in the restoration and sustainable management of land resources. Over the past 5 years, he has hosted two to three busloads of visitors per week, including community leaders, development workers, researchers and policymakers from the region and the country. He is passionate about sharing his life experience in SLM and can influence regional, national and international polices in land management.

Figure 31: Abreha-we-Atsbeha community and the leader Gebremichael (bottom right) restoring degraded lands through check dam construction (top left), assisted regeneration of lands (bottom left), regeneration of pastureland (top right).

3.5.3.2. Hands-on participatory engagement

Involving and engaging the target community has been a common and routine practice in SLM planning, monitoring and quality assurance processes. Describing the processes and their implications separately for each of the three stages makes the process easier to understand for readers.

At the planning stage, Participatory Rural Appraisal is a common tool adopted to identify the local land degradation problems, assess its change in terms of severity and extent over time, prepare resource maps and rank problems. At this stage, the community is engaged mainly through representatives. That is, key informants selected from the community, CWT and KWT are fully engaged in socio-economic and biophysical data collection, as well as transect-walks, problem ranking and the prioritisation of interventions. The DAs document the process along with any issues raised and keep the documentation at kebele level for future use in operational planning and change monitoring. At the end of the process, the larger community discusses the outcome and gives its agreement before the findings are converted into a clear multi-year plan.

At the implementation phase, the able-bodied members of the watershed community are mobilised for NRM activities and organised into groups of 20–30 members led by

a development team leader. For the execution of specific soil and water conservation measures, these groups are further divided into smaller groups of five members, led by a production team leader. This arrangement is known throughout the country as a 1:5 working group. Generally, the 1:20–30 development team is assigned a specific site for the execution of certain conservation structures, which it then divides among the 1:5 groups to simplify the management, follow-up, technical support and quality checking. For each development team (1:20–30 group), there are three trained farmer technicians (sometimes called contour markers), who are responsible for placing contour marks before the start of construction and who help approve the quantity and quality of work done (Figure 32). Quality control is performed by a three-member committee involving one farmer technician. Its task is to check the quality of layout and structures both during and at the end by measuring width, height, depth, gradient and other parameters, and by checking compliance with technical standards. Unless the quality control group gives approval, the executed work is not recorded and reported. Using such a centralised and uniform work arrangement engaging farmer technicians has played a major role in maintaining the quality of soil and water conservation structures. Adopting this work arrangement at community level has also helped trace activities by individuals and enforce minimum quality standards.

Figure 32: Trained field technicians making contour lines before the construction of a soil and water conservation structure (left) and measuring the depth and width of the structure after construction (right).

Monitoring and quality assurance: The community are also involved in monitoring according to their defined responsibilities and procedures in SLM M&E documents, namely results-based monitoring and evaluation (RBM&E), joint monitoring mission (JMM) and the woreda guideline documents below. Moreover, most communities endorse a watershed management and use bylaws to provide CWT/KWT with regulatory authority to ensure the quality of work done individually, as well as follow-up on timely maintenance of soil and water conservation structures after certain intervals. The community-based M&E is a complementary process of quality assurance at community level, adoption of work norms and technical standards,

establishment of 1:5 working groups and getting advice and support from trained farmer technicians, as discussed in the preceding sections.

Resident-owned information transfer: The SLMP has been continuously encouraging information sharing within and outside watersheds. Shared information includes adopted hands-on best experiences, tested technologies and farmers' incorporation of their indigenous knowledge into implemented technologies and innovations. Challenges encountered during execution and local 'way-outs' employed are also shared.

During various occasions farmers stood up in meetings of neighbouring farmers and spoke of the livelihood improvements following SLMP intervention. Beyond that, beneficiary farmers have outlined the comprehensive achievements of the SLMP and its benefits while attending training sessions.

There have been countless cases in which people from non-SLMP woredas arranged visits to SLMP woredas far from their own. They have visited treated farmland, closed areas and nursery sites of the SLMP farmers. They have observed, asked questions, tested the fruit of newly introduced improved fruit trees, practised grafting and communicated with women and youths who were engaged in watering plants.

These self-initiated exposures have encouraged visiting farmers to start constructing soil and stone bunds, fencing farmland and homesteads for protection against free grazing, digging shallow and deep wells to get water for irrigation, establishing their own mini-nursery sites for the production of improved varieties and mobilising all members of their family rather than depending upon only a few. They did not face the problem of obtaining tree seedlings to start with because they got some for free from the visited areas and grew some others by procuring seeds. Nowadays, as a result of such self-instigation, numerous farmers have generated additional income and significantly improved their livelihoods.

3.5.3.3. Experience exchange visits (EEVs)

Most inhabitants of rural areas understand the contemporary scope of land degradation and its dire environmental and livelihood consequences. At the same time, some farmers perceive that land degradation is imposed by nature or a higher force, and that it is thus difficult or futile to rehabilitate degraded land and make it productive. Of course, most people realise that physical soil and water conservation measures alone cannot bring change. Such measures have to be integrated with other development activities, focusing on tackling the causes of degradation rather than trying to eliminate the effects or symptoms.

Having said this, the potential rehabilitation of degraded land is still not well understood. General solutions like soil and water conservation activities have been suggested by farmers during community-action planning. As a result, training and EEVs

have been planned for the CWTs, with selected farmers obtaining full participation of the community during implementation of various land development measures. Farmers can easily convince others after a suitable EEV to a demonstration site. Visitors should comprise different social groups (women, youth, elders and ordinary farmers). Farmers' perceptions genuinely change after observing the results of implementation of the various measures. Examples of improvements witnessed include reduced runoff, increased crop yield, rehabilitation of existing vegetation and the seeding of new species resulting in increased biomass. The development history of a watershed selected for an EEV should be explained by the community members themselves.

Farmers are easily convinced when other farmers share practical experiences. The EEVs must therefore be well organised, from the selection of participants – reluctant and model farmers, community leaders, woreda experts and administrators – to the selection of demonstration sites.

Accordingly, preparations for each visit, such as making appointments and logistical discussions, should be made about two weeks before departure. Times must be chosen that suit both visitor and host communities in order to guarantee the participation of all concerned.

A series of novel pioneering strategies have been employed to bring about sound breakthroughs during EEVs compared with outdated agricultural intervention approaches. The subsequent innovative strategies have been admired by government sectors, donors and technical assistant development partners.

Selection of one or two representatives from each locality for EEVs has been the practice in agricultural extension for a long time. It is a lamentable recent experience that, immediately after conducting such activities, an expert, DA or community facilitator leaves the agricultural sector through promotion to local cabinet, zone administration and/or other sectoral offices. This has often occurred and entails not only the loss of an expert but also the unwise use of financial resources.

By the same token, farmer-to-farmer EEVs have not always included the expected number of farmers. Some farmers who were, for instance, transported from one region to another for a EEV might move to urban areas later. This happens especially in cases of watersheds adjacent to main cities and/or fast developing towns. Hence, the implementer farmers lack an eyewitness farmer participant who can elaborate their observations of practical experiences.

In light of these challenges, the ground-breaking idea of 'one woreda at a time' was introduced. Via this new principle, from a single woreda are selected two lead farmers, eight female farmers, eight male farmers, two DAs, two community facilitators, two woreda experts and one head of the NRM section from the OoA. These people are then placed on a single bus and taken for EEVs.

This resolved the past challenge of losing the partakers immediately after the EEV and improved SLM in many of the woreda watersheds. For instance, in Woliso, one of the leading SLMP watersheds, farmers were astonished by results of such EEV-based adoption of technologies and independently organised a farmers' day and gave awards to woreda experts.

Special arrangement for decision-makers: The EEVs were previously considered the sole domain of lead farmers, DAs and community facilitators, with decision-makers ignored. Later, especially in cases of serious implementing challenges – such as retardation of NRM rehabilitation, inefficient use of financial resources, mismatch between expenses and construction of physical structures and/or procurement of materials needed – decision-makers were included.

Special EEVs were organised for decision-makers only. Zone administrators or their deputy, zone SLMP focal persons, woreda administrators, woreda heads of the NRM section, woreda focal persons and some other financial heads were selected to visit the best-performing woredas.

After such action, decision-makers started replacing inactive experts with reputed ones, and cabinets included cases of SLMP in their weekly, monthly, quarterly and yearly evaluation agendas. Cabinets also sped up both the local level implementation and slow procurement processes, and strengthened relationships between sectoral offices due to a focus by senior officials.

Women-to-women exposure visits: Men often do not want to send their wives to EEVs. This is probably the result of embedded male chauvinism and the husbands' fear of harassment by co-travelling men.

Increasing women's participation required another innovative approach. First, as much as possible, selection of EEV participants started from an assortment of women experts and/or DAs. Women want to be advised by women experts and/or DAs rather than men. With female professionals they are not hesitant and openly discuss routine activities, local demands, challenges and possible ways-out. They admire the presence of women experts as they appreciate qualified gender representation.

During visit execution, the SLMP advised hosting communities to ensure the presence of articulate and influential women to talk with the visiting women and exchange experiences. After attending the opening talk, the host women first join the visiting women in the hall and then move to a field visit to observe and gain hands-on experience.

This does not mean women sit in a separate bus and communicate with women only when travelling. Talking with men in the bus also allows them to hear the men's discussion because men mostly do long travel and know more about environmental differences. Generally, the women prefer to sit next to other women in the same row

of seats. Their habitual action, after hearing men's discussion, is to start analysing and relating cases concerning their own homestead, farmland and livelihood improvement. Women claim that they learn a lot via such actions.

Preference between visiting best-performing or dwindling sites: Customarily, experiences were chosen from best-performing woreda watersheds or those that had received awards. Later, technocrats of the SLMP realised the importance of visiting selected watersheds that had been best performing long ago and also those that were contemporarily declining. People adopt tested technologies and learn up-scalable knowledge, skills and practices from best-performing woredas. Similarly, observing why best performers failed can be a lesson to avoid similar errors.

Community facilitators and local leaders: Community facilitators' contributions to, and roles in, integrated participatory watershed development are vital. After being selected and employed on a temporary basis, separate training in effective and efficient task execution is provided to these experts. These 'home-grown' experts speak the languages of the local community; respect indigenous culture, values and norms; have a reputation of working with the local community; and work with farmers, experts at all levels and development actors. Before their assignment in the community, community facilitators agree with the woreda OoA to accomplish the following tasks:

- facilitate training of extension workers, woreda experts and DAs in participatory watershed development, management and use planning, implementation and monitoring in consultation with the regional GIZ office;
- guide, coach and backstop community- and district-level agricultural extension workers in establishing and registering community watershed users' association/ cooperatives;
- develop criteria for the selection of model watersheds in consultation with partner staff and the regional GIZ office;
- support the establishment of model watersheds in selected SLMP intervention woredas/watersheds and facilitate networking and knowledge exchange between relevant actors;
- provide guidance and technical support to woreda experts and DAs in preparing quality and timely annual and multi-year watershed development plans;
- advise zonal and woreda administrations on establishing and registering community watershed users;
- contribute to the development of innovative concepts in SLM, which strengthen the ownership of local communities.

In contrast to positive performance in many areas, there were some cases in which community facilitators were unable to deliver planned activities as desired. In these

under-performing woredas, after evaluating low performance during yearly reviews, the contractual agreement was cancelled and the whole activity was transferred to DAs and woreda experts.

3.5.3.4. Organising communities

Experience from the SLMP indicated that sensitised communities can effectively implement land management only when they are organised into manageable groups. Communication, technical advice, learning and accountability for the work are ensured through community organisation. The SLMP follows procedure in organising communities for restoration, management and use of watershed areas and for knowledge exchange.

Forming working and user groups: In the SLMP, group formation has various local arrangements, although the general principle is similar across all areas. Work groups, usually consisting of ten farmers, are established in order to accelerate implementation of planned activities. For instance, if the activity is the construction of a gabion check dam, the first group is assigned to unload stones from a truck, the second group dig soil for stone placement and the third group transports seedlings from nurseries and plants them on site.

There are also conditions in which groups are used to construct deep wells. In cases where ten deep wells are planned, ten groups of ten farmers each will be assigned to dig the ten ponds. As well as assigning people for group work like well construction, a time for completion is agreed. In cases where other seasonal activities also need to be done in time, they may decide to carry out one activity in the morning and another in the afternoon.

Membership of the work group assigned at one time could be reassigned later to perform other activities. Even demonstration of improved technologies requires grouping. There are practices, like selecting the first ten lead farmers to learn more about SLM technologies, that need to be demonstrated. Afterwards, these ten people promise to transfer their knowledge to ten farmers one at a time. Above all, such a strategy helps to quickly reach all watershed farmers within a short period.

Women are also grouped into tens. The first ten women boil coffee and serve lunch and the second ten water seedlings for five consecutive days; the third group might also distribute newly arrived inputs like apple seedlings, chickens, improved sheep and goats and crop and/or tree seedlings.

Lastly, experience shows that unless farmers are congregated into work groups, tasks are left unattended, timeliness is not respected, easy-going people disrupt actions of the hardworking, accountability issues are not addressed and competition does not take place among farmers for successful accomplishment of planned activities.

Community agreements and bylaws: A bylaw is a rule adopted by an organisation chiefly for the government of its members and the regulation of its affairs.

Community bylaws are instrumental to ensure proper implementation of agreed watershed management. The bylaws may differ based on the type of issue. The bylaws are developed by involving the community, experts from the woreda OoA and other stakeholders.

Bylaw development presupposes several steps. First, woreda experts, DAs and community facilitators should complete their office work before providing any support to bylaw development. Statute frameworks need to be prepared in advance to serve as a skeleton. Experts should comment, contribute innovative ideas and provide sound suggestions through repeated revising of the draft document. Second, sensitisation should be carried out by woreda experts (agronomists, cooperative professionals, experts of the gender office, foresters, livestock professionals, micro and small enterprise promotion experts and horticulturalists). During SLMP intervention, sensitisations were performed to achieve acceptance of the organisational set-ups and their bylaw formulations. In cases of rejection, repeated sensitisation takes place rather than trying to impose outsiders' perspectives, enabling agreements to be reached via the inclusion of insiders' viewpoints.

Senior experts of the institutional development have been providing support and coaching activities only in two or three model cases. After repeated practice, DAs and community facilitators were carrying out sensitisation, supporting bylaw formulation and processing legalisation on their own. In cases of unexpected challenges, local experts either use their own discretional power or consult respective woreda experts.

The bylaws established with respect to the implementation and protection of the established physical and biological structures are sometimes opposed by the customary indigenous institutions usually because of power and/or status conflict, impositions of influential personalities or resistance to change.

Several bylaws were developed through full participation of watershed farmers in many SLMP intervention areas as well as areas of government interventions. Bylaws play a great role in the proper management of rehabilitated land, whether communal or individual. For various reasons, most bylaws are either not properly formulated or revisited frequently. Hence, trustworthiness and abiding power of bylaws both tend to deteriorate.

3.5.3.5. Provision of resources

Sensitised and organised communities require resources such as hand tools, planting materials and land to demonstrate and implement the agreed land management measures. Agricultural resources are mobilised by the government, local people and

development partners. For example, land is the major resource owned by private farmers, the community and/or government.

Planting materials: Seeds of planting material are generated from various sources, from nearby farming communities, more distant regions and/or abroad. For instance, seedlings of desho grass were taken from Sidama Region and transported to various areas with similar eco-regions. Similarly, in an attempt to control termite infestation, Menesibu woreda of the Oromia Region was used a source of Chomo grass (Figure 33). Other adjacent woredas of the West, East, Horo Guduru and Qellem Wollega zones propagated Chomo by procuring seedlings from Menesibu. Watershed farmers of Menesibu also generated additional income from this. Furthermore, apple seedlings used in promotion during SLMP implementation were imported from countries like Spain and Germany.

Figure 33: Planting material (trees, forage and fruit) production centres managed by local communities in the SLMP intervention watersheds.

Land resource: In Ethiopia, land ownership is under state control. Hence, a community requires user rights for land to be used for the production of communal goods and services such as nurseries and training centres. In some areas only private land exists. The communal lands are steep, stony in nature, without rivers or ponds and far from main roads. In some areas, unrestrained communal land is unavailable. Such challenges can be a major hindrance for community resource centres. Farmers either formally or informally analyse the seriousness of the issue and finally lobby a farmer who has

better land (e.g. access to water, not stony, close to main roads or better fertility) for an allotment. In compensation, the other farmers in the village provide relatively better farmland.

Acquiring, storage and use of agricultural hand tools: Restoration and sustainable management of land is labour-, capital- and knowledge-intensive. It requires commitment and collaboration between the community, the public, private sector and development support programmes.

Farmers usually contribute labour for communal activities (as agreed in the project concept), actively participate in planning watershed development interventions, test innovative practices or technologies and vote for watershed committee members.

The limitations of the efficient use of communal land are mainly technical, financial or related to tenure. In many circumstances, adoption could be resolved through the process of trust building, regular communication, training and the involvement of government institutions.

Agricultural hand tools are procured to aid construction of physical structures like hillside treatments and shallow wells as well as for gully rehabilitation and farmland handling. These tools include various hoes, shovels, rakes, spades and hammers.

Farmers badly need secure rooms to store agricultural hand tools. Most farmers agree to keep their common hand tools in the homes of highly respected, hardworking, influential farmers who are acknowledged by government for their positive contribution to the development in the village. Farmers' training centres are preferred in other areas, although some are not secure. When constructing physical structures, the assigned work group members travel to the residence of the lead farmer and choose tools for daily work. Upon completion of their regular routine, they take the tools back. These tools are not only used for the project work but also, following the same procedure, during yearly campaigns.

On some occasions, hardworking and exemplary farmers who seriously followed professional advice and increased their income through maximisation of production, and thereby made their farmland and homestead into learning centres, have bestowed tools individually. They organise farmer field days and open their fields for observation. They discuss their achievements and relate challenges faced and proudly present their timely solutions.

Technical advisor support: Technical advice of DAs and woreda extension workers during implementation of SLM is crucial. Adoption of land management by communities at individual and group level is high in the presence of strong support by technical advisors. Communities who are left alone during the implementation of land management become discouraged and feel uncertain in regard to the quality and effectiveness of the measures.

The DAs play a facilitating and technical role, leaving the CWT to own the planning process, which increases their sense of responsibility and confidence. In this respect, DA professional skills and experience must guide them towards activities that are sound and beneficial to the community and the target group. The DAs do the following:

- liaise and communicate between woreda and communities, guiding communities in activity planning;
- provide technical support during implementation of project activities;
- prepare periodic reports on project progress;
- actively participate in the introduction and testing of new methods or technologies;
- participate in and support all planning and M&E activities.

Local community awareness and enhancement of their participation to achieve a sense of ownership of rehabilitated land is the critical stage that is completed before the implementation of physical land restoration measures on the ground:

- woreda leaders and experts, DAs, kebele leaders, village leaders, the watershed committee, community facilitator and the wider local community fully participate in an arranged discussion forum;
- a detailed discussion and negotiations take place before communities reach a consensus and final commitments are by members of a given watershed (Figure 34).

Figure 34: Local community discussion for awareness and agreement on implementation of biophysical measures before implementation (Ada'a Berga woreda, Bilacha, Oromia).

3.6. Quality Assurance Through M&E in SLM

3.6.1. Overview of developments in the concept and practices over time

Quality assurance through M&E under SLM has passed through a wide range of changes and improvements, both in terms of conceptual framework and actual practices, since the development of the first version of Ethiopian Strategic Investment Framework (ESIF). The ESIF emphasises the need for a harmonised M&E system to be applied by all SLM projects implemented throughout the country. This has triggered the development of M&E tools to measure quality and coverage of SLM in Ethiopia. However, efforts to develop a functional SLM M&E system have been cumbersome and took a long time because the process changed over time to accommodate tools or indicators from the M&E practices of SLM projects implemented after 2008. Below is a review of the core changes or improvements to M&E in SLM since the inception of the national flagship SLMP in 2008.

Looking at good practices and experiences gained from Sustainable Utilization of Natural resource implementation, the technical support responsibility largely rested on GIZ during the first phase of SLMP, implemented from November 2008 to December 2013. As part of this technical support responsibility, MoA and other development partners financing the programme, particularly the World Bank, tasked GIZ to develop and institutionalise an M&E system for the project. The key planning and M&E products delivered in this phase include an annual and multi-year work and budget Planning and Reporting Tool (PRT); SLMP-specific M&E guideline development; training of SLMP and MoA staff through continuous coaching and training offered by GIZ M&E advisors and international consultants; producing project baseline and end-line study impact reports; and producing a Normalized Difference Vegetation Index study impact report through expert technical and financial support. On top of these, GIZ contributed both technically and financially to the running of regular SLMP M&E activities. Worth mentioning in this regard is the support given to the biannual Joint Implementation Support Mission (JISM) for assisting indicator-based internal monitoring events, biannual project review and re-planning workshops (Figure 35).

Figure 35: SLMP implementation support mission members discussing with woreda and community watershed teams in Tigray (left) and Amhara (right).

The SLMP M&E system was again fine-tuned during implementation of the second phase of SLMP (2013–2016). Like the first phase, developing and institutionalising a functional M&E system was given top priority. Key products added in this regard include the result-based M&E manual printed as a book; a multi-year and annual work plan and budget development; a micro-watershed-level database; sub-woreda-level data collection and reporting guidelines; developing and institutionalising web-based PRT; and training and coaching of partner staff. Furthermore, MoA and development partners contributed personnel and resources for the biannual JISM, for internal indicator-based monitoring activities and even assigned a full-time seconded planning and M&E staff member at the national SLMP coordinating office and in some regional SLMP units (Amhara and Oromia) to strengthen partner M&E capacity. An exit strategy document to guide watershed performance assessment was also developed and introduced during this phase, in watersheds covered by financing from the German Government and the Canadian Department of Foreign Affairs, Trade and Development (DFATD).

The M&E practice during the third phase of SLMP, under implementation since 2016, is largely a continuation of the second phase. Nevertheless, the use of technology to support M&E, particularly geospatial monitoring via satellite and radar images, received more attention. The GIZ support to M&E was minimised and the area of attention was changed. This was partly due to the understanding that the partner had gained a better M&E capacity due to past assistance and partly due to GIZ revising its focus from direct land rehabilitation interventions to interventions that attempt to maximise the use of land rehabilitated during phases 1 and 2 of the SLMP for economic development opportunities. Even in this third phase, GIZ has been trying to upscale innovative M&E methodologies from the GIZ SURED project (such as tracer studies and survey solution software for tablet-based surveys and tapestries) to partner systems.

The above long-term process of tailoring the SLM M&E system and practice, and the commendable results of this process, were not without drawbacks and challenges.

Some of the excellent results were not used sustainably for successive projects. Contributions and impacts of M&E in steering the management of SLM, along with the lessons identified, are discussed in subsequent subtopics under each of the quality assurance M&E approaches and tools as appropriate.

3.6.2. Quality assurance approaches and tools adopted

The SLMP put in place various approaches and tools to ensure high quality work through monitoring and work supervision. Key quality assurance tools and mechanisms are discussed below.

3.6.2.1. Use of standard work norm and technical guidelines

A document on information technologies, commonly referred to as 'infotech', has been the main guiding document within the CBPWDG for the implementation of watershed management practices under the SLMP. The main purpose of this document was to guide field staff to follow correct and quality-oriented technical standards pertaining to local conditions of soils, slopes, vegetation and rainfall patterns. The information technologies document further attempts to summarise several aspects related to the interventions, providing information on key design features of the measures. Hence, this helps practitioners identify recommended soil and water conservation measures for each agro-ecological zone and guide implementation by setting minimum specifications of each measure.

In order to enhance the required functions, the type of soil and water conservation technologies should be carefully identified and selected and properly matched with the specific local conditions. Accordingly, measures for cultivated land were identified based on soil drainage, soil erodibility, slope gradient and shape, rainfall characteristics and the prevailing farming system. Moreover, to meet the specific functions, combination and integration of the different technologies were well considered. Thus, selection and integration of soil and water conservation technologies were supported with detailed spatial information such as topographic, soil and climatic information as well as the connectivity of upstream and downstream uses.

For ease of identification and understanding, the information technologies document is grouped under 12 headings:

- physical soil and water conservation technologies;
- in-situ physical moisture harvesting – water storage measures and drainage management structures;
- gully rehabilitation technologies;

- biological soil and water conservation technologies;
- area closure;
- rehabilitation of degraded land and management practices;
- agroforestry practices;
- wind erosion control measures;
- structural water harvesting technologies;
- small scale irrigation – irrigation water application and management, and water lifting devices;
- homestead development and livelihoods;
- feeder road construction.

Specification of each activity provides a description of the appropriate site to be considered, other activities that need to be implemented in combination, and detailed measurements and dimensions of the activities in regard to local conditions. For instance, for a graded bund, the specification requires that the vertical interval between two bunds is 1 m for slope gradients of less than 15%. For steeper slopes, the vertical interval must be 2.5 times the depth of reworkable soil. No gaps can be provided for ploughing oxen to cross (as for level bunds) because the graded bund serves as a drainage line that cannot be interrupted. Whenever possible, traditional waterways in the area are used and improved where graded bunds are to be applied. The waterways are constructed one year before the graded structures to stabilise them before use. If the bunds are long, the basins behind them are increased towards the waterway, as more runoff will have to pass during storms. The size of the ditch can be 25 cm deep by 50 cm wide at the beginning of the bund, but should be 50 cm deep by 100 cm wide after about 100–150 m, when the bund reaches the river or waterway.

The examples above demonstrate that availability and application of the information technologies document as a technical standard has been a critical factor in maintaining a minimum quality of work, which is the basis for durable structures that perform as intended.

3.6.2.2. Technical review of annual and multi-year plans at woreda, zone and region levels

One of the reasons for low quality soil and water conservation works executed through the government's regular programme is the inclusion of measures without adequately considering a region's local socio-economic and biophysical conditions. In contrast, the SLMP implementation is guided by a five-year plan containing integrated rehabilitation activities designed to address land degradation problems in each targeted micro-watershed, with a target and indicative budget allocated by activities and by year.

Before preparing this plan, socio-economic and biophysical data for micro-watersheds are collected, reviewed, organised and analysed by woreda, zone and regional technical teams following the methodology and tools recommended by the CBPWDG (Figure 36). Making these practices a common and standard approach has allowed identification and incorporation of locally appropriate and evidence-based types of integrated activities, which eventually contributes to quality of the work implemented.

Figure 36: Woreda and zonal watershed teams reviewing and analysing the biophysical and socio-economic data of watersheds in Oromia.

In addition, DAs and woreda-level partner staff are extensively involved in this process from the very beginning. They are supported by GIZ advisors to improve the quality of planned activities through the use of Google Earth free-source images, applying GIS and GPS for biophysical data collection. Finally, the activity target, cost, coverage area and other factors are calculated and further elaborated with an Excel-based planning tool developed by the GIZ Oromia regional office; the full and complete multi-year plan document with narration and maps is prepared using the output of this tool. The significance of the multi-year plan is as follows:

- enhances quality because evidence-based locally appropriate activities are included;
- guides scheduling of project activities according to watershed management intervention logic;
- helps to visualise future changes and monitor quality of work over time;
- serves as a basis for annual operational plans.

3.6.3. Use of planning and reporting tools

In SLMP, it is standard practice and a precondition for release of finances by development partners to have annual workplans and budgets drawn from the multi-year plan. The MoA and development partners recognised the importance of strengthening the annual planning process with technologies and software from the very beginning. Accordingly, different solutions were introduced to speed up and

improve the quality of the planning process and output. Two of them (Eco-pop and PRT) are briefly discussed below.

Eco-pop: An offline Excel-based planning tool that integrated all work norms and activity lists. It helped simplify the planning process and reduced workload on partner staff. It also allowed planned activities to be more accurately framed in line with the project result framework.

PRT: A web-based activity and input planning and progress reporting tool developed based on the experiences of Eco-pop. The PRT is a useful system for activity and budget planning and reporting and has been used for preparing SLMP plans in KfW- and DFATD-supported woredas since 2012. Regular reporting remained problematic because the tool lacked an offline data entry option. Later, the PRT was transformed step-by-step into a new system with an offline functionality while keeping its initial functionalities.

The application of Eco-pop and PRT for SLM planning helped to improve many aspects of work quality. First, the workload of woreda-level technical team members was minimised, allowing them to think through the complementarity and timing of activities more thoroughly before including them in the plans. Second, the tools lowered personal errors made in estimating quantities of items needed and calculating work costs, which was a common cause of compromised quality during implementation. Lastly, the tools increased transparency and reduced deviation from plans, leading to better quality control of implemented activities and accountability for targets not achieved.

As well as the quality enhancement discussed above, the tools brought the following benefits:

- sped up the plan review and approval process, which in turn helped lower-level activities start on time;
- enabled standardised, timely and systematic SLMP planning and reporting for activities and budgets;
- enabled standardised RBM&E indicators and possibly automated reporting on the website;
- helped to reduce error and raise accuracy of planning and reporting.

3.6.4. JMM and guidelines for quantity and quality management

The JMM is an approach for checking the reported quantity and quality of outputs and/or services and selected outcome indicators at ground level. The document prepared

to elaborate the JMM approach clearly defines the role, procedure, instruments and templates to be used by woreda experts and DAs for monitoring and ensuring quality. The approach allows participation of key stakeholders (e.g. GIZ advisors, region MoA staff, woreda technical experts and DAs) in the process. Expert observation, measurement and focus group discussions are the basic M&E instruments applied during JMM. More specifically, JMM helps with the following:

- measure quantity of biophysical measures and compare them with reported figures;
- rate quality/sustainability of biophysical measures;
- identify reasons for successes and failures with respect to biophysical measures through discussion with communities;
- assess adoption rates for SLM practices on individual land and the resulting productivity increases in discussion with farmers;
- assess extent of land certification contribution in facilitating investments on individual land and in a reduction of land-related disputes in discussion with farmers;
- assess the level of woreda platform members' satisfaction with managerial support provided by the regional and federal SLM;
- evaluate extent to which farmers apply the knowledge and skills they learned from training and experience sharing visits;
- evaluate level of community participation on SLM planning, implementation and M&E via discussions with community members.

3.6.5. Technical review and steering of project by MoA and development partners

As well as the above regular monitoring and reporting by lower-level partner staff, the SLMP adopted indicator-specific monitoring of various types, as is briefly explained below. It is noteworthy that the selected indicator-based monitoring is carried out under the auspices of the national SLMP coordination body at MoA after agreeing with development partners on internationally and statistically acceptable methods and representative sampling techniques. Reaching such prior agreements among partners is one of the key success factors for the usability of the findings and recommendations, including restructuring results frameworks, project components and budgets.

3.6.5.1. Programme-level monitoring of development and environmental goals

Productivity impact monitoring: Done mostly through engaging the Central Statistical Agency for household survey and crop harvest data collection while another consultant is involved with analysis and report writing assignment. This helps to measure the impact (if any) of the project in increasing crop and livestock productivity. For that purpose, baseline, mid-line and end-line surveys are conducted both in intervention and counterfactual micro-watersheds. The effect of the project is analysed through adopting the difference-in-difference technique.

Watershed performance assessment (exit strategy): A methodological approach applied to assess overall status of a micro-watershed through a rigorous analysis of the watershed from ecological, economic, social and sustainability perspectives. It is usually conducted before the start and at the end of project support and also allows identifying the key remaining interventions to exit from target micro-watersheds. It is developed and documented by the Water and Land Resource Centre in collaboration with GIZ (Figure 37).

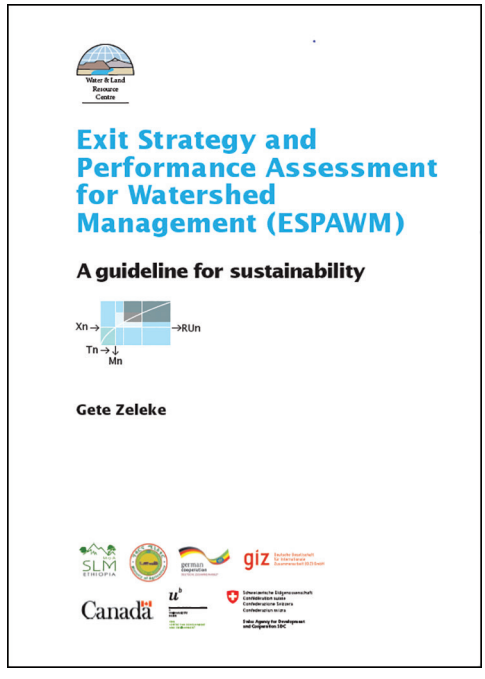


Figure 37: A guideline for watershed performance assessment.

Environmental goal of carbon monitoring: The SLMP applied various approaches – the Ex-Ante Carbon-balance Tool (EX-ACT), before/after soil laboratory tests and the

Rot-C model – to measure the effect of project intervention on increasing below- and above-ground carbon stocks.

EX-ACT was developed by FAO to assess a project's net carbon balance. This is the net balance of tonnes of carbon dioxide equivalent (tCO_2-eq) greenhouse gases (GHGs) that are emitted, or carbon sequestered because of project implementation, compared to a 'without project' scenario. EX-ACT captures project activities in five modules: land use change, crop production, livestock and grassland, land degradation, and inputs and investment. EX-ACT estimates the carbon stock changes as well as GHG emissions per unit of land, expressed in tCO_2-eq per hectare and year. EX-ACT is particularly applicable for SLMP-2 as it offers the following advantages:

- simple, user-friendly, interactive and participatory;
- robust and offers a broad of scope of GHG analysis;
- flexible in terms of requirements for coefficients and site-specific data;
- can handle land use conversion, changes in agricultural practices and projections over long-term horizons;
- outputs can also be used in financial and economic analyses of projects.

Rot-C is an Excel-based model that requires use of the activity baseline and monitoring survey tool to collect data on crop production and SLM practices used on cropland in relation to residues, manure, perennials, fertiliser, cover crops, livestock and grazing patterns. Finally, the data are entered into Rot-C to automatically calculate the change in carbon stock level.

Before and after soil laboratory tests are chemical tests of soil samples collected from the field and brought to laboratory for estimation of carbon stock level. This is a costly and cumbersome exercise.

3.6.5.2. JISMs to selected woredas and watersheds

In addition to the SLM M&E methodological approaches discussed above, other mechanisms were also applied on a regular basis to examine the status of on-the-ground implementation and also provide timely managerial and technical support. These mechanisms were also helpful to make quality improvement of work accomplished because they engaged a wide range of stakeholders in the process. Below is a further explanation for two of the most commonly applied approaches.

JISMs: These are biannual joint field visits led by MoA involving all development partners. The JISMs focus on overall project performance assessment, focusing on issues such as the functionality of SLM implementation structures, including a Steering Committee and a Technical Committee, GIZ's technical support to the SLMP, key challenges/opportunities in SLMP implementation, key issues to be communicated to

the national/regional/zonal leadership and key recommendations to improve future project performance.

At the end of every mission, the observations and need for action are jointly documented and released by the World Bank as an 'aide-mémoire' for follow-up by the SLM Programme Coordination Unit (PCU). Rating of the project implementation is also indicated in the aide-mémoire, which, once agreed to by both the development partners and the government, becomes part of the project agreement and binding.

Infrastructure monitoring: This is conducted by the financial counterpart of KfW to assess implementation progress of selected infrastructure such as the construction of waterpoints, small irrigation schemes, rural roads and check dams executed with project financing (Figure 38). The infrastructure specialists of the financial counterpart use GPS and photo monitoring techniques to locate and measure progress over time. This practice is considered a key element of quality assurance because the experts provide advice to implementers on areas that require action. Moreover, in cases of big quality problems, payments are withheld until measures are put in place to rectify the defects.

Figure 38: Hand pump and check dam pond constructed by SLM projects.

3.6.5.3. Guideline for result-based monitoring

The RBM&E system of the SLMP has been elaborated by the GoE to ensure regular M&E of programme performance. The RBM&E system is composed of elements derived from the project log frames of the development partners supporting the SLMP. They include the World Bank, GIZ, KfW, DFATD, the European Union, the Government

of Norway and the Government of Finland. The manual was prepared on the basis of a harmonised log frame (Harmonised Results Framework) approved and consolidated after consultations with all stakeholders in 2015. The working process was conducted under the auspices of SLMP's M&E Working Group, was chaired by the SLM PCU and received intensive technical support from GIZ.

The manual (Figure 39) was developed with the purpose of providing the SLM PCU with a tool for M&E of the SLMP results. Another purpose was to guide alignment of new development partners to the SLMP in the future.

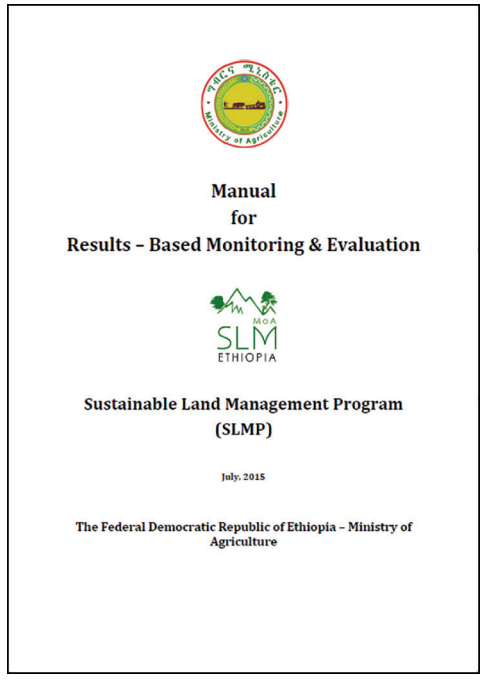


Figure 39: Cover page of the national manual for results-based M&E of SLM.

Issuing the manual helped to realise the following benefits:

- common understanding among staff and development partners on indicator definition, data collection tools and roles/responsibilities for data collection and reporting creation (Table 5);
- while operational, the manual and its indicator framework can be expanded to other SLM interventions in Ethiopia with few adaptations.

Table 5: Example of indicator definition sheet based on RBM&E guideline.

Indicator:	**Change in rain-fed crop productivity for three major crops and livestock (t/ha)**
Indicator description	
Indicator definition	Crop productivity: yield of three major crops per region • household data on crop production; • livestock productivity: milk yield (litre/cow/year). Additional information could include meat production; however, because livestock, particularly cattle are often kept for economic security rather than commercial production (and therefore in some areas are only sold in cases of emergency) meat production is not a good indicator. Since a number of other factors influence crop and livestock productivity, these should be considered in the final analysis of SLMP impact. Ideally annual measurement will allow gauging the influence of rainfall, seed quality and use of organic/chemical fertiliser on crop productivity. Livestock productivity is influenced by factors such as feeding and keeping habits, and characteristics of livestock as well as their age. Moreover, farmers (particularly in the highlands) tend to increase their livestock numbers when fodder resources improve or when the household economy improves. The number of livestock is therefore also important information; increased herds might lead to increased competition for fodder (lower productivity).
Measurement unit	Crop yield: for three major crops (t/ha) Livestock: milk yield (litre/cow/year)
Disaggregation	Male-/female-headed households
Data collection, analysis and reporting	
Data sources	Data collection at household level (crop and milk yields)
Methods (tools) for data collection	Crop yield data collected through household study Livestock productivity data (milk yield) collected through household study As part of the study, information should be obtained on other factors contributing to increased crop/livestock productivity
Additional information (cross-checking/ triangulation)	Extended JMM including gross margin and income calculations Woreda/regional data and studies of other organisations
Sampling size	Decided, based on available expertise and budget. Stratified sampling criteria: <u>Selection of Micro-Watershed (MW)</u> • agro-ecological zones; • level of land degradation; • altitude and soil characteristics; • scale of interventions; • performance of MW management; • phase of watershed development according to the phasing model of the exit strategy. Selection of households: • Three types of beneficiaries: (1) households living in the MW; (2) households living outside the MW, but with individual plots in the MW; and (3) households living outside the MW, but being members of user groups. Male- and female-headed households (according to the division at kebele level)

Indicator:	Change in rain-fed crop productivity for three major crops and livestock (t/ha)
Baseline	Data extended JMMs and gross margin study for crops, milk and income-generating activities and household income analysis before project intervention is considered
Frequency and timing	Impact study – end of programme
Responsible for data collection	External consultants
Responsible for data analysis/reporting	External consultants analyse data from household study; cross-checked with other data Federal level initiates and supervises the external study
Quality assurance (management)	Extended JMMs will cross-check the data, e.g. through focus group discussions with farmers (change of productivity of certain crops over time). The extended JMMs will also study the relationship between socio-economic differentiation and productivity

3.6.5.4. Below woreda-level data collection and recording guideline

This document is prepared to supplement the RBM&E through elaborating the indicator definition, data requirement, tools to be used for data collection, data recording templates and reporting formats. It has the aim of simplifying the data collection, recording and reporting tasks of the SLM woreda technical committee.

In this chapter we outlined the major processes followed in preparing SLM plans that lay the foundation for and determine the outcomes of implementation. In this regard, this chapter highlighted both the biophysical and social considerations that were part of preparing the watershed development plans starting from the identification and selection of watersheds all the way to M&E of the processes. Thus, this chapter also identified, based on more than 15 years of practical experience, the major ingredients of participatory planning processes which guided SLM efforts in Ethiopia. The following chapter presents how the different SLM components were rolled out in practice, with specific reference to watershed-level implementation of the technologies and approaches followed.

4

Land Management Measures: Technologies, Practices and Approaches

Key messages

- Land management for reversing resource degradation requires selecting and promoting integrated technologies, practices and approaches to ensure sustainable use of land resources
- Implementation of physical structures in land management requires identification of appropriate technologies, survey tools and equipment, and knowledge of using these in the construction and maintenance of structures
- Understanding biological measures in watershed development is key to optimise integration of measures for stabilising structures, diversifying food sources, mitigating climate change and promoting regeneration of biodiversity
- Implementation of agronomic measures as part of land management is important in improving agricultural productivity through enhanced availability of essential nutrients in the soil

- Selecting and pilot testing innovative technologies, practices and approaches is an important step in the large-scale adoption of practices in agricultural systems
- Realising benefits to local communities from implementation of land management measures contributes to further restoration of landscapes, ensures sustainable and equitable use of resources, and empowers local communities in resource ownership and governance
- Understanding the procedures needed in implementing measures, the extent of technology integration and improving productivity are key in land management for ensuring sustainability of development efforts

There are a variety of factors that potentially cause agricultural land to become degraded: excessive disturbance, erosion, organic matter loss, salinisation, acidification, nutrient leaching and other processes that curtail productivity. As mentioned in the previous chapter, these problems are identified and measures to tackle them are prioritised during the preparation of a watershed development action plan. The following sections present the different technologies and practices implemented as part of sustainable land management (SLM) measures.

4.1. Degraded Land Restoration: Structural Measures

When the protective vegetation cover is removed through clearing or heavy grazing, light soils become susceptible to wind and water erosion and consequently result in land degradation.

It is particularly important to manage these soil landscapes carefully to maintain vegetation cover and prevent soil erosion. Applying SLM measures, which consist of a whole range of activities aimed at making soils healthier and more productive, minimising soil erosion by building barriers that retard runoff, increasing agricultural productivity and household incomes, provide a host of tangible benefits – from food security to clean water to carbon sequestration due to biological and/or physical soil and water conservation (SWC) measures. Physical SWC structures are permanent features made of earth, stone, masonry or combinations of these, applied mostly

based on labour availability, cost and the adequacy of existing agronomic or vegetative conservation measures.

The structures installed to combat land degradation control dispersed runoff, reduce slope length, increase infiltration, trap sediment, maintain water stored in the soil and harvest water. They are also intended to provide off-site benefits through reduced runoff and decreased sedimentation, increased infiltration and spring development, and enhanced vegetation growth. Additionally, they help resolve problems associated with severe erosion such as landslides, soil depletion and reduced moisture availability that limit the application of biological measures. Physical structures help to create space for planting multipurpose species on the structures where soil moisture and fertile soil have accumulated.

The implementation of physical SWC measures on any land use system requires the use of certain survey tools, including the knowledge and methods for their use, to be able to measure factors such as slope gradients, vertical intervals and plotting contour lines, which determine the quality of any physical structures to be constructed (Figures 40 and 41). It is therefore important that these tools are mobilised and users are equipped with the required knowledge. The following items were provided by SLM to users:

- line level; thin plastic string, 11 m long; metre tape or metre stick; two wooden poles, 2 m long, marked every 10 cm; and stakes/pegs for marking the ground. Slopes are determined by measuring the vertical and horizontal distances using the mentioned items and calculated with a given formula;
- slope percentages are used in choosing physical SWC measures and to calculate distances or intervals between two consecutive bunds.

Figure 40: Field example of layout of a field using a line level (Ambo woreda, Oromia).

Figure 41: Field example of a gully layout method (Lume woreda, Oromia).

The selection and design of a structure depends on the climate, the need to retain or discharge the runoff, farm size, soil characteristics (texture, drainage and depth) and the availability of an outlet or waterway. In SLM, physical SWC measures were applied either through construction of physical structures such as levelling of irregular surface of land; removing grass and other vegetation; construction of bunds, terraces and trenches; or the application of simple technology like gabions (cages filled with rocks) that slow rainwater when it flows through dips. Rehabilitated gullies are becoming sources of elephant grass, shrubs and clean water for irrigation of food crops and fruit trees, demonstrating that land restoration is more than simply planting trees.

4.1.1. Bund, terrace and trench construction

Bunds or banks are created from earth, stone or their combination, and are generally used for runoff interception and storage. They are constructed along contours to slow and hold back water. This technology has been used widely in Ethiopia since land management practices began.

Soil bunds are constructed in areas with gently sloping, deep and well-drained soils, and in areas where moisture is needed for crop production. This technology is widely implemented and adopted in the SLM Programme (SLMP) intervention areas and especially on relatively level farmland due to ease of construction and being relatively economical compared to other types of bunds. Graded bunds, with runoff diversions, are constructed at an angle to the contour to slow and divert runoff, and are mostly applied in areas of high rainfall. Experience has shown that bunds sustain well only in shallow and medium depth soils. Deep black soils undergo cracking in dry conditions, which causes bunds to fail, because water flows through the cracks and large breaches are caused that result in severe damage to fields.

The spacing and land occupied by conservation structures were critical issues raised by farmers as complaints in many SLMP intervention areas. For example, in the construction of bunds, the actual spacing applied, the land occupied by the structures and the tendency to destroy the bunds by ploughing the fertile soil accumulated along the bunds were issues of discussion, particularly at the beginning of land management works. However, with time, these problems were minimised with increasing awareness and practical demonstrations, and also significant efforts to adopt planting of valuable grasses and forage trees on bunds to compensate for the land occupied by bunds. Experiences also show that soil bunds are easily damaged, less durable and need frequent maintenance if not supported by biological measures and if free grazing is not managed. Assessments conducted in SLMP areas showed that

soil bunds supported by biological conservation were sustained for years and stabilised while those without biological measures were damaged within less than a year. Therefore, in SLM, soil bunds constructed are often integrated with biological measures. Figures 42–44 show communities constructing soil bunds and constructed channels holding runoff water.

Figure 42: Community constructing soil bund on farmland to the recommended standard (Amuru woreda, Oromia).

Figure 43: Constructing soil bund and measuring dimensions for quality management (Ade'aBerga, Oromia).

Figure 44: Level soil bund with tie ridge and collected rainwater (Jmma, Ambo, Oromia).

Stone-faced soil bunds are embankments made from soil reinforced by stone wall risers on one or both sides, which are constructed along the contour. In SLMP, the embankments are made with a water collection channel on the upper side similar to that of soil bunds. Single and double stone-faced soil bunds are commonly used in land rehabilitation in the SLMP and the country at large. These are mostly implemented on farmland, grazing land and to some extent on hillside areas, where stone is sufficiently available.

Ejere woreda is one good example of a SLMP intervention community watershed, where stone-faced soil bunds were widely implemented on farmland because stones were abundantly available in farmland and close by. As shown in Figures 45 and 46, the construction was mostly carried out to the required standard recommended by the Community Based Participatory Watershed Development guideline.

Figure 45: Community constructing stone-faced soil bund on hilly farmland (Wara Jarso woreda, Oromia).

Figure 46: Stone-faced soil bunds constructed on farmland (Ejere woreda, Gunjo, Oromia).

Stone bunds are stone embankments constructed along the contours of the land to minimise soil erosion and prevent runoff damage from downstream fields. These structures are usually built in places where stones are available. In some areas where stone bunds are most appropriate, stones are transported from other places. In the SLMP, implementation of stone bunds was limited to areas where stones for construction were sufficiently available. So, stone bunds covered less area than soil and stone-faced soil bunds.

Because construction of stone bunds is more technical, their construction by local communities was mostly under close supervision of extension workers. They have been constructed on farmland generally and on grazing land in some cases. Figure 47 shows typical stone bunds implemented in a SLMP intervention woreda.

Figure 47: Stone bunds (Haromaya woreda, Oromia).

Fanya juus are physical conservation structures constructed from soil across slopes to retain soil and moisture (Figure 48). In contrast to level soil bunds, where soil is thrown to the lower side of the ditch, a fanya juu is constructed by excavating a ditch/channel and throwing this soil to the upper side of the ditch. Compared to soil bunds, they are constructed on gentler slopes (<10%). They are not implemented as widely as soil bunds, both in SLMP and other interventions areas of the country, but are worth implementing in suitable areas. Jeldu and Uraga woredas are good examples of SLMP intervention woredas where fanya juus were widely implemented.

Figure 48: Fanya juu constructed on farmland (Jeldu woreda, Oromia).

Terraces are areas of a sloped plane that have been cut into a series of successively receding flat surfaces or platforms resembling steps, constructed to allow more effective farming. A number of factors determine the type of terrace most suitable for a given area, such as its purpose, steepness of slope, soil depth and farming practices. The objective of terracing in dryland farming is to reduce erosion and increase water infiltration. Since most cultivation is done using oxen in many parts of the country, terraces need to be sufficiently wide to allow easy turning at each end. In areas where cultivation is by hand, terrace width is less important.

Construction of terraces requires a great deal of labour input, which is a major constraint to their application. In some areas, terraces with outward slopes are built, or the labour input is spread over time by progressively moving towards level terraces over several years due to the severity of soil erosion on steep slopes. Where there are stones, construction of stone terraces is the only realistic option. Alternatively, grass strips are created along contour lines to reduce erosion on slopes. In SLMP, grass strip contouring is also used by many farmers in different regions. Vigorous grasses are selected to be propagated easily and provide a good quantity of palatable fodder. Grasses are also controlled to prevent invasion of cropping areas and in order to be effective. In most cases, however, livestock is kept away from the grass strips to allow them to grow to their proper height. However, some grass species that are introduced solely for conservation purposes, such as vetiver grass (*Vetivera zizanioides*), are usually unsuitable for fodder.

A number of other species have also been used for vegetation strips depending on the preferences of local farmers; however, a disadvantage of vegetation strips as well as stone bunds is that they can harbour burrowing animals that can damage food crops.

By excavating soil, small pits of suitable dimensions can also be constructed over the land surface to arrest surface runoff and silt, thus leading to storage of runoff and ground water recharge. These pits trap rainwater during rainy periods and result in healthy soil moisture and nutrient status for plant growth.

Hillside terracing is one SWC technology adopted by local communities and implemented in hilly areas in SLMP intervention areas and beyond. These are generally suitable for steep slopes and shallow soils; predominantly implemented on communally owned hilly areas and to some extent on privately owned hilly land, both in the SLMP as well as in the country at large, where SWC has been implemented. Construction of hillside terraces alone and in combination with trenches was commonly practised in SLMP intervention areas.

In the SLMP, hillside terraces have been constructed from stone, wood such as bamboo, brush and soil depending on availability of materials around the project intervention areas. This technology has been implemented in almost all of the country's SLMP intervention woredas. This has also been copied and scaled up to neighbouring watersheds and kebeles beyond the project areas. Figures 49–52 show hillside terraces constructed from different materials within SLMP intervention locations.

Figure 49: Community constructing hillside terrace on a communal hilly area (Ejere woreda, Oromia).

Figure 50: Hillside terraces constructed with bamboo (Wonchi woreda, Oromia).

Figure 51: Hillside terraces constructed with stone (Hawa Gelan woreda, Oromia).

Figure 52: Hillside terraces constructed with soil (Ambo woreda, Oromia).

Bench terraces are stone embankments placed along the contour with land levelled in between two terrace walls. They are constructed on hilly areas of communal land and individual farmland. Bench terraces are intended to break slope length and convert a steep slope into a series of steps, with nearly horizontal benches to reduce runoff speed and soil erosion and create suitable conditions for cultivation. Bench terracing is one physical SWC technology that has been traditionally practised for a long time in many parts of the country, such as Konso (SNNPR), Hararge highlands (Oromia), Nadier Adet and Erob (Tigray) and Ankober (Amhara). Bench terraces have been used for generations on all continents, and are now used widely and have expanded in many parts of the country.

In the SLMP, bench terraces have been implemented on a limited number of steep slopes compared to soil bunds due to the technique involved in their construction, the higher labour demand they require and the limited exposure of extension workers and the local community to the technology. The land conserved with bench terraces is mostly used for plantations of high-value crops (e.g. fruit), which, in some places, is mixed with annual crops. This technology is highly appreciated by farmers, who have adopted it after seeing the results of converting sloping land to flat land, enabling the production of cereals and other crops. This technology needs to be promoted more widely in the future. Experience in the SLMP includes bench terraces constructed using stone, soil and wood (bamboo). Figures 53–55 show bench terraces implemented in different SLMP intervention woredas of the country using different construction materials.

Figure 53: Bench terraces constructed on hilly individual land (Bore woreda, Oromia). Left: soil mixed with stone bench terrace. Right: bamboo bench terrace.

Figure 54: Bench terraces constructed from stone on hillside area in Atsbi Wonberta watershed (left) and Sheka micro-watershed (right), Tigray.

Figure 55: Bench terraces constructed by earth cutting (Gumer woreda, SNNPR).

Trenches are physical conservation structures applied for all land uses. They are used to control erosion, as well as collect and store rainwater to support the growth of trees, shrubs, cash crops, grasses or various combinations of these in moisture-stressed areas. Construction uses different geometrical configurations and sizes along the contours and they can be used alone or in combination with hillside terraces.

In the SLMP, the commonly implemented technologies are water collection trenches and hillside terraces, with trenches mostly on hillside or communal land. Trenches were also constructed alone and in combination with hillside terraces on hillsides and grazing land depending on the situation of the specific area (Figures 56 and 57).

Figure 56: Trenches with hillside terraces (Alle woreda, Oromia) (left) and: deep trench on farmland upper catchment (Ana Sora woreda, Oromia) (right).

Figure 57: Trench construction on degraded grazing land (Sinan woreda, Amhara).

4.1.2. Gully erosion control

In the Ethiopian context, gully erosion has significantly contributed to land degradation. Inappropriate land use, deforestation and improperly designed and constructed infrastructure – particularly cut-off drains, waterways and road/foot paths – unsafe disposal of concentrated flow of water, overgrazing and mining are the main causes of gully formation.

The Ethiopian landscape varies from flat land to high mountains, making it vulnerable to rapid formation of gullies even in one rainy season. Lume and Wonchi woredas in Oromia region provides some of the clearest example of gullies formed in one rainy season (Figures 58 and 59). As a result, considerable amounts of farmland and hillsides are lost to gully erosion in the country.

In Ethiopia, communal grazing land and hillside areas are greatly affected by gully formation compared to individual farmland, due to less attention given to the management of commonly owned land. That is why SLMP intervention prioritised communal land/hillsides and gully areas.

Figure 58: Gullies formed on hillside area (Wonchi woreda, Oromia).

Figure 59: Gully formed on farmland (Lume woreda, Oromia).

Because rehabilitation of gullies by individual farmers is difficult, due to the volume of work and labour required for stabilisation, the required physical structures have been constructed by organising the local community into a working group, regardless of whether the gullies are owned privately or communally.

Physical structures constructed on most gullies lying on individually owned land are maintained by the owner and any management work is done by family members. In some cases, where there is SLMP intervention, inputs such as gabions are supplied externally by projects. In the case of communally owned gullies, the management, maintenance and use are the responsibility of the community group.

In the SLMP, most rehabilitated gullies are put under enclosure, and bylaws established in written form or orally agreed upon are enforced. Maintenance of the physical structures is also carried out by participation of all beneficiaries, and the benefits are shared among members. In some places, youths are organised into groups to manage and benefit from the use of the communally owned gullies by negotiating with the elders who own the land. Often a problem in the management and use of such gullies owned communally or individually is the destruction of rehabilitated gullies by cultivation carried out too close to the gully channel mouth, due to the desire to use land that is supposed to be left aside to sustain the rehabilitated gully.

4.1.2.1. Construction of check dams

Check dams are gully erosion control physical measures constructed across the floor of a gully for reducing the gully channel gradient, slowing runoff and trapping sediment. In the SLMP, check dams have been used to gradually build up the floor of gullies to the original ground level, or to rehabilitate them. They are mainly used to facilitate the establishment of vegetation in gullies, which eventually stabilises and permanently protects them from further erosion.

Most check dams are constructed during the dry season to make the land ready for planting in the rainy season. Following the construction of a check dam, gully reshaping

is a prerequisite for gully stabilisation. The gully head, side walls and bed are reshaped to be ready for planting. In Ethiopia generally, as well as in the SLMP, this is done at the beginning of the rainy season for better shaping of gully parts and better compaction.

The sediments behind a check dam are planted with cash crops or trees/shrubs and grasses to generate additional income for the farmers. Physical measures commonly implemented by the SLMP in check dams for gully restoration include gabions, loose stones, brush wood and sandbags (Figure 60).

Figure 60: Community constructing gabion check dam across a gully (Lume woreda, Oromia).

4.1.2.2. Stabilisation of gully beds, walls and embankments

Gully erosion is one type of soil erosion and is an advanced form or stage of rill erosion by water. It is the removal of soil and soil materials by water concentrated along drainage lines, usually due to heavy rainfall in the upper bare catchment area. Gully erosion cannot be fully controlled or reversed by normal cultivation.

The mechanics of gully erosion can be reduced to two main processes: down-cutting of the gully bottom, leading to gully deepening and widening; and head-cutting, extending the channel into un-gullied headwater areas and increasing the stream net and its density by developing tributaries. Therefore, in the SLMP, effective gully control was implemented to stabilise both the channel gradient and the channel head cuts.

In areas where effective vegetation cover could grow, gradients were controlled by establishing plants without supplemental mechanical measures; whereas in areas where growing conditions did not permit the establishment of effective vegetation cover, engineering measures were applied in critical locations where erosion processes prevailed. The main objective of these structures was to stabilise the gully gradient. Once the gully gradient was stabilised, vegetation was established to stabilise gully banks. When sediment accumulation in the gully behind the structures increased, the storage capacity of the channels decreased, channel gradients also decreased and thus the speed of the channel flows decreased and consequently reduced the channel erosion.

In practice, controlling gully erosion is difficult and expensive. Deciding whether establishing control structures is justified depends on other objectives, such as preventing downstream storage dams from being silted up by sedimentation.

The structures in small dams and weirs built across gullies to trap sediment and thereby reduce channel depth and slope. These works provide temporary or permanent stability and are normally used in association with agronomic treatments of the surrounding land where grasses, trees and shrubs are well established.

In the SLMP, the dangers of scouring and tunnelling around check dams were minimised by keying in such a way that lateral seepage around the end of the dam was prevented. The route of seepage was considerably lengthened and dam stability greatly increased by keying the dam into the sides and floor of the gully and digging a trench, usually 0.6 m deep and 6 m wide. Where excessive instabilities were demonstrated by large amounts of loose materials on the lower part of the channel side slopes or by large cracks and fissures in the bank walls, the depth of the trench was increased to 1.2 or 1.8 m. The trench was filled with loose rock in such way that no large voids remained in the key. A mixture of pebbles, of which 80% were smaller than 14 cm across, was used where this was available. When long dams were used, the bottom layer was set below the ground surface or long posts were driven deep into the firm soil. Figures 61–64 provide a few examples of the physical measures practised for gully rehabilitation in SLMP intervention areas.

Figure 61: Check dam constructed with gabions (Lume woreda, Oromia).

Figure 62: Check dam constructed with loose stone (Raya Azebo, Tigray).

Figure 63: Check dam constructed with brush wood (Hawa Gelan woreda, Oromia).

Figure 64: Check dam constructed with sandbags (Endamkoni woreda, Tigray).

Even though a considerable landmass had been affected by gullies throughout the country, a significant effort has been made to reverse the existing conditions in different corners of the country under the SLMP, both in lowland and highland areas. Physical and biological gully control and rehabilitation measures have been implemented for years across vast areas of the country.

4.1.2.3. Gully reshaping and stabilisation

Stabilisation of gullies typically requires removing or reducing the source of water flowing through the gully and building dikes, or small dams, at specific intervals along the gully. Reshaping and stabilising overly steep banks may also be needed.

Typical gully stabilisation structures are built from rocks, gabions, logs, wood stakes with wire or brush, bamboo or vegetative barriers. Biotechnical methods offer a combination of physical structure and vegetative measures for physical protection as well as additional long-term root support and aesthetic appeal. A head-cut structure is also typically needed to stabilise the upslope, or top-most portion of the gully, and prevent additional headward movement.

Recommended and applied practices in SLM follow:

- systematic removal of sources of water; water flow controlled as needed with ditches, berms or out-sloping to divert water away from the top of gullies;
- gully control check dam structures constructed of materials such as stakes, logs, gabions or loose rock, and live vegetative barriers or brush layering planted along contours in disturbed areas to control gully erosion (Figure 65);
- gully control structures installed as soon as possible after initial formation of a gully;
- gully control structures installed using appropriate design details;
- structures properly spaced, well keyed into the banks and channel bottom, notched to keep flows over the middle of the structure and protected from downslope scour;
- head-cut structures well installed at the top of the gully to prevent headward migration of gullies in fields;
- local plant sources and nurseries for native vegetation that can be used in gully control measures developed.

Figure 65: Debris retention and gully control structures with a notched weir to keep flow over the middle of the structure, scour protection added at each structure outlet and the structure is keyed into the firm soil banks.

Success story 1:

Gully rehabilitation to save livelihoods: the case of Hawassa Zuria, SNNPR

Hawassa Zuria is a woreda in Sidama Region, 305 km south of Addis Ababa. The woreda is surrounded by mountains and characterised by silt loam soil which is affected by excessive runoff that threatens the lives of the community in the area. According to local farmer Maritu Sintamo, the runoff from the surrounding highlands and roads has eroded the farmland and resulted in deep gullies.

Maritu Sintamo says: "for the past three years, this gully took my farmland and my hope to live in Obolo-dankaka kebele; spending every night at my home near the gully was a nightmare for my family and myself as we were afraid that a landslide would kill us all. But SLMP gave me a second chance to live in a place where I belong."

Figure 66: Gully erosion in Hawassa Zuria woreda at Fechena micro-watershed in Obolodankaka kebele, 2015.

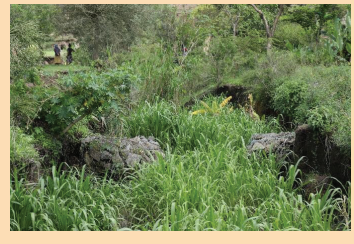


Figure 67: Treated gully in Hawassa Zuria woreda in Fechena micro-watershed, 2021.

Due to massive soil loss, the woreda administration proposed resettling farmers in another area in 2015. However, the community did not

endorse the resettlement proposal. That same year the SLMP started working in the kebele to control gully erosion with SWC practices and the introduction of sustainable livelihood approaches.

The woreda administration, with the support of SLMP, consulted the community and started to deploy participatory SLM practices to rehabilitate the landscape and fix the gully that threatened the community's livelihood. Construction of physical structures, followed by planting various trees and elephant grass, has significantly reduced the runoff. The elephant grass has become an alternative source of feed for livestock-owning farmers.

After three years of effort, the gully reduced in depth and became a site to grow feed for livestock. The elephant grass grown in the gully, in addition to conserving soil and controlling erosion, is used for house construction.

Learning from the successful SLM interventions, 40 households living around the gully organised and managed their lands by controlling the formation of small and active gullies by constructing deep trenches. As result of these efforts, water now soaks into the soil, enhancing off-season crop production.

Figure 68: Mrs Maritu cutting forage from the treated gully of Fechena micro-watershed, 2021.

Local farmer Mrs Maritu says, "first we healed the gully and produced feed in the gully but this is not the end." The landscape needs additional work to sustainable rehabilitate it. She further condemns the situation they had faced due to the gully erosion and appreciates the project support that enabled them to rehabilitate the land and allowed them to avoid resettlement. Mrs Maritu now owns small ruminants and chickens and she earns a cash incentive for engaging in the watershed development activities.

Mrs Maritu also reconstructed her house using the woody elephant grass and purchased three sheep and a heifer. She produces maize and haricot beans and has planted enset (kocho) for household consumption. She sends her children to a nearby school and says that the SLMP gave her a second chance to live in the village.

SLM considerations for successful gully rehabilitation:

- ✓ Design details are considered important for successful gully stabilisation.
- ✓ Construction begins by removing the source of water.
- ✓ To concentrate the water flow into the middle of the channel, weirs are made either notched or with a 'U'-shaped top.
- ✓ It is important to tightly key structures far enough into the adjacent banks to prevent erosion around the ends of the structures.
- ✓ There is a need to bury the structures deep enough in the channel to prevent flow under the structure.
- ✓ Spilling water over the structures onto a splash apron, protective layer of rock or into a pool of water is necessary to prevent scour and undermining of the structure.
- ✓ Structures should be spaced close enough that flow over each structure spills into the backwater of the next downstream structure.

4.1.3. Flood water harvesting and sediment storage

Water harvesting is one of key water-related interventions with the potential to contribute to rapid improvement in the yields of rain-fed crops. Water harvesting and small-storage technologies can also help provide water for domestic use, livestock, fodder and tree production and, less commonly, for fish farming. Water harvesting enables farmers to store water when it is plentiful and make it available when it is scarce. There are three categories of small-scale storage: soil moisture storage, groundwater storage and surface storage.

Flood control and management methods applied include planting vegetation to retain extra water, terracing hillsides to slow flow downhill and the construction of floodways (channels constructed to divert floodwater). Other techniques include the construction of levees, lakes, dams, reservoirs and retention ponds to hold extra water during floods. Depending on the need for water in the specific area, particularly in moisture-stressed areas, the water harvested from different sources such as the upper catchment of the gully, gully channel, roadside runoff, cut-off drain, roof and direct rainfall is stored in a purpose-built water reservoir.

Community and household ponds are used for water storage and were commonly implemented in the SLMP, with special focus on moisture-stressed watersheds with no

annual flowing rivers or springs. Harvesting of flood water was predominantly practised in areas where moisture stress in soil for plant growth was prevalent and there was limited water in the dry season for other consumption such as for supplement irrigation, livestock and human consumption, and fish production at both household and community levels.

Flood water harvesting from catchments, roadsides and natural and artificial waterways has been exercised in the SLMP. Direct diversion of flood water from roadsides to cultivated land is a common practice in moisture-stressed areas to supplement crop growth. Additionally, community and individual household ponds are widely used to store water for off-season use. In some places, these are connected to drip irrigation systems to improve water use efficiency, particularly at the household level. Most ponds constructed at the household level are closed (with roofing) to reduce evaporation during the dry season. Figure 69 shows a community pond constructed in Lume woreda, where there are no water sources for consumption. The local community use this pond for house and livestock consumption.

Figure 69: Community pond (Lume woreda, Oromia).

Sediment storage dams are physical structures or barriers made of stones or gabions, mostly constructed at the outlets of catchments and within large active gullies, either alone or in combination with check dams.

Sediment storage dams were found to be one of the important physical structures applied to control erosion. They trap significant amounts of sediment within gullies and convert unproductive gully land to productive agricultural land for fruit and crop production. Sediment storage dams in the SLMP have been constructed in large and deep gullies for their effectiveness in changing gullies into productive land. Figure 70 shows a deep gully filled with silt in Lume woreda during one rainy season. Within two years the damaged land had changed to productive land.

Figure 70: Gully changed to productive land due to sediment storage dam construction (Lume woreda, Oromia).

Water collection ponds are physical structures constructed to store water collected from runoff water, ground water and seasonal stream flow for dry season use such as domestic use (human and livestock) and/or for irrigation, fish production and other uses. When water collection ponds are constructed, excavated soil accumulates on the surface of the ground according to conditions of the specific site (Figures 71 and 72).

The excavated pond is the most common type of pond implemented in the SLMP. The construction approach is either for individual household consumption or for communal use. The technology has been in use in the SLMP for many years, in many places, and has contributed to environmental conservation and economic improvement of local communities at the individual and collective levels.

Figure 71: Household-level pond constructed from stone.

Figure 72: Household-level pond constructed with geo-membrane (Amhara).

4.2. Degraded Land Restoration: Biological Measures

Biological soil conservation methods are various ways of maintaining vegetation cover during periods of high erosion threat. Contour farming, crop rotation, strip cropping, crop choice, mulching, cover crops, reforestation, mixed crops, wind break reforestation, area enclosure and enrichment planting are the major biological soil conservation methods. Biological methods are an effective method of soil conservation.

Biological SWC measures applied in SLM are key in stabilising slopes through vegetative and soil treatment measures and known to be more sustainable and require less maintenance than engineering structures. When vegetative measures are not sufficient, however, engineered structures are also necessary. In the SLMP, watershed development is aimed at rehabilitating degraded land and improving land productivity and production through rehabilitating communal and privately owned farmland.

Watershed development works done through the establishment of physical conservation structures are greatly supported by biological measures. Forests and trees play crucial roles in hydrological processes in watersheds; planting of trees and grasses helps stabilise structures, and also serves as a good source of protection, animal forage, food and income; and contributes to mitigation of climate change effects. Reforestation involves the replanting or regeneration of areas of forest that have previously been damaged or destroyed and controls splash erosion by intercepting the raindrop before it directly hits the ground.

4.2.1. Nursery establishment and identification of input sources

Establishing nurseries is a precondition of producing the seedlings required for planting on physical structures, enrichment planting on already existing forest/shrub/bush, afforestation of bare land, reforestation of deforested land and woodlot plantations.

In the SLMP, nurseries were established in a central location of representative places within the critical watershed. The central nurseries obtain financial and technical support from the SLMP, development partners and the government. Central nurseries are managed by woreda offices of the Agriculture and Natural Resources Office. User group nurseries established at micro-watershed level are managed by women and unemployed youth groups organised into self-help groups, and obtain the required inputs and technical support from respective government bodies.

The species and quantity of tree seedlings to be produced in either central or user group nurseries depend on the locality, the size of the plantation area and whether the aim is afforestation, enrichment planting or other biological measures. The labour supply for central nurseries is mainly unemployed youth hired daily, while user group nurseries use their own labour from self-help group members. Self-help group members generate income from the sale of seedlings for the community in demand (Figures 73 and 74).

Figure 73: Different tree and shrub seedlings produced in a central nursery (Wonchi woreda, Oromia).

Figure 74: Grass seedlings produced in a central nursery (Uraga woreda, Oromia).

Before planting, pitting is carried out on the selected site. In SLMP experience, planting has been carried out in enclosure areas; communal land and gully rehabilitation sites; farmland; forest enrichment, reforestation and afforestation sites; homesteads; areas allocated for woodlots; or on bunds, terraces or gullies to support constructed physical measures. Planting of trees, shrubs and grasses are the biological SWC measures commonly implemented in SLMP intervention areas (Figures 75 and 76).

The assessments undertaken at different times and locations confirm high seedling survival and establishment rates in most SLMP intervention locations. However, the drawbacks during planting include inappropriate seedling transportation, improper spacing, not adhering to the best time for planting trees, failure to prepare pits to required standards and inappropriate placement of seedlings in pits.

Figure 75: Community planting vetiver grass on soil bund (Metu woreda, Oromia).

Figure 76: Tree planting on hillside communal land by the local community (Ejere woreda, Oromia).

Planting on individual land and its management are undertaken by the individual owner. Communal land, such as enclosure areas, hillsides or gullies, are managed by the whole community or by organised jobless/youth groups.

Tree and shrub planting: Indigenous and exotic tree species that have environmental, conservation and economic benefits have been used in the SLMP. Planting has been carried out on hillside communal land, grazing land, degraded sites, woodlot/homestead plantations, farm boundaries and roadside plantations, and gully sides and beds. Enrichment planting has also been performed in enclosure areas or degraded forests, and on areas where physical conservation measures were implemented (Figure 77).

Figure 77: Plantation developed on degraded lands, Agam micro-watershed, Gondar zuria woreda, Amhara.

Grass planting: grasses are planted for physical structure stabilisation and economic purposes. On bunds, terraces and gully sides and beds, grass strips have been commonly planted for conservation as a priority, with forage and income generation as secondary benefits. Elephant, vetiver and desho grasses are widely applied in SLMP intervention areas and commonly adopted by local farmers as well. They are usually planted as seedlings but are also directly sown as seeds. Due to the short-return time benefits of bund stabilisation and income generation, desho grass has been disseminated among farmers in SLMP intervention areas and beyond, for example in Ana Sora and Uraga woredas.

From SLMP experience, tree planting and grass development practices have been implemented mainly for the following purposes:

- degraded hillside planting and enrichment planting in enclosure areas;
- structural stabilisation, e.g. on bunds, hillside terraces and gully sides;
- as sources of household fuel and wood for construction, e.g. for woodlots and communal and homestead use;
- income generation, e.g. woodlots and communal, homestead, roadside and farm boundary plantations;
- living fences and wind breaks, which also serve dual purposes like income generation and as a source of fuel and wood supply for construction.

4.2.2. Bund and terrace stabilisation

Stabilisation refers to the planting of grass, shrub and tree species in different combinations on physical structures such as soil bunds, terraces, trenches, micro-basins, waterways, cut-off drains, ponds, reservoirs and drainage canals to increase their stability and resistance against the effect of raindrop splash, runoff and cattle

trampling. Stabilisation makes the surface area occupied by these structures productive. The practice is applicable to all agro-climatic zones and for all land uses in which physical structures are constructed for soil conservation and water harvesting. In the SLMP, this practice has been carried out commonly on constructed bunds and terraces. Shrubs, grasses and other forage species are used for stabilisation as the first priority and for forage and income sources as alternatives. Both to stabilise and make bunds and terraces productive, different multipurpose tree, shrub and grass species were planted in many target watersheds. In this regard, farmers observed the positive impacts in stabilising structures, improving soil fertility and use as forage sources for animals.

In most cases, grasses are planted in mixtures with woody species, either in single or double rows. This helps the community to address different benefits such as grass and forage for livestock feed and legume species for soil fertility improvement. In watersheds where free grazing is controlled, the impact of bund stabilisation with biological measures has been significant, and has been observed in many SLMP watersheds.

This practice was implemented in almost all SLMP watersheds and adopted by many farmers in these watersheds and beyond. However, some of the constructed bunds and terraces were not covered by biological measures for different reasons, including a shortage of planting materials and unequal consideration of physical and biological measures. Figures 78–82 show examples of bunds stabilised with grass and forage species in SLMP intervention areas.

Figure 78: Desho grass planted on bunds (Ana Sora woreda).

Figure 79: Bunds stabilised with vetiver grass (Bilo Nopha woreda, Oromia).

Figure 80: Bunds stabilised with tree lucerne (Hidhabu Abote woreda, Oromia).

Figure 81: Bunds stabilised with sesbania (Amhara region).

Figure 82: Bunds stabilised with pigeon pea (Sasiga woreda, Oromia) (left), and Amhara (right).

4.2.3. Gully revegetation

The SLMP has invested huge resources in gully rehabilitation works due to serious soil erosion resulting from gully formation. These resources were invested in physical measures which also need additional biological interventions to ensure sustainability of structures and to change gullies into productive land. As a result, gully revegetation has been applied in many watersheds and demonstrated as an effective measure both to stop or reduce erosion and to produce huge quantities biomass for animal forage, wood for household use and in some cases fruit. In some watersheds, there were attempts to integrate gully revegetation interventions with other economic activities such as oxen fattening and beekeeping. In some other sites, gullies have become timber production sites for household consumption and income generation.

In SLMP target watersheds, successful gully revegetation works have been demonstrated and lessons gained for future recommendations for wider implementation. The limitations during implementation were also identified and are under review by different development actors and professionals. Some limitations identified include limitations in gully reshaping, a lack of appropriate species selection, limited time for planting, lack of proper management after planting and lack sustainable use. Most of the time, gully beds, side walls and heads are the gully parts exposed to erosion by water and human-induced factors. Because rehabilitation with physical measures is insufficient by itself, it requires support by biological measures to ensure stability of constructed check dams and sustainability of rehabilitated gullies in terms of land restoration and economic benefits.

Experience shows that revegetation can also take place in gullies without added physical structures. Depending on the severity of the formed gully, reclamation can be biological in combination with physical, or biological measures alone, and both approaches have been implemented in the SLMP. Following gully reshaping, planting of tree, fruit and forage seedlings, direct sowing of grass and forage seeds, or some mixed use have all been applied within the SLMP. However, all gullies incorporating physical structures are

not yet supported by biological measures, either due to less attention to revegetation or a shortage of planting materials, which is the main challenge facing rehabilitation of gully land (as well as farmland and hillside areas). Gully revegetation is not only to restore degraded gully land but also to generate economic benefit. Most gullies in SLMP intervention areas were planted with trees and grasses used for environmental conservation as well as forage for livestock and income sources for livelihood improvement. Further promotion is critical for gully revegetation. Figures 83–85 show revegetated gullies and the change to productive land in SLMP intervention areas.

Figure 83: Revegetated gully with grass and trees (Gimbichu woreda, Oromia).

Figure 84: Revegetated gully with trees (Lume woreda, Oromia).

Figure 85: Gully before revegetation (left) and revegetated gully with grass and different economic value crops (right) (Endamekoni woreda, Tigray).

4.2.4. Forestry and agroforestry

Although underrated and not widely recognised, smallholders in the highlands of Ethiopia perform traditional agroforestry practices. The purposeful retaining of indigenous trees on farmers' cropland is recognised as separate from other agroforestry practices. Farmers cultivate indigenous trees for a variety of benefits, including:

- livelihoods (for income generation and household uses);
- ecosystem services and the existence of socially and economically valued birds.

The adoption of farmland agroforestry has been driven by similar household-level variables that explain the adoption of many other agroforestry practices. However, in contrast to other agroforestry practices, farmland agroforestry is not a management priority for farmers, possibly due to a lack of appreciation for naturally occurring trees. Because agroforestry on farmland is declining, interventions are required that improve extension services, the availability of indigenous tree seedlings and credit, support reliable legal frameworks and land titles, and foster the processing and value adding of tree products suitable for higher value uses.

Woodlot development was one of the forestry and agroforestry practices that was widely promoted in SLMP target watersheds (Figures 86 and 87). In many of these watersheds, woodlots have been developed and used as good sources of fire and construction wood and charcoal. Woodlots have also become a source of income mainly for individual farmers. Woodlot development was one of the preferred land use options in watersheds where production and productivity of agricultural crops have been much reduced or minimal. Farmers have made a land use change from cultivated land to woodlot development, because woodlots are more profitable than crop production on such degraded land.

Woodlots have become a good source of income for farmers because establishment and management costs and the labour required are minimal. The most widely used tree species in many areas are *Eucalyptus globulus, Eucalyptus camaldulensis, Grevillea* spp., *Acacia decurrens* and other fast-growing species. However, *Eucalyptus* species have been criticised due to negative impact on water resources, soil fertility, biodiversity and other environmental services. Due to these possible negative impacts, the government is discouraging development of *Eucalyptus* woodlots on agricultural land, especially on flat land where agriculture is still possible and its contribution to increasing food production is much valued.

Figure 86: *Acacia decurrens* woodlot plantation on farmlands in Fagita woreda (left), and on degraded communal lands in Quarit woreda (right) in Amhara.

Figure 87: Tree seedlings planted on grazing lands as part of agro-silvopasture development to diversify benefits (wood and forage production), Banja woreda, Amhara.

Success story 2:

Old coffee with new friends: agroforestry practices in the Wonsho woreda of the Sidama Region (source: MoA SLMP 2021)

Figure 88: Old coffee plantation at Mr Amente Adele's farm, 2014.

Figure 89: Stumped coffee with SWC practices, 2021.

Mr Amente Adele is one of the farmers applying agroforestry practices in the Wonsho woreda of the Sidama Region with the support from the Resilient Landscapes and Livelihoods Project (RLLP) and the previous SLMP projects. Between 2012 and 2015, Mr Amente planted an improved coffee variety on 4.5 ha of land and obtained a coffee yield of 7.2 quintal/ha in 2014/15. However, after five years of planting, production started to decline, and after seven years it was one-third of the original yield (2.5 quintals/ha). For Mr Amente, the soil erosion that wiped out the fertile soil on his farm was responsible for making the coffee trees' yield lower than expected. At that time the SLMP started implementing activities in his kebele by training farmers on various SWC

practices and coffee development packages to enhance productivity.

In 2016, Mr Amente was one of the early adopters of the SLM practices on coffee stumping, soil bund construction, composting, mulching and planting desho grass followed by shade trees. After two years the stumped coffee trees produced 5.25 quintals/ha of coffee beans, which convinced Mr Amente to continue the practice. In 2018 and 2020, with the support of RLLP, he repeated stumping of 2 ha of coffee trees and deployed various SLM practices which increased his yield by more than 2 quintals/ha.

"The desho grass in my coffee farm is a source of feed for my cattle and it also reduced the soil erosion by tightly holding the soil" said Mr Amente while explaining the added benefits of combined SLM practices. Because of integrated efforts, in 2020, Mr Amente collected a monthly average production of 30,000 kg of clean coffee from planted and stumped coffee land, which equals an average production of 6 quintals/ha. In addition, the regional state gives an export licence for coffee farmers with more than 2 ha of land, and Mr Amente took this opportunity to start a coffee export business and built a coffee store close to his farm. Thanks to a considerable increase in revenues, Mr Amente has now built houses in Yirgalem and Wonsho woreda towns. According to Wonsho Woreda Agricultural Office, the experience of Mr Amente is a clear demonstration that deploying various SLM practices and engaging in agroforestry practices enhances coffee production.

4.3. Degraded Land Restoration: Agronomic Measures

4.3.1. Composting

Composting is one of the soil fertility management practices implemented by smallholder farmers to improve farmland productivity. Soil nutrients that are in deficit on farmland are supplied through compost applied to the fields. The process of composting is most rapid when conditions that promote the growth of microorganisms are appropriately established and maintained for the period required. Efficiency of compost making is improved when the required inputs and conditions are fulfilled and maintained appropriately. Maintaining a steady climate, carbon to nitrogen ratio, aeration, moisture, material size and turning are all important conditions in composting and are key steps in producing the appropriate compost containing the required elements.

The level of decomposition in the composting process indicates the healthiness of the compost being produced. Rapid decomposition in composting is indicated in different ways related to maintaining conditions of composting. Some signs that healthy compost is being produced include: pleasant odour; heat produced by composting, as shown by water vapour during turning the compost; growth of white fungi on decomposing organic material; reduction in volume of the heap; and change of material colour to dark brown. At the end of the composting process, the temperature drops and finally little or no heat is produced from the materials, indicating that the compost is ready for use.

4.3.2. Rapid composting: vermiculture and vermicompost

Practical experience of SLM has shown that conventional composting procedures take as long as 4–8 months to produce compost. This has prompted a search for faster composting methods to meet the growing need for the product. Accordingly, rapid composting methods that offer possibilities for reducing the composting period have been practically applied in SLMP watersheds. Vermicomposting is one approach that is practically applied and tested by farming communities.

Vermicomposting is a method of quickly preparing enriched high-quality compost by using earthworms. Earthworms are valued by farmers because, in addition to aerating the soil, they digest organic matter and produce castings that are a valuable source of humus. Vermicomposting is a simple technology that converts biodegradable

waste into humus with the help of earthworms. The process of vermicomposting is inseparable from vermiculture, which requires continuous breeding of earthworms in boxes for the production of high-quality compost. The earthworm is the primary product, and the vermicompost is a valuable by-product, with the primary objective of the vermicomposter being production of vermicompost. Vermicompost is the excreta of earthworms, and is rich in humus.

Vermicomposting is a method of preparing vermicompost by the use of earthworms. It is one of the easiest methods to recycle agricultural waste and to produce quality compost. The worms consume biomass and excrete it in digested form called worm casts. The casts are rich in nutrients, growth promoting substances and beneficial soil micro-flora, and have inhibiting properties against pathogenic microbes. Vermicompost is a stable, fine granular organic manure that enriches soil quality by improving its physicochemical and biological properties. It is useful in raising seedlings and for crop production. Vermicompost is becoming popular as a major component of organic farming systems. Vermicomposting can be undertaken in pits, concrete tanks or wooden crates appropriate to the situation (Figures 90–97).

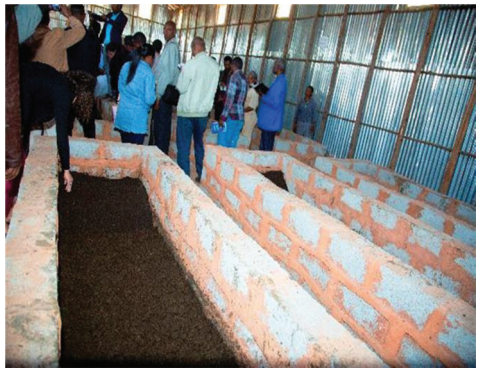


Figure 90: Vermicomposting in Oromia and use of plastic sheeting to contain soil and earthworms. *Source: Adapted from ISFM+ Project 2021.*

Figure 91: Vermicomposting worms.

Figure 92: Stages in the reproduction of the worms.

Figure 93: Worm bins with bedding.

Figure 94: Watering of chopped raw material for optimum moisture.

Figure 95: Raw materials under decomposition with few materials left undecomposed.

Figure 96: Final stage of decomposition.

Figure 97: Well-decomposed compost that is ready for application.

4.3.3. Green manures and cover crops

Green manures are plants that are deliberately grown for the purpose of incorporation into the soil to improve the organic matter content and soil fertility. Leguminous plants are largely used for green manuring due to their ability to fix biological nitrogen, their drought tolerance, quick growth and adaptation to adverse conditions. Sometimes green manures are referred to as cover crops as their roles are similar. The main purpose of growing a cover crop is to cover the soil with a low vegetation cover to protect the soil from exposure to sun and rain as well as to suppress weeds. Green manures are grown with the prime purpose of building as much biomass as possible. However, they also play a role in covering the ground and protecting it from solar radiation and soil erosion. Crops that serve both these functions are often referred to as green manure cover crops.

Green manures supply the soil with great amounts of fresh biomass. After incorporation into the soil, the biomass is quickly decomposed by soil organisms within about two weeks under humid and warm conditions. Most nutrients are then readily available to a new crop. A small proportion is also transformed into stable soil organic matter, contributing to better soil structure, better aeration, improved drainage and increased soil water and nutrient holding capacity.

Green manure cover crops also help to stop the soil from being carried away by wind and rain by providing a ground cover during their growth. They also have a root system that holds the soil in place. As they contribute to increasing soil humus, they contribute to improving soil structure, improving water infiltration and reducing the susceptibility of the soil to being carried away by runoff water.

Experience in SLM indicates that implementing green manuring as part of integrated soil fertility management (ISFM) measures contributes to enhanced agricultural production. An important part of the green manuring process is selecting local species that are best adapted to the areas to achieve the intended results. Consulting local communities for their knowledge on the subject and visiting local agricultural research centres are key in the process of selecting appropriate crops that can be used for green manuring. The SLM practical experience in highland areas of Ethiopia shows that lupin, lablab and vetch are suitable crops for green manuring (Figure 98). Important considerations when selecting appropriate crops for supporting green manuring on farms include the crop's potential to fix nitrogen and length of roots, for breaking up and aerating heavier soils. Methods of establishing and managing green manures are given below.

Figure 98: Green manure crops: lupin (left), vetch (middle) and lablab (right). *Source: Adapted from ISFM+ Project, 2021.*

Selection of species best adapted to the area: In Ethiopia, some of the crops used for green manuring include lupins, lablab and vetch. Lupins (*Lupinus* species) have been successfully grown in several areas in the Amhara region, where they are a hardy annual leguminous green manure with tap roots that dredge up minerals. They can also fix more free nitrogen than peas or beans. The long roots also help to break up and aerate heavier soils and allow more soil moisture retention with the addition of humus from the breakdown of the roots in the soil. They produce a blue flower, although it is best to cut the plant down and dig it in before flowering to prevent seeding and the plant becoming a nuisance to other crops.

Planting the green manure cover crop: Green manures can be grown before cereal row crops such as maize, millet sorghum or teff. To avoid or reduce competition with these crops, the green manures are usually sown towards the middle or the end of the growing season, when the main crop is well established or near maturity. In this situation, known as relay cropping, major growth of the green manure occurs during the dry season, after the harvest of the main crop or the early rains. This has the advantage that the green manure uses land that normally would not be under cultivation. For instance, in Amhara, lupin should typically be planted in March, using a high-quality, inoculated legume seed; it should be planted at a high seeding rate (240 kg/ha), aiming for incorporation into the soil in June, before planting a cereal crop.

Incorporation into the soil: Green manures are ideally allowed to grow up to the flowering stage, when biomass is greatest and the plant material will still easily decompose, as it is still green and not yet woody. The green manure is then incorporated into the soil during land preparation. The biomass is broken down quickly by soil organisms, allowing the nutrients to become available. Within a few months the green material will be completely decomposed (Figure 99). Young and succulent material should be incorporated at least two months before the new crop is sown, because in the initial period of decomposition substances are released that can damage the young, sprouted plants or can make the root ends sensitive to damage by pathogens.

Figure 99: Green manuring of a lupin crop during land preparation before planting the main cereal crop.
Source: Adapted from ISFM+ Project, 2021.

Benefits of using a green manure crop: These include protecting the soil from wind or water erosion, shading the soil and reducing soil moisture loss, increasing soil biological activity, reducing nutrient leaching loss, suppressing weeds, providing animal fodder and increasing yield of crops that follow.

4.3.4. Reclamation and sustainable use of acidic soils

Despite many years of investment in SWC measures, farmland in the highlands continues to be affected by soil acidity, which reduces crop productivity. In some watersheds the problem was so severe that farmers lost interest in practising any farm activity on affected land and abandoned their farmland. Practical experience in land management has indicated that use of composts, application of manures and green manures are important measures in improving soil organic matter. However, given the widespread challenge in highland areas, additional measures are critical to tackle soil acidity. Acidic soil reclamation measures have been applied in SLMP watersheds to reverse acidity of farmland and improve land productivity. Addition of organic matter on farmland is a viable approach to manage problems associated with soil acidity. In this regard, remarkable lessons have been learned in treating acidic soils with lime application, which has increased productivity of agricultural landscapes.

Lime can neutralise soil acidity, which improves suitability of soil for cultivation of different crops. To ensure sustainable use of farmland, acidic soils are ameliorated with lime to maintain increased productivity. Large amounts of lime resources are available in the country, which makes treating acidic soils with lime feasible. However, transportation costs are still very high for areas that are far from potential lime sources. Therefore, lime application is economical in areas where potential lime sources are close by.

Promotion of ISFM measures has led to improved productivity of agricultural landscapes by sustainably improving the organic matter of farmland. This has led to a

range of benefits due to rehabilitated watersheds improving livelihood of households. Increased production of crops and livestock products in rehabilitated watersheds has enabled farming communities to produce and sell substantial volumes of consumable products to generate more income. Benefits realised from increased production, and the experience gained, also motivate farmers to invest in development measures that ensure sustainable use of rehabilitated areas. The number of farmers engaged in productivity enhancement measures has increased substantially for years, as evidenced by ISFM measures in SLMP watersheds.

Experience in SLM has also proven that the use of resources created in the rehabilitated watersheds is critical for ensuring sustainability. Practice has shown that rehabilitation of watersheds improves availability of ground and surface water, which is used for enhancing agricultural production. In this regard, practical experience of SLM in small-scale irrigation development as an important element of ensuring sustainability of rehabilitated areas is discussed in the following section.

The addition of organic matter should not be considered a total substitute for lime. Liming acid soils has several immediate consequences other than raising soil pH. It increases the lime potential and the calcium ion concentration in the soil solution, which ultimately results in the displacement of aluminium ions from the soil solution.

Addition of lime: Lime is capable of neutralising soil acidity by increasing soil pH. Extreme acidity (below pH 5) is especially problematic to manage with only addition of organic matter and needs liming. Currently, there is a massive campaign in Ethiopia coordinated by the Federal Ministry of Agriculture to treat acidic soils with lime with the aim of increasing the productivity of acidic soils. There are vast lime resources within Ethiopia that can be exploited. These include marble, limestone, dolomite and marl from the Proterozoic, Mesozoic and Cenozoic eras.

When applying lime, appropriate placement is important since lime particles do not move readily in the soil. Lime must be placed where it is needed and completely mixed with the soil to ensure a uniform distribution (Figure 100). For instance, lime applied on the surface of an acid sub-soil could lead to transitory effects, since it does not readily and substantially move to effectively bring about the intended soil reaction change for fertility improvement. This means that deeper ploughing would be necessary for thorough blending with the soil. The calculation of lime requirement should be done in close consultation with regional soil laboratories and research institutes.

Figure 100: Lime transport, spreading and incorporation.

4.4. Land Management Measures: Adoption, Benefits and Lessons

Different assessments and observations of, and interviews with, beneficiaries showed that benefits gained from implementing biophysical SWC measures can be explained in terms of landscape conservation, economic use and social value (capacity/ skill development).

4.4.1. Adoption of land management technologies and practices

Experiences during the implementation of SLM have shown that smallholder farmers face both internal and external challenges concerning the adoption of modern agricultural technologies. Some of the most significant challenges and related factors include:

- limits to the pace of adoption of modern technology in agriculture;
- speeding up adoption of new technology involves a lot of knowledge and understanding of some of the elements that influence decisions by farmers to adopt modern farming technology;
- institutional, social and economic factors all influence the speed that agricultural technologies are adopted;
- land size, land cost and the benefits of technology are some of the economic factors that determine the rate of agricultural technology adoption;
- farmers' education level, age, social groupings and gender are some social factors that influence the probability of them adopting modern agricultural technologies;
- what matters most in the rate of adoption is whether a modern technology has any value in the agricultural sector.

In the SLMP, practical pilot demonstrations with voluntary and model farmers' land were used to break the reluctance to adopt among land users. Consequently, most of the biophysical technologies applied by the SLMP have been accepted and very well adopted by most farmers within SLMP intervention areas. To date, these biophysical technologies include soil bunds, stone-faced soil bunds, hillside terraces, bench terraces, water harvesting structures, desho and vetiver grass production, and plantations.

4.4.2. Benefits gained from implementation of land management measures

Restored landscape: From the beginning, SLMP has given priority to those landscapes degraded due to no or poor management and with significant negative impact on environment. This was aimed to stop or minimise the expansion of gullies towards farmland in particular. Degraded hillsides have been closed and afforested, and gullies changed to productive land in most SLMP intervention areas. Also, soil moisture restoration, improved soil depth and fertility, and ground water recharge are other benefits gained from ecological aspects. In general, land management and vegetation coverage have improved and controlled grazing is exercised in these areas. Figures 101 and 102 show restored land as a result of SLMP intervention, particularly implementation of biophysical SWC measures.

Figure 101: Termite-affected land changed to productive land (Gimbi woreda, Oromia).

Figure 102: Restored gully (Raya Azebo woreda, Tigray).

Economic use: In Ethiopia, a study found that crop yield was 30–40% higher in fields with contour bunds than in fields without them. In the SLMP context, the assessments and observation at field level showed promising achievements in terms of economic value as a result of bund construction, particularly on farmland. Field level observations and interviews with beneficiaries during SLMP performance assessment showed improvements in soil depth and moisture availability in the soil which endured through to crop maturity, particularly for cereal crops, compared to fields without SWC measures. Observed increments in production of field crops are presented below.

Success story 3:

SLMP phase I performance assessment in Oromia

According to information from community group discussions and household individual interviews at ten SLM phase I woredas watersheds, there is an increase in productivity and production as a result of natural resource management practices initiated and supported by SLMP. Farmers expressed that bunds on farmland are prominent practices that contribute a significant share of farmland soil moisture conservation, which allows the crop to stay green until actual ripening. According to farmers' observations, improved soil moisture has contributed significantly to increased crop productivity. The responses from household interviews show that productivity increased up to 100% due to the implementation of SLM practices, as shown in Figure 103. The data also show that the adoption of improved SLM practices, technical support by the project and an increase in land fertility and moisture are major factors for the increase in productivity.

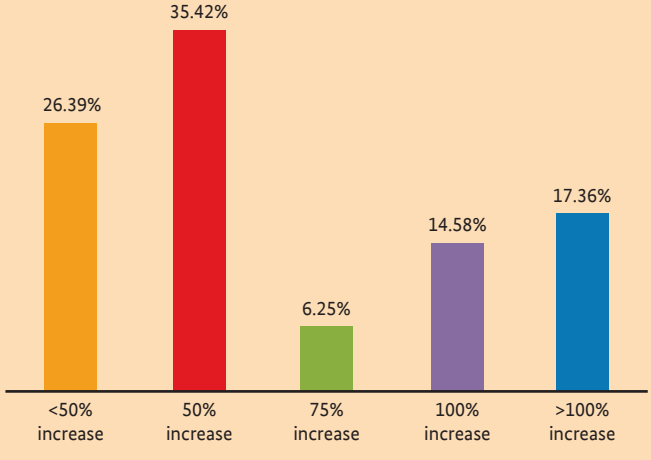


Figure 103: Farmers' perceptions of change in crop yield due to SWC practices (percentage of total respondents).

According to farmers' perceptions of Arbegona woreda of the SNNPR, the productivity of the treated area increased to three- to four-fold of the gain from conventional farming. Conventional farming resulted in wheat yields of 15–25 quintals/ha. However, treating abandoned sites previously used for cattle rearing with SLMP interventions resulted in 45–69 quintals/ha. Bench terrace technology contributed significantly to increased productivity in this area, and farmers who implemented this technology enjoyed multiple benefits including decreased soil erosion, conserved soil moisture, soil depth and fertility increments, and improved crop productivity and fodder production (e.g. desho grass and apple trees).

In addition, as a result of gully areas changing to productive land, land users gained further income by producing high-value crops on rehabilitated gully land. These areas also provide feed sources for livestock from forage grown on bunds, gullies and closed areas. Figures 104–109 demonstrate the economic benefits gained.

Figure 104: Bench terrace constructed on degraded communal land changed to wheat-producing land (Gumer woreda, SNNPR).

Figure 105: Pigeon pea seed production as an income source (Bedele woreda, Oromia).

Figure 106: Livestock feed production (access to grass production) (Atsbi Wombereta woreda, Tigray).

Figure 107: Grazing land protected from free livestock grazing and planted with productive grass species (Densho grass), Chayiti micro-watershed, Banja woreda, Amhara.

Figure 108: Maize production on bench terrace (Haromaya woreda, Oromia).

Figure 109: Cash crop (gesho) planted on restored gully land (Raya Azebo, Tigray).

Success story 4:

The multiple benefits of bench terracing combined with climate-smart agriculture practices in Arbegona woreda

Arbegona woreda is characterised by rugged and steeply sloped landscape. Its agro-ecological zone is 58% highland and 42% lowland, with average annual rainfall of 1,500 mm and an altitude range of 2,200–3,360 metres above sea level. Barley and wheat are the dominant cereals or annual crops while bamboo, habesha tid and koso are the major tree species in the area.

However, with its landscape and climatic condition, it is very difficult to have additional cultivable land for crop production in the woreda and hillside farming is highly exposed to soil erosion and acidity. With this condition, it is unthinkable to have uniform crop production on hillsides. Moreover, the landholding size per household is too small to provide sufficient production.

The SLMP intervention and technology

To tackle the above problem and increase production and productivity in the woreda, the SLMP provided new technology for Arbegona woreda through bench terrace construction and improvement of soil fertility. Since bench construction was a new idea and technology for the Arbegona farmers, a number of awareness creation and training events were conducted. These programmes include the woreda administration staff and experts, DAs, kebele administrators and farmers. Moreover, several experience-sharing programmes have been organised to show the effect of bench terraces on decreasing erosion and improving productivity.

Following these processes, bench terrace construction started at the

Farmers' Training Centre (FTC) and government office compounds as part of the method/result demonstration and experience-sharing sites.

Figure 110: Barley production on the bench terrace at FTC of Wene watershed, Dume Goth, Toshine kebele of Arbegona woreda (SLMP demonstration site).

After the construction of bench terraces on steep slopes, certain soil fertility improvement and agronomic efforts were made to improve production and productivity on the bench terraces. The technology was applied in combination with lime treatment, row planting and fertiliser application to decrease acidity and improve productivity, respectively.

Figure 111: Barley production on a bench terrace at the compound of Toshine Health Centre in Arbegona woreda (demonstration site).

In addition, on FTCs and other government office compounds, some model farmers have started to apply the bench terrace technology of SLMP and obtained some significant results in terms of runoff reduction, additional cultivable land and high production of barley. Figure 112 is taken from Ato Frew's farmland. According to our observation and interview, we found that Ato Frew is an innovative farmer who experimented with the application of the full package of the technology by having different experimental and control plots (lime and fertiliser applied but no row planting).

Figure 112: Barley production on the bench terrace at the farmland of Wene watershed of Toshine kebele, Arbegona (a plot with the full technology package).

As shown in Figure 113, the control plot without lime treatment and fertiliser had much lower crop biomass than the experimental plots that received the full package of the technology (i.e. bench terrace, lime treatment and fertiliser application).

Figure 113: Barley production on the bench terrace at the farmland of Ato Frew of Wene watershed of Toshine kebele (a plot without the technology package).

The benefits of bench terraces

According to the farmers who have adopted bench terrace technology, they are enjoying multiple benefits such as decreased soil erosion, improved water and soil conservation and increased crop productivity and fodder production (e.g. desho grass and fruit trees like apple). These farmers were able to grow 20 kg of barley from 30 m^2 (i.e. 67 quintals/ha) and the technology helped them to use additional uncultivated land. Consequently, it increased the awareness of many farmers in the watershed, which led to the scaling up of technology adoption among other farmers.

Figure 114: Barley crop on bench terrace (with full package of lime treatment, row planting and fertiliser).

Social aspect (skill development): Knowledge enhancement of end users meant that the local community developed their skill in implementing biophysical SWC technologies at large and are also well aware of the importance of constructing these technologies on their land. In general, farmers developed land management skills. Additionally, youth and jobless groups organised to work on enclosure areas and rehabilitated gullies to generate their own income contribute to indirectly minimising social crises.

4.4.3. Lessons learned during implementation

Through implementing physical SWC technologies in the SLMP, several lessons were learned from scaling up successes and areas needing further attention. Biological measures such as planting of trees, forages and grasses have been widely applied in SLMP watersheds primarily for land rehabilitation purposes. Different forestry, agroforestry and biological conservation measures have been applied with the integration of physical measures on hillsides, farmlands, gullies, grazing sites and other miscellaneous land. Commonly applied tree, shrub and grass planting practices in SLMP watersheds are bund/terrace stabilisation, biological gully treatment, hillside planting and homestead development interventions. The following are lessons learned from the implementation of biophysical SWC.

Technology integration: Sustainability of physical SWC is achieved with support from biological measures, which means that integration of both technologies is critical.

Community knowledge improvement: Local community skills in landscape management, particularly in the application of SWC technologies, was well developed and, as a result, technology adoption commenced among individual farmers in different SLMP intervention sites.

Community willingness enhanced: Through time, local community commitment and interest in implementing conservation technologies and changing their environment improved. The process of engaging communities during the formulation of bylaws and the enforcement of the bylaws to protect rehabilitated and enclosed areas was appreciated by farmers. In addition, collective actions of communities and other stakeholders in the construction of conservation measures have received better recognition by respective institutions and the government.

Productivity improvement: By conserving moisture (with bund construction on farmland) alone, remarkable productivity improvement was observed among farmers.

Impact of successes: Success stories are a step-by-step process requiring great patience. Farmers are always suspicious at the start of any project intervention. In general, successes smooth the way for scaling up.

Procedural implementation: Proper layout before construction of SWC technologies is the basis for the quality, durability and sustainability of any added structures.

Misperception: In a few locations of SLMP interventions, farmers destroyed the constructed bunds on their land as they perceived that the bunds took up space that could be used to cultivate more crops. This was one of the misconceptions observed among some farmers that need critical discussion and agreement with land users before constructing SWC technologies.

Stabilisation of bunds with multipurpose species: Where free grazing is controlled, the impact of bund stabilisation with biological measures has been significant, and was observed in many SLMP watersheds.

Hillside plantations and enrichment of closure areas: In most degraded sites, tree and shrub species that can tolerate the harsh environment are planted and used as pioneer species for further development of productive species. However, in sites with better soil depth and fertility, productive species have been planted and used as a source of wood for both household consumption and for sale as an additional income source. In such sites, plantations are becoming community assets and are used as a source of income for communal development work.

Gully revegetation: In SLMP target watersheds, successful gully revegetation works have been demonstrated and lessons gained for future recommendations to wider implementation. However, limitations such as gully reshaping, lack of appropriate species selection, limitation in appropriate planting time, lack of proper management after plantation and lack of sustainable use, are lessons that need to be considered and corrected in future.

Planting around homesteads: Farmers have been growing trees and shrubs in their compounds to satisfy their household needs for construction and firewood. This has indirectly contributed to reducing the huge pressure on natural forests and closure areas for fuelwood collection and in some cases for construction purposes. The SLMP in this regard widely promoted agroforestry practices, including establishing homestead plantations by providing different tree and shrub seedlings. As a result, this practice has been widely implemented by communities even in woredas and watersheds where experience was very limited. However, there are limited supplies of different tree and shrub varieties that can provide multiple benefits. The dominance of *Eucalyptus* species must be considered, as these fast-growing trees establish monocultures that do not contribute many ecosystem or environmental services.

Woodlot development: *Eucalyptus* species are widely planted by farmers for woodlot development. Due to criticisms regarding these species, farmers have been advised to instead develop woodlots of *Acacia decurrens*, which is fast growing, improves soil fertility and has potential for charcoal production. As a result, many farmers particularly in Amhara have been developing *Acacia* woodlots in the SLMP targeted and other watersheds.

Grass strip development: Development of grass strips was promoted and introduced in some SLMP watersheds. The technology was introduced by some communities on gentle sloping farmland. The practice was promoted to reduce sheet erosion, increase infiltration and improve soil fertility via addition of organic matter into the soil. The communities' background in free grazing limited the dissemination and wide application of this technology. Farmers are not interested in grass strip technology if it requires some portion of their farmland that could be used for crop production. Because the technology is useful in different aspects, this should be a future consideration in revising the situation.

Multi-storey development: Multi-storey development is the development of different trees, shrubs, fruit trees, forages, vegetables, spices and other plant species in different vertical crown arrangements. This technology is an intensive production system that requires special skill and experience and diverse production inputs. The technology is very successful in irrigable areas, which helps integrate fruit and vegetable production in the system. The SLMP has experience in some micro-watersheds where irrigation is developed and farmers have participated in similar interventions. The multi-storey development practices in Burie Zuria woreda of Amhara region is an exemplary demonstration of this technology. Farmers showed interest because the technology helps them to get year-round production from the integration of diversified species. However, the technology was not widely applied, because it requires water supply, adequate skill and experience, and huge input and labour. This should be considered for further assessments to promote in potential areas across the SLMP intervention.

This chapter presented the technologies, practices and approaches that have been implemented to improve land management at the watershed level. In this regard, major structural, biological and agronomic soil and water management technologies that have been promoted to reverse land degradation were documented. In addition, the adoption of those technologies, the benefits of implementing the measures and the key lessons learned during implementation are highlighted. In this chapter, exemplary case studies from different watersheds were also included to further amplify the results of SLM interventions.

In Chapter 5, the enabling environments to support the maintenance and sustainability of land management measures are presented. These enabling environments for SLM include, among others, securing sense of land ownership through second-level land certification, establishment of community, strengthening local institutions for watershed governance and promotion of value chain development for selected watershed produce.

5

Enabling Environment for Sustainable Land Management

Key messages

- Sustainability of land management efforts is ensured when land rehabilitation and stabilisation measures are linked with improved productivity of the land, income generation from products and services, and appropriate natural resource governance arrangements
- Selecting and applying appropriate integrated soil fertility management technologies and practices is important in improving the productivity of rehabilitated farmlands and ensuring sustainable use of the resource base
- Promoting small-scale irrigation technologies and approaches enhances the productivity of smallholder farmers through the use of available water resources in the production of high-value marketable products, which increases the income of farming communities
- Supporting value addition interventions in rehabilitated areas is key to diversifying the livelihoods of beneficiaries, improving income of farmers and ensuring the sustainable maintenance and use of resources through the production of valuable agricultural products

- Practising an appropriate backyard livestock management system, which includes stall feeding and addressing free grazing, increases the productivity of crop–livestock farming practice and contributes to ensuring the sustainable use of rehabilitated areas
- Understanding participatory resource management processes – resource identification, beneficiary selection, resource surveying and benchmarking, identification of benefits, tapping benefits and developing resources – are important for ensuring the sustainable use of resources through community participation
- Strengthening local institutions through the development of community bylaws, harmonising development procedures for participatory land use planning and watershed development, and defining the responsibilities of key actors is vital in empowering local communities in the governance of resources

As described in Chapter 4, four different land management measures have been implemented to restore degraded watersheds. As a result, substantial areas of land within watersheds have been stabilised and become available for productive use.

However, sustainability of the rehabilitated areas can only be ensured when land rehabilitation and stabilisation measures are linked with improved productivity of the land, income generation from products and services, and appropriate natural resource governance arrangements. In this regard, practical experience of sustainable land management (SLM) implementation shows that enhanced productive capacity of agro-ecosystems through the production of fruits and vegetables, forage and forest products and honey leads to improved rural livelihoods.

Inclusive benefit sharing and responsible use on the part of primary resource users are also decisive factors to ensure sustainability. Experience from the Sustainable Land Management Programme (SLMP) has shown that such considerations provide the opportunity for the different social groups in a watershed to actively participate in the development, management and responsible use of the watershed. This chapter details the approaches followed and practices applied to ensure the sustainability of rehabilitated watersheds, such as enhancing farmland productivity, income-generating activities and improved local natural resource governance arrangements.

5.1. Farmland Productivity Enhancement Interventions

The various erosion control measures that have been in place are necessary but not sufficient to ensure enhanced productivity of farmland. In this regard, the SLMP has promoted different productivity enhancement practices and approaches, such as integrated soil fertility management (ISFM), small-scale irrigation (SSI), honey production and backyard livestock management. These practices and approaches, implemented in various watersheds throughout the country over the past 40 years, have proven successful. In the following sub-sections, the practical experiences of SLMP related to land productivity enhancement are presented.

5.1.1. ISFM for improved productivity

One way of ensuring the sustainability of rehabilitated and stabilised farmland is by increasing crop productivity through the application of ISFM practices. In the highlands of Ethiopia, where SLMP is being implemented, crop–livestock mixed farming is dominant. Under suitable management, livestock contribute to enhanced crop production with manure and draught power, while appropriate crop production contributes to enhanced feed and fodder for the livestock. Hence, maintaining the balance between the two production systems is considered to be a key principle of ISFM in the SLMP intervention areas. Furthermore, ISFM comprises the use of both inorganic fertilisers and organic inputs as well as improved germplasm or seed. To ensure maximum benefit, a careful combination of inorganic and organic fertilisers, in association with complementary agronomic practices including tillage, rotation, crop sequencing and soil and moisture conservation, has been adopted.

The ISFM follows important principles that ensure the flow of nutrients, organic matter and manure around a farm as a system of nutrient cycling and recycling. In this regard, optimal nutrient cycling is essential for maintaining high productivity, the aim being to create a tight system that synchronises the soil release of nutrients with the demands of the crop. Another important aspect of ISFM is the maintenance or increase in soil organic matter. In an intensive cropping system, recycling and reusing nutrients from organic sources may be insufficient to maintain high crop yields. In these situations, nutrients removed from the soil, through harvested biomass, must be replenished from external sources. Thus, the use of adequate inorganic fertilisers is essential to maintain soil fertility. In this regard, ISFM is an important strategy for enhancing soil nutrients through the combined use of both organic and inorganic fertilisers. Integrating other locally suitable crop management practices with fertiliser use is an important measure in maintaining soil fertility. Experience of SLM shows that

implementing integrated fertility management measures such as organic fertiliser, inorganic fertiliser and crop management measures on farmlands contributes to enhanced crop yield. In this regard, practical lessons of SLM in implementing soil fertility management technologies and approaches are presented as follows.

5.1.2. Selecting ISFM technologies

Practical experience of SLM shows that the selection of appropriate ISFM technologies and approaches is an important step to maintain soil fertility. There are a host of practical proven ISFM technologies and approaches for managing soil, nutrient and water resources, which can be selected and adapted to specific local contexts. Technologies are selected by considering different parameters, such as response rate to soil nutrient deficit, household income, labour, assets ownership of household, agro-ecology and other farm management practices. In this regard, practices that are selected for application are site-specific and profitable. Another important aspect in the selection of technologies is that they should use both organic and inorganic fertilisers. Consideration is also made of the use of practices and techniques that maximise plant uptake of nutrients provided for different soil types.

Practical SLM experience indicates that considering both socio-economic and biophysical contexts is important in the selection of technologies and practices that best fit the local situation of individual farmers. In this regard, the selection of appropriate ISFM technologies is undertaken by critically analysing the possible combinations of organic and inorganic fertilisers with respect to the following four scenarios.

***High returns – high potential*:** on good soils, where socio-economic constraints are less important, an ISFM focus on inorganic fertiliser use makes sense. This is especially so where soils are highly responsive to external input of inorganic fertilisers, where soils already have high levels of organic matter and where returns to inputs are significant and perhaps the main factor constraining production.

***High returns – low potential*:** on poor soils where socio-economic constraints are also less important, then ISFM focuses on a mixed strategy of organic and inorganic fertiliser use, the ratio being dependent on existing soil organic matter levels.

***Poor return – high potential*:** on good soils where there are likely to be poor returns due to socio-economic constraints, organic ISFM options are most appropriate. However, efficient methods of inorganic fertiliser application, such as micro-dosing, still play an important role.

***Poor returns – low potential*:** in situations where soils are least responsive, whether due to low organic matter, poor rainfall or a combination of both, and where returns to inputs are low due to high input prices or low prices of farm products resulting from

poor market and transport linkages, an integrated and long-term ISFM strategy that uses a combination of technologies is essential to build organic matter.

Those four scenarios are indicated in a matrix (Table 6) as an important tool when selecting appropriate technologies.

Table 6: Socio-economic and biophysical context of soil fertility management.

Socio-economic context: Profitability and affordability	Low potential: Low organic matter, low rainfall	High potential: High organic matter, high rainfall
High returns Land tenure, market and other production constraints less important	***Mixed strategy*** Organic and inorganic	***Application of inorganic fertilisers appropriate*** Market based but including organic
Poor returns Due to high input prices, low prices of farm products with poor market and transport linkages	***Low external input options*** Mostly organic	***Efficient application is critical*** Market assisted (such as micro-dosing)

Biophysical context
Inherent soil fertility and potential

Source: Adapted from ISFM Technical Manual, October 2020.

In the selection of technologies, respective cases are assessed using the matrix in Table 6. Socio-economic context is analysed from the viewpoint of the profitability of choosing the technology and its affordability for local communities. Candidate technology is also categorised as high or low potential based on an assessment of biophysical contexts, which are reflected in the inherent soil fertility and potential for improvement. Socio-economic and biophysical contexts are mapped on the matrix to determine the quadrant in which the ISFM technologies belong. Selecting diverse technologies and allowing for flexibility in the process are key to achieving long-term resilience and sustainable use of the resource base while maintaining its productive capacity.

5.2. SSI Development for More Benefits

Practical SLMP experience of SSI development shows that the sustainability of rehabilitated areas is also ensured through the use of productive resources created in the process. Rehabilitated land in the watershed is used by local communities to produce high-value crops that are desired in consumer markets. Rehabilitation measures implemented in the upper catchment improve water availability in the lower part of the watershed. This creates opportunities to establish SSI schemes and practices that enhance household productivity through the use of resources. Use of water for irrigation has contributed to ensuring watershed sustainability by enabling

farmers to cope with periods of inadequate rainfall and drought. As a result, SSI development exploits the potential of rehabilitated areas for ensuring food security, nutrition and higher incomes for rural households.

Farmers have benefitted from irrigation directly through increased and more stable incomes for them and their families. The low-cost SSI techniques used by farmers have increased crop yields without damaging the environment. Technologies and approaches promoted within the scope of smallholder farmer investment, such as small dams, diversion weirs, wells and water-harvesting structures, have improved agricultural productivity. The SLMP has intensively promoted the construction of structures that improve groundwater recharging in the upper, middle and lower catchments of watersheds. Encouraging results in a number of rehabilitated watersheds supported by SLMP indicate increased agricultural productivity through promoting SSI (Figure 125).

Figure 125: Successful SLM practices that contribute to irrigation development. ***Source:*** *GIZ SLM archive, 2020 - Tigray region.*

5.2.1. SSI development techniques

The SLMP has promoted SSI development measures to enhance the agricultural productivity of rehabilitated watersheds. In this regard, the experiences of promoting different irrigation development measures, along with corresponding water management and related agronomic practices, as detailed in this section, have been remarkable. Different SSI systems are implemented in different SLMP watersheds depending on the availability of technologies and the source of the water used. Lessons learnt in implementing diversion weirs, spring development and the construction of water storage systems in the context of SLMP watersheds are presented below.

5.2.1.1. Diversion weirs

Figure 126: River diversion constructed by the community.
Source: *GIZ SLM archive, 2020 - Tigray region.*

River diversion systems are off-take systems and are the most common form of irrigation system implemented in SLMP watersheds (Figure 126). Diversion systems use natural river flow; however, the regulation of river flow via a permanent structure in the riverbed is also common to increase the off-take. Diversion systems abstract water over a sustained period and deliver regular irrigation throughout the cropping regime. A key characteristic of diversion systems is the adequacy of water supply during dry seasons, the ability to irrigate a dry season crop and providing supplementary irrigation during rainy seasons.

5.2.1.2. Spate system

Spate systems make use of the occasional flood flows of streams and operate during the dry season (Figure 127). Common spate systems implemented in SLMP watersheds are those on foothill sites that divert flood flows originating in highland areas. Spate systems have proven difficult to rehabilitate due to the difficulty of designing weirs to divert flows that change over a short period of time and that can also resist structural damage from flood flows.

a. Traditional spate irrigation

b. Modern spate irrigation

Figure 127: Spate/flood irrigation in Raya Azebo Tabaia Tsegea, Tigray.

5.2.1.3. Storage systems

Storage systems store water for an extended period of time behind earthen dams (Figure 128). Storage systems were recently introduced in SLMP watersheds to maximise the use of water in rehabilitated watersheds and enhance agricultural production in these areas. For optimal use of the resource catchment, the flow and amount of sediment are considered when designing storage systems. Storage structures are constructed with the participation of local communities in different ways, such as providing labour, equipment or in some cases cash, to ensure ownership of the systems at a later stage. Storage structures are made to collect water usually during rainy seasons, which is then used to water crops during dry seasons and times of water shortage. This system demands appropriate planning of cropping practice to improve water use efficiency by considering the amount of available water stored for irrigating farmland. Experience has indicated that irrigable areas are larger during rainy seasons than during dry periods.

Figure 128: Partial view of storage structures established in SLMP watersheds. ***Source:*** *GIZ SLM archive, 2020 - Tigray region.*

5.2.1.4. Treadle pumps

The SLMP has promoted treadle pumps as one technology to enhance agricultural production through the use of irrigable land (Figure 129). Treadle pumps are procured from suppliers in the market. They are installed by technicians in shallow wells that are constructed by users who have the required skill. Experience has shown that treadle pumps are also used to lift surface water to farmland. Proper functioning of treadle pumps is dependent on a sustained supply of spare parts and maintenance functions in the vicinity of farmers.

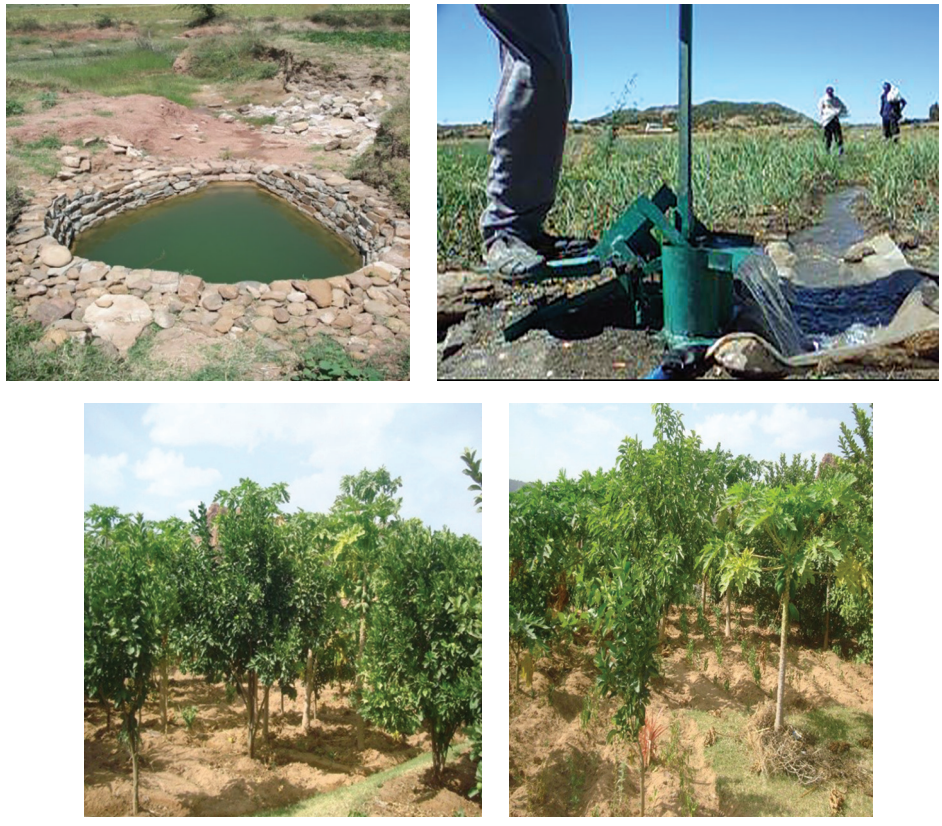


Figure 129: Lifting water with a treadle pump from shallow well and storage (top two photos) and irrigated fruit crops (bottom two photos). ***Source:*** *GIZ SLM archive, 2020 - Tigray region.*

5.2.2. Practices to enhance water use efficiency

As part of the effort to enhance irrigation efficiency and water management, different technologies and practices have been implemented in the SLMP. Promoting irrigation schemes and demonstrating drip and furrow irrigation systems are important measures that have improved productivity through the use of water resources in watersheds. To improve water use efficiency, technologies that provide on-point application of available water and reduce water evaporation losses have been implemented in SLMP watersheds. Drip irrigation technology is practised by farmers as a principal technology to improve water use efficiency (Figure 130). Other crop management practices such as row planting are also applied by farmers to improve drip irrigation productivity.


Figure 130: Family drip irrigation field planted with vegetables, Qorrir SSI Scheme, Tigray.

5.2.2.1. Establishment of sustainable water management systems

The SLMP has supported the construction of SSI systems to bring water to farms. The SLMP implemented a participatory approach whereby local communities have owned and managed the irrigation systems through their water user associations, which train members on the management and efficient distribution of water on farmland. Water user associations are established and strengthened for respective SSI schemes to ensure sustainable use of the structures. Experience shows that creating access to financial resources, such as local microcredit lines to user groups, is an important step for the sustainable operation and maintenance of SSI schemes.

As part of ensuring the sustainability of irrigation development measures, support is extended to water user associations to help them develop management plans for the operation and maintenance of structures. Training has been provided to actors in the partner system, particularly for agricultural and water management advisory services in the Ministry of Agriculture and irrigation technicians at operation levels, for the sustained delivery of irrigation-related extension services to communities. Farmers' capacities are also improved by the adoption of appropriate irrigation technologies and by changing farming practices in the irrigation system.

5.2.2.2. SSI opportunities and challenges

Opportunities: Experiences of SLMP indicated that households who have practised SSI development measures show increased willingness to participate in rehabilitation works. Integrated watershed management interventions implemented in the upper catchment of watersheds to reduce erosion and runoff have contributed to ensuring sustained performance of SSI schemes established in the rehabilitated watersheds. Enactment of policies which incentivise local communities to contribute free annual labour for watershed development practices have led to increased availability of rehabilitated areas and resources for scaling up irrigation development technologies.

Intensive area enclosure measures in the upper catchment of watersheds are improving water recharge in the bottom outlets, which are ideal areas for promoting SSI practices.

Challenges: The promotion of SSI is challenged by the administration of scarce resources such as land and water, which are the basis of development measures. Technologies and practices that promote SSI are new to local communities, and the limited supply of spare parts for some SSI technologies, together with inadequate postal services, limit the promotion of irrigation development. Development of SSI is also challenged by the frequent occurrence of crop diseases and pests spreading across adjacent plots. Conflicts over sharing water among communities in the upper and lower parts of the watershed are another challenge related to irrigation promotion.

5.2.3. Lessons learnt and recommendations

The irrigation infrastructure established in SLMP watersheds has benefitted local communities by securing water for irrigation and domestic use around their homesteads. The dependency on rain-fed agriculture in these SLMP-supported areas has significantly declined with access to irrigation water. The following lessons have been learnt from the promotion of SSI development by SLMP:

- Irrigation systems have served as an effective risk management strategy for smallholder farmers vulnerable to unreliable rainfall and subject to frequent drought, who can grow crops and earn income throughout the year by engaging in irrigation development.
- Farmers practising SSI increase their production of high-value crops such as vegetables and fruits. These products are characterised by shorter shelf-lives, which require the creation of complementary market linkages to tap higher income from production activities.

Recommendations

To capitalise on SLMP experience of promoting SSI, and to scale up success stories to other agro-ecological areas, the following key measures are recommended:

- SSI has a very significant positive effect on the income of rural farm households. Thus, improve coordination among key actors to increase coverage of best practices and the adoption of emerging technologies.
- Diseases and pests are limiting factors in irrigated areas, and are aggravated by a limited supply of inputs for reversing the problem. Improve supply systems for inputs and promote the adoption of integrated pest management measures by watershed communities.

- Train water user association members and extension workers on sustainable management, irrigation scheme maintenance and the efficient use of water resources.
- Intensify current efforts to improve the quality and volume of water used for irrigating command areas.

5.3. Adding Value to Rehabilitated Watersheds

With the emergence of SLM, the inclusion of interventions that add value to the watershed development process are becoming increasingly important in ensuring the sustainability of results. The inclusion of value addition in natural resource management goes back at least to the time of the Sustainable Utilisation of Natural resources (SUN) programme, which ran until 2005. Experience of successfully promoting fruits and vegetables on semi-circular terraces in Tigray, and of apple and enset (false banana) cultivation in Oromia, are both success stories for shifting focus towards value addition interventions. Since 2008, significant efforts have been made to enable beneficiaries to go beyond rehabilitation works to generating additional value. Capitalising on the lessons of the SUN programme, SLMP interventions are developed at later stages to comprehensively support crop, livestock and natural resource sectors. On top of this development, measures are designed and supported for a range of land uses like communal land, farmland and homestead areas on which the livelihoods of communities depend. Thus, supporting value addition in SLM is a key focus for improving the livelihoods of beneficiaries through optimal resource use, while ensuring the sustainability of development efforts. In this regard, SLMP experience of adding value to maintaining sustainability and gaining more income from rehabilitated watersheds is presented in the following sub-sections.

5.3.1. Value addition in rehabilitated gullies

The SLMP experience shows that the rehabilitation of gullies requires intensive investment of capital and labour. Exploiting the potential for value addition in rehabilitated gullies is key to recovering the investment costs and ensuring equitable resource use as an integral element of sustainability. Because most communities contribute to the treatment of gullies in different ways, it important to consider the benefits to the community during use. For gullies owned by individual farmers, it is simple to direct the benefits. However, significant parts of treated gullies in rehabilitated areas are commonly owned by local communities and so public consultation is needed regarding the use of the resource. Establishing ownership titles

for treated gullies is a key step as it ensures long-term management and protection of the resource. Meanwhile, other members of the community are likely to benefit indirectly from reduced flooding, increased bee foraging and the improved aesthetic value of the treated gullies. Sequestered carbon and increased water yields are other additional benefits (Figures 131 and 132).

Figure 131: Ground water raised in the bed of a rehabilitated gully, Dershem SUN-supported watershed, near Axum in Tigray. ***Source:*** *Gete Zeleke (2010).*

Figure 132: Use of biomass from treated gullies as livestock feed. ***Source:*** *adapted from Guideline for Sustainability, 2015.*

Experience has shown that the development of clear management and a use plan for treated gullies is necessary to capitalise on rehabilitated areas and ensure greater sustainability of interventions. Emphasis needs to be given to communally owned gullies. A well-rehabilitated gully needs a management plan for its sustainable and equitable use. Gullies are usually owned by more than one person and agreement is needed on how to see activities through to their conclusion, as well as the proper use of resources after completion. A management plan for a treated gully should address the issues of harvesting resources, maintaining structures, planting, protection from animals and pests, value chain development and decisions regarding which plants to grow.

Once community consultation on the use of the gullies is complete, a model management plan is developed which can be easily adjusted by woreda experts and development agents. Once the model management plan is known to development workers, the regional, zonal and project staff have to check the quality of planning and advise on any necessary changes.

Implementing the management plan is the responsibility of the beneficiaries of the gully. Sharing of responsibilities among individuals should be clear in the management plan. The plan should be prepared in a way that is easily understood and implemented by farmers, and should include translations into local languages. Farmers using a common gully should be organised into a gully user group to allow better implementation of the management plan.

5.3.2. Income-generating activities

Income-generating opportunities for different watershed products and services have emerged because of watershed development measures and the protection of the rehabilitated sites in SLMP watersheds. Communities are encouraged and supported to engage in different natural resource-related value chain activities as a means of sustainably using rehabilitated land. Watershed communities are supported to derive economic benefits from rehabilitated watersheds, taking advantage of the enhanced productive potential for valuable crop, livestock and natural resource products. Enhanced fertility of farmland, grass and other biomass on enclosures, and forested areas of individual households enable farmers to engage in income-generating activities. Because watershed products are communally owned by watershed communities, beneficiaries are organised in economic units to make use of these resources. As a result, special emphasis is given to the involvement of women, landless youth and resource-poor communities in different economic groups, based on watershed potential. The following topics detail SLMP experiences of income-generating activities of selected watersheds in highland areas.

5.3.2.1. Honey production

Honey is an important high-value product produced in rehabilitated watersheds through the engagement of households in beekeeping as an economic activity. Accordingly, SLMP promotes beekeeping in rehabilitated watersheds. Improved availability of water in rehabilitated watersheds creates a conducive environment for beekeeping because water is a key ingredient in honey production for bees. Biological soil and water conservation measures, which are promoted to ensure the sustainability of structures, also serve as principal sources of bee forage. Target communities can participate in beekeeping individually, at household level, or in groups. The SLMP supports individual households who are engaged in beekeeping by creating capacity for new technologies, field-level technical backstopping and by introducing commercial thinking regarding earning more income. The following success story details the experience of an individual household supported in the SLMP framework.

Success story 5:

Beekeeping in Oromia

"My name is Ato Yasin Bati and I am a 54-year-old farmer living in the Haro micro-watershed in the Gechi woreda of Oromia Region. I have seven children and agriculture is my livelihood, by which I produce the necessities of life for my family. I usually harvest maize and teff for feeding the family and coffee for cash on 3 ha of land that I own.

"On top of crop production, I have been engaged in beekeeping in my backyard. I started beekeeping with three modern, six transitional and five traditional beehives in 2015. I did not consider beekeeping as a business and source of income for years. Honey was used for household consumption as supplementary food. Our watershed is an ideal area for this business with huge potential for beekeeping. However, my focus on beekeeping was low and I considered it a side business. It was my participation in Farmer Business School (FBS) training that prompted me to look for opportunities related to the business in the area.

Figure 133: Mr Yasin Banti.
Source: *SURED archive, 2020.*

Figure 134: Bee shade in backyard.
Source: *SURED archive, 2020.*

"In 2019, I took part in FBS training delivered by development agents, which introduced me to the perspective of thinking commercially about agricultural activities supported by the GIZ Sustainable Use of Rehabilitated Land for Economic Development (SURED) project. I gained knowledge and skills in

farming as a business, which includes recording costs and income, and the importance of groups, saving, credit, using improved inputs and good agricultural practices. I also received training on the construction of beehives using local materials and apiary management by woreda experts. After all of this training, I constructed a 200 m^2 shade in my backyard. I have increased the number of modern beehives from 3 to 20 and transitional beehives from 6 to 12 to improve the volume and quality of production of honey to generate income. I sold my calf and bought three modern hives. I also received three modern beehives as reward for my hard work from the woreda livestock office. Currently, I have a total of 20 modern, 12 transitional and five local or traditional beehives. I have established a water point in the vicinity of the apiary.

"I have harvested 25, 18 and 7 kg from modern, transitional and traditional beehives, respectively, during the June 2020 harvesting period. I harvested 100 kg of pure honey using a machine borrowed from the woreda livestock office. As result, I earned ETB 11,100 during the period through selling honey for ETB 110/kg in the local market. The income was used for covering expenses of improved seeds, fertiliser, clothes, student uniforms and stationery items for kids. I started saving in an interest-free account in Oromia Cooperative Bank in Gechi town. I am working to further improve the quality of the honey I produce by using clean materials to handle honey, not mixing with other equipment as honey is susceptible to spoilage, and using a queen excluder, as I was not doing this previously. I have a plan to expand the scope of the business and reach 100 modern beehives with colonies.

Figure 135: Water trough for bees.

"We came to realise that rehabilitated land in our watershed is crucial for a beekeeping business as it is the source of water, bee forage and input for hive construction. Thus, I actively participated in rehabilitation and enrichment plantation of 2.5 ha of rehabilitated land around my apiary. We also planted multipurpose seedlings like sesbania, girawa, tsigerieda and *Grevillia robusta*. I hand dug a well in my compound to provide water for bees and to grow different vegetables throughout the year. I would like to thank the SURED project for introducing such an innovative way of doing things."

Rehabilitated hillsides and area closures have played significant roles in livelihood improvement for women and landless youth by serving as sources of employment and as income-generating opportunities. Local community members, mainly economically disadvantaged groups, women and landless youth, are organised into beekeeping groups in the rehabilitated areas. To ensure equitable sharing of benefits to stakeholders and the public, consultations are organised and facilitated at regional, woreda and community levels. Decisions are made through a participatory approach to avoid conflict in the long run. Beneficiaries are organised as self-help groups, cooperatives or enterprises, depending on local contexts and experience. This is done to formalise the entities established and ensure sustainability of achievements by establishing accountability in the process. User groups are also supported to manage the individual hives in their own backyards and cooperate in group purchasing of inputs and group bargaining when selling honey and other bee products such as wax. This enables farmers to fetch higher prices for their products through higher negotiation power and increase business income (Figures 136–138).

Figure 136: Practical wax-making training for organised beekeepers (left) and group shade (right) in Emba-alaje woreda, Tigray. ***Source:*** *GIZ SURED office Tigray, 2020.*

Figure 137: Organised group apiary in Ahferom woreda, Tigray.

Figure 138: Honey processed by a Cooperative Union in Bore woreda, Oromia.

Beekeeping is exceptionally sustainable because it has no negative impact on the environment. Indeed, it can stabilise a fragile environment by helping to reclaim degraded land and increasing biodiversity and productivity. To change attitudes regarding benefit sharing among beneficial communities, serious sensitisation and consultative sessions are facilitated and supported. Promotion of service exchanges between suppliers and buyers at different levels has enhanced market orientation and improved partnerships among the actors. Extending business linkages to beekeepers, processing companies and individuals are key steps in the honey value chain, enabling producers to competitively meet market requirements in relation to quantity, quality, cost and time of delivery.

5.3.2.2. Triticale production

The SLMP has also gained practical experience of introducing crops for enhancing the resilience of households to shocks. In this regard, triticale was introduced and tested due to its drought and disease resistance, and its potential to adapt to difficult soils. Triticale is a grain crop resulting from a cross between wheat (*Triticum aestivum*) and rye (*Secale cereale*).

Triticale was new to the country and, following permission given by the Ethiopian Seed Industry Agency, six cultivars from Stellenbosch University and one from Germany were introduced and tested for their adaptability for more than three years. In the end, the best

Injera

Pasta

Bread

Bread

Figure 139: Value addition for triticale in the production of food items.

three cultivars were chosen by researchers to be tested in verification trials for release. After release of the cultivars, support was extended to start multiplication of the released cultivars through contractual farming on school compounds and private farmers' plots in both rain-fed and irrigated farmland. During testing and seed multiplication phases, on-farm demonstrations showed the performance of triticale to farmers, extension workers and policy-makers in the field. This approach created a large demand for the cultivars to be disseminated outside the region. After multiplication, triticale was distributed to Oromia, Tigray and Southern Nations, Nationalities and Peoples' Region (SNNPR).

Experience of promoting triticale has proved its potential as a viable commercial business to generate additional income for farming communities (Figures 139 and 140). The crop has shown its potential in areas previously known for wheat and barley production, where triticale has demonstrated remarkable adaptability and excellent crop yield.

Figure 140: Value addition potential of triticale with seed cleaning machine, Amhara region.

5.3.2.3. Issues for consideration in triticale promotion

Triticale performs better than wheat and barley in marginal environments, including acid soils, high elevations in the tropics, semi-arid conditions and sandy soils. The land area currently devoted to triticale is now likely more than 4.4 million hectares. Introduced triticale cultivars are cultivated as bulk production for seed marketing and commercialisation. However, ownership of the effort by public and private development actors is limited to maintaining multiplication and dissemination of the seed. This is because it requires consideration of the efforts and achievements to persuade private seed producing companies to engage in this business.

Practical success stories of enhancing land productivity have improved the capacity of rural households to get improved products. This helps them support their livelihoods and earn more income from rehabilitated watersheds. These economic engagements have explicitly demonstrated the benefits of rehabilitated watersheds in serving the

needs of local communities. Sustainability of rehabilitated watersheds is increasingly taken care of by ultimate beneficiaries, which indicates that the promotion of productive enhancement measures and value addition are necessary to ensure sustainability of development measures. Enhancing the productivity and added value of resources is a necessary but not sufficient condition to ensure the sustainability of rehabilitated watersheds. The productive capital created in rehabilitated watersheds must be supported by an appropriate resource governance system, so that the benefits generated through resource use are equitably shared among the communities.

5.3.2.4. Backyard fruit and vegetable production

Farmers in many parts of the country usually produce similar crops each year. When these crops fail to give enough yield, food shortage occurs. In the SLMP, the initiative to diversify agricultural production through backyard fruit and vegetable production is important, both to increase production that can contribute to food security of the area and also to increase the income of smallholders. Smallholders' production methods also change with the supply of improved varieties of fruit and vegetable seeds for farmers.

In rural areas, farmers plant many trees near their farmland that do not bear fruit. In the SLMP, farmers are encouraged to either substitute or complement their production by growing fruit trees. This allows them to generate more income from selling the surplus and benefit from the high nutritional value and health benefits of these products. This is also encouraged by the ongoing government-led Greening Programme.

5.3.3. High-value crop production: avocado production and management

High-value crops, particularly fruit, can make an important contribution to improving sustainable livelihoods in Ethiopia. The high value of fruits is not only for their monetary, social and environmental value, but also their significant strategic role in improving the diets of the people for better health and work performance. Fruit production also has a comparative advantage over cereal crops when land is scarce and labour is abundant.

Commercial avocado trees are propagated by grafting scions of desirable cultivars. Rootstocks can be grown from seeds collected from healthy, vigorous, productive and disease-free local avocado trees. Grafted avocado trees usually produce fruits of standard quality in 3–4 years, while un-grafted trees often need 8–10 years. The western part of Ethiopia has enormous potential for avocado production. By now,

improved avocado seedling propagation and standard fruit production interventions have diffused from project success to many group and private producers.

In this regard, improved avocado fruit exports, started by producing export-standard fruit in SLMP districts, is one noteworthy learning area. In SLMP districts, substantial areas receive sufficient rainfall and have suitable climatic and soil conditions to support fruit production in an integrated manner. Despite this potential, the farming communities in project districts produce limited fruit types, with productivity below the existing capacity of the area. A reliance on traditional methods of raising avocado planting materials, together with poor cultural practices, a lack of healthy and true-to-type improved varieties, insufficient supply of planting materials and accompanying knowledge and skill were some of the key constraints to avocado production identified in project districts. As a result, the yield quality and productivity were very low compared to the potential yield obtained at research centres and model farms elsewhere. It was observed that, due to low and poor-quality production in project districts, members of farming communities were subject to food insecurity, poverty and malnutrition.

To alleviate the existing production problems in the watersheds, avocado seedling raising in fruit nursery and homestead development interventions were started in Gudeya Bila in 2014 by the Global Climate Change Alliance, and in three project woredas in the Yayu eco-region in 2018 via EU support to SLMP. This activity was coordinated within the framework of project intervention modalities. The overall development goal of this involvement was to promote alternative income and nutrition sources for the beneficiaries. The following section introduces SLMP experiences on avocado production and management activities.

5.3.3.1. Benefits, impacts and lessons learnt

The watershed communities involved in high-value crop development practices benefitted from project intervention. The widely applied practices performed, and the long-lasting results in the project woredas, include:

- Through continuous capacity development provision from SLMP, partner staff's knowledge and technical skill improved and they were able to support communities in avocado development activities.
- Beneficiaries incorporated technologies through intensive practical training and follow-up at the field level. A number of model farmers and nursery operators became input source suppliers and private service providers (resource persons) for avocado development activities.
- Government-owned fruit nurseries were privatised into organised, gender-sensitive user groups by completing the legalisation process. These nurseries

support homestead development activities by supplying inputs and becoming the learning sites for the beneficiaries.
- The economic returns of a successful avocado development are noticeable and the lifestyle of communities involved have improved both socially and materially through the successful intervention and its achievements.
- Avocado development tends to require additional labour input during the harvesting period of production, so it contributes to poverty reduction by providing employment and wage opportunities to the landless, women and youth in rural areas.
- Project beneficiaries have benefitted from domestic and increasing avocado fruit export markets by engaging in quality and export-standard fruit production systems.
- Because of project intervention, women's empowerment has increased due to their participation in avocado seedling, scion and fruit production activities and marketing.
- Due to successful project intervention, the practice was scaled up to other watersheds and non-project woredas more rapidly.

From planning to implementation, integration and collaboration of government sectoral offices has had a major role in the success of these activities. Linkages with NGOs, research centres, input suppliers and private service providers has supported the successful performance of the planned activities. This has been helped by community interest in participating in avocado production and the existing natural resources and suitable climatic conditions of the area.

Some of the successes and lessons learnt during the intervention of avocado production technologies are:

- avocado development intervention has high acceptance among the community;
- land productivity increased and soil erosion reduced greatly compared to the previous methods of production;
- avocado production technologies are rapidly scaling up by themselves due to the knowledge and skills gained from the project intervention;
- livelihoods of the participants in avocado production technologies have greatly improved;
- pioneer participants in the technology have gained sufficient knowledge and skill that they have become reliable avocado input sources and private service providers in their woredas and in the region generally;
- farmers could produce export-standard fruit and improved planting materials;
- management of fruit nurseries has to be commercially minded, and nurseries need better production and marketing plans;
- transporting grafting materials over long distances was one cause of grafting failure.

Success story 6:

Avocado seedling grafting business in Tibbe micro-watershed, Oromia

The Tibbe micro-watershed is in the Jere major watershed of Gudeya Bila woreda, in the East Wellega zone of Oromia Region. The SLMP intervention in the Jere watershed started in 2012, with technical support from GIZ and financial support from KfW, and was implemented by the Government of Ethiopia.

The focus of the project was soil and water conservation; introduction of improved technologies like improved seeds, organic fertiliser, support area closure and tree planting on hillsides; capacity building with relevant training for experts, development agents and farmers; irrigation development; and the introduction of fruit production, mainly avocado and banana. The Global Climate Change Alliance project established a tropical fruit nursery in 2014 to produce grafted avocado and banana planting materials and has been distributing these to the community in the watershed and to other project woredas. Experts and farmers were trained in avocado seedling grafting technologies. Later, in 2016, a youth group was organised and took over the nursery and engaged mainly in the production of grafted avocado seedlings. In 2020, the woreda organised a second youth group on the same nursery site for an avocado grafting business. Currently, two youth groups and 45 farmers have engaged in the avocado grafting business in Tibbe watershed.

Obbo Sima Geleta is one of the beneficiaries of irrigation infrastructure in the Tibbe micro-watershed and is involved in an avocado seedling grafting business (Figure 141). He has an avocado seedling nursery on 0.02 ha of land and avocado mother trees on 0.75 ha of land. Sima is 30 years old and has completed grade 10. He has seven children and two other dependents, making a family of 11 including himself and his wife. He sends

Figure 141: Mr. Sima Geleta in his nursery with grafted avocado seedlings.

all his children and the other two dependents to school and involves them in farming and avocado grafting activities when they are off school.

Sima has benefitted from training provided by different development actors, including training on soil and water conservation technologies, irrigation water management, avocado grafting and tree management, compost making and use, soil fertility management and FBS. He has benefitted from increasing yield and biomass of crops and grasses because of the soil and water conservation works on his farmland.

From the FBS training, he has practised planning his avocado and other crops as a business, keeping records of income, expenses, savings and investments. He has also improved family nutrition by diversifying his family diet from maize to teff and barley. His family is benefitting from the consumption of vegetables and fruits (banana and avocado) produced from their own garden and uses potato and tomato from their irrigated farming for home consumption.

Sima started preparing and selling grafted avocado seedlings in 2017. The same year, he sold 1,100 grafted avocado seedlings with a unit price of ETB 70. In 2018, he sold 1,600 grafted avocado seedlings for the same unit price; in 2019, he sold 2,200 grafted avocado seedlings for the same unit price. In 2020, he prepared 3,000 grafted avocado seedlings and sold 2,600 seedlings with unit price of ETB 80, with 400 seedlings left unsold.

As of writing this success story, in 2021, Sima is preparing 5,000 grafted avocado seedlings for sale. In addition, his two dependents have started their own avocado grafting business due to the help and practical training they have received by working with him in the past few years. During our field visit, Sima was preparing 5,000 scions for sale at a price of ETB 10 per piece, for which he will receive ETB 50,000 (Figure 142).

Figure 142: Labourers preparing scions (left) and scions prepared for sale (right).

Sima has access to irrigated land and is able to benefit from double cropping, growing maize and teff in the rainy season and potato and tomato using irrigation. In 2021, he grew irrigated wheat on 0.5 ha (improved variety seed was freely supplied from the government), bought fertiliser by his own means and is expecting a harvest. In addition, he grew irrigated potato on 1 ha of land.

Sima has purchased a motor pump to increase irrigation access on his farm plots. The business of avocado grafting became possible because of the accessibility of his land to irrigation. He has planted six improved avocado varieties (Hass, Fruite, Ettinger, Nabal, Bacon and Pinkerton, introduced by the project) and has 223 avocado trees in his homestead. He planted these avocado trees in 2015 and 2016. Beyond fruit, he sells scions collected from the mother avocado trees. Last year, he sold scions for ETB 85,000 and avocado fruit (2,300 kg) for ETB 21,000. He is also one of the farmers involved in exporting avocado fruit to Israel for one season.

As a pioneer, Sima transfers the knowledge and the skills he learnt about avocado crop production and management technologies to neighbouring farmers. The woreda agricultural bureau uses Sima's orchard and nursery as a demonstration site for training and experience sharing for farmers in the woreda and from other woredas in Oromia Region. As a successful farmer, Sima is honoured and respected by the community, and serves as a resource person for any advice needed on avocado orchard management and seedling propagation techniques.

Production and revenue from avocado and potato

Sima grew potato last year and sold 100 quintals of potato (excluding home consumption) with a unit price of ETB 700/quintal, resulting in total revenue of ETB 70,000. Variable costs were ETB 6,700 for labour and ETB 13,300 for other inputs. Thus, he has realised a gross profit margin of ETB 50,000 from potato and ETB 272,000 from avocado (sale of grafted seedlings, scion and fruits). His total annual gross margin in 2020 from avocado and potato only was ETB 322,000, excluding his income from other farming activities.

Major investments made from increased income

Sima sends all his children to school and covers all costs. He buys improved seed and other improved technologies. In the past four years, since commencing the avocado grafting business in 2017, he has invested a total of ETB 455,000 in the following ways: purchased a house in the nearby town of Bako for ETB 350,000 in 2020; purchased land in Bako for ETB 65,000; bought 500 m^2 of coffee land from a farmer in the area for ETB 30,000 and investing ETB 10,000 improving his house in the town of Bila.

Future plans

Sima plans to expand his farming business, avocado seedling grafting and coffee planting. In addition, he plans to diversify his business by constructing a house in town and buying a truck. He is also in the process of starting a dairy farm investment on his own parcel of land to integrate into his commercialised farming system.

5.4. Backyard Livestock Management System

To make the mixed farming system practised by smallholder farmers provide sustainable benefits without harming the natural resource base, it is of the utmost importance and a matter of urgency to align or adjust livestock husbandry and management by considering research findings on livestock and other development studies carried out by government bodies and private institutions. Accordingly, experiences gained in areas practising improved livestock management have shown

it essential to implement a backyard livestock farming system that can be adopted by most farmers.

Backyard livestock farming means stopping free grazing and practising stall feeding in a farmer's backyard. This improved livestock management increases productivity of crop–livestock production systems and also substantially reduces the negative impacts of free grazing on natural resource development. Backyard livestock farming is a livestock husbandry system that can be practised by community members living in a defined area (for example, at watershed level) and who have willingly chosen to implement the system. In this system, all community members keep their livestock in their backyards and, based on their land holding size, prepare hay plots, collect fodder from different sources and feed their livestock. The system prohibits all farmers from allowing their livestock to move into the communally used places and on any farmland.

To protect and manage communal grazing land and farm plots, farmers living in a given locality or watershed are expected to formulate common bylaws. In this regard, the proclamation enacted by the Amhara regional state (Proclamation No. 204/2005) serves as an important input and can act as a base for enacting national-level proclamations on the protection and management of communal resources by the federal government. It is essential to understand that controlling free grazing and adopting backyard livestock farming not only benefits soil protection and water conservation structures, but also has far-reaching economic and social benefits.

In general, the process of implementing the backyard livestock farming system is a change in production system and demands concerted efforts from stakeholders and the provision of adequate resources. Among the several activities that the stakeholders carry out individually, as well as jointly, the following are worth mentioning:

- Monitoring the implementation of Proclamation No. 204/2005, enacted by the Amhara Regional State to regulate 'the administration and use of already-developed watersheds and those to be developed in the future'.
- Organising the community in each micro-watershed into a Watershed Users' Association and supporting the community to formulate rules and regulations/bylaws guiding its activities.
- Carrying out consultative workshops with the watershed community to create common awareness of backyard livestock farming systems and build the capacity of each micro-watershed committee to take control of managing the system.
- Ensuring that the implementation of the improved livestock management system enables farmers to equally benefit from communal land.
- Creating conducive conditions to carry out experience exchange for farmers in areas of better experience, and following up the implementation of best experiences in a similar way in their localities.

- Providing the required support for inputs needed to implement improved livestock management. In this regard, much is expected from projects and programmes providing support to the different development activities carried out by the Regional Bureau of Agriculture.
- Together with the watershed community, evaluating the contribution of backyard livestock farming to crop productivity, improvement of soil fertility, forest and fruit development, reduction of carbon emission and other social benefits.

The adoption of backyard livestock management brings numerous benefits to communities and the natural resource base they depend upon, as detailed in the following sections.

5.4.1. Natural resources protection and development

Livestock play a central role in farming systems in the highlands of Ethiopia. The management of livestock and grazing resources is therefore key to the overall maintenance and sustainability of watersheds. Likewise, enhanced productive capacity of rehabilitated watersheds creates fertile ground for the livestock sector in the SLMP watersheds. Grasses and biomass in rehabilitated areas improve access to resources that are used for adding value in livestock production. In this regard, fattening as an important income-generating activity has been practised in SLMP watersheds since the time of the SUN programme. Experiences in fattening are important because a large part of households' livestock ownership in rehabilitated watersheds is now being brought under a changed system with intensive feed management.

The lessons from SLMP show that watershed products in rehabilitated areas, such as treated gullies, enclosed areas and hillside terraces, provide greater benefits through the implementation of use plans in these areas. Experience shows that parcel-based land use plans are a prerequisite for optimising the benefits of rehabilitated areas and ensuring sustainability of interventions.

Success story 7:

Communal enclosure area in the Werebo community watershed

The Werebo communal enclosure area is in Tombe-Anchebi kebele, Woliso woreda, Southwest Shewa Administrative Zone of Oromia. The site known as the Werebo communal hillside has an altitude range of 2,400–2,600 m with an average annual rainfall of 1,300 mm. The site was a grazing area, but was bare, unproductive and without sufficient pasture, and used only for the free movement of animals before the intervention of the SLMP.

Through appropriate SLMP implementation practices, 15 ha of the degraded communal land and about 45 ha of bushland have been rehabilitated (Figure 143). As per the agreement of the community, there was a local management plan to protect the enclosed area from interference by livestock and human activities. To manage and use the resources in the communal area, the community developed and endorsed regulations that defined

Figure 143: Partial view of regenerated community forest in Ambo (left) and rehabilitated closure area in Woliso (right) used as per recommended land use.

equitable use of the resource. Communities now practice a cut-and-carry system to ensure that the use of grasses from enclosure areas follows the recommendation in the use plan to sustainably maintain regeneration capacity of the area. The grass from the enclosure area is fairly distributed among the group of members. This was achieved through discussion, negotiation and by demarking everyone's share on the ground using local marks (Figure 144).

In the community watershed, biological materials grown in the treated gullies and the forage grown on rehabilitated bunds are used by households engaged in shoat rearing, animal fattening and beekeeping.

In the farmers' asset creation process, the SLMP also supported resource-poor farmers by providing inputs such as poultry, sheep, beehives, material needed for establishing household water-harvesting structures, high-value crops and soil amendments. With this, many resource-poor farmers, especially women, were given priority to benefit and improve their livelihoods by the creation of an asset using the developed resource. The beneficiaries are organised into saving and credit groups and repay the grants to their group to ensure equitable access for the other group members.

Figure 144: Using enclosure areas as per recommendations of the land use plan: rehabilitated area enclosure (left) and harvesting their share from enclosure areas (right). ***Source:*** *GIZ-SLM archive, 2015.*

5.4.2. Improving forage development/supply

Of the major sources of livestock fodder, the natural grazing land which is used in the free grazing system comprises the largest share. Exposure of the natural grazing land to free grazing has remained a fundamental problem to improving livestock productivity and sustainable natural resources development. In addition, the increasing human population has brought grazing lands under crop production, reducing the size of grazing lands. Even the existing grazing lands are severely overgrazed and less palatable, with thorny bushes and scrubs expanding and other unwanted plants emerging. Gully formations, deforestation, soil erosion and desertification have become evident in many places.

The idea of stopping free grazing and introducing backyard livestock farming was complemented by repeated meetings and discussions with watershed communities to enlighten and convince them about the value of the proposed interventions. During the discussions the burning question repeatedly raised by most participants was: 'what can we feed our livestock if we tie them in the backyard?' In response, the possible ways of producing adequate feed for their livestock in the backyard farming system were elaborated. Currently, farmers that have banned free grazing and started backyard livestock farming have seen that the amount of forage they harvest from communal grazing land and forage crops planted in other areas is far greater in terms of quantity and quality compared to what they used to get during the free grazing period.

In addition, the creation of favourable conditions to improve the long-held but ineffective forage production system has helped to produce high livestock fodder yield. In areas that have started implementing backyard livestock farming it has become possible to produce about 25–40% of the forage requirements on soil terraces, mountains and gullies (Figure 145). Additionally, when livestock are kept in the

Figure 145: Desho grass growing and used for livestock feed in a cut-and-carry system in Bure Zuria woreda, West Gojam Zone.

backyard, farmers prepare feeding troughs and feed their livestock by grouping them according to their age and productivity, which has enabled farmers to use the forage properly and avoid wastage.

The pasture improvement activities undertaken at Kanat, near Debre Tabor, are another good illustration of the potential for improvement. A livestock count conducted on three consecutive days in August 2004 found that the Kanat pastureland held 580 cattle, 220 equines (horses, donkeys and mules) and 760 sheep. In March 2004, Kanat community representatives presented a request for support from the then integrated food security project in south Gondar. After detailed discussion, the treatment of 4 ha of gully land and 5 ha of offset land was worked on in April 2004 through the joint effort of the project and the community. As per the agreement, the total area was fenced off with local materials and grazing was restricted. Simple check dams (loose stones, reed mats and plastic bags filled with soil) were constructed to dissipate runoff. Gully beds and walls were planted with various grasses, legumes, trees and shrubs. On the offsets, fast-growing grass species and multipurpose trees were planted. Trenches were constructed around the fence to increase infiltration and reduce the pressure of the lateral flow into the gully sidewalls. Gullies were also reshaped in order to quickly stabilise the vertical walls and to create more space for planting. The indigenous grasses were allowed to self-seed (Figure 146).

March 2004 October 2005

Figure 146: Transformation of Kanat pastureland from degraded (left) to productive (right).

A total of 235 households benefitted from the rehabilitated rangeland, with communal bylaws on use in place. In October 2004, a total of 106 oxen were fed twice a day for six weeks from the rehabilitated area, following construction of a feeding trough next to the gully fence using the cut-and-carry system. By the end of the 2005 rainy season, a remarkable increase in biomass production was observed: 280 oxen had been fattened by forage supplied from the area, and farmers generated an estimated additional collective income of ETB 140,000 (approximately USD 7,000) (Figure 147).

After this time, the feeding regime was changed: groups of 60 households each began alternating every four weeks to cut-and-carry for stall feeding at their homesteads. The cut-and-carry system proved preferable to in-situ feeding due to its reduced damage of forage by trampling and thus faster regeneration of fodder crops by up to 50%.

Figure 147: Farmers harvesting grass from fenced gully (left) and oxen feeding using a cattle trough (right), Kanat.

Local communities adopted additional measures to take care of the area even without the support of the then GIZ-IFSP South Gonder. The site is well recognised as a flagship intervention, serving as a live-learning platform on zero-grazing management systems and a place of experience sharing.

The Kanat community remain encouraged by their results, and are trying to replicate this success in other degraded areas. The size of the treated areas in the locality is thus increasing with time. Community members receive forage biomass to cover the feed demands of their livestock, and even sell extra biomass to others. The community members are well-organised into user groups and have formulated universally binding bylaws.

Communities in rehabilitated watersheds are also organised into groups to engage in cattle fattening. Grasses and forages used for fattening practice are harvested on communally owned parcels. Consultations are undertaken at regional, woreda and community levels on the selection of beneficiaries and sharing of grasses from rehabilitated areas. Inclusiveness of groups is ensured for community members from different social groups, especially the resource-poor, women and landless youth. To ensure equitable use of grasses and biomass from rehabilitated communal land, parcels of land are equally allocated to individual households by watershed committees. Rehabilitated communal areas are measured using a metre rule, pacing or other locally available measuring tools, with participation of the general assembly of the watershed. Households who serve as guards of the enclosed area receive additional parcels of land for their contribution. Households who do not own animals for fattening harvest grasses from their share and sell this to others to generate income (Figures 148–151).

Figure 148: Grass on treated gully, Banja micro-watershed, Amhara.

Figure 149: Measuring treated areas before harvest, Banja micro-watershed, Amhara.

Figure 150: Farmers harvesting grass, Banja micro-watershed, Amhara.

Figure 151: Schoolboy harvesting grass from family parcel, Sekela watershed, Amhara.

Assessments of rehabilitated micro-watersheds indicate that biomass availability in enclosed areas contributed to increased participation of farmers in fattening activities. The number of fattened animals coming to marketplaces in the rehabilitated watersheds has grown with time. Most recent watershed development approaches are taking a more comprehensive perspective by focusing on creating market linkages, access to financial sources, organising groups into more formal structures and introducing innovative approaches to natural resource-based fattening activities. To ensure the sustainability of the fattening exercise, a chain of activities has been undertaken to link the production of valuable products with inputs coming from rehabilitated watersheds (Figure 152). Efforts made to link products with more than one service of the rehabilitated watersheds are receiving a greater focus in the watersheds. For example, cattle fattening involves the use of a number of products and services from rehabilitated areas, such as water for maintaining sanitation and drinking, forage for feeding animals and forest products for constructing troughs and shade for animals. Increased awareness of farming communities on these linkages has raised concerns about the contributions made for maintaining the sustainability of rehabilitated watersheds (Figure 153).

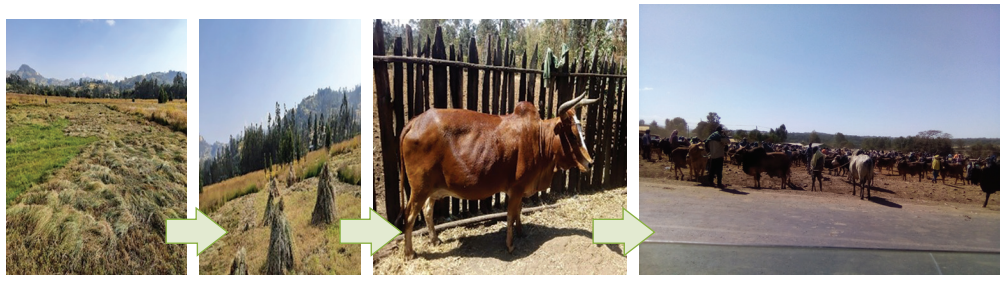


Figure 152: Flow of grass from rehabilitated field (first and second images) via cattle fattening (third) to Adiete cattle market (fourth), Banja micro-watershed, Amhara. *Source: SURED archive, 2020.*

Figure 153: Use of resources from rehabilitated areas as part of maintaining land uses. Left: a woman with a grant for sheep rearing. Middle: a woman with a grant for poultry. Right: desho grass cut-and-carry feeding.

The experience of SLMP also indicates an increased emphasis on the use of biological measures to stabilise physical structures. Consequently, planting materials produced at central nursery sites are insufficient to meet growing needs. Contract-based seedling production initiated at the time of the SUN programme provided another source of income for local communities. Beneficiaries establish nurseries individually and/or in groups, allowing them to produce and sell seedlings at the time of planting to generate income. As well as the income-generating activities described above, fish production in ponds, dairy interventions and the production of bamboo, cassava, sweet potato and vegetables contribute to the income generated from rehabilitated watersheds.

Practical experience indicated that implementation of technologies as per land use plans improved the natural resource base by sustainably reversing degradation, promoting restoration and increasing land productivity.

5.4.3. Improving soil fertility and productivity

In the Amhara region, population growth means that more land is brought under agriculture by clearing forest and cultivating steeply sloping areas using poor farming techniques. A free grazing system has led to the consumption of vegetation cover and

crop residue by livestock, removal of topsoil by runoff and wind, compaction of topsoil by trampling of livestock, reduction of soil depth and depletion of the soil's natural fertility, all of which have drastically reduced crop productivity.

Especially in the *dega* (highland) areas, the build-up of soil acidity has forced much of the land out of production. About 30–35% of the arable land in the region is affected by soil acidity, clearly showing the severity of the problem. In addition, studies indicate that in soils affected by acidity and lacking natural organic matter, the use of improved and expensive technology like improved seed and chemical fertiliser has brought no visible yield increment.

However, in areas where free grazing has been stopped and backyard livestock farming implemented, for example in the Shikudad woreda and Chentale watershed (west Gojam zone), land that was out of production due to soil acidity was closed to free grazing and tree lucerne was planted on terraces. The biomass from tree lucerne and other green vegetation was turned or ploughed under and the decomposed biomass drastically reduced the soil acidity, rehabilitating the land (Figure 154). As a result, farmers were able to grow crops on this land and the yield harvested increased three-fold. Improvement in the soil was attributed to the increase in organic matter in the soil and its capacity to retain important minerals within the soil system, where they could then be absorbed by plants. Compared with lime application, which requires a lot of money and labour, this biological method is a far more cost-effective way of increasing crop production.

In free grazing areas, the constructed soil and water conservation structures are often destroyed by livestock or grazing animals, and the survival rate of fodder plants and other species planted to reinforce soil and water structures is low. In addition, it has remained difficult to develop forest and fruit crops. However, in areas which have currently stopped free grazing, for example the Metcha woreda, forest and fruit trees planted in closed sites are thriving.

Figure 154: Implementing biological soil conservation in closed areas to reduce soil acidity: Chentale watershed, Guagusa Shikudad woreda, West Gojam Zone.

5.4.4. Improving soil moisture and ground water

Although great efforts are made by the government to use different soil and water conservation methods to increase water infiltration, the effective use of current moisture conservation technology is only on about 5–10% of the treated land.

When backyard livestock farming is carried out and free grazing is abandoned, it is observed that the biomass generated from the crop residue and the proliferating vegetation cover on common grazing lands and other land holdings is incorporated in the soil. As well as reducing the chance for runoff formation, this increases the capacity of the soil to absorb moisture, enhances water infiltration and thereby increases the groundwater.

Improvements in soil moisture holding capacity have enabled farmers to grow chickpea, rough pea and other crops using residual soil moisture and generate additional income. Moreover, the increased prevalence of water at shallow depths has given farmers the opportunity to extract groundwater easily and use it for livestock watering and household use. This was observed in many places.

5.4.5. Improving crop production and productivity

A great proportion of the agricultural land in the region is used for crop production. Cultivated plants extract and use large amounts of soil nutrients every year and this tends to reduce soil fertility unless soil fertility management techniques are applied. In the region, crop production and livestock husbandry are highly integrated, and the livestock are used for ploughing, threshing and transport. However, about half of all households in the region have either no oxen or one ox. This indicates that current livestock husbandry is not satisfactorily supporting crop production in the region.

When carrying out backyard livestock farming, it is easy to collect manure and prepare compost, which plays a vital role in improving soil fertility. In addition, because oxen reared under backyard farming are healthy and strong, they provide effective traction power for timely and good seed bed preparation that improves crop productivity. Improvements in soil fertility and its capacity to retain moisture have enabled farmers to grow additional crops such as chickpea and rough pea using the residual moisture after harvesting the major crop. This has increased production from a unit of farmland.

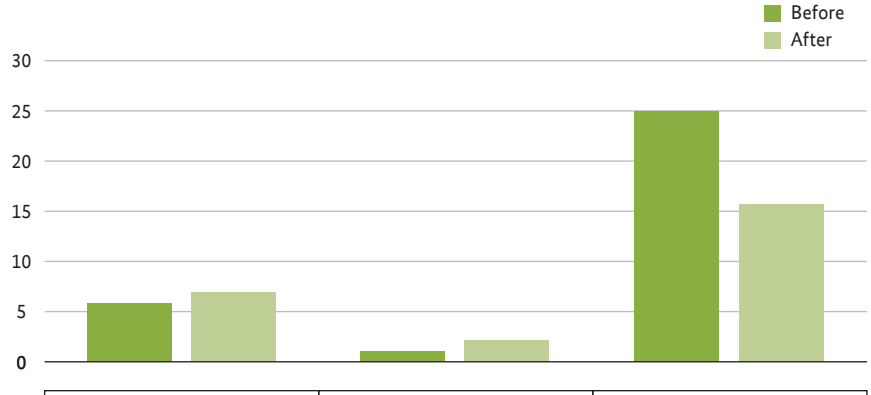
Carrying out proper backyard farming enhances the conservation of natural resources. Moreover, implementing integrated and supportive farming comprising livestock husbandry, crop production and forest and fruit development creates good opportunities for farmers to generate additional income that can be used for adopting new technologies to improve productivity in all sectors.

5.4.6. Improvements in livestock resource development

As livestock resource development was traditionally managed based on free grazing, the benefit that the country and farmers obtained from the sector was very low. In the free grazing system, large numbers of livestock are deployed on a small area of grazing land which does not enable them to get adequate fodder; hence, the yield from livestock is low. In addition, as the livestock come from different places or villages, the congregation of many livestock in a small place creates conducive conditions for the incidence and spread of livestock disease. In this situation, apart from economic losses inflicted by livestock death, farmers are exposed to high expenses for livestock veterinary services. However, backyard livestock farming can avoid these problems and obtain high meat and milk yield.

Currently only 0.07% of the total oxen in Ethiopia are taken for fattening. Meat processing plants in different parts of the country are operating at 30–40% of their full capacity, and meat exports from the country are negligible. The milk productivity in the country, as well as the region, is currently about 1.3–4 litres per cow per day, and this is obtained on average for only five months each year. Although there are about 19 million cows in Ethiopia, poor milk yield has forced the importation of large amounts of milk at the expense of a large sum of foreign exchange.

However, it is observed that backyard livestock farming can increase livestock production (meat and milk) in areas that have started implementing the system (Figure 155). For example, in Gonji Kollela woreda, West Gojam zone, the community stopped free grazing and farmers have started fattening their oxen once farmland ploughing is completed. In this woreda, keeping a skinny ox or cow is now seen as an unacceptable social norm.



	Lactation period in months	Daily milk yield per cow in litres	Calving interval in months
Before	5.65	0.88	24.76
After	6.85	2.06	15.58

Figure 155: Milk yield, lactation period and reproduction efficiency before and after banning free grazing.

5.4.7. Improving livestock health

When different kinds of livestock are kept on a small area of grazing land in large numbers, incidence and spread of livestock disease negatively affect the sector's productivity. In these cases, it is difficult to closely follow up and take livestock to veterinary service centres. However, information collected from those areas that have banned free grazing and started backyard livestock farming shows that the disease distribution has drastically decreased in terms of type and area coverage. In some places there is an almost total disappearance of disease.

The experiences of watershed communities practising backyard livestock farming show that it is possible to reduce the current 10% annual livestock death rate to an estimated 5% by changing the livestock management system. If we calculate this from the perspectives of available livestock (cattle, sheep and goats), there is a high probability of saving more than 1.5 million head of livestock from dying, thereby making them productive. Backyard livestock farming also helps to drastically reduce leech attack and gastrointestinal problems, physical damage due to fighting among livestock, losses due to livestock falling into gullies or off cliffs, and losses from wildlife attack.

5.4.8. Improving reproductive potential of livestock

Backyard livestock farming creates conducive conditions for productive livestock husbandry. The system enhances opportunities to improve and expand livestock breeding through use of genetically superior bulls and artificial insemination. It also helps to keep records of breeding history and avoid problems of traceability, particularly for livestock products supplied to the international market. As backyard livestock farming enables the livestock to get improved fodder, better veterinary service and management, their first calving age and calving intervals become shorter (Table 7). The weaning age of calves and calf mortality is also reduced. The system further allows farmers to closely follow up the heat period of cows and to carry out crossings that result in better reproduction.

Table 7: Improvements/changes observed in livestock reproduction in areas before and after the implementation of backyard livestock farming.

Improvement in reproduction	Kanat/Farta woreda		Tinde Wat/Gonji Kolella woreda		Kedsti/Lay Armchiho woreda	
	Before	After	Before	After	Before	After
Interval between two successive calvings in years	3	1.6	2–3	1–1.6	2–3	1–1.6
First calving age in years	3–4	2–2.5	4	2.5	4–5	3

Source: *Survey result in areas supported by SLMP.*

5.4.9. Destocking and creating equity in the use of grazing land

The free grazing system principally uses communal grazing land as a major source of fodder. The grazing land is not equitably divided among the community, and instead allows farmers with more livestock and those with fewer livestock to use the grazing land without any restriction. This system has encouraged farmers to keep greater livestock numbers with no regard for livestock productivity. In those areas that have banned free grazing, poor famers, including women, can benefit equally from the communal grazing land. Although farmers with greater livestock numbers were unhappy when free grazing was stopped, in due course they were able to earn more income by reducing livestock numbers and keeping fewer but more productive livestock (Table 8). Now these farmers are supporters of the backyard livestock farming system.

Table 8: Changes observed in livestock numbers held by households in areas implementing backyard livestock farming.

Type of livestock	Kanat/Farta woreda		Kedsti/Lay Armachiho woreda	
	Before backyard farming	After starting backyard farming	Before backyard farming	After starting backyard farming
Ox	3	1	2	2
Milking cow	3	2	3	2
Heifer and calf	3	2	3	2
Sheep	4–5	2	10	4
Goat	-	-	7	2
Donkey	-	-	2	2

Source: Survey results in areas supported by SLMP.

5.4.10. Social benefits of backyard livestock farming: reducing conflict

The current livestock management in the Amhara region is predominantly based on free grazing, which means that freely moving livestock encroach on privately owned crops and grazing lands, causing conflicts that sometimes involve the loss of human life. The proposed backyard farming system, which bans free grazing, plays a vital role in solving social problems that arise due to free grazing.

5.5. Participatory Forest and Woodland Management

The question of scale is important in the management of natural resources. Although watershed development activities might be undertaken in micro-watersheds of

200–1,000 ha, the conservation and management of forest and woodlands may cover larger areas. This difference does not mean that the same approaches are not applicable for forests as for micro-watersheds. However, scale has to be contextualised depending on the type of natural resource under question, and efforts should be made to apply Participatory Forest Management (PFM) methods to forest areas, woodlands and enclosures located within every critical project watershed.

Experience from the Adaba-Dodola Project showed that a large forest was managed with the participation of communities. The main problem that led to the inception of the project was unregulated access to the forest, which enabled wood extraction beyond sustainable limits, as well as the encroachment of farming into the forest and overgrazing.

Conventional forest management approaches, such as hiring forest guards, had been applied before the establishment of PFM. No improvement in forest condition was seen after four years of this intervention, and so a new approach was sought with the establishment of a forest-dwellers' association. The creation of exclusive user rights for Wajib, the forest-dwellers association using PFM in Oromia, boosted the sense of ownership and responsibility for the forest. Members voluntarily organised themselves into a committee of 30 households and were given the responsibility of managing a forest area of 360 ha. The group was given rights to harvest regulated quantities of forest products, but only while also allowing the forest to increase in growth. The rights and responsibilities of the group were specified in an agreement entered with the woreda administration, who have since made annual assessments of the areas allocated to each group to check compliance. Other complementary activities such as tree planting, triticale cultivation, eco-tourism, trophy hunting, beekeeping and promotion of highland fruits have been supported by the project to supplement the incomes of forest inhabitants.

Based on its success, the Wajib approach was applied with support from GIZ in four other large forest areas: Suba-Sebeta, West Hararge, Chilalo Galama and Wellega. Along with its partner institutions, GIZ-SLM promoted the PFM approach in Tigray, Amhara, Oromia and other regions, with the aim of sustainably conserving over 36,000 ha of forest. The approach followed for PFM can be applied to any communal area, including to enclosures.

The establishment of forest-user associations was an important first step in the conservation and management of threatened forest and other communal areas. The primary purpose of PFM was to transfer the forest management responsibility and use rights to the local communities. To do this, primary forest users were identified, supported and established. Several community-based organisations (CBOs) were established in areas where PFM has been introduced and piloted. The CBOs have been established either in the form of cooperatives or associations based on the legal provisions and potential advantages of these institutions in different local contexts.

Experience indicates that different approaches and processes are applied by key actors implementing PFM in SLMP watersheds. Within SLMP, a working group was established to initiate harmonisation of PFM approaches used by different

organisations, so that standardised procedures and steps are implemented by concerned actors with some level of flexibility to adapt to local contexts. As a result, with the support of these organisations, the National PFM Guideline was prepared and endorsed as the first national guideline for wider promotion and implementation of PFM as a system. The National PFM Guideline has three phases and six distinct steps, and includes different activities as part of each step.[6]

All relevant organisations have adopted the harmonised national guideline and implemented PFM projects in different regions and forest sites. Key procedural activities following from SLM PFM implementation are discussed in the following pages.

5.5.1. Resource targeting

Forests which were within or adjacent to SLMP target critical watersheds and did not have significant socio-economic and ecological significance to the public and to the environment were selected and mapped, and a resource survey was conducted in a participatory manner. Some typical features of the forests targeted by the projects in the three regions include: Afromontane tropical forests, forests dominated with

Figure 156: Some typical features of the forests targeted by the GIZ PFM project.

[6] Ministry of Agriculture and Natural Resources, 2012. *Guideline for Participatory Forest Management in Ethiopia*. Addis Ababa, Ethiopia: MoA.

incense- and gum-producing trees in lowland areas, degraded secondary forests in mid-latitude areas and forests dominated by coffee (Figure 156).

5.5.2. Stakeholder analysis and beneficiary targeting

The identification and selection of beneficiaries is another important step in the sustainable management of forests. Accordingly, both direct and indirect potential beneficiaries were selected with participation and consultation of the local community and different stakeholders in respective locations. Beneficiaries were selected based on the traditional use-right experiences of the resource over the past two to three decades. The resource stakeholders were mapped and consulted in the process. The different segments of the community that benefitted from the forests were identified and their interests mapped. Interest and possible influence of key stakeholders were analysed using different tools, including stakeholder interest and an influence matrix.

5.5.3. Resource survey and establishing benchmarks

Forest and forest biodiversity surveys were conducted in a participatory manner in SLMP watersheds. A team of experts and community representatives conducted detailed resource surveys and established a database to be used for planning and future evaluation to determine any changes following interventions in the forest. The wood volume was quantified, regeneration condition investigated and overall woody cover estimated. The woody species diversity and richness as well as fauna diversity were quantified. Both timber and non-timber potential products were identified and quantified.

Following an appropriate survey of forest resources against the key parameters described above, a forest management plan was developed. Forest management plans for sustainable forest management, with adequate access for local communities, were prepared by a team of community representatives from primary forest users and government experts, with technical support from development partners. The major components of the plans prepared for forest management included the results of the resource survey and protection, development and use plans (Table 9).

5.5.4. Forest management and its benefits

The participatory management and conservation of forests has had multiple benefits, including increased sense of ownership, increased forest cover, regulation of environmental services and alternative livelihood options for local people.

Table 9: Some selected PFM projects piloted in different regions.

Serial number	Region	Forests where PFM is piloted (ha)	NGOs/government organisations which supported the implementation
1	Oromia	10,000	FZS
		170,000	JICA
		22,337	SZARDD
		53,000	GIZ
		8,000	GIZ
		4,000	Farm Africa
		163,000	Farm Africa
	Oromia Total	430,337	
2	**SNNPR**	8,739	NTFP-PFM Project
3	Amhara	22,000	GIZ
		46,700	ORDA
		8,800	SOS Sahel
		48,000	Amhara Forest Enterprise
		6,600	SUNARMA
	Amhara Total	**132,100**	
4	**Tigray**	**18,000**	GIZ
	Combined Total	**589,176**	

Under umbrella CBOs, different working groups were formed and started different forest-based income-generating activities. In some areas, a working method was designed to formalise the links between the umbrella CBO and the user groups under it. This modality helped the community to properly implement forest management plans with their bylaws as an enforcement mechanism (Figure 157).

Figure 157: Forest cooperative leaders, Guangua Elala Forest, Degerabo kebele.

The next step is to develop forest management agreements signed between forest management cooperatives and the responsible government institution at the woreda level. By doing this, the use rights and management responsibility of forests are formally transferred to cooperatives representing identified primary forest-user communities. The agreements are binding and written in local languages.

5.5.4.1. Buffer zone and enrichment plantation development

Experiences of SLMP indicated that communities practice forest development in their communities via their CBOs by planting tree seedlings, either as enrichment plantations or as a buffer zone development at the periphery of forest sites. As part of this exercise, fast-growing tree species are planted by local communities as buffer zone development measures aimed at preventing encroachment and creating a source of income for the community (Figures 158 and 159).

Figure 158: Buffer zone plantation by PFM cooperatives in Zigem and Gondar Zuria woredas, Amhara.

Figure 159: Buffer zone development. Plantation of *Juniperus procera* in church compounds (E/Estie woreda, Yekura Eyesus Church).

5.5.4.2. Income generation from forest-based activities: forest honey production and marketing

SLM lessons indicate that community institutions that are organised around potential forest products have received additional income from forest and non-forest products. These economic benefits derived from forests are factors driving local communities to sustainably manage forest resources. Communities are supported to be organised in economic groups and trained to use the resource base in a way that optimises additional benefits that are harvested from forests. Inputs are provided to user groups on a credit basis via formal forest management groups. To enhance the bargaining power of user groups, the marketing of products is promoted through cooperatives. Major income-generating activities based on forest resources are described in the following sections.

User groups are established and engaged in beekeeping and forest honey production in their target natural forests. Apiary sites are established in the nearby forests for daily follow-up and management by user groups. To optimise benefits received from the resource, and to fetch higher prices for their products, users engage in value addition activities such as the extraction and packaging of honey, which lead to additional income (Figure 160).

Figure 160: Honey production by user groups, Amhara.

5.5.4.3 Increased access to livestock fodder

As an additional farming practice, user groups have started oxen fattening as a farm business, using grass and other forage species from forest sites through a cut-and-carry harvesting system. As a result, farmers obtain additional income from the sale of fattened animals (Figure 161).

Figure 161: Cattle fattening by the Gubay and Gundo PFM group, Metema woreda, Amhara.

5.5.4.4. Tree seed collection and marketing

Natural forests are sources of tree seeds for production. The PFM user groups are provided short-term training on site selection, seed collection and handling techniques as well as marketing for community representatives who are interested in this business. Additionally, they are supported in the creation of market linkages with potential buyers and consumers (Figure 162).

Figure 162: Tree seed collected by user groups, Akako and Jemora Forests, Zigem woreda, Amhara.

5.5.4.5. Tree and fruit seedling production and marketing

SLMP experience indicates that tree and fruit seedling production is another forest-based practice that can generate additional income for the local community. User groups are trained in nursery management and supported with start-up investment capital in the form of materials and equipment needed for nursery operations, such as tree seeds, polyethylene tubes and hand tools (Figure 163).


Figure 163: Seedling production by user groups.

5.5.4.6. Fuel-saving stove production

The main source of fuel wood for rural communities is local natural forests. Promotion of fuel-saving stoves is usually included in the forest management plans, and communities are engaged and encouraged to use and produce such technologies. This has produced remarkable success stories in SLMP watersheds where economic activity is implemented as an integral part of PFM. As a result, community demand has been created for fuel-saving stoves. Practical training is given for those group members who have started producing and marketing fuel-saving stoves and have started getting additional income. Fuel-saving stoves produced by women's groups are sold via forest cooperatives, so that the responsibility for the promotion and demand for these stoves is strategically given to the forest cooperatives (Figure 164).



Figure 164: Fuel-saving stoves produced by PFM group members in lowland programme areas.

5.5.4.7. Use of bamboo

Bamboo has been promoted in SLMP watersheds as a potential watershed product for income generation. In this regard, training has been provided with adequate practical sessions to enable user groups to produce valuable products. Bamboo was shown to be an ideal source of additional income for watershed communities to support their livelihoods and ensure sustainability of the resource base (Figure 165).

Figure 165: Bamboo furniture production by PFM groups, Akako Forest, Zigem woreda, Amhara.

In conclusion, SLMP experience has shown that PFM is an important element of resource governance for local communities. Experience has also indicated that the sustainability of rehabilitated watersheds can be maintained by implementing appropriate management measures for respective productive resources. However, PFM practices are limited to forest resources in the watersheds, and other land resources will require different management measures depending on the capacity of respective parcels of land. These all indicate the need for participatory land use planning (PLUP) in the rehabilitated watersheds, which evaluates the potential use of respective categories considering the productive resources of each parcel. Thus, the following section details the practical experience of SLMP in implementing PLUP in selected highland areas.

5.6. Strengthening Local Institutions for Watershed Governance

The delivery of watershed development has been taking place with the coordinated actions of public and community organisations. The public involvement of stakeholders in SLMP watersheds has been institutionalised within the community and local government administrations to facilitate the watershed development processes through a bottom-up approach. Fundamental decisions determine who the decision-makers are, why and how decisions are made, the type and scope of information flows, responsibilities of community and local government sectors, and the development, monitoring and enforcement of activities and bylaws. The institutional arrangement also includes inter-institutional coordination between actors. This coordination has been demonstrated in existing initiatives and has facilitated timely, well-planned and well-implemented public involvement.

5.6.1. Key roles of watershed-level institutions

The important roles of community-based institutions pertaining to ensuring suitability are the regulation and governance of developed watersheds using community-agreed bylaws. Community-based institutions are also responsible for regulating benefit sharing among the beneficiaries. Watershed-level institutions are responsible for enforcing community bylaws as well as mediating conflicts within the community. The common watershed-level institutions that are tasked with these responsibilities are the community watershed teams, development groups, one-to-five arrangements and community elders.

5.6.2. Community bylaws for sustainable watershed development

Bylaws for watershed management in Ethiopia are a site-specific delegation of the community to manage resources in the watershed. Bylaws are particularly formulated by the local community after the given watershed is treated using physical and biological soil and water conservation activities. This represents a devolution of power from the region and woreda to the watershed level.

In the SLMP intervention sites, developing and enforcing bylaws for watershed resource governance is one of the most important functions of the institutions.

Community-agreed bylaws are set up to be respected and applied to resource governance and work ethics. The process of bylaw formulation starts at either the watershed or kebele level depending on the extent of the intervention. In the case of community watersheds, bylaw formulation begins with the selection of a watershed committee representing different villages in the watershed. The committee drafts bylaws, which are then discussed with the watershed community. After the draft is agreed by the watershed community, it is forwarded to the kebele administration to be presented to the kebele council for approval. Once approved by the council, the kebele administration forwards the draft to the woreda court, where bylaws get their final approval after being checked for consistency with the different laws and rights.

Although bylaws are important to guide the actions and behaviours of watershed members, their actual enforcement is part of the management of communal areas. Accordingly, in addition to the formulation of bylaws, other important enabling conditions, such as appropriate incentives for the parties involved, need to be in place.

5.7. Land Administration and PLUP for Watershed Development

The SLMP experience showed that land administration and PLUP are important mechanisms to ensure the sustainability of rehabilitated watersheds. PLUP is instrumental specifically in the management of degraded mountains, hillsides and communal grazing areas located within the watersheds. The land use plan is not only instrumental in defining the land use type and rehabilitating degraded lands, but also determining how to sustainably manage and rehabilitate degraded mountainous areas in a participatory manner. The common practice in this regard is, first, to organise landless youth in the watershed to rehabilitate and manage the hillsides or mountain areas and, second, to get access to the rehabilitee and engage in income-generating activities while managing the areas sustainably. The scope of PLUP also facilitates landscape planning across kebeles and woreda levels.

In summary, Chapter 5 has presented the enabling environments that should be implemented and followed to ensure the sustainability of watershed rehabilitation efforts. In this regard, interventions that boost farmland productivity, increase benefits to local communities in the form of income-generating activities, and governance arrangements that regulate access and use of natural resources within the watershed were discussed.

As highlighted in previous chapters, land rehabilitation efforts have had commendable results in terms of reversing degradation, increasing sources of alternative livelihoods as well as building necessary capacities at the community level. However, these results are very much confined to the micro-watersheds where SLMP has been operational. To have a transformational impact at scale requires the wider application of these promising SLM practices in additional watersheds throughout the country. In Chapter 6, we present the approaches, experiences and directions followed related to the scaling up of SLM practices.

6

Scaling Up of SLM: Experiences

Key messages

- Scaling up is a managed process
- Innovations must be tested for scaling up
- Synergy between projects and regular government programmes facilitates scaling up of proven practice
- Capacity development is an important tool for dissemination and institutionalisation of tested innovations
- Scaling up requires ownership of actors and integration into the strategic plans of the partners' systems

Although significant progress has been made in Ethiopia regarding the restoration of degraded lands, soil erosion, sedimentation and flooding continue to be major challenges to sustainable food production in the country (Figure 166). The prominent Rift Valley lakes, biosphere reserves and hydro-dams are endangered due to massive soil erosion of the catchment areas and related sedimentation of the water bodies.

Figure 166: Massive erosion and sediment transportation in farmland in Tigray.

Realising the imminent sustainability challenges, the Government of Ethiopia has given special attention to reducing land degradation through large-scale implementation of natural resource management practices. To this effect, a 15-year (2010–2023) strategic investment framework has been designed to mobilise public and private investments towards the implementation of sustainable land management (SLM). To date, 96,000 communities have been engaged in SLM, which is considered substantial progress from the initial 33,000 in 2010. Building on past experience, the 10-year (2020–2030) Plan for Sustainable Development and Use of Natural Resources, currently under implementation, also gives special emphasis to scaling up restoration and sustainable management of land resources – increasing the area under SLM reached the current 18 million ha. However, scaling up does not occur automatically. Rather, it is a managed process requiring the generation of innovations, testing and verification in different contexts, customisation to local contexts, documentation and mobilisation of resources, and steering and effective coordination among stakeholders in planning, implementation and progress monitoring (Figure 167).

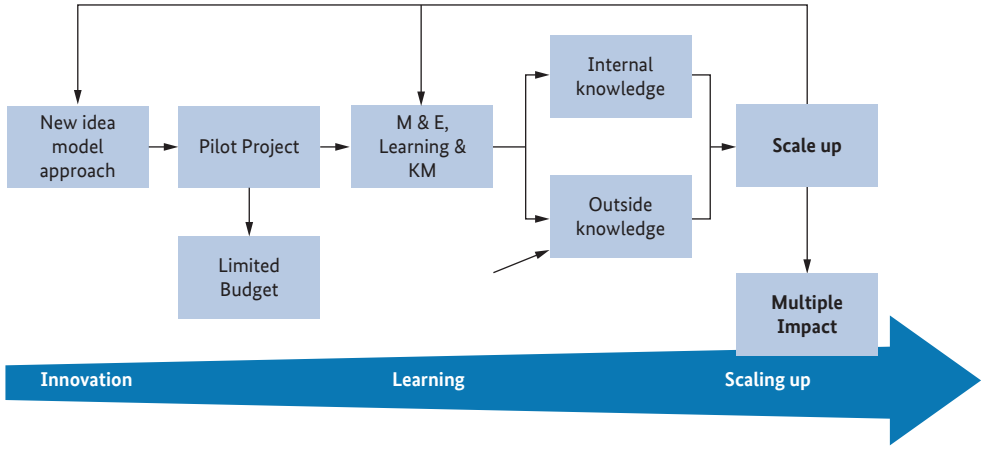


Figure 167: Scaling up pathways – innovations, learning and scaling up.

Approaches followed in scaling up land management over the past 15 years are described in the following sections.

6.1. Piloting Innovative Approaches and Practice

Community-based land management has been implemented in selected locations through project support to stimulate watershed development planners and extension workers, district and regional administrators and local communities and community leaders. Available land management technologies and practices from local and international experience and research have been tested by the projects. The evaluation and customisation of the technologies and approaches has been an important first step for scaling up. Community members, researchers and extension workers have participated in the piloting, packaging and repackaging technologies to ensure adaptation to local contexts with due consideration of community priorities (Figure 168).

Figure 168: Farmers and extension workers visiting land management practices in Southern Nations, Nationalities and Peoples' Region (SNNPR) during field day.

Realising the need for context-specific innovations, the government has considerably increased the outreach of project intervention watersheds and strengthened linkages with the mass campaign on natural resource management. For instance, the SLM programme intervention areas increased from 35 watersheds in 2008 to 297 watersheds in 2021. The number of development partners supporting the land management initiative also increased from 2 in 2008 to 10 in 2021 (see Figure 169).

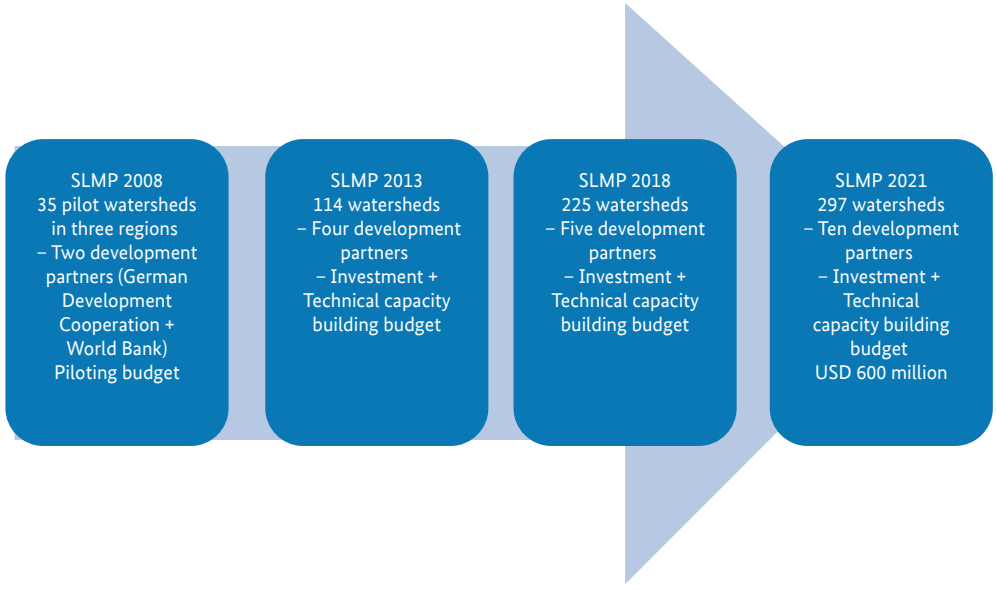


Figure 169: Trend of SLM programme intervention watersheds during 2008–2021. *Source: National SLM Coordination Office.*

Consequently, a huge number of SLM practices and technologies have been introduced, developed and tested on the ground. Many local and international non-governmental organisations (NGOs) have also been involved in the execution of SLM practices since 2008, and the expansion of project-supported pilot areas has enhanced the generation of innovative land management approaches at community, district and region levels (Figures 170 and 171). The communities themselves, meanwhile, have been managing their land for millennia, trying to maximise the retention of soil moisture, preserve nutrients and thereby increase land productivity.

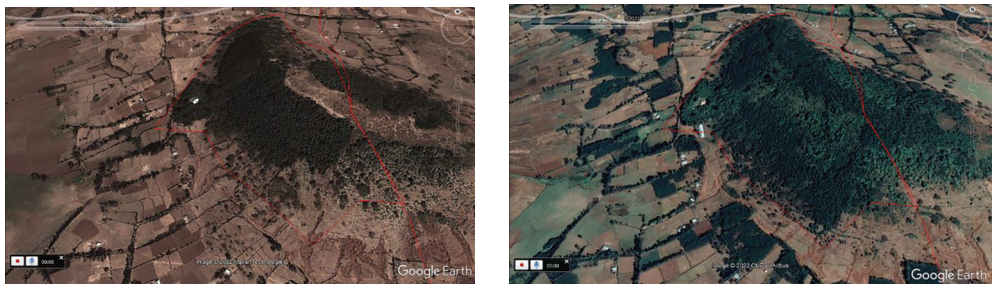


Figure 170: Community-managed sustainable restoration of degraded forest and agricultural land with GIZ Sustainable Use of Rehabilitated Land for Economic Development (SURED) project support in Amhara, Hunkan between February 2013 (left) and February 2021 (right). *Source: Google Earth.*

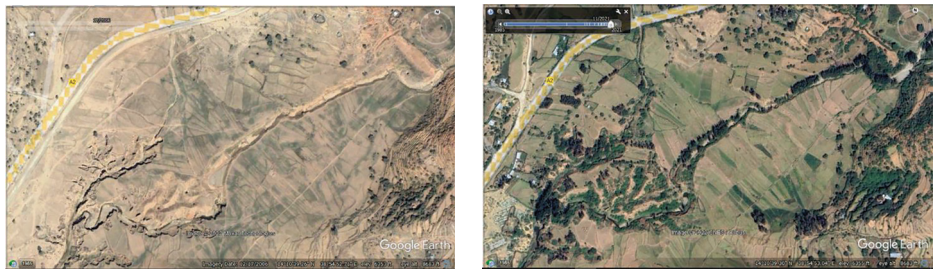


Figure 171: Community-managed sustainable restoration of Agricultural Land with Sustainable Utilisation of Natural Resources project support in Tigray Adwa between December 2006 (left) and December 2021 (right).
Source: Google Earth.

Communities have had the opportunity to test combinations of land management approaches in different land units in their watersheds and to learn from others' experience. The projects, in partnership with international and national development partners, have facilitated knowledge sharing and introduction of innovative approaches based on global and local experience. This has created the opportunity for communities and extension workers to learn not only technical solutions but innovation management within or adjacent to their districts. As the extension workers and communities are responsible for the implementation of both the projects and the regular soil and water conservation (SWC) campaign, which is organised every year throughout the country, the knowledge and experience gained during project implementation has been mainstreamed into the regular programmes, with some modifications to fit local requirements (Figure 172).

Figure 172: Mass campaign for SWC, SNNPR.

Performance evaluation of the land management practices and approaches is conducted, both formally and informally, by the communities, individual farmers and extension workers during community events and watershed development planning. Evaluation mainly focuses on labour requirements, technical complexity, purpose

(e.g. moisture conservation, soil conservation and livestock feed) and suitability to specific land use (farmland, pasture, forest and bare land). Best practices are selected for scaling up to larger areas through training of farmers and implementation through mass campaigns.

The number of proven best SLM practices piloted in different localities has increased over the past 10 years. However, implementation of the innovative approaches for broader impact to address food insecurity challenges entails collaboration between different sectors and actors. The national and regional governments are fostering dissemination of land management innovations beyond piloting to reach more people, increasing efficiency of land management practices and encouraging local-, regional- and national-level generation of innovative land management.

Proven land management practice (or packages of practices) in specific localities with specific sociocultural and biophysical conditions are documented for dissemination and institutionalisation through capacity development of implementing partners and mobilisation of resources, budgeting and scheduling.

6.2. Documentation of Proven Practices

Screening and documenting piloted SLM innovations with promising results is a critical step in scaling up to other areas/communities through the extension system. In recognition of this, the Ministry of Agriculture (MoA), in partnership with the World Overview of Conservation Approaches and Technologies (WOCAT), established an Ethiopian Overview of Conservation Approaches and Technologies (EthioCAT) network in 2001. This network comprises field facilitators at regional, woreda and community levels and reviewers from different organisations, including research, academia and development support programmes. From 2001 to 2009, the EthioCAT network documented about 52 technologies and 27 approaches. Among these, 35 technologies and 8 approaches were selected through rigorous consultations and technical evaluations for scaling up.

The Eastern and Southern Africa Partnership Programme was the main financer of EthioCAT, while WOCAT provided close technical support and backstopping. In addition, the World Food Programme supplied computers to EthioCAT and offered the use of their existing digital infrastructure, including computer facilities at regional level. The responsibility of the MoA was limited to general coordination, mainly individuals, and providing office facilities (Figure 173).

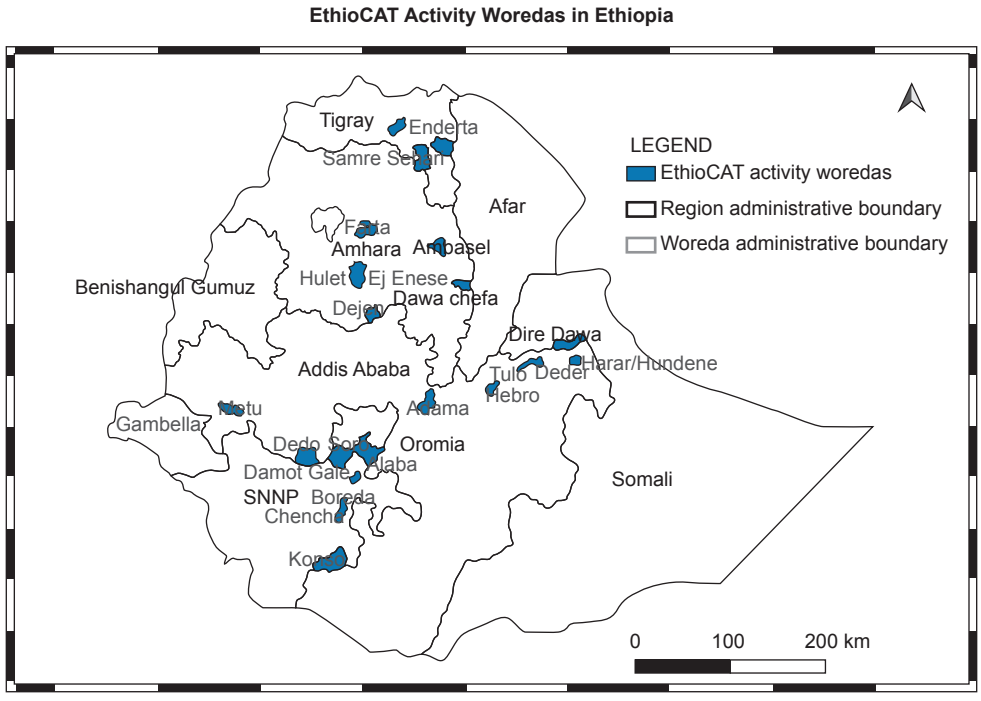


Figure 173: EthioCAT activity woreda map.

The screening and documentation of these SLM practices from different agro-ecologies are usually conducted by a group of experts with the participation of farmers, using the following criteria:

- relative advantage of the SLM practices over the farmers' own practices;
- relevance of the SLM practices in tackling 'the problem', as understood and defined by members of the community within the watershed (e.g. decline in soil fertility or crop production);
- compatibility of the SLM practices with the farming community's available resources, norms and values;
- ease of understanding and putting into practice (less technical sophistication of the technologies);
- SLM practices or technologies are well understood by woreda experts and development workers for guiding farmers;
- approach or technology supports the directions of the government;
- approach or technology has been proven as the most cost-effective solution to the constraint.

Accordingly, the MoA has identified a list of SLM technologies and approaches for further dissemination. However, the selection of technologies and approaches was not exhaustive, as the assessment was conducted in only a few woredas (see EthioCAT woredas) and the EthioCAT network could not continue its documentation efforts as expected due to technical and institutional challenges.

The Sustainable Land Management Programme (SLMP) has revitalised and strengthened the documentation of best SLM practices. The project has supported the development of a guiding document for the documentation of best SLM practices throughout the country. A task force composed of a team of experts drawn from different offices at national level has been established to develop the guideline. The task force has developed a set of criteria for the screening of best practices (Table 10). Regional and national consultations with relevant stakeholders are used to validate the selection criteria. Furthermore, field testing has been conducted by the team of experts in the SLMP intervention regions.

Table 10: Criteria for screening best SLM practice.

Criteria	Score	Weight	Remark
Acceptance: To what extent is the SLM practice accepted by the community/individuals where it is practised? • **High: ≥75%** of the farmers to whom the technology has been introduced continue to use/apply it. • **Medium: 50–74%** of farmers continue to use/apply the practice. • **Low: 25–49%** of farmers continue to use/apply the practice.		0.22 (22%)	**Key:** Each criterion is scored as High, Medium or Low as outlined under 'Criteria' and these are assigned scores of 3, 2 and 1, respectively.
Effectiveness: To what extent does the SLM practice achieve its intended results in terms of land rehabilitation and/or increased productivity? • **High: ≥75%** of the interviewed farmers respond that the practice is effective with regard to its immediate objective. • **Medium: 50–74%** of interviewed farmers respond that the practice is effective. • **Low: 25–49%** of interviewed farmers respond that the practice is effective.		0.22 (22%)	A practice must satisfy a minimum requirement of **weighted average points of 1.72** to be considered and documented as an SLM best practice.
Efficiency: To what extent do farmers perceive investing in this technology is worthwhile? • **High: ≥75%** of the interviewed farmers perceive that investing in this technology is worthwhile. • **Medium: 50-74%** of interviewed farmers perceive that investing in this technology is worthwhile. • **Low: 25-49%** of interviewed farmers perceive that investing in this technology is worthwhile.		0.14 (14%)	

Criteria	Score	Weight	Remark
Relevance: To what extent is the SLM practice suitable for tackling land degradation and/or generating increased productivity? • **High: ≥75%** of interviewed farmers agree that the technology is relevant with regard to its immediate objective. • **Medium: 50–74%** of interviewed farmers agree that the technology is relevant with regard to its immediate objective. • **Low: 25–49%** of interviewed farmers agree that the technology is relevant concerning its immediate objective.		0.14 (14%)	
Sustainability: To what extent is the SLM practice (or physical infrastructure) possible to implement with locally available resources? • **High: ≥75%** of interviewed farmers confirm that individuals or the community are applying the technology without external support. • **Medium: 50–74%** of interviewed farmers confirm that individuals or the community are applying the technology without external support. • **Low: 25–49%** of interviewed farmers confirm that individuals or the community are applying the technology without external support.		0.14 (14%)	
Replication for scaling up: To what extent is the SLM practice, as it is currently carried out, replicated elsewhere under similar conditions? • **High: ≥75%** of interviewed farmers confirm that the technology is replicated in adjacent areas. • **Medium: 50–74%** of interviewed farmers confirm that the technology is replicated in adjacent areas. • **Low: 25–49%** of interviewed farmers confirm that the technology is replicated in adjacent areas.		0.14 (14%)	
Total		1 (100%)	

Source: *MoA 2015.*

Example of the screening criteria in Table 10: a land management innovation such as water collection ditches introduced to a certain locality is acceptable by 90% of the respondents from the community who tested the innovation; 70% of them perceive it is efficient, 80% agree it is relevant to their context, 60% of them confirm that farmers are applying the practice and 80% of them confirm that it is replicable. Then the innovation will get a score of 3 for acceptability, 2 for efficiency, 3 for relevance, 2 for sustainability and 3 for replicability. This implies the weighted average value for the innovation will be (0.22 × 3 × 0.9) + (0.22 × 2 × 0.7) + (0.14 × 3 × 0.8) + (0.14 × 2 × 0.6) + (0.14 × 3 × 0.8) = 0.594 + 0.308 + 0.336 + 0.168 + 0.336 = 1.742. This value is higher than the minimum required (1.72), indicating that the practice can be considered as best practice and should be documented for scaling up.

Accordingly, the guideline is being used by land management programmes, regional bureaus and NGOs for objective judgement on the selection of best practices. Furthermore, the programme has established web-based knowledge management platforms at regional and national levels to facilitate the compilation and institutionalisation of best practices for wider application. The MoA, through its regional-level national resources management (NRM)-implementing structures, and with support from development partners, is actively promoting the wider adoption and scaling up of selected SLM practices.

Adoption of the best practices is also happening through spontaneous diffusion, with farmers independently learning and applying technologies from neighbouring farmers. However, such unorganised learning and dissemination of technologies and practices has limitations because, without assistance, adopters face difficulties in understanding the details of the implementation processes, as well as the benefits, risks and mitigation measures of SLM technologies to be applied. In addition, spontaneous diffusion means that it may take decades for SLM practices to be applied at the required quality standard at scale and have the desired impact.

6.3. Capacity Development

The purpose of scaling up is to broaden impacts by reaching more people and areas with appropriate technologies, which have been tested and successfully demonstrated by communities or individual farmers, in a specified location in a given implementation period. Disseminating tested innovations requires addressing barriers, including awareness, technical know-how and policy or framework conditions at organisational/institutional and individual levels. The MoA has used media campaigns, community meetings, local advocators (religious leaders and respected community members) and extension workers to raise community awareness of natural resource management and its implications for rural livelihoods. Farmer training centres have also been used as demonstration sites for farmers to observe implementation of the technologies and practices. Intensive and practical training of trainers has been provided to extension workers and early adopters, who train and guide farmers in implementing tested SLM practices (Figure 174).

Figure 174: Practical training of trainers on SWC technologies in Oromia.

As a result of the above concerted efforts, the government has stepped up its watershed management intervention to more than 90,0000 communities throughout the country by mobilising labour and financial resources. It has been reported that, in the Amhara region alone, around 4.5 million labour days per year were mobilised to develop community-based watersheds. Figure 175 shows the progress made between 2015/16 and 2019/2020 in reaching out to community watersheds throughout the country in a planned manner. This was part of the five-year strategic plan of the MoA to scale up SLM by strengthening the implementation capacity of the NRM through planned community watersheds.

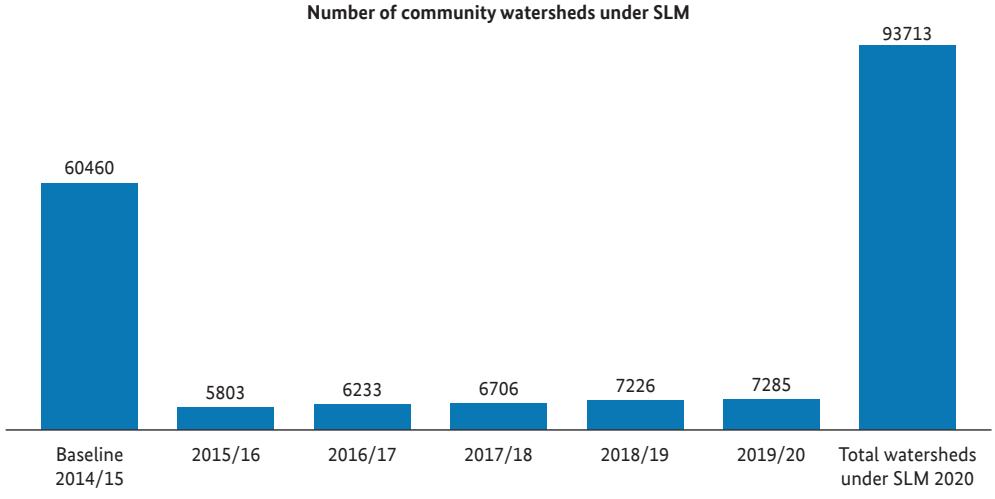


Figure 175: Baseline and number of planned community watersheds up to 2020. *Source: MoA, 2020.*

Financial resources have also been mobilised to complement the community campaigns and scale up implementation of SLM in food insecure areas through cash for work, for a limited number of days per month throughout the year. In this regard, the Productive Safety Net Programme – Public Works has played a significant role in scaling up SLM practices in Ethiopia's food insecure areas over the past 10 years through targeted support to communities in the form of cash and food for work (Figure 176).

The Community-Based Participatory Watershed Development guideline, which was updated in 2019, has served as a framework document for the implementation of SLM in the lowlands and highlands of Ethiopia. The guideline elaborates not only work procedures and processes but also technical specifications and standards of selected land management practices and approaches. This facilitates large-scale application of the SLM technologies and practices throughout the country using the same standard.

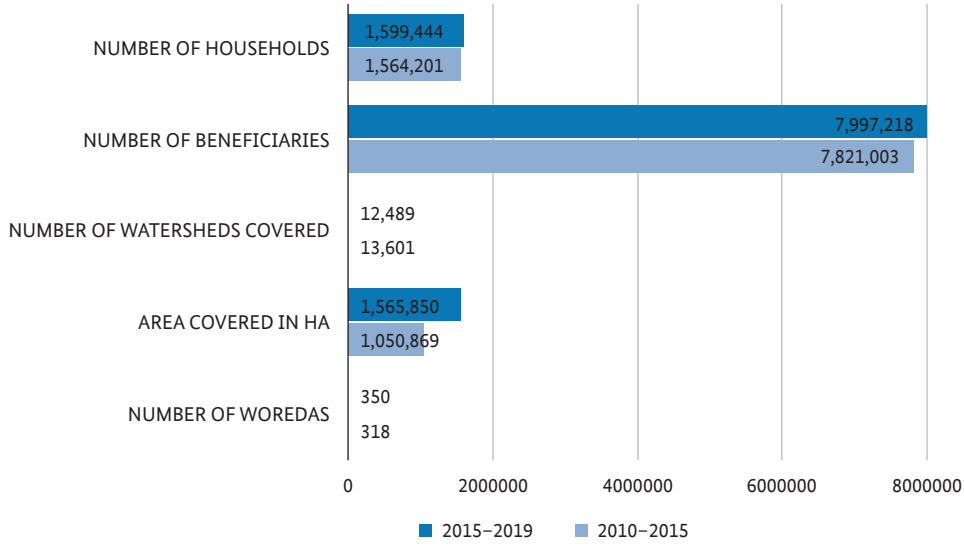


Figure 176: Completed Productive Safety Net Programme – Public Works SLM investments and areas covered.
Source: Revised Ethiopian Strategic Investment Framework.

So far, around 26 technologies have been elaborated in the guideline. The MoA has also developed field manuals and strategies to promote climate-smart agriculture, which are being used by extension workers and lead farmers as reference materials when implementing relevant practices.

Frequent staff turnover at region, woreda and kebele levels was among the main challenges in the scaling up of proven SLM. The MoA has followed diversified approaches to address these challenges. To reduce the risk of knowledge losses due to staff turnover, the extension system has adopted several strategic approaches, including: shortening the training cascading process and direct training of development agents (DAs) and woreda experts; immediate cascading of the training to lead/model farmers; and strengthening the capacity of institutions and groups of individuals in institutions.

6.3.1. Strengthen the capacity of local organisations

From the outset, MoA gave due attention to building the capacity of community-based organisations at watershed level because they are central to the scaling up process (both horizontal and institutionalisation). Community-based organisations were identified as mediums to promote the uptake and wider application of SLM practices

among members of watershed communities. Capacity development at the local level has focused on the following aspects.

Strengthening farmers' capacity to lead demonstrations of SLM technologies and practices: This had the main objective of building the capacity of model farmers, who have a relatively better understanding and experience of the importance of land management approaches, are respected by their village and are willing to demonstrate and promote SLM technologies on their farm. In the Ethiopian extension system, emphasis has been given to model farmers who were believed to have the capacity and interest to run demonstration sites (Figure 177) as well as mobilise communities under the training and supervision of kebele and district extension workers. The role of model farmers who run the short- and long-term SLM demonstrations in villages has been empowered and promoted to village facilitators. This supports the adoption of SLM such as the Integrated Soil Fertility Management (ISFM+) Project technology and soil and moisture conservation practices. As facilitators, model farmers are considered multipliers of proven SLM practices. They closely advise those farmers who face challenges in their farming that could be addressed through SLM technologies, organising small training and follow-up sessions with and for these farmers. These model farmers are expected to continuously act as facilitators for the spread of more sustainable farming practices in their community.

Figure 177: A model farmer demonstrates compost preparation on his own farm to visiting extension workers and neighbouring farmers in Amhara.

Model farmers could also be tasked with providing training and sharing their specialised knowledge on different topics to selected groups of farmers in their village, with the objective of facilitating farmer-to-farmer learning and enhancing technology promotion, alliance building and networking in the village.

To ensure that this role change is realised effectively, the former model farmers and now village promoters need to be supported by projects such as ISFM+ or by the national extension system. When the objective is to achieve out-scaling of ISFM+ technologies, such investment should be a necessary condition for success. Ato Desalew is among the model farmers in Banja woreda, Hunkan watershed, who is engaged in integrated homestead development, including compost making for soil fertility management, greenhouse cultivation for forage and vegetable production and backyard fruit production (Figure 178).

Figure 178: Extension workers visiting Ato Desalew, a model farmer in Banja woreda, Hunkan watershed, Amhara, and his integrated homestead development.

Currently, the ISFM+ project is experimenting with this approach. Model farmers – termed 'ISFM Ambassadors' in the project – are coaching and advising the farmers who need special support and follow-up in terms of ISFM practices within the community (e.g. female-headed households). In return, model farmers receive some inputs from the project (Figure 179).

Figure 179: ISFM green manuring experience, Banj woreda, Amhara Region.

Empowering local institutions: Recently there has been progress in scaling up SLM practices through organised watershed user associations to speed up the collective adoption of practices as community best practices. Working in groups also increases the opportunities for farmers to solve their common problems and build their confidence through peer-to-peer learning. In other words, as the capacity of a group strengthens, it positively impacts the livelihoods of individual members and their families through access to better extension services and technologies and by allowing them to harness joint learning. The best entry point for scaling up could be to start in areas where capacity is relatively strong. The effectiveness of the scaling up to community and district level requires prior studies and understanding of the challenges

and opportunities, so that necessary capacity development measures are planned and implemented before and during the dissemination of best practices. Important success factors in scaling up best practices include maximising existing capacities and need-based capacities.

However, experience in SLM implementation shows that farmer groups do not always function smoothly, and members may not have a clear idea of why they are in the group. In many cases, farmers perceive projects and their involvement in groups as opportunities to get access to free inputs rather than having long-term 'visions' of putting what they observe and learn into practice with less outside support. In this regard, any project that aims to implement its activities through a group approach should emphasise the following:

- build the capacity of group leaders and extension staff to facilitate groups;
- devise in-group tools to monitor positive changes and handle conflicts when they arise;
- regularly revise protocols for group formation to respond to in-group dynamics and membership.

In general, organising farmers into groups should focus on the quality of group activities performed by participating farmers and how this could help facilitate scaling up. Furthermore, rather than creating new and parallel structures for organising and mobilising farmers, effort and time should be put into addressing the weakness of the existing system (if any) and upgrading its structures.

6.3.2. Strengthening technical competence of extension workers through training and the training delivery system

As mentioned above, the MoA relies mainly on the agricultural extension and advisory system to scale up the best SLM practices and tackle the problem of land degradation. Agricultural extension services of the MoA at regional, zonal, woreda and kebele levels are by far the most important channels for scaling up SLM best practices in the field. It is the mandate of these services to advise households and communities at kebele and watershed levels in the planning and implementation of SLM measures. Skill development of extension workers at the woreda and kebele level through training and coaching was one of the institutional and technical capacity development approaches of the MoA (Figure 180).

Figure 180: Field and classroom training of extension workers in Oromia.

In 2018, the GIZ support to Sustainable Use of Rehabilitated Land for Economic Development (SURED) commissioned a study assessing the capacities of the training system in support of the NRM sector. Central questions evolved around the extension workers' potential needs for additional skill development, who and how this could be delivered under the given circumstances – or what would have to change to address the potential gaps.

Analysing data from the field, collected through workshops and focus group discussions, yielded the following results. Although considerable government resources and 8–13% of the SLMP's annual budget were designated for training purposes and activities related to organisational competency building, the impact persistently remained below expectations. The human and institutional capacities of the agricultural extension advisory service providers of the MoA, the regional Bureaus of Agriculture (BoAs) and grassroots-level institutions proved inadequate in generating the anticipated response of increased farm productivity. Despite the resources deployed by both government and its development partners, the signs for improved economic development of rehabilitated watersheds remained feeble at best. The uptake of innovative agricultural technologies and the establishment of new market linkages and value chains only progressed slowly.

Since the inception of SLMP, GIZ has been involved in supporting and implementing training interventions for its partners. Yet, only since SURED have the traditional dynamics been questioned. The traditional setup of the NRM sector's training delivery system was characterised as follows:

- training interventions were not systematically informed by needs or performance gap assessments;
- training materials were often of poor quality, outdated and lacking adequate contextualisation regarding trainees' level of comprehension, language, culture and local setting;
- little attention was paid to adult learning methodologies and the standardisation of training processes and instruments in the context of training material development;

- an appreciable proportion of trainers (both at development agent and woreda expert levels) had neither sufficient experience nor skill to effectively implement adult learning approaches, either for lack of exposure or lack of resources;
- most training delivered did not comply with basic quality standards such as seasonal timing, group size or adherence to adult learning principles – a situation that leads to substantial performance gaps;
- SLMP/BoA staff were often forced to multitask by designing, preparing, implementing and managing training programmes. Meanwhile, they were also responsible for supporting and coaching trainees at every level, down to community and farmer level;
- the training sector had no central coordination unit to efficiently steer training efforts, including resource allocation, output-based training needs assessments and the adequate matching of training with trainees;
- training was often carried out without any impact assessment or long-term monitoring strategy.

And GIZ-specifically:

- Many training sessions were either held entirely or strongly assisted by GIZ staff instead of being led by private training providers (PTPs) or experts related to the implementation partner, the MoA.

Based on this experience, GIZ SURED adjusted its capacity development-related objectives in general and its approach to training delivery in particular. As a result, the project's more recent capacity development of extension workers on rehabilitation and economic development in watersheds does not represent a mere continuation of training provision, but the pioneering of an innovative training delivery system.

The underlying concept includes training needs assessments; producing a catalogue of standardised training materials; promoting the consistent application of internationally recognised adult learning methodologies; private sector involvement to create a market-driven dynamic for continued quality assurance of training delivery and quality assessment through pre- and post-training exams; and impact monitoring through tracer studies. In practice, this translates to highly skilled, self-employed PTPs competing against each other in support of the public agricultural extension service, thereby improving value for money.

In late 2018, GIZ SURED enlisted the services of an international consultancy with extensive expertise in adult learning. Its tasks comprised the revision of existing and/or creating new training materials conforming to the experience-based learning approach known as Creation of Competence for Competition (C^3), and the simultaneous creation of a pool of local experts able to effectively deliver C^3 training.

In early 2019, six private limited companies (PLCs) with the explicit mandate of training provision and advisory services began operating. Throughout the following

two years, they were systematically supported by GIZ SURED in methodological and entrepreneurial capacity building.

Trained in C³, these multipliers have started aiding and partially replacing GIZ staff in the provision of training and coaching to extension service providers such as DAs and woreda experts. Feedback from the field has been overwhelmingly positive, with training participants appreciating the highly practice-oriented approach. Instead of traditional, one-sided communication through classroom training, participants get to actively engage through a diversified mix of group work, simulations and role play, case studies and field work. Building associations, deductions and mnemonic devices allow participants to retain knowledge more effectively as well as develop a sense of ownership. Satisfaction levels consistently ranged within 94–100%[7], and repeated requests by trainees were made to provide all training according to C³ principles (Figure 181).

Figure 181: C³ training on motor pump maintenance and a classroom group discussion on water management.

The long-term goal is to render GIZ's substitution of these services fully obsolete and so allow the partner system to become autonomous. Eventually, this would mean self-reliance as well as the use of the system's in-built resources, including the private sector, civil society and academia. For this to happen, however, the economic viability of the seven current PLCs needs to be strengthened and their business and marketing strategies for non-GIZ client acquisition refined. Further cooperation with the three other pillars of training provision – Agricultural Technical Vocational Education and Training, NGOs and research institutions – is expected to create further multiplying agents for C³ as well as synergies for quality training provision, such as shared facilities or experts (Figure 182).

GIZ SURED training support: from its beginning in March 2018 until its initial end date of December 2020, the project supported individual-level capacity development to partner staff in over 110 training events. There were nearly 3,800 participants in the courses across the six regions of the GIZ SURED intervention areas.

[7] Combining answers for training feedback of 'excellent' and 'good'.

Figure 182: Innovation through experience-based learning. *Source: GFA Consulting Group.*

C³ approach

In contrast to traditional teacher-centred and often lecture-based training approaches, the C³ technique entails learning through action. The concept emphasises the active participation of the trainees who – instead of being 'taught' – are guided in acquiring knowledge autonomously. In other words, ownership of learning is key.

The essence of this concept is to strengthen learners' ability to deduce and apply relevant concepts and techniques to their everyday professional context. Through action-oriented exercises sensitive to the trainees' respective situations, trainers merely guide their expert participants in identifying their own practical, hands-on solutions.

More than 18% of the training was conducted by C³-instructed PTPs, accounting for 684 of the total trainees. Among the most popular training topics were Participatory Land Use Planning (15 times and 7 times Geographic Information System-related courses), Value

Chain Development (11 times) and Climate-Smart Agriculture (7 times). The Beekeeping and Biological Soil and Water Conservation courses were facilitated six times each. As of 2021, all of these courses – a total of 17 – are available based on training materials that strictly adhere to adult learning principles[8].

The unit cost of delivering training for each SURED training is measured in trainee days, defined as the number of days during which trainees are trained multiplied by the number of trainees during that training. This indicated an average of 1,000 Birr per trainee day using woreda experts and C³ training (Figure 183). The unit cost analysis is meant to feed back into the planning of more efficient operations.

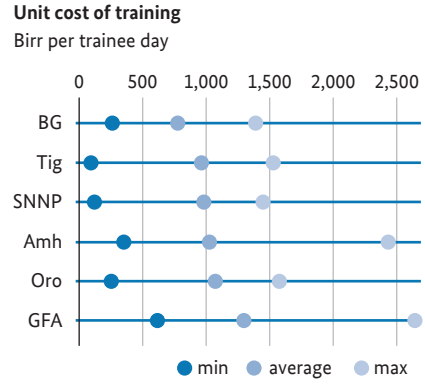


Figure 183: Unit cost of training.

Higher training costs for C³-based courses are mainly due to the facilitators' fees, which are now calculated at actual market rates instead of the per diems paid to GIZ or partner staff. To mainstream into the partner systems and become a viable option for future clients (e.g. MoA, NGOs and international donors), the PTPs will have to further demonstrate their added value in terms of increase in knowledge gained and retained after the training.

Tracer study scores from pilot training conducted in late 2019 show that, for 11 training topics provided through the conventional training system, the average knowledge increase after almost a year of the initial training remains at about 9 percentage points increase (compared to the immediate 15 percentage point increase after training) from the pre-training average score of 48 percentage points.[9] A similar tracer study, conducted on training provided by PTPs found an increase in knowledge gained by 27 percentage points for the immediate post-training evaluations and 26 percentage points 6–12 months later, which is higher than for the conventional training.

[8] Training Material Catalogue: (1) Physical Soil and Water Conservation, (2) Avocado, (3) Beekeeping, (4) Biological Soil and Water Conservation, (5) Value Chain Development, (6) Participatory Land Use Planning, (7) Climate Smart Agriculture, (8) Forage Management, (9) Mango, (10) Participatory Watershed Development Planning, (11) Integrated Water Resource Management, (12) Biophysical Gully Erosion Control and Rehabilitation, (13) Pasture Development, Use and Management, (14) Planting Materials Production and Nursery Management, (15) Social Management in Watershed Development, (16) Environmental Management and (17) Conservation Agriculture.

[9] Note that the originally applied pre-/post-training questions are being revised to provide a more adequate representation of the actual learning inputs.

An important point is here that the knowledge retention (measured after 6–12 months) is higher for the training provided by the PTPs. This could be mainly due to the practice-oriented and hands-on training approaches applied by the PTPs, as stipulated in the C^3 methodology. However, further study is required to conclusively explain the difference.

6.4. Scheduling and Budgeting

Scaling of successful land management practices requires proper planning of budgets and time. Experience of the SLMP in Ethiopia indicated that an average of USD 320,000 over 5 years is required for the full development of a community watershed (500–1,000 ha) in high potential areas. Higher budgets could be required for community watersheds with high levels of degradation and rugged topography. External funds from development partners are used to purchase construction materials such as gabion wires (Figure 184), cement and hand tools and to produce and purchase planting materials. Some programmes, including the SLMP and the Productive Safety Net Programme (PSNP), also pay cash incentives (80% of the labour cost) for community members participating in the restoration of communal lands.

Figure 184: Gabion wires used for check dam construction in Amhara.

The NRM is a year-round activity with specific activities every season. For example, most physical SWC activities, including terraces, irrigation canals and diversion weirs, are implemented in January–April, followed by pitting, grass seed sowing and tree planting during summer. Most training and experience exchange visits of extension workers and community leaders are organised during autumn (September–October). Seed collection and nursery activities start in October and extend until planting time in June–August (Figure 185). The NRM sector uses context-specific scheduling; for instance, it looks for opportunities to mobilise community labour for public works during agricultural slack periods, such as after crop harvests. Accordingly, implementation of the SLM is scheduled in such a way that considers not only the SLM practices but also the timing of implementing these measures at watershed, district, zone and region levels. Most physical SWC measures including terracing and gully erosion control measures are implemented in January–May every year when agricultural activity is relatively low. Tree and grass planting on the terraces and bunds is carried out during July and August.

Figure 185: Seedlings produced at a nursery site and farmers transporting the seedlings to the plantation site.

Experience within MoA shows that SLM practices are clearly embedded into national development plans and strategies, which is very important for scaling up those best SLM practices tested and proven to be successful in pilot micro-watersheds.

6.4.1. Financing scaling up of SLM practices

The resources to finance the scaling up of SLM practices mainly come from public resources with support from development partners, usually in the form of loans. Rural communities also contribute with labour for the construction of physical SWC structures during the dry season and tree planting during the rainy season to rehabilitate communal areas within their respective watersheds. In this way, communities' members in rural areas contribute up to 30–60 days of free labour a year. The number of labour days per year varies from region to region and year to year.

Tree seedling production is co-financed by the public and development partners through cash for work. Furthermore, limited gabion wires and cement for the construction of check dams and water spreading weirs are supported by projects and the government.

The government has also mobilised financial resources through a national programme called Climate Action through Land Management (CALM) to incentivise farmer adoption of SLM practices in private and communal lands. To speed up implementation

of SLM by farmers and group of farmers, USD 500 million has been allocated in 5,000 community watersheds in the highlands through payment for result. Unlike the investment programmes such as the Resilience Landscapes and Livelihoods Project and PSNP, the CALM payment for result provides in-kind and cash incentives based on results achieved rather than results to be achieved.

Despite the growing opportunities, the contribution of the private sector in SLM is not effectively used. Private businesses such as water bottling companies, breweries, planting materials producers and beekeepers are directly affected by watershed ecosystem health. However, their involvement, contribution and accountability in shaping watershed policies remain limited.

This is despite the fact that recent experience has highlighted the significant potential of private sector representatives to become active in the following:

- participating in experience sharing and knowledge exchange events (workshops);
- provision of training service, development of training materials and compiling project evaluation and documenting best practices;
- demonstration of technologies, on-farm research and provision of input;
- co-financing land management measures in selected areas.

A good example of such cooperation is that between the previously mentioned PLCs and GIZ. The PLCs were given the responsibility to conceptualise and develop modules and training manuals in different languages and training of extension workers for a project supported by SLM/SURED. They implemented the assignment by soliciting support from their members, at little cost. Currently, seven PLCs that are available for delivering quality training services across the six SLMP intervention regions can easily be mobilised.

The SLMP has also demonstrated effective partnerships with water bottling factories and brewers by co-financing watershed development investments based on a signed memoranda of understanding. The Raya Brewery in Tigray and Eden Water Bottling in Oromia are pioneers in establishing these sorts of partnerships.

Considering these emerging opportunities, extension workers and watershed development planners should develop an inventory of potential private sector candidates for partnerships in different ecosystem services. Advisers should establish links in the regions and at federal level with assistance from the SLM Coordination Unit. Although cooperation with other organisations should be well-established and based on mutual understanding of cooperation parameters, a memorandum of understanding should be reviewed for clarity and transparency on expectations and responsibilities before being signed.

6.5. Learning and Networking

Both horizontal (within the country from community to community and from region to region) and vertical (policy-level south–south exchange visits and participation in global forums such as the Global Landscape Forum) experience-sharing visits are used to promote learning among various actors to facilitate the wider uptake and scaling up of SLM practices. One of the most commonly applied approaches throughout the country is regular field exchange visits and dialogues with farmers at the local level to show policymakers and regulators the successes achieved through SLM in pilot watersheds (Figure 186).

Figure 186: Extension workers and development partners takes part in a field visit and experience exchange with communities to learn about watershed development.

Such approaches to learning are vital to promote scaling up of best practices, as policymakers get the opportunity to incorporate these best practices into woreda- and regional-level planning. Initially, country-wide studies and experience-sharing tours were organised by projects to successful communities such as Abreha-We-Atsbeha of Tigray, Debretabor (Tsegure-Eyesus watershed) of Amhara, Hararegie in Oromia and the Konso community in SNNPR (Figure 187). However, over time, intraregional exchange was considered to promote learning among communities of similar socioeconomic and agro-ecological set-ups. Furthermore, exchange visits to exemplary watersheds were instrumental in motivating those farmers who were previously reluctant to apply SLM practices.

Figure 187: Experience exchange visit of regional land use planning experts in Amhara.

In a similar vein, and building on the network and partnership with WOCAT, the MoA has organised numerous study tours and experience exchange visits since 2009 for policymakers and technical experts to harness international experience in SLM. Kenya, Tanzania, China, India and South Korea are among the most visited countries by higher officials and technicians from the MoA for experience sharing in watershed management. The watershed development experiences of China's Loess Plateau and Kenya's conservation agriculture were shared with extension workers and community members through documentary films. The World Bank and the Federal Ministry for Economic Cooperation and Development, through GIZ, have played a critical role in facilitating and financing these study tours.

Through its flagship programmes such as the SLMP, Agricultural Growth Program and PSNP, the government has also invested in community-to-community knowledge exchange and networking. These grassroots-level efforts are further complemented at federal level by the overarching national platform, Rural Economic Development and Food Security. Its central objective is to bring together the public sector and development partners to formulate and shape the SLM policy framework and generate regular knowledge exchange between the various stakeholders. Regardless of the inconsistencies and limitations in the functionality of the regional- and national-level SLM knowledge exchange platforms, considerable successes have been recorded in both outreach and participation. The SLM principles are currently being adopted by more than 8,000 communities, of which a significant number have managed to effectively control soil erosion. A broad range of model and learning watersheds exist across many districts, which speeds up practical learning of both communities and watershed development planners.

As mentioned above, mass mobilisation and media campaigns are the two major approaches promoted by MoA to raise awareness of SWC. However, despite the wider geographical application of SWC technologies through mass mobilisation during specific periods of the year, the approach has had several limitations. For example, because many of the technologies were applied on communal areas such as hillsides without an appropriate institutional framework for their management and access, there is often a lack of ownership. The lack of an appropriate governance arrangement to manage and maintain the SWC measures after they were put in place through mass mobilisation was a major obstacle to scaling up. This is another equally important limitation in considering context-specific agro-ecology and farming practices when promoting technologies through mass mobilisation. The over-emphasis on geographic coverage of technologies, as opposed to systematic and locally appropriate scaling up, was proven to be at best inefficient and at worst counterproductive, as it aggravated land degradation and resulted in ecosystem disturbances. In summary, the mass mobilisation approach to scaling up SLM was meant to reach as great a geographic

area as possible. This approach was instrumental to mobilise community labour. However, over-emphasis on geographical coverage without carefully considering questions such as incentive mechanisms for participation, resource maintenance and benefit-sharing arrangements in regard to communal areas in many cases limited the sustainability of the investments.

One major accomplishment of GIZ SURED during its implementation period was the inclusion of scaling up under the project output, 'Experiences based on implementing SLM are analysed so that they can be scaled up beyond the current intervention area'. During its implementation period, the project had many undertakings.

Of the different key accomplishments, the first was the assessment of the concept and application of scaling up in BoA structure. The overall rapid assessment conducted highlighted a number of variables worth considering in future efforts to promote scaling up of best technologies in the region and elsewhere in the country:

1. **Best practice selection** and documentation is not guided by organised teams; rather, every DA and experts are told to package based on their understanding (the guideline produced by the MoA with support from GIZ is not known and in use).
2. The concept of **scaling up in general** is not clearly understood at any level (experts to higher officials) throughout the structure of the regional BoAs.
3. There is a **spontaneous type of scaling up** of some technologies in areas where the assessment team visited; the scaling-up process is a conventional one usually accomplished through farmer field days.
4. There is **no solid work plan** indicating the introduction of a specific technology by a specified number of farmers in the context of scaling up; no record and documentation is made, which is the pillar of scaling up. It is unfortunate that the well-rehabilitated watersheds in one area were not properly documented and scaled up to other areas.
5. The **role of stakeholders seems overlooked;** the only actors involved in the process are BoAs; no private sector or other relevant organisations are included. One important accomplishment is the development of Watershed Users Associations, which seem an ideal structure that can support both scaling up and selection of best practices to be scaled up.

Considering all these recommendations, the regional offices have organised a number of workshops and consultative meetings and shared a planning template for this purpose.

The second major achievement was the production of a guideline document for scaling up best practices. One key issue that arises when dealing with change processes in any area of social concern is how to achieve results that are as broad-based as possible. Scaling up is one way of replicating innovative, tried-and-tested approaches on a

wider scale. Scaling up is defined as 'expanding, replicating, adapting and sustaining successful policies, programmes or projects in geographic space and over time to reach a greater number of people.' Scaling up is presented as part of a broader process of innovation, learning and scaling up

Considering the available guideline and workshop results, four products are identified for scaling up and are discussed with partners: Community Managed Development Initiative (COMADI) experience, SURED Protection through production (Figure 188), backyard livestock farming (Figure 189) and hydroponic fodder production (Figure 190). As part of the scaling up efforts, extended notes (information products) are prepared and shared with partner offices. For some products, detailed descriptions and scaling options are also developed.

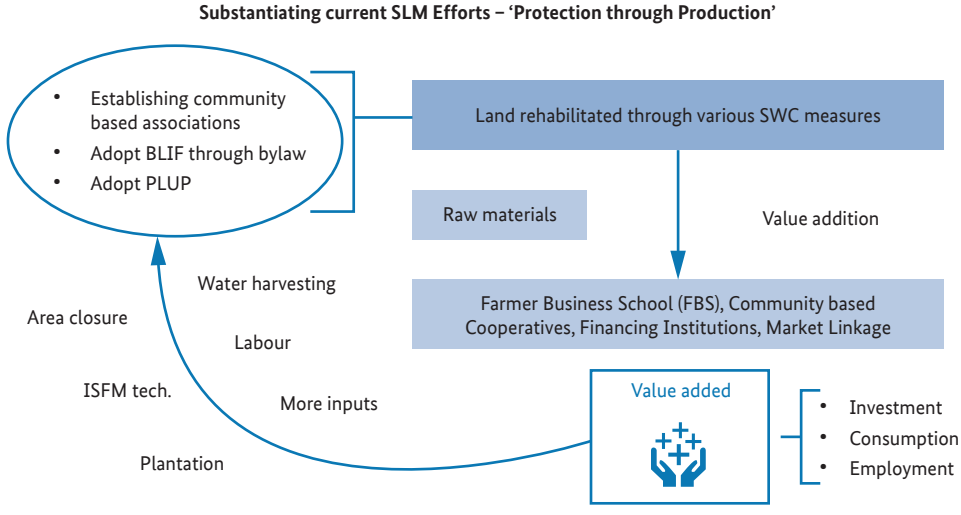


Figure 188: GIZ SURED's protection through production model for SLM.

Figure 189: Free grazing and backyard livestock farming experience sharing by communities and experts.

Figure 190: Hydroponic fodder produced by a woman in Amhara.

6.6. Success Factors for Scaling Up

Based on the past 15 years of practical learning, the success factors for scaling up SLM are summarised in Table 11.

Table 11: Success factors for scaling up of SLM.

Success factor	Issue for consideration
Verification and testing of innovations	Testing of innovation in diverse socioeconomic and biophysical set-ups is critical. Extension workers, researchers and community members have to be consulted early on the type and suitability of practices or combination of practices for testing. Necessary adjustment and modification based on local experience, objectives and biophysical and socioeconomic conditions. Develop effective tracking tools and approaches (developing monitoring tool).
Documentation, developing standards and manuals	Document the context under which the innovation could be effective, limitations and technical standards. Modification of the initial design standard during testing should be documented and necessary guidelines or training manuals that describe important components (process steps) for wider application should be developed using local languages. Develop quality assurance mechanism.
Technical and institutional capacity development and incentives mechanisms	Identify multipliers (institutions and individuals) within the extension system who can train and provide timely and quality advisory and guidance on the change processes. Community groups and individual farmers should get the required training, practical experience and follow-up during implementation of the practice. Strengthening institutional capacities, including farmer training centres and farmer cooperatives, to provide required service to early adopters within the community is crucial for scaling up. Focus on emerging needs of partner institutions.
Multi-level approach	Large-scale land restoration and sustainable management of land require concerted efforts of actors at different levels. Large-scale implementation of innovative technologies and practices requires backing at macro- and meso-level for improved framework conditions and resource mobilisation. Furthermore, local-level implementation requires setting operational standards and guidelines based on regional and local contexts. Knowledge generated at the local level has to inform policies and strategic plans at the national and regional levels for broader impact.

Success factor	Issue for consideration
Partnership, networking and communication	Scaling up of best practice requires the partnership and engagement of multiple stakeholders. However, the role of each stakeholder has to be defined early on to avoid inefficiency and duplication of efforts. There is a growing interest in establishing knowledge exchange platforms, networking and synergies between actors at national, regional and local levels. However, effectiveness of the platforms and networking largely depend on developing common ground, shared rules and working procedures and clearly defined objectives. Partnership/collaboration between stakeholders needs strong leadership and steering, a review and update of goals and appropriate communication. Start with a manageable number of actors and an achievable target for scaling.
Incorporate scaling up into planning	Scaling up is a managed process which requires answers to the questions: What? When? Where? And at what cost to scaling up? Ensure that scaling up is part of the strategic goals and an integral part of long-term development plans of the stakeholders. Scaling up plans should consider realistic targets (number of woredas and watersheds and innovations to be upscaled), actors, existing capacities and capacity needs and risks. Consider what resources including time, finance and personnel are required for scaling up from the outset.
Ownership by key actors	Scaling up requires the ownership, will and commitment of political and development leadership. Ensure that scaling up is a priority agenda of key actors, progress is regularly reviewed and appropriate actions are taken to address key challenges. Consider mainstreaming into key actor's strategic plans (Growth and Transformation Plan) and national guidelines.
Scheduling and budgeting	Consider the limited financial and human resources within the partner system. Hence scaling up should ensure that planned measures are aligned with partner planning calendar and budgetary processes. Explore opportunities for sustainable financing and resource mobilisation, such as public–private partnerships, social corporate responsibility and payments for ecosystem services. Obtain shared and realistic overview of what is feasible.

6.6.1. Lessons learnt

1. Importance and relevance of scaling up is not well understood. Most of the projects and programmes do not have scaling up components. As a result, their effort in mainstreaming this important concept in their development endeavours have been at best minimal. The scaling up strategy of the government, although formulated some years before, has not yet been introduced to key staff and is not in action in general.
2. We also learnt that, in most cases, particularly from the government side, concern is all about innovations but not scaling up. Mention should be made here that in any development intervention, innovations without full account of scaling is a waste of time and money.

3. Availability of best practices for scaling up. From the limited effort that we made we found that there are a sufficient number of innovations that could be scaled up. Proper joint planning with partners will give the possibility of scaling up the various innovations.
4. Options for scaling up. Depending on the type of product selected for scaling up, options are also identified. As part of such an effort, three strategic options are proposed for scaling up the community-based agriculture development initiative – COMADI. The other commodity was hydroponic fodder production, for which we produced a standard business plan and also potential target groups for possible scaling up of the technology with a wider scope.

6.6.2. Issues for future consideration

1. The effort by GIZ SURED to introduce the concept and application of scaling up is constrained by time and other external factors. As a result, additional and concrete efforts are needed to mainstream the concept and application of scaling up. In this regard the provision of training for both higher officials as well as field experts is of paramount importance.
2. Further awareness and familiarisation of the already-identified best practices is encouraged. GIZ SURED, together with partners, has selected around five best practices for possible scaling up. Nevertheless, for different reasons such practices could not be fully implemented by the government structure. The available resources from different programmes, coupled with high interest of the government, will make adoption of scaling up more pragmatic as well as productive.
3. Development of important documents is needed. Scaling up has its own procedures and approaches. There are also success factors that every organisation needs to follow if scaling up is its objective. Our preliminary assessment shows that, with limited scale, various development organisations have conducted scaling-up. Thus, considering the experience of different programmes/projects, the development of a comprehensive scaling-up guideline suitable for application is necessary.

7

Emerging Issues in Sustainable Land Management

Key messages

- Digital training system management has the potential to improve training effectiveness
- Digitalisation of agricultural extension advisor services enhances synergy and cooperation between actors
- Payments for ecosystem services contribute to sustainable development of resources and livelihood improvement
- Realising productive use of land resources ensures protection and maintenance of agro-ecosystems
- Farming as a business opens opportunities for protecting natural resources and improving livelihoods
- Empowering local communities and community-based institutions ensures sustainable management of natural resources

As described in Chapter 2, the implementation of land management in Ethiopia has passed through various structural and technological changes in response to emerging contexts. Soil erosion protection, including terrace construction, gully rehabilitation, flood control and soil bund construction on farmlands, was the primary focus of sustainable land management (SLM) in the 1980s. Accordingly, different programmes and projects have piloted and generated various context-specific technologies and practices for restoring degraded lands. However, the mounting pressure exerted by Ethiopia's rapidly growing population on the country's limited land resources, coupled with mismanagement of rehabilitated land, have deteriorated the productive lands and erosion is once again increasing. Communities could not realise the economic incentives to maintain and protect natural resources due to poor local resource governance arrangements. Degradation of the agro-ecosystem is further aggravated by natural and social stresses such as community conflicts, expansion of farming and livestock grazing into protected lands, drought, flooding and pest infestation.

As a result, ensuring economic benefits and building resilience to climate change impacts through integrated and climate-smart landscape development has received increased attention in planning and implementation of the Sustainable Land Management Programme (SLMP) since 2010. The Global Climate Change Alliance (GCCA) project, implemented during 2011–2014 in 34 selected districts in the Amhara, Benishangul-Gumez, Gambella and Tigray regions through EU financing and GIZ technical support, was among the initiatives to address economic benefit concerns while maintaining compromising ecological and social benefits. The GCCA project and other similar initiatives have proven the possibility for a new development path of 'green growth'. Despite the presence of proven innovations, however, broader impact could not be realised due to limited technical, institutional and financial capacities at the community, district and regional levels to promote the practices beyond the pilot project areas. Consequently, the government has mobilised financial and human resources to address the institutional, technical and financial barriers to large-scale implementation of the tested innovations by integrating them into long-term strategic plans, such as the Climate Resilient Green Economy and the Growth and Transformation Plans II and III, which have been implemented through the Agricultural Growth Program (AGP), the Productive Safety Net Programme (PSNP) and the SLMP.

The Resilient Landscape and Livelihood Program (RLLP), implemented since 2019, is among the investment programmes designed by the government to address technical, institutional and financial barriers at community and district level and to strengthen community resilience to shocks in the Ethiopian highlands. Furthermore, the government has designed the Climate Action through Land Management (CALM) programme for results to incentivise the adoption of proven climate-smart practices and approaches by farmers and local institutions. Unlike the RLLP and the other SLM programmes, which provide financial resources for the implementation of land management measures, CALM does not provide financial resources for

the implementation of such programmes. Instead, CALM provides financial and material incentives to communities for the results achieved in terms of land area sustainably managed and protected from erosion. The synergy between the investment programmes (RLLP, AGP and PSNP) and CALM is expected to accelerate the adoption of climate-resilient agricultural production.

The increasing demand from farmers and communities for technical and financial support to implement land management practices could not be fulfilled due to the limited capacity of the agricultural extension system to provide quality and timely advisory services, to track performance/achievements and to provide sustainable finance. Travel restrictions due to COVID-19 and other security concerns have further restrained the interaction and exchange of knowledge between the extension workers and communities. These pressing challenges have, however, provided opportunities for the extension system and partners to explore sustainable solutions. The following outlines the emerging approaches in addressing the technical and financial challenges to satisfy the growing demand at the local level.

7.1. Digitalisation of Agricultural Extension Advisory Services

Land management is knowledge intensive. Local implementors and extension workers require up-to-date and consistent information on SLM technologies, practice and approaches, and regular exchange of knowledge and experience. Traditionally, the extension system relies heavily on face-to-face advisors, training and visits of extension workers. The application of information and communication technology (ICT) in Ethiopia's agricultural sector remains low even compared to other African countries. For instance, in a many sub-Saharan African countries, smallholder farmers get technology-related advice as well as location-specific market information on inputs and outputs through ICT kiosks. The internal ethnic and political conflicts as well as the spread of the COVID-19 pandemic in Ethiopia have severely limited the possibilities for in-person meetings and training. This leaves the agriculture sector struggling with its mandate to transfer the required knowledge to its beneficiaries. Consequently, extension workers could not reach out to communities and farmers with the required quality and timely advisory services.

As a result, new arrangements have been developed that allow interaction and collaboration despite physical distance. Forced to embrace the change, the Ministry of Agriculture (MoA) has witnessed and supported an unprecedented wave of digitalisation initiatives sweeping the country: e-learning and blended-learning approaches, online platforms and digitalised content are being developed intensively to bridge the physical gap. Hard-pressed to keep up with the new dynamics that need to accommodate new players and legal scenarios, policymakers are also seeking the necessary adjustments with regard to the regulatory and strategy framework.

The following sections describe some of the initiatives by the MoA and development partners in the digitalisation of the agricultural extension advisory service, data and knowledge management and information communication.

7.1.1. National Digital Agricultural Extension Advisory Stakeholders' Forum

The MoA realised that various stakeholders – including the private sector, public institutions at the national and regional level, development partners and civic society organisations – have been testing various approaches for the digitalisation of their advisory services, and there has now been a call for a harmonised approach and cooperation among stakeholders. This triggered the MoA to establish a national forum in which the different stakeholders could come together to do the following:

- identify and develop strategic interventions on ICT for agricultural extension services;
- create synergy and harmonisation among those engaged in digitalisation of agricultural extension advisor services;
- establish networking and knowledge exchange among actors engaged in ICT.

A total of 36 organisations engaged in the development, testing and upscaling of ICT for agricultural extension advisors at national and regional levels have so far joined this national forum. The forum was established in such a way that members can join and leave at any time. However, any commitments have to be respected. The stakeholder engagement mapping indicates that a broad range of ICT tools have been used for the advisory services, and e-learning is widely used by different organisations for teaching and learning (Figure 191).

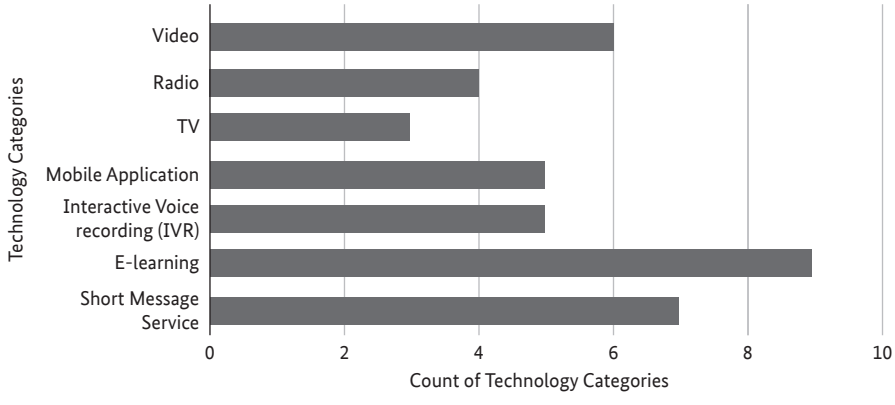


Figure 191: ICT used for agricultural extension in Ethiopia. ***Source:*** *MoA, National Digital Agricultural Extension Advisory Stakeholders' Forum 2021.*

Furthermore, the analyses indicated that the digitalisation of extension services is occurring not only at the national level but also in the different regions (Figure 192).

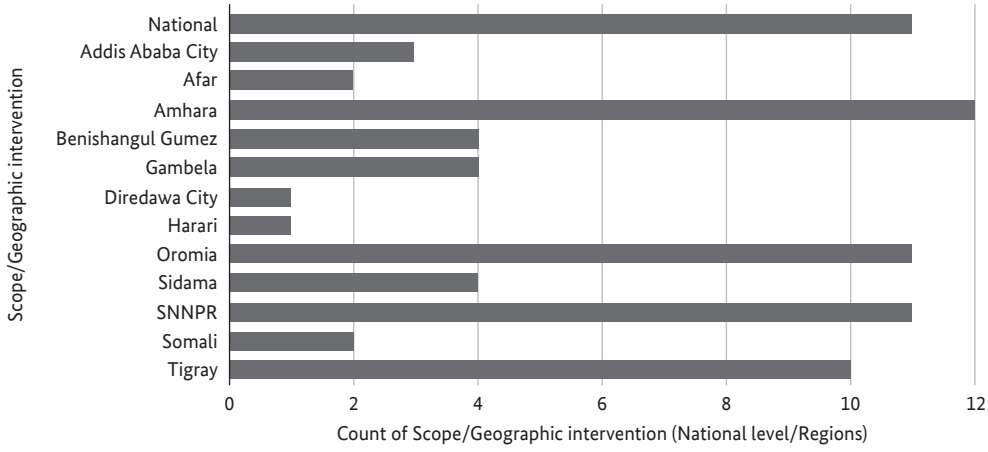


Figure 192: ICT used for agricultural extension in Ethiopia nationally and by region. ***Source:*** *MoA, National Digital Agricultural Extension Advisory Stakeholders' Forum, 2021.*

Some of the initiatives in the digitalisation of agricultural extension advisory services are described below.

7.1.2. Mobile app-based training management system

Traditional SLM training has been provided by different organisations at different levels. Training communications such as invitations, registration and reporting were paper based. Furthermore, targeting of trainees was not transparent and systematic and so was not effective in many cases. Trainees could not obtain required information on the content of the training, the training place or the trainer prior to the training event. Adding to these difficulties, post-training databases rarely exist at the woreda, region and even national level.

Taking the above gaps in the training system into account, the GIZ Sustainable Use of Rehabilitated Land for Economic Development (SURED) project, in consultation with the SLMP Coordination Office within the MoA, is testing a training management system based on a mobile app in the seven project regions.

The tool is based on a common database in the cloud and a unified text-based communication system. It requires an internet connection with a 2G network from the smart device side (Figure 193).

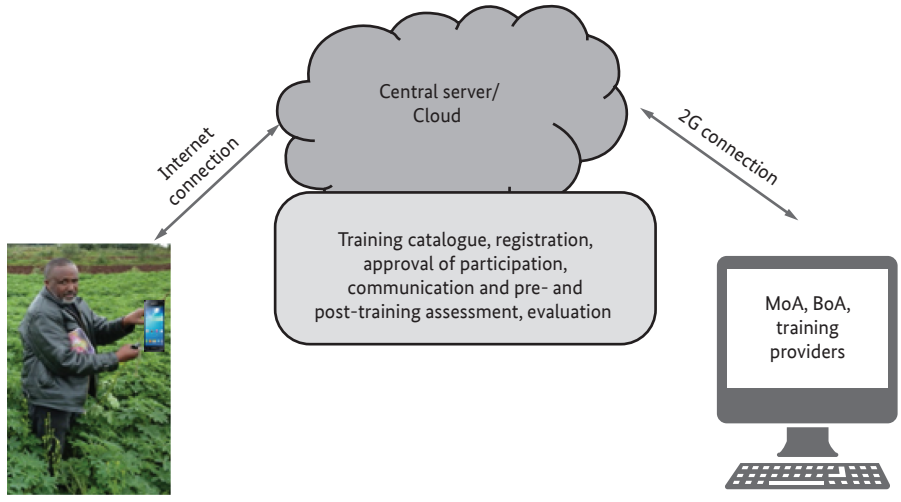


Figure 193: The training management system based on a mobile app. ***Source:*** *Bureau of Agriculture.*

The system interlinks different actors in the training system according to their position within the national hierarchy: federal, regional, zonal, woreda and end user (trainees). The domain 'slm.com.et' has been registered for the users from federal to woreda office level as well as an android application for the smart device side of the system.

The system has been practically tested in selected woredas in Benishangul-Gumez and Oromia by GIZ SURED and has been accepted by the woreda training planners. Accordingly, the SLMP team, after five days of training, is adopting the system for the 2021/2022 training planning in the project intervention regions.

7.1.3. Natural resource podcast

Communities and actors at the community level are seeking to develop stronger ownership of land-use planning and land management. The use of policies and strategies by the communities and local-level government structures is challenged by a lack of sufficient information on the benefits and opportunities that these provide to them and how they can be practically implemented.

Moreover, communication is very often still top-down, from federal through regional to woreda and community levels. There are many examples and experiences across the country that may inform the debate, but these are often not well known, either at the central level or by other communities.

The GIZ SURED project, in collaboration with the MoA and private service providers, is establishing a communication platform that allows detailed and interactive debate about Natural Resource Management (NRM) programmes and activities, in the light of the above needs and challenges, using podcasts.

Experience of podcasts in social and health services has indicated the effectiveness of this medium in Ethiopia; however, there is little experience of it within the NRM sector. Three service providers have therefore been selected to develop content on selected NRM-related topics. The podcast, as the core of this communication platform, is envisaged to foster a lively yet informed debate within the professional NRM community, with horizontal information flow on topics of concern. It is hoped that the podcast will prove a reliable, effective and efficient channel for top-down information flow and an effective channel for bottom-up and horizontal information and communication.

7.1.4. Video-based extension services

While traditional media such as radio and television continue to play a major role in extension and development communication, growth in the use of internet and mobile technology for communication is perceived to be a game changer for extension services.

A video-based extension approach was recently introduced by the Digital Green Foundation in collaboration with the MoA and other development partners. This approach follows a stepwise process from initiation stage to diffusion of best practices and innovations, as shown in Figure 194 and detailed below. Development agents (DAs) and experts are trained in video production, screening and facilitation of discussions with farmers to adopt the featured practice.

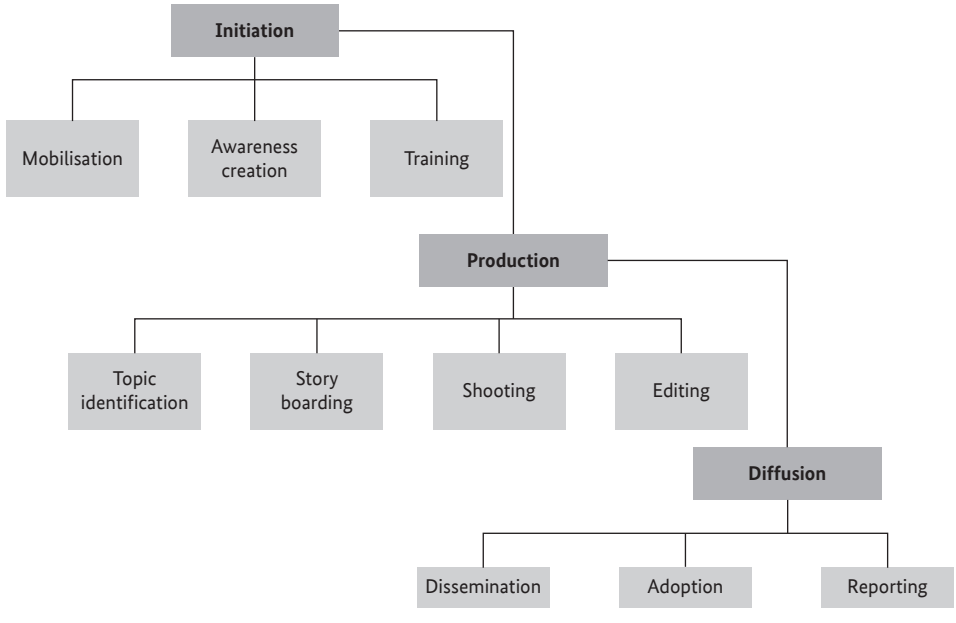


Figure 194: The video-based extension approach.

7.1.4.1. Initiation

Initiation is the first step in the video extension approach. This stage includes mobilisation, situation awareness and training activities.

Mobilisation: This could be resource mobilisation in terms of people and finances as well as identifying and pinpointing the necessary scaled-up documents.
Situation awareness: The operation areas for scaling up need be clearly defined, with understanding of the situation and a recording baseline.
Training: Policymakers and leaders are trained in the general overview of the video-based approaches. The DAs and woreda, zone and region experts are trained in video production, dissemination and facilitation techniques.

7.1.4.2. Video production

Each video is relevant to the local region and features a model farmer from the area locality speaking the local language. The video is captured by trained farmers jointly with DAs and woreda experts.

Topic identification: The topic intended for scaling up should be selected in participatory ways involving all stakeholders, including beneficiaries. The topic should be substantiated by knowledge and skill, and be recorded in the agriculture extension package and research output.
Story boarding: The ordering of content is important, and video production begins with the presentation of practices known to have immediate results for farmers. Local extension staff and knowledgeable persons can also assist in determining the sequence of the content to be shown. In GIZ SURED cases, the best practices identified and documented by the Federal MoA and Regional Bureau of Agriculture are sources of the content for video production. However, the message in the document is broken down to a specific sequential message suitable for video production. Each component of the sequence is no more than 15 minutes long, but follows and retains the technicality of the overall message.

A. **Participatory content development:** Content producers can be university scientists, NGO experts, field staff, progressive farmers and other volunteers from the local community, with the most common content producers being extension officers.
B. **Locally generated video database:** The video features known farmers who have in-depth knowledge and skill on the topic.
C. **Mediated instructions for dissemination and training:** The dissemination of videos is mediated by DAs. Introduction of the video topic, facilitation and responding to any unclear ideas highlighted by farmers are handled by DAs with the involvement of participants.

D. **Regimented sequencing for initiation:** The initiation phase of the process starts with the identification of operation areas and the mobilisation of officials, policymakers, farmers and other stakeholders. The existing situation of the operation areas, in the case of GIZ SURED model watersheds, model and non-model farmers, self-help groups, economic groups, farmer business schools (FBSs) and watershed committees and other relevant groups, should be clearly identified and assessed to ensure that the content of scaling up favours their interests.

Shooting: The knowledgeable farmers to be featured in the video could be model or experienced farmers and be filmed by trained woreda/zone experts. Prior to shooting, the featured farmers, representative places and times of shooting should be arranged. The farmers selected to feature in the video should rehearse so that they understand the topic and flow of the message prior to shooting.
Editing: After shooting, the footage is immediately edited to ensure a coherent flow of messages from the featured farmer, and that other technical issues such as sound and light are attractive for audiences. The editing requires the use of appropriate software by trained experts at woreda level.

7.1.4.3. Diffusion

Videos produced and endorsed by woreda officials and concerned bodies are then distributed to frontline extension workers for dissemination.

Dissemination of videos: As frontline extension workers, DAs are responsible for collecting the videos from the woreda office and agreeing on appropriate places, dates and times with farmers to show the videos. The DAs should use a pico projector for dissemination. They should also keep records of the attendants and facilitate the dissemination.
Adoption: DAs should follow up with farmers who attended viewings to evaluate the adoption of the best practices presented in the video. DAs keep records of the farmers that decide to adopt for further follow-up and support. Evaluation reports of DAs indicate that the adoptability and scaling up of the knowledge and skills learnt are correlated with the economic and social conditions of the farmer.
Reporting: DAs produce reports and submit them in a timely manner to their supervisors using a standard format. The report should include the video displayed, participants, issues raised by the participating farmers and any obstacles to video production and dissemination. These reports should be signed by the DAs and officially stamped by the kebele office.

The video-based extension system is being used by the public extension system to better reach farmers and increase adoption rates of improved practices and technologies.

7.1.5. Agricultural performance tracking tool

Despite encouraging results in terms technical capacity of the implementing partners, and the overall improvement in NRM and agricultural production, the planning, decision-making and impact monitoring of SLM continue to be challenging.

In 2019, an ambitious project to launch a cost-effective planning and impact monitoring tool was begun by the MoA in collaboration with the University of Wageningen and five GIZ projects: Participatory Land Use Planning (PLUP), Integrated Soil Fertility Management, SURED, Nutrition Sensitive Agriculture and Supporting Sustainable Restoration of Agricultural Investment. The University of Wageningen is developing the planning, decision-making and impact monitoring tool in partnership with professionals from the different projects (Figure 195).

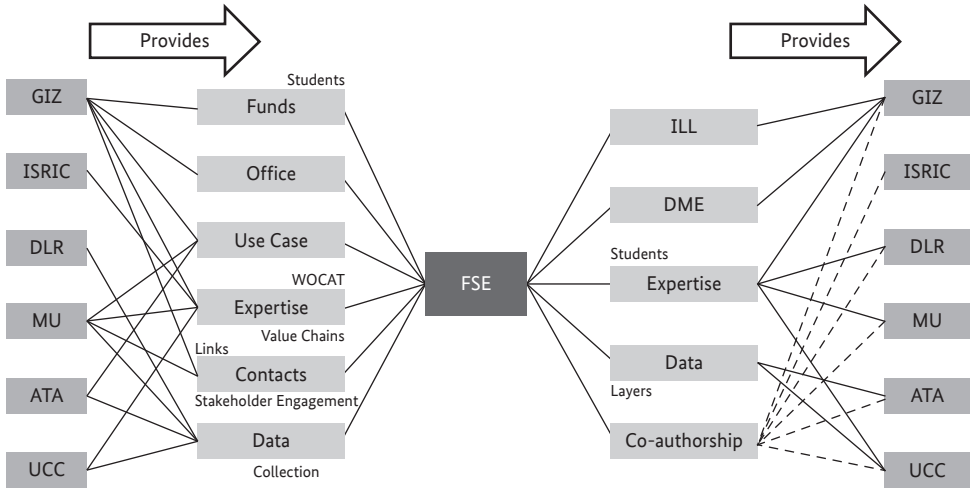


Figure 195: Mutual support and strategic partnership among stakeholders. ISRIC: International Soil Reference and Information Centre; DLR: Deutsches Zentrum für Luft- und Raumfahrt; MU: Mekelle University; ATA: Agricultural Transformation Agency; UCC: University College Cork; ILL: Interactive Landscape Lab; DME: Design module provider; FSE: Farming Systems Ecology. ***Source:*** *WUR.*

The tool will incorporate two complementary systems (Figures 196 and 197):

(1) A portable Interactive Landscape Lab (ILL) for planning and decision-making via (a) the co-design of a shared vision/plan for SLM in individual catchments which contribute to national objectives, and (b) the co-design of an implementation model, with clear roles and responsibilities for involved actors.

(2) A web-based Monitoring and Impact Assessment Dashboard for monitoring and impact assessment via landscape-level key performance indicators (physical, agronomic and socio-economic), based as much as possible on remote sensing and other remote data technologies.

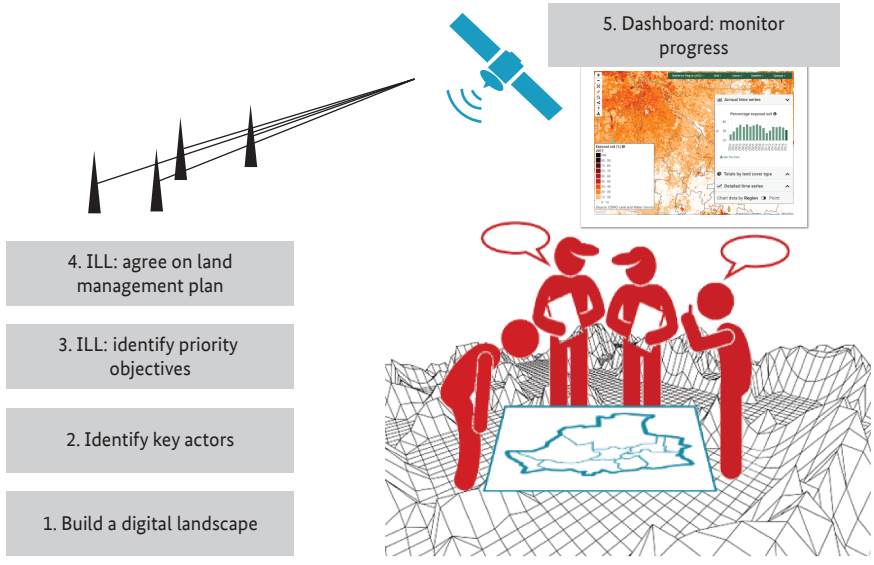


Figure 196: Conceptual overview of the interactions between the ILL and the web-based Monitoring and Impact Assessment Dashboard.

Figure 197: ILL for the Guder watershed, Sekella woreda, Amhara. ***Source:*** *Tapestries project*.

The prototype for the dashboard and ILL was developed using data from the Atsbi catchment in Tigray and Selekella in Amhara.

7.2. Management Information System in the Agriculture Sector

Assessment reports of the MoA's PSNP indicated that, despite continuous investment in the restoration of degraded areas, reports on the land areas rehabilitated, land-use changes and agro-ecologies are rarely available and unorganised. The watershed development strategy drafted in 2019 also recognises the need to develop a robust management information system that can support decisions on resource allocation and intervention prioritisation. Accordingly, the MoA, with support from development partners, and as part of the digitalisation of the research–extension–farmers linkage, recently developed a management information system to strengthen the documentation, dissemination, monitoring and evaluation of watershed development.

The national management information system comprises national data related to NRM through government programmes and development support projects, updated information on land use, land cover and agro-ecologies, and degradation trends. The research and extension will acquire necessary data for planning and implementation of projects and developing national strategies. The management system is connected to the woreda information centres, which provide the required information to woreda-level decision-makers and extension workers related to NRM and agricultural development.

7.2.1. Woreda information centres

As part of the management information system, the Government of Ethiopia and development partners have put significant effort into establishing a collection of woreda information centres – 'WoredaNet' – which serves as a platform for knowledge, data and information exchange, and educational products to local-level communities on agriculture and natural resources. Currently, more than 600 woreda, regional and federal government offices across the country are connected through WoredaNet. The SLMP has also complemented the project target woredas with additional facilities on data and information management primarily meant to serve woreda- and kebele-level NRM experts/offices who are implementing the SLMP. Furthermore, the information centres serve other actors, such as technical and vocational education and training colleges, communities in the woreda or nearby kebele, and other sector offices in the woreda or kebele that have linkages with the NRM sector and are affiliated to provide support for the project.

The woreda information centres serve as repositories for data, information and knowledge products relating to SLM and make this information publicly available for multiple audiences. As a result, decision-making for planning and implementation of climate-resilient strategies has improved over the past five years. The information provided by these centres includes, for example, best practices, indigenous knowledge

and experience of farmers, and scientific knowledge and practices. The centres also collect and document biophysical, socio-economic and spatial information (i.e. maps) as part of a comprehensive database to track changes and the impacts of SLM. These information centres are expected to be equipped with basic office furniture, computers, shelf cabinets, scanners and photocopiers, as relevant, and may provide space for reading and learning (Figures 198 and 199).

So far, across SLMP regions, a total of 109 woreda information centres have been established by the SLMP: Amhara (28), Benishangul-Gumez (12), Gambella (4), Oromia (31), Southern Nations, Nationalities and Peoples' Region (SNNPR) (25) and Tigray (9). However, access to these centres from regional and federal level institutions is limited due to a lack of connection to the programme's web-based knowledge and information management system.

Assessment reports of the SLMP on the functionality and effectiveness of these information centres indicated that the woreda watershed teams and DAs are visiting the centres at least once a week. However, access to up-to-date information materials is limited in almost all centres.

Figure 198: Woreda Information Centre at Gumer woreda, SNNPR. *Source: Woreda Information Centre document of the National SLMP Coordination Unit.*

Figure 199: Woreda Information Centre at Mengeshi woreda, Gambella.

7.2.2. Codification of watersheds for standardised communication

Despite extensive investments in watershed restoration and management, the data on the location, size and history of the watersheds are poorly organised at the national, regional and woreda levels. As a result, watershed development planning and decision-making on resource allocation, which relies on locally available information and regular studies, is cumbersome and time consuming. As part of the improved management information system, the MoA recently initiated codification of watersheds in the country to ensure proper data organisation related to size, location and development history.

Codification of the watersheds takes into account the Ethiopian administrative structures, which consist of regional, zonal, woreda and kebele administrative units, with region and kebele representing the highest and lowest units, respectively. This codification uses an eight-digit code comprising administrative units, river basins and hydrological characteristics. This unique international code provides a single standard to coordinate all the development programmes related to NRM (Figure 200).

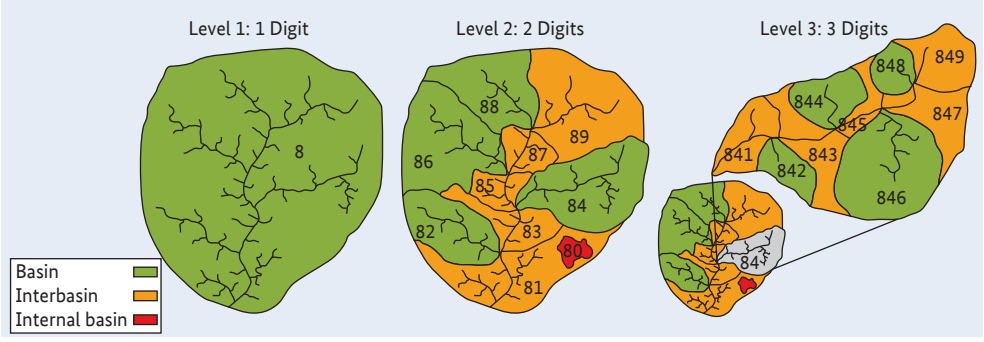


Figure 200: Coding system for watershed identification.

Thus, a watershed code consists of codes for the region, basin, sub-basin, zone, woreda, major watershed and the community/micro-watershed (a micro-watershed being defined as a geographical location with a size range of 250–500 ha). The codification system is shown in Table 12.

Table 12: Administrative and hydrological coding.

No.	Administrative/ hydrological hierarchy	Delineation/codification system
1	Region	Codified by numbers, e.g. 01 (Tigray), 02 (Afar), 03 (Amhara), 04 (Oromia), 05 (Somali), 06 (Benishangul-Gumez), 07 (SNNPR), 12 (Gambella), 13 (Harari), 14 (Addis Ababa) and 15 (Dire Dawa)
2	Basin	Assigned their first two letters, e.g. Me (Mereb), Da (Danakil), Aw (Awash), Wa (Wabi Shebelle), Ge (Genale-Dawa), Ri (Rift Valley), Om (Omo-Gibe), Ba (Baro-Akobo), Ab (Abay), Te (Tekezie), Og (Ogaden) and Ay (Aysha)
3	Sub-basin	Represented by numbers 1, 2, 3, ...
4	Zone	Represented by lower case letters a, b, c, ...
5	Woreda	Represented by numbers 1, 2, 3, ...
6	Major watersheds	Represented by capital letters A, B, C, ...
7	Kebele	Represented by numbers 1, 2, 3, ...
8	Community/micro-watersheds in the kebele	Represented with lower case letters a, b, c, ...

Accordingly, the codes for the different watersheds in the country are organised as described in Table 13. For example, one of the micro-watersheds of Tach Gaint woreda in Amhara Region is identified with the code 03Ab06a06A06a.

Table 13: Watershed codification system examples.

Code	Hydrological/administrative units	Coded name of the area
03	Region (Amhara)	03
Ab	Basin (Abay basin)	03Ab
06	Beshlo sub-basin in Abay basin	03Ab06
a	South Gondar Zone in Amhara Region	03Ab06a
06	Tach Gaint woreda in South Gondar Zone	03Ab06a06
A	Zita (a major watershed) in Tach Gaint woreda	03Ab06a06A
06	Antseta kebele in Tach Gaint woreda	03Ab06a06A06
a	Meshant community/micro-watershed in Antseta kebele	03Ab06a06A06a

Source: *Infotech of the Community-Based Participatory Watershed Development Guideline of MoA.*

Tigray has already coded more than 7,000 community/micro-watersheds within the region's three major basins, 23 sub-basins and 488 major watersheds.

Further development and adoption of the system by offices of other sectors is required for country-wide application. The Ethiopian Basin Development Authority (EBDA) and the Central Statistical Agency are already supporting development of the system. The EBDA has an interest in hydrological data collection and analysis for watershed status. The Central Statistical Agency is also concerned with evaluating watershed management activities in administrative units.

7.3. Sustainable Financing

SLM is a continuous process that requires ongoing investment for maintenance, productive use and management. Currently the bulk of investment funds for SLM activities come from the federal government, donors, NGOs and local communities through community campaigns that mainly include labour mobilisation. However, considering the growing demand to address land degradation challenges and ensure the continuation of SLM investment throughout the country, acquiring innovative financial mechanisms that could be tapped to support the promotion and scaling up of SLM is crucial.

To this effect, sustainable development programmes and the government have recently been exploring different approaches to ensure sustainable financing for country-wide implementation of SLM. Below are some of the ongoing initiatives by government and development projects.

7.3.1. Payments for ecosystem services (PES)

International experience, for example with local community contracts for reforestation and watershed management in Mexico, has demonstrated the potential of PES approaches to mobilise additional resources for SLM. The Ethiopian Strategic Investment Framework recognises PES as an important financing instrument to promote and scale up SLM in the country. The government has identified the following alternative financial sources (innovative financing) that would be most applicable and considered as PES in Ethiopia:

- payments for carbon sequestration and charcoal production;
- PES on domestic water supply and irrigation;
- deforestation taxes;
- environmental levy on entry fees to national parks/game reserves and protected areas;
- appropriate PES on investment projects, industries and mining projects;
- improving PES in various industrial, commercial and service provision sectors within municipalities' jurisdictions;
- enforcement of regulations and laws pertaining to taxes.

The Humbo Clean Development Mechanism (CDM) project located in the southwest of the country is the first example of using PES for forest regeneration in Ethiopia. The project was initiated by the Government of Ethiopia in partnership with World Vision and the World Bank BioCarbon Fund. The project has contributed to poverty alleviation in two ways: directly, by providing increased grass (cut and carried) for livestock, increased domestic firewood and environmental benefits such as improved groundwater and decreased erosion; and indirectly, by creating a new community-based income stream through the generation of carbon offset credits. The area covered by the CDM was previously bare of trees, with some small shrubs remaining. High rainfall led to flash flooding in the area, destroying roads and bridges and causing extensive erosion. Large amounts of topsoil were lost, reducing potential productivity in higher areas and leaving large silt and rock deposits on farms in lower areas.

Important success factors of the CDM were the norms on inclusion and exclusion of members, active participation of local households in forest management, fair sharing of benefits and costs, strong institutional setup and security for property rights. As a result, regular participants gained a greater share than irregular participants and so distribution and sharing of benefits and costs were not perfectly equitable.

The project is currently considered a model for other potential reforestation projects that the Commission for Forest and Climate Change identified with support from development partners. The project's success stimulated the Government of Ethiopia to call for it to be scaled up to include an additional 15 million hectares.

Another important example of PES is the SLMP initiative regarding water use by Raya Brewery. A memorandum of understanding was signed on 15 May 2018 by Raya Brewery,

MoA, the Tigray Bureau of Agriculture and Rural Development, Mekelle University and the local community to rehabilitate and sustainably use water resources from a catchment in Tigray, northern Ethiopia, for the community and the brewery. The quality of the brewery's products is largely due to the fresh spring water discharged from Gereb-hara watershed located 9 km southwest of the brewery. This is one of the micro-watersheds adjoining the Upper Burka Abagabir major watershed and the newly selected Gereb-hara major watershed, and has not yet received support through the SLMP. The catchment has great economic significance both to communities in the settlements and to Raya Brewery. It is a vital source of grazing land, arable land and water for drinking and irrigation for the communities as well as an important source of spring water for the brewery.

The watershed has been subject to a series of environmental, social and economic pressures including deforestation, soil erosion and land degradation. These pressures have affected the natural resources in the watershed including the water resource, communal grazing land and productive capacity of cultivated land. Moreover, the environmental deterioration associated with unsustainable management practices in the watershed has seriously affected the discharge rate and sustainability of locally available spring water, which could ultimately jeopardise the operation of Raya Brewery. To mitigate these challenges, there is a need to plan and implement a locally viable integrated catchment protection, restoration and management package, with the aim of achieving environmental restoration, economic profitability and social prosperity for the catchment communities and ensuring a sustainable supply of spring water to Raya Brewery.

Accordingly, the community, with technical support from the regional Bureau of Agriculture and Mekelle University, prepared a development and management plan for the catchment, and the brewery financed the implementation of the proposed development measures. A total of ETB 400,000 was invested by Raya Brewery in 2019 for the protection of the watershed as part of the investment costs for the restoration and sustainable management of the land and water resources.

Similar initiatives from the private sector, including the Eden Water Bottling Factory, Bahir Dar Marble Industry and water tariffs in the Awash basin have also emerged as PES schemes. However, despite these initiatives, and the potential to generate income in the country, the approach has not greatly advanced due to the lack of national guidelines and implementation modalities for the payment systems and standards.

In 2018, the Commission for Forest and Climate Change prepared a national strategy and road map for PES for Ethiopia, which was piloted in four sites recognised globally for their high biodiversity value but also at very high at risk of degradation. This establishes a system for compensating land users for engaging in biodiversity-friendly practices. The commission also organised a study in 2017 to charge fees from different companies and individuals who directly and indirectly generate income by using the country's natural resources. Draft proclamations on PES were submitted by the commission to the Office of the Prime Minister in 2020 for approval.

7.3.2. Managing rehabilitated areas through income and livelihood development

The SLMP experience reveals that communities need economic incentives to protect and maintain rehabilitated areas through better access to market for products and services. In this regard, partnerships between development organisations and private sector partners (PSPs) are becoming important. Private companies are proactively choosing to run their businesses in ways that help ensure lasting sustainability. These firms collaborate and co-invest with communities in activities that are designed to simultaneously achieve development objectives and address key business interests. The following describe some of the measures undertaken by the government and development partners to ensure incomes and livelihoods for improved SLM of rehabilitated areas.

7.3.2.1. Use of rehabilitated watersheds

Watershed management considers the management and conservation of all available natural resources in a comprehensive way. It provides a framework for integrating different land-use and livelihood systems, using water as the 'entry point' in the design of interventions. Therefore, the following principles are key to engaging PSPs to make use and ensure the sustainability of rehabilitated watersheds:

- local communities receive benefits from rehabilitated watersheds to ensure the sustainable use of resources;
- benefits of rehabilitated watersheds should include 'immediately' obtainable increased income for communities;
- activities undertaken in the rehabilitated watersheds must at least maintain and ideally enhance productive capacity of rehabilitated watersheds;
- measures should focus on linking diversified and environmentally friendly valuable products to output markets.

Support to private engagement in rehabilitated watersheds involves linking products from rehabilitated watersheds to value chains through the development of product processing, bulking and storage capacity. This will ensure the sustainability of environmentally friendly livelihoods and increased income through better access for the PSPs.

Experience has indicated that watershed development can increase the availability of productive resources used as a base for production of valuable products that attract PSPs. The following engagement strategies, as principal sources of finance for development works, can encourage PSPs to ensure the sustainability of rehabilitated watersheds:

- Medium-term private sector engagement opportunities include PSP businesses, cooperative unions, base cooperatives or foundations operating in the geographical areas of rehabilitated watersheds.

- Long-term private sector engagement requires strong engagement with PSPs and the provision of incentives to encourage and enable them to engage in communities, begin to implement key activities in the watersheds and continue to stay engaged.

7.3.2.2. Private sector engagement hub for market access

Private sector engagement in watershed development efforts is an important measure to ensure the sustainability of interventions, as it enables smallholder farmers to diversify their income through the production of different valuable products. In this regard, PSPs serve as output markets for the produce of smallholder farmers. To engage in sustained product-based business relationships between smallholder farmers and private actors, the capacities of actors in meeting market requirements in the production process must be improved. Accordingly, the following measures are important means of creating markets for smallholder farmers and establishing sustainable business relationships with PSPs:

- investment promotion in agribusiness;
- food safety and national quality infrastructure reform to reduce barriers to market access for smallholder farmers;
- develop market linkages between local suppliers and other economic sectors;
- facilitate and support trade and investment policy reform for agricultural product markets.

7.3.2.3. Protection of landscapes through productive use

Tackling the challenge of sustainability in watershed rehabilitation that promotes the protection of natural resources while boosting the production of local communities is critical. In this regard, rehabilitated watersheds with improved production capacity are good bases for natural resource-based economic development. Products and services in the rehabilitated areas are key for NRM-based business development, and different business development approaches are implemented in the NRM sector to optimise economic gains from use of the resource base. Business development based on natural resources is undertaken considering two subjects:

- optimising economic benefits by creating alternative livelihood options (income and jobs) for local communities;
- maintaining sustainability of rehabilitated areas through reinvestment of economic value gained from resource use.

Thus, ensuring the sustainable use of rehabilitated areas is a concern for safeguarding returns on resources invested in rehabilitation works and optimising the use of natural capital. The conventional approach of NRM is skewed towards physical and biological measures of conservation rather than socio-economic elements. The concept of 'protection through production' argues that the economic value gained from the use of rehabilitated areas should be partly re-invested in the rehabilitation of natural resources on top of improving livelihoods of local communities.

The central tenet of the 'protection through production' framework is that the community's dependence on external resources for implementing and financing rehabilitation efforts is minimised. A sense of ownership among the ultimate beneficiaries of the resource base is increased as they put part of the economic value of their production into maintaining production capacity of the natural resource. The conceptual framework of protection through production is described in Figure 201.

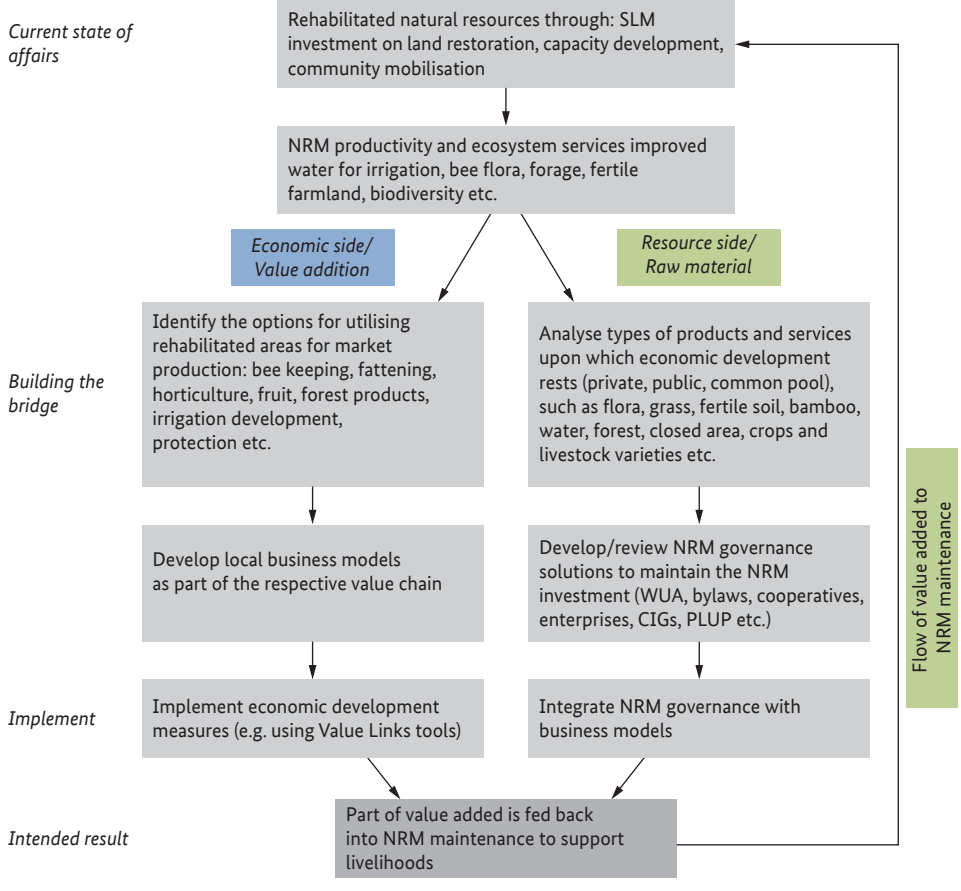


Figure 201: Conceptual framework of 'protection through production' business model. CIG: common interest groups; WUA: watershed user association.

The business model of 'protection through production' considers supply and demand sides of the resources in a given rehabilitated watershed. Promoting interventions that view the supply of environmental resources as a factor of production for valued products and services is critical for the continued sustainability of any economic development based on natural resources.

Previous experience shows that most efforts are focused on reversing the degradation of natural resources. Efforts towards the sustainable use and management of rehabilitated areas for economic development interventions, like income generation, job creation and increasing livelihood options are relatively minimal. Different development actors conceptualise watershed rehabilitation differently and use different sets of watershed selection criteria for economic development. Accordingly, selecting the appropriate intervention watersheds is an important first step for joint learning and scaling up for a broader impact.

Selection of rehabilitated watersheds

To ensure the sustainable use of rehabilitated watersheds, it is important to select specific watersheds as proof of concepts for innovative approaches which can be taken up by the larger system. Previous experience of assessing the performance of watersheds using sustainability parameters indicates that there are possibilities to understand the status of watersheds and hence make decisions on the appropriate actions needed to ensure optimum sustainability of watersheds. Rehabilitated watersheds that are supported for NRM-based business development are selected in an iterative process of consultation among different stakeholders. Consultations of key stakeholders at all levels are conducted to take account of local contexts, make qualitative descriptions, validate overall processes and ensure active participation and ownership from partners.

The criteria used to select rehabilitated critical watersheds are shown in Table 14. The criteria are composed of economic, environmental and social dimensions that are key sustainability elements.

Table 14: Description of criteria used for the selection of critical watersheds.

No.	Criteria	Description of considerations
1	Watershed where the major parts are treated or do not need new treatment but may still require follow-up and maintenance	Proportion of watershed area that is treated or is in good condition as a result of previous SLM investment and technical support
2	Watershed with potential for irrigation development or rich in water resources	Watersheds with irrigation development schemes that are being used and/or with potential for agricultural production
3	Watershed with community-developed legal frameworks	Communities in the watershed who are organised in user groups, with agreed bylaws and legalised by a concerned body

No.	Criteria	Description of considerations
4	Watershed potential for production of various products and services	Potential of watershed for production of different crop and livestock products. Potential for engagement in off-farm activities
5	Watershed potential for market outlets and establishment of value links	Inclusion of the watershed area/nearby surrounding under the Agricultural Cluster Commercialisation initiative
		Availability of market opportunity nearby (at reasonable distance)

For quantitative reasons, numerical weights are attached to each of the descriptions. Field-level verification and review of available resources are undertaken to trace ground truth in each potential watershed (Table 15).

Table 15: Weights attached to criteria used in the selection of critical rehabilitated watersheds. WUA: watershed user association.

No.	Selection criteria	Overall share and rating (%)	Rating parameters	Value
1	Watershed where the major parts are treated or do not need new treatment, but may still require follow-up and maintenance	30	If 51–60% of the watershed area is treated or does not need any more	15
			If 61–70% of the watershed area is treated or in good condition	25
			If 71% or more of the watershed area is treated or in good condition	30
2	Watershed with potential for irrigated agriculture/rich in water resources	10	Watershed with irrigation scheme	10
			Watershed with ponds and traditional irrigation practices	8
			Watershed with rope and washer pumps and shallow wells	5
3	Watershed with community agreement/bylaw (possibly with WUA)	20	Only local bylaw	10
			Bylaw with organised community	15
			Bylaw, organised community with legalised WUA and economic groups	20
4	Watershed potential for various products and services (crop and livestock commodities and possibly off-farm income-generating activity opportunities)	30	Mainly potential either for crops or livestock	10
			Mainly potential for both crop and livestock development	20
			Potential for off-farm activities in addition to crop and livestock development	30
5	Watershed potential for market outlets and establishment of value links	10	Inclusion of the watershed area/nearby surrounding under the Agricultural Cluster Commercialisation initiative	10
			Availability of market opportunity nearby (reasonable distance)	6

Source: *SURED concept note for selection of model watersheds, 2018.*

Following the criteria and rating parameters described above, watersheds scoring 50% or above of the total rating (the aggregated value of the five criteria) are selected as rehabilitated (Figure 202).

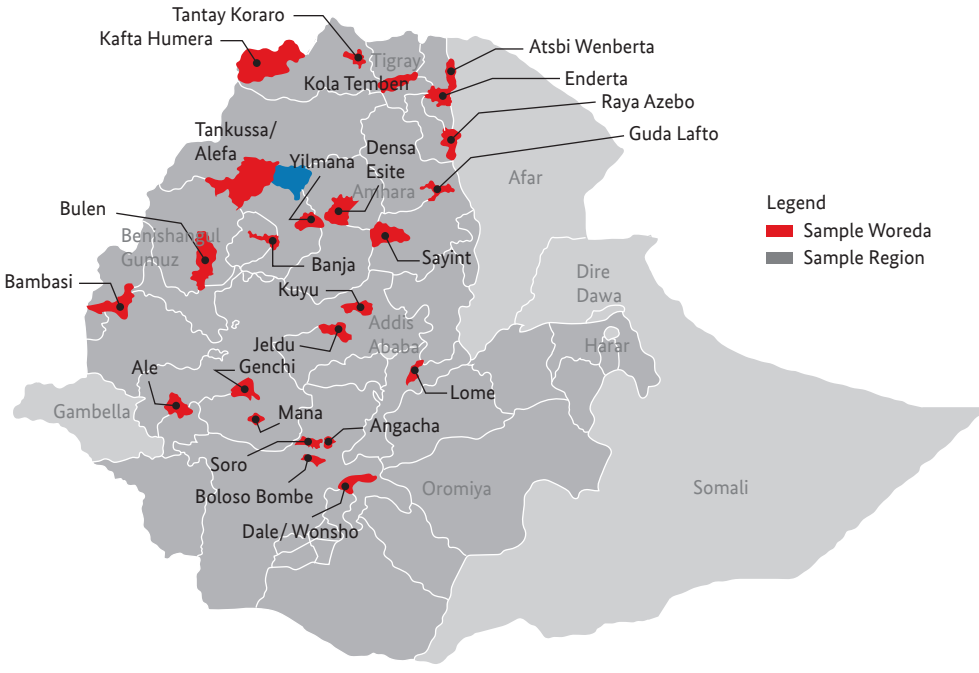


Figure 202: Map of rehabilitated watersheds selected for SURED intervention. ***Source:*** *SURED database, 2019.*

Selection of model watersheds

Those watersheds that are nominated as rehabilitated are further subdivided into a number of micro-watersheds. These micro-watersheds are found in different parts of the major watershed and are generally classified as upper, middle and lower parts. Micro-watersheds can serve as learning platforms through the testing of innovative approaches to ensuring sustainability. Thus, specific model micro-watersheds in the nominated rehabilitated watershed are selected with the help of additional selection criteria which can be operationalised in local contexts.

In addition to the basic criteria described above for the selection of a rehabilitated watershed, more specific and operational criteria are used in the selection of model micro-watersheds (Table 16 and Figure 203). To simplify the quantification process and to reach a final rating in the selection of model watersheds, consultative sessions are supported and facilitated at regional, zonal and woreda levels to ensure the participation of extension workers and include the professional judgement of key advisors, specialists and partner staff.

Table 16: Criteria for selection of model watersheds within rehabilitated watersheds.

No.	Selection criteria	Weight (%)
1	Agro-ecological representativeness of micro-watershed	15
2	Local leadership: proven commitment of woreda steering committee, technical committee, DAs, kebele watershed team, community watershed team and user groups	15
3	Potential for involvement of private sector and community-based organisations in developing interventions	30
4	Accessibility of micro-watershed for supervision and competitiveness of potential watershed products and services	20
5	Availability of organised or potential economic groups that are inclusive	20
Total		**100**

Source: *SURED concept note for watershed selection, 2018.*

Model micro-watersheds are selected to demonstrate practical application of the 'protection through production' business concept and used as learning sites for further scaling up. One model watershed per zone is selected as a standard procedure. Considering similarities in agro-ecology and socio-economic situations, one model watershed is then selected to serve two or more zones.

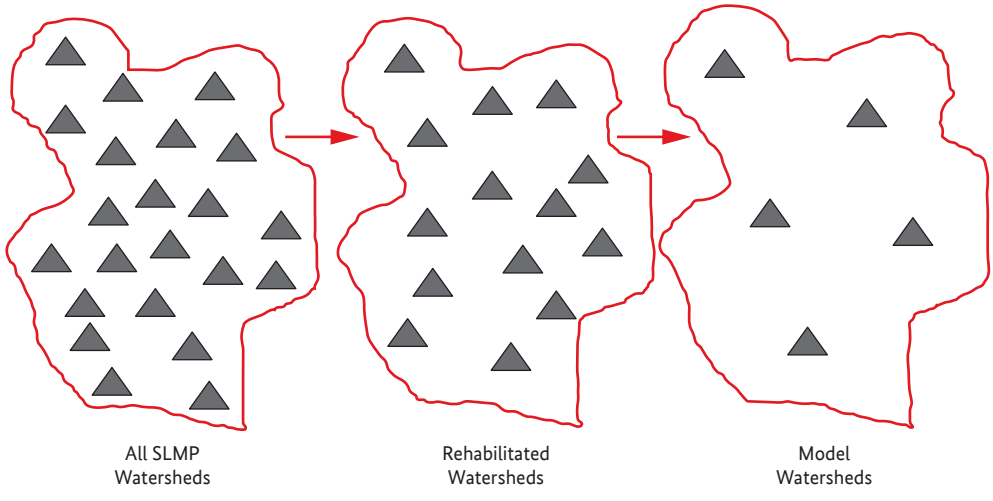


Figure 203: Selection of rehabilitated watersheds and model watersheds.

After finalising the selection of model watersheds, the next step is to agree on the types of interventions to be implemented in the learning sites. This is covered in the following subtopics.

7.3.2.4. Value chain development

Selection of watershed products

Once the model watersheds are selected, the next important step is to assess the feasible products and services in each of the rehabilitated watersheds. Hence, the identified commodities (products and services) are further supported and promoted for contributing towards the economic development of the watershed communities. For that purpose, a multidimensional approach was chosen, based on the model developed by the GIZ Value Links Module 2.0 Volume 1, and contextualised for the objective. Accordingly, the following steps are taken to select appropriate products for value chain development from rehabilitated watersheds of SLMP:

(1) Regional-level secondary data are analysed, and products made based on the criteria in the value links training manual are scoped. Accordingly, a long preliminary list of products is identified and prioritised to promote economic development interventions.

(2) Field verification and validation of the scoping exercise is undertaken at regional, zonal, woreda and community levels with the help of a consultant specialised in the field. The consultant visits selected model micro-watersheds and consults the direct beneficiaries of proposed watershed products.

(3) A scoping exercise by the external consultant, supported by the study results, is presented to the regional partners, and a selection process further narrowed to the most feasible products is proposed in respective intervention areas.

(4) Results of the field verifications and validation exercises at woreda and community levels are presented to decision-makers at the region level in a workshop. Regional-level verifications and validations are enriched at the federal level in the workshop with the participation of decision-makers and technical professionals from public and development partners. Accordingly, final decisions in the region are made and endorsed at the national level on the selection of products for value chain promotion.

The following section shows some products selected in regions for development.

NRM-based value chain promotion

The potential of rehabilitated watersheds for value chain development is assessed once the watersheds are prioritised using their rehabilitation status. Accordingly, NRM-based value chain products (e.g. honey production in Oromia, Amhara, Tigray and Benishangul-Gumez; cattle fattening in Amhara; sheep fattening in SNNPR, Benishangul-Gumez, Tigray and Oromia; avocado production in SNNP; and dairy production in Gambella) are documented following GIZ Value Links Module standard procedures (see the Value Link training manual). Field verifications and validations of

selected watershed products are undertaken in consultation with regional and woreda offices in the implementation model watersheds. Development potential of respective watershed products is analysed against key sustainability dimensions. Strategic interventions identified in the documentation process are considered for supported economic development interventions in the model watershed.

Accordingly, technical support is extended to strengthen community-level institutions and extension workers in selected micro-watersheds through training, coaching and backstopping in market creation for documented products. Regional-level multi-stakeholder platform establishment and strengthening is supported in Amhara, SNNPR and Tigray for business-to-business linkages and improved market service. A woreda- and kebele-level multi-stakeholders' platform is also established and supported for its functionality. Extension workers are given basic knowledge and skills in business development, value chain development and product-specific good agricultural products. Technical support is also extended to cooperatives, and enterprises are established and/or strengthened to ensure the sustainability of efforts and optimal use of resources.

Success story 8:

Cattle fattening in Amhara

"My name is Ato Abera Abirito and I am a 49-year-old resident of the Mehdero watershed in Goshiye kebele, Yilmana Densa woreda of Amhara Region (Figure 204). I have nine family members of which three are women. Agriculture is the only means by which I feed my family and generate income, by growing different types of crops like teff, maize, barley, potato and wheat on the 3 ha of land that I own.

Figure 204: Cattle fattening in Mehdero watershed, Yilmana Densa woreda, Amhara. ***Source:*** *SURED archive, 2020.*

"Besides producing crops, I have been fattening oxen and cows together with my wife and my son since 2000. Fattening as an economic activity is closely linked with religious and public holidays, mostly for Christmas, Timeket and Ethiopian New Year. Before the intervention of the SURED project and FBS training, I had not considered fattening as a business and means of income generation for many years. I had only been rearing livestock as usual and with minor profit. The watershed area where I live has potential for oxen fattening; however, I had little interest and limited skill to practice modern fattening until I received FBS training on better management and improved feeding practices, which are requirements to promote ordinary cattle fattening to be business oriented.

"In 2019, I attended FBS training on new business thinking in farming, introduced with support of the SURED project. After the training,

and with the use of the knowledge and skills acquired, I have tried to introduce innovative practices into my cattle fattening business. In this I have been helped by training received from DAs and woreda experts on livestock feeding and management. To mention some changes, I constructed 20 m^2 of shade and bought 4 quintals of concentrated feed from Tana Livestock Feed Processing PLC jointly with the livestock fattening cooperative members of the Mehdero watershed. Due to the introduction of these new practices, I increased the number of livestock, both oxen for fattening and dairy cattle. I received a one-year ETB 70,000 loan for the business from Tana Union. I invested the profit generated from the business in four rounds of fattening. In these rounds, I bought a total of nine oxen at a cost of ETB 216,000 and sold them for ETB 368,000; the estimated cost of fattening in the four rounds was ETB 37,300 and the generated profit was ETB 124,700.

"I have started a fifth round of fattening activities with four cattle (one ox and three cows) with a value of more than ETB 110,000. I prepared standard shading for fattened oxen and cows and fed them additional concentrated feed to maximise carcass weight. I also prepare feed using maize and other crops. Nowadays fattening is my best business for improving other agriculture sector activities and technologies. Using the money that I got from the fattening business, I bought a water pump generator with full accessories to start growing irrigated onions and potatoes; I constructed a 52-metal-sheet house in my village; I gave ETB 100,000 to my son to start a business in Bahira Dar town and I bought improved seed and fertilisers. I have a plan to increase numbers of fattening oxen in each round, up to five oxen, in the coming year.

"In the Mehdero model micro-watershed, to enhance sustainable natural resource conservation activities, I planted different dual-purpose tree species such as gesho, *Grevillia robusta* and *Acacia decurrens*, as well as different grass species, which are vital for rehabilitation and have economic value. I thank the SURED project for helping me find my hidden skills and motives to improve my family's economic and social well-being."

To the same effect, analyses of appropriate land-use types on which economic development rests (private, public and common pool) are made to ensure optimum production and sustainable use of the ecosystem services. In order to provide ownership to and participation of the land users, as well as acceptance within the community, support is extended to PLUP preparation and implementation in model micro-watersheds as an innovative approach to sustainable NRM governance. Periodic learning events (review meetings, workshops and experience-sharing events) are organised and facilitated at national and regional levels to capitalise on lessons learnt in supporting and introducing innovative approaches and to help embed the approaches in the partner system.

7.3.2.5. Sustainable business development skills of land users and extension work

Farmer business schools

The implementation of FBS as a business model and alternative extension approach has recently been introduced to Ethiopia through the GIZ project. The introduction and implementation of FBS in SLMP watersheds follows a three-phase approach (Figure 205).

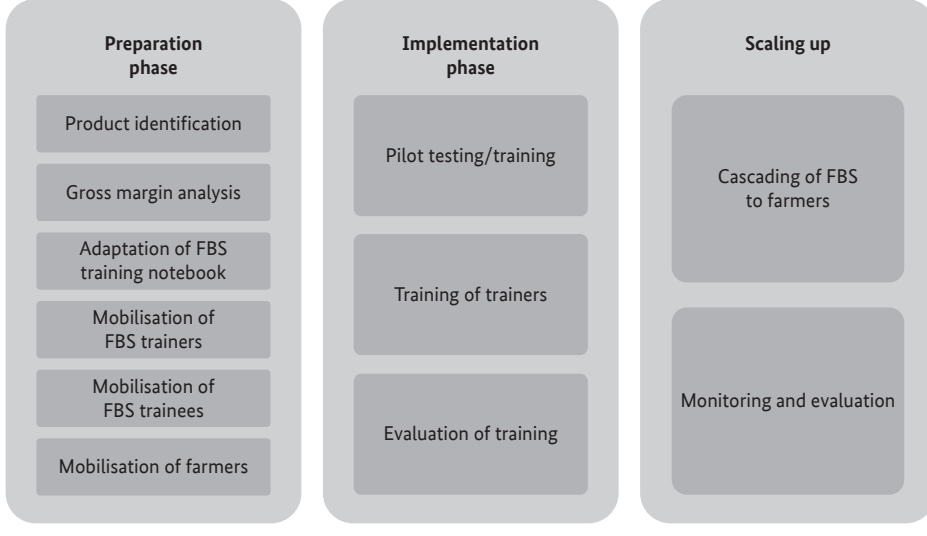


Figure 205: Summary of the three phases of FBS introduction and corresponding activities. ***Source:*** *SURED Protection Through Production team archive, 2021.*

The introduction of a FBS starts with the selection of products. In this approach, the concept is introduced as an integral part of value chain development. One of the main products selected for the value chain is considered as the lead product for the FBS. However, FBS not only supports businesses but also ensures food security as well as improving farmland fertility at the household level. Two additional products are selected and considered as complementary products for addressing food security, and rotational products for maintaining soil fertility are also considered. Identifying complementary and rotational products for the FBS implementation in each region employs the standardised product identification criteria adapted from the FBS introduction and implementation guideline. Products are identified with the participation of key actors at regional, woreda and community levels.

Gross margin analysis: task teams composed of extension workers and advisors are mobilised in respective intervention areas to collect primary data and review secondary source documents on the selected FBS products using current (traditional scenario) and improved scenarios for gross margin analysis. Farmers (non-model and model), frontline extension workers and woreda, zone and region offices are consulted to provide primary data. These data are verified with FBS product-related agriculture extension packages and research studies. To create similar approaches and output among intervention areas, guiding notes on FBS and gross margin analysis are developed at the national level, which is then circulated to regions for use.

As per the FBS introduction and implementation guide, gross margin analysis follows the standard methodological approach and produces a gross margin analysis spreadsheet (Figure 206). The regional task team and regional GIZ offices draft a gross

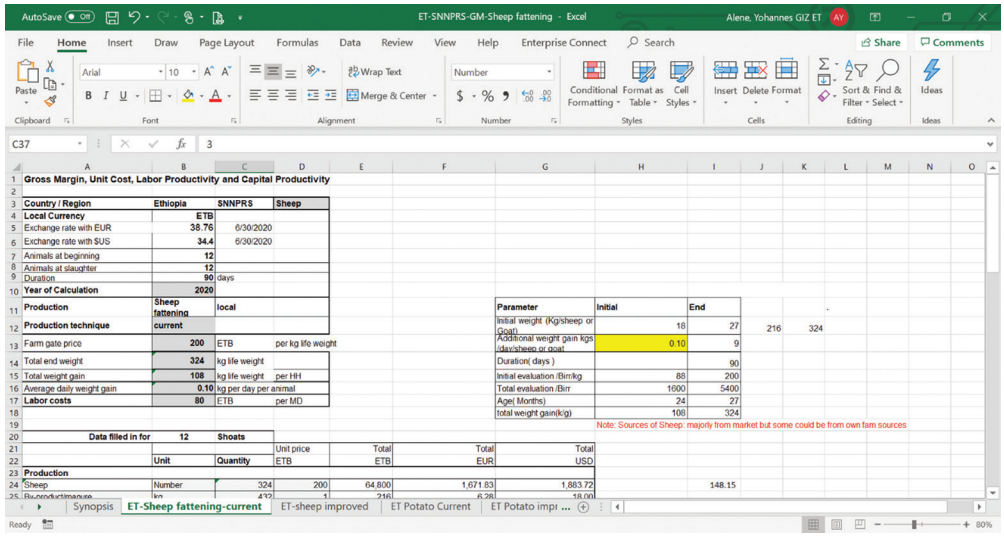
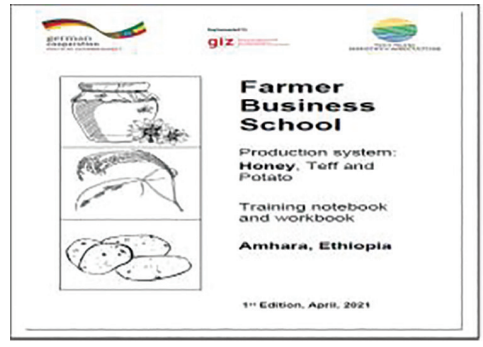


Figure 206: Spreadsheet used in sheep fattening gross margin analysis, SNNPR. *Source: SURED archives, 2021.*

margin spreadsheet using Microsoft Excel, with full support from the federal office on possible review and check. This spreadsheet is then shared with the agri-business advisory facility for technical support and feedback at GIZ headquarters.

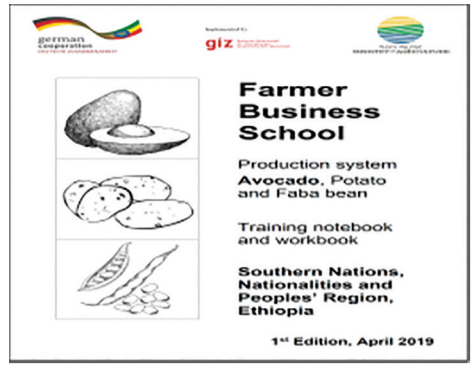
Product-specific training materials are then developed using standard templates designed for the same. Training materials that are developed in the English version are translated into local languages (Amharic, Oromifa and Tigregna) for ease of use for extension workers and ultimately beneficiary farmers (Figure 207). Because there are no national FBS master trainers, international master trainers are recruited and mobilised to facilitate training in the intervention areas. National assistant FBS trainers are mobilised to support international master trainers, as part of a strategic intervention to build capacity of FBS trainers in the country.

Sheep fattening value chain FBS training material, Tigray.



Honey value chain FBS training material, Amhara.

Dairy value chain FBS training material, Gambella.



Avocado value chain FBS training material, SNNPR.

Figure 207: Sample of training materials adapted and developed for four value chain products.

The FBS training materials are structured into 12 modules that deal with different topics related to changing the business attitudes of farming communities (Figure 208).

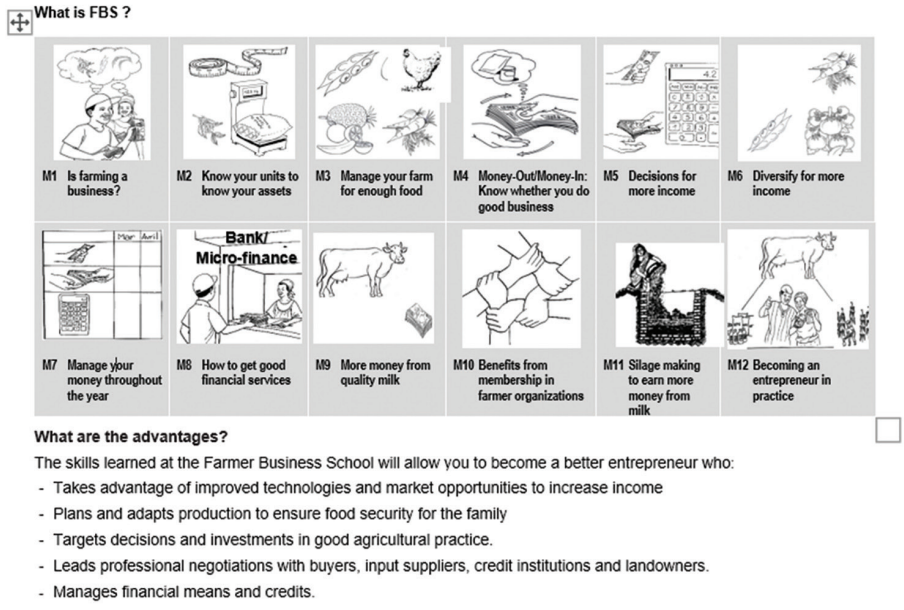


Figure 208: Modules of standard FBS training materials. ***Source:*** *Adapted from SURED training materials, 2019.*

Once training materials are developed, training of trainers (ToT), trainee identification and selection criteria are developed at the national level and circulated to regional offices for adaption to their local contexts and to select training participants accordingly. Consultative sessions are organised with partners to create a common understanding on the selection criteria and implementation of the approach. Regional implementing partners select ToT participants as per agreed criteria in which regional, zonal and woreda experts, DAs and private training providers are selected to receive the training.

Farmers are also mobilised for pilot and group learning sessions during FBS training. Depending on regional contexts, 25–30 farmers, disaggregated by age, sex and educational status, are identified for the piloting and group learning. Groups of farmers are also mobilised by prospective training participants for different sessions like pilot and group learning sessions (hosted in two rounds for two consecutive weeks) of the training.

The FBS manuals are objectively tested with farmers during pilot testing to get feedback on the validity of assumptions made in each module during the development of training materials. Master trainers facilitate the session with at most 30 farmers in the modules for five consecutive days and collect feedback from participants. Module content is jointly amended by advisors and master trainers considering feedback provided by farmers. Experience shows that farmers give important feedback that enriches the content of the modules according to the local farming system context and practical experience.

The ToT follows a pilot training approach, and the selected participants attend the training. Accordingly, regional, zonal and woreda extension workers take part in these sessions as well of DAs and private training providers. The performance of each participant is evaluated throughout the course by the master trainer, supported by assistant trainers deployed during each training session. At the end of each session, participants with successful performance are awarded a certification of participation (see Figure 209).

Figure 209: Certified training participants (trainers left and farmers right), honey value chain, Benishangul-Gumez. ***Source:*** *SURED team field documentation, 2021.*

With support from the DAs and woreda extension workers, trained FBS farmers organise themselves and engage in selected businesses. Two such businesses are shown in Figure 210.

Figure 210: Sheep fattening and poultry production group, SNNPR.

Prospective FBS trainers are tasked with cascading farmer training in the selected model watersheds where DAs play a significant role in training. Prospective FBS trainers from other regions, zones, woredas and sometimes private training providers are engaged in supporting, supervising and coordinating the cascading of training.

Success story 9:

FBS-trained farmers in Amhara

Amhara is one of the GIZ SURED intervention regions. In Amhara, there are five SURED intervention woredas, each with one pilot micro-watershed.

As an innovative approach, FBS training was provided to smallholder farmers on cattle fattening as the lead product and maize and teff as complementary and rotational products, respectively. Hunkan is one of the micro-watersheds in Banja woreda, and a total of 120 smallholder farmers from Hunkan attended FBS training. Financial services, managing money throughout the year and benefits of organisation were some of the modular topics that participant farmers focused on.

The FBS-trained farmers democratically elected an executive committee for their respective FBS groups at the end of the training programme. This committee was responsible for steering the groups and leading the transition to a primary cooperative while joining hands with other farmers who attended the training in the watershed.

Unfortunately, no saving and credit cooperative organisation had been previously formed in the micro-watershed to provide FBS-trained farmers with access to financial services for cattle fattening businesses. Therefore, FBS-trained farmers asked their respective executive committees to request technical support from the Woreda Cooperative Agency and the GIZ Office to establish their own cooperative to access financial services and so mitigate capital limitations to their businesses. Executive committees from each FBS-trained group collectively consulted the Woreda Cooperative Promotion Office and, with technical support from GIZ, established their own cooperative that met all the requirements set by the Woreda Cooperative Promotion Office, which registered the cooperative and provided them with a certificate (Figure 211).

Figure 211: Executive committee members (left) and the Woreda Cooperative Promotion Office cooperative certificate (right). ***Source:*** *SURED team field documentation, 2021.*

The Hunkan Saving and Credit Cooperative (hereafter Hunkan Cooperative) was founded by 80 interested FBS-trained farmers in 2010. The number of members has since increased to 156. Smallholder farmers who did not attain FBS training are also included in the cooperative membership because, by principle, cooperatives are open to every member of the community.

In addition to a registration fee, as per the bylaw, members agreed to set a compulsory saving amount for each member of the cooperative in the range of ETB 50–200 per month for 6 months and to share contributions. Recent data show that the Hunkan Cooperative collected ETB 1,200, ETB 172,000 and ETB 380,000 from registrations, shares and savings, respectively. The Hunkan Cooperative bought a share from the Kokeb Saving and Credit Cooperative Union and they are now members of the Cooperative Union.

As a member of Kokeb Union, and in light of its good performance and its strong capital accumulation, Hunkan Cooperative was provided a one-year loan at 12% interest by Kokeb Union to access finance to mitigate limitations of capital to the cattle fattening business. In total, Hunkan Cooperative received ETB 3,773,000 in loans in three rounds from Kokeb Union. This money was delivered to 124 cooperative members at 13% interest rate, of which 1% was the transaction cost for Hunkan Cooperative. Members received ETB 10,000–70,000 in the first and second rounds and ETB 12,000–120,000 in the third round. The FBS-trained farmers used the credit received from Hunkan Cooperative mainly to purchase 130 quintals of improved feed from Andnet Fattening and Marketing Cooperative. Members also purchased 516 oxen from the market for the cattle fattening businesses.

Capacity development: Good agricultural practice training

Capacity development under FBS focuses on introducing innovative ways of undertaking training in a very organised way. The system developed for training delivery and training needs assessment, monitoring quality and impact of training, and cost efficiency interventions have received significant support in the partner system. For a deeper look into strategic interventions, with the engagement of key partners, these initially assessed the capacity of the training system to promote land restoration and the economic use of rehabilitated watersheds in the model watersheds. As a result, support was extended to develop standard training modules for training topics that were prioritised in consultation with implementing partners. The training modules were also pilot tested at field level to collect feedback on the documents, and modules were updated accordingly with supplementary input from technical experts in thematic topics. Support was also provided to establish private service providers by deploying an international company with experience in business establishment and adult training methods.

Documents were also developed to guide, standardise and systematise capacity development efforts. Accordingly, process maps, stakeholder analysis, training needs assessments, a post-training tracer study, experience exchange visits, concept notes, case stories and reports of special technical support missions were among the tools developed and used to implement the measures. Field-level technical support missions were also instrumental in transferring professional knowledge and skills of thematic area advisors to grassroots extension workers, and to triangulate actual changes observed at the beneficiary level. Significant efforts were made to strengthen regional- and woreda-level platforms as well as establish and strengthen producer and economic groups.

Lessons learnt

Through NRM-based promotion of economic development interventions as new strategic areas of engagement in selected model watersheds, the following lessons were learnt:

- The concept of value chain development based on natural resources, from the perspective of 'protection through production', is being adopted by partners, as evidenced by increased requests for support for piloted thematic areas of interventions like value chain development, FBS and PLUP.
- Adequate preparations and consultative events for partner engagement in the planning, preparation and implementation of innovative approaches like FBS and training system development are critical for a positive impact in meeting objectives.
- Addressing issues of access to well-organised markets, quality and improved inputs, access to credit facilities from financial institutions and organising beneficiaries into economic groups are critical to tapping benefits from rehabilitated watersheds.
- Organising and facilitating reviews and experience-sharing events are important in provoking the interest of farmers to participate and adopt piloted innovative approaches.

7.4. Improving Framework Conditions for Community Resource Governance

The causes of land degradation in Ethiopia are complex and diverse, with socio-economic factors such as overgrazing and a lack of appropriate local community organisations being critical. Overgrazing is one of the major causes of soil degradation. In Ethiopia, the livestock population increases at a rate of 1.8% annually, indicating that the impact of livestock under poor grazing management will remain challenging unless measures are put in place.

Another important determinant of land degradation is the lack of appropriate local institutions responsible for the protection, development and sustainable use of natural resources. Natural resources are the wealth of communities and so need to be protected, developed and sustainably used by locally organised community associations. Until recently the effort of the regional government in fighting land degradation mainly focused on biological and physical conservation measures. This was based on the assumption that the key factors in land degradation are natural factors (e.g. rainfall, topography and climatic factors), and therefore neglecting the role of various socio-economic factors. Although there were some efforts to involve rural communities, this was mainly through mass mobilisation for the construction of soil and water conservation measures and related tasks. In some programmes and projects, communities were also involved in the planning process to a limited extent.

7.4.1. Need to address grazing management

Recognising the severity of land degradation, the Government of Ethiopia produced a strategic framework, the Ethiopian Strategic Investment Framework, which resulted in SLMP, aiming to remove critical barriers – such as the lack of grassroots community organisations and livestock management based on free grazing – for scaling up best SLM practices. Considering this as an opportunity for effective SLM implementation, Amhara Region put maximum effort into addressing socio-economic factors of land degradation by establishing watershed user associations (WUAs). The introduction of the backyard livestock farming system – a livestock management system operated by organised communities with a view to improving livestock–crop–tree productivity while controlling adverse environmental effects of livestock under a free-grazing system – is the main outcome achieved through these WUAs.

As part of these efforts, Amhara Region enacted a proclamation in 2013 offering legal protection for the bylaws developed by the WUAs. The most pressing matter for the bylaws of WUAs is how to halt free grazing. Figure 212 depicts the process from bylaw development to WUA formation.

Figure 212: Producing a proclamation to support a WUA and the legalisation process.

7.4.2. Key features of the proclamation for WUAs

7.4.2.1. Formation process

Categorised into articles and sub-articles, the proclamation allows a community located in a micro-watershed to organise themselves with the view to protect, develop and sustainably use the natural resources within their locality. As a law enforcement mechanism, the proclamation is supported with regulation, direction and model bylaws. The process of formation of a WUA is fully participatory, with successive meetings and discussions facilitated and supported by extension staff. Although it is not obligatory for a member of the community watershed to also be a member of the WUA or cooperative, concerted efforts are made by extension workers to encourage all watershed community members to participate during the establishment of these bodies. The WUA executive committee members draft bylaws – an agreed enforcement instrument for approval by the community to guide the protection, development and use of the resources they have.

7.4.2.2. Organisation and management

The administration of a given watershed is implemented based on the organisation structure depicted in the organogram in Figure 213. Community members are organised as a WUA, based on proclamation 304/2013. The WUA, as an umbrella organisation, is fully responsible for the governance of all natural resources as well as the implementation of different livelihood interventions. Different subcommittees are established under it with the view to support the day-to-day implementation of the development process. The association is independent of the kebele agriculture office and the kebele administrative office. However, the association can receive support as required from the woreda agriculture office, kebele agriculture office and administration offices. Grievance and good governance committees involving the WUA and kebele-level agriculture and administrative offices are established to address conflicts and ensure equal and genuine participation of the community members.

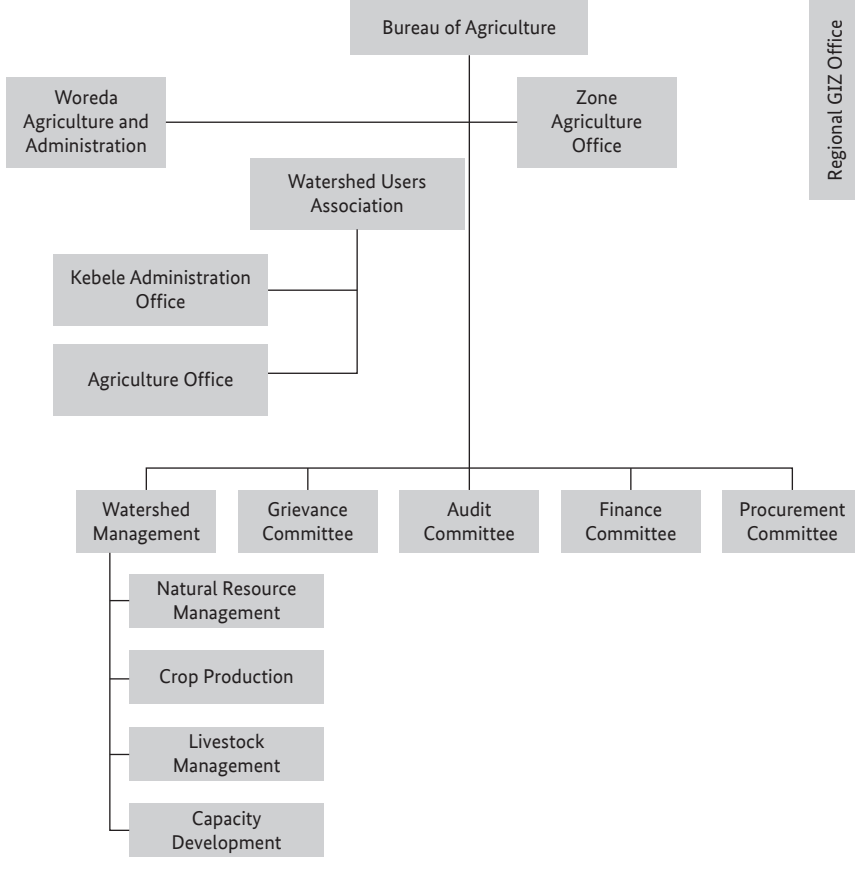


Figure 213: Organisational structure of Community-Managed Agricultural Development Initiative implementation.

7.4.3. Key achievements and lessons learnt

- **Increased capacity:** Focus group discussions with the watershed community and woreda extension workers, together with performance assessments of financial and physical resources, show that considerable capacity has been created at the community level within two to three years as a result of the community-based WUA arrangement, established to manage the watershed development initiative.
- **Ownership and empowerment:** Community members participate at different levels and are able to make decisions regarding their land and water resources. The WUAs have their own criteria to select beneficiaries as well as specific parameters used for the provision of different inputs. These are all supported with minutes. The functional revolving system, substantial community labour and material contributions from the communities are good examples in this regard.
- **Reduction in land degradation:** Communities have shown interest in land rehabilitation tasks and contributed significantly towards this goal, including via their agreed bylaws. The rehabilitated lands are currently used for different livelihood activities, as previously mentioned. Gullies are rehabilitated, degraded lands enclosed and treated with different productivity enhancement packages. These actions are also paying dividends in crop and livestock production. A comprehensive assessment of the role of WUAs in halting land degradation and enhancing agricultural (livestock and crop) productivity shows a significant improvement in productivity while maintaining their natural resource basis.
- **Engagement in other livelihood options:** 88% of the funds supplied by the project for the procurement of inputs started to be returned and so were used in the revolving fund. These funds are used for new technologies and inputs related to crops and livestock to produce more and increase income. This indicates that the community members can invest in other livelihood options.
- **Sustainability:** In this approach, institutions are strengthened and systems and processes are well established. This enables the management of funds and motivates people to participate in WUAs and the decision-making process. This community ownership helps sustain the watershed development intervention. The community is aware, informed and empowered to engage and negotiate with different stakeholders, for instance in the procurement of inputs.

Climate Sensitive Innovations for Land Management (CLM) Programme
Addis Ababa, Ethiopia
P.O. Box 100009
T +251-(0)11-5180 200
F +251-(0)11-5540 764
giz-aethiopien@giz.de
www.giz.de/ethiopia

Published October 2022