

# Enhancing the Role of the Forestry Sector in Building Climate Resilient Green Economy in Ethiopia:

Scaling up effective forest management practices in Tigray  
National Regional State with emphasis on  
area exclosures



Center for International Forestry Research  
Ethiopia Office  
Addis Ababa



THE FEDERAL DEMOCRATIC  
REPUBLIC OF ETHIOPIA  
MINISTRY OF ENVIROMENT,  
FOREST AND CLIMATE CHANGE

# **Enhancing the Role of Forestry in Building Climate Resilient Green Economy in Ethiopia**

**Scaling up effective forest management practices in Tigray  
National Regional State with emphasis on  
area exclosures**

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## FOREWORD

This regional strategy document for scaling up effective forest management practices in Tigray National Regional State, with particular emphasis on area enclosure, was produced as one of the outputs of a project entitled “Enhancing the Role of Forestry in Ethiopia’s Climate Resilient Green Economy”, and implemented between September 2013 and August 2015. CIFOR and our ministry actively collaborated in the planning and implementation of the project, which involved over 25 senior experts drawn from federal ministries, regional bureaus, federal and regional research institutes, and from Wondo Genet College of Forestry and Natural Resources and other universities. The senior experts were organised into five teams, which set out to identify effective forest management practices, and enabling conditions for scaling them up, with the aim of significantly enhancing the role of forests in building a climate resilient green economy in Ethiopia. The five forest management practices studied were: the establishment and management of area enclosures; the management of smallholder plantation forests; Participatory Forest Management (PFM); agroforestry (AF); and the management of dry forests and woodlands. Each team focused on only one of the five forest management practices, and concentrated its study in one regional state.

Accordingly, the team working on enclosures conducted its study in Tigray. The other teams examined practices in PFM; AF; the management of dry forests and woodlands, and smallholder plantations, and worked respectively in Oromia; in Southern Nations, Nationalities and Peoples; in Benishangul Gumuz; and in Amhara National Regional States. The five teams met regularly to exchange their findings. The findings of all teams were used in the write-up of this strategy, though this report focuses primarily on area enclosure. The engagement of senior experts and researchers from national and regional institutions made the document more relevant to the region, and the process created opportunities for building the capacity of all staff involved. The draft document was presented and discussed at various workshops, and was assessed and endorsed by the respective regional authorities.

The Ministry of Environment, Forest and Climate Change (MEFCC) will continue to be actively involved in similar processes. I take this opportunity to encourage relevant offices in the region to make best use of the document, and plan to further improve its content and scope by building on experiences to be gained during the implementation of the strategy. It is important that we systematically document the process and outcomes of the scaling up work and draw lessons. Implementing this strategy will further build the capacity of regions to plan and implement the scaling up of good practices in the forestry sector at large. The selection and scaling up of effective practices supports regional and national efforts to develop the forestry sector, and significantly enhances the contribution of the forestry sector to building a climate resilient green economy, as envisaged by the government.

On behalf of the MEFCC, I would like to thank all team members and their respective institutions for their contributions. I am particularly grateful to the Center for International Forestry Research (CIFOR) for initiating and implementing this joint project, which played an important role, not only in filling gaps, but also in building capacity at various levels.

I also thank the Strategic Climate Institutions Program (SCIP) for funding the project. As SCIP is financed by the Governments of the UK, Norway and Denmark, I would like to extend my appreciation to the peoples and governments of these three countries for their support.

Ato Kebede Yimam

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Addis Ababa

15 October 2015

## FOREWORD

Tigray National Regional State is endowed with a range of natural resources, including dry forests and woody vegetation, which represent the most widespread forms of vegetation. Forests, which are valued for a number of reasons, are critical to the wellbeing of the environment, the national economy, and society at large. They contribute significantly to household economies and food security, and thereby, to poverty reduction, economic growth, and social transformation.

The regional government, in collaboration with communities, relevant stakeholders and development partners, has worked hard to increase tree and forest cover, through a range of mechanisms, including afforestation, reforestation, enclosure, watershed development, and annual tree planting campaigns. As products and services are enhanced, these initiatives are improving vegetation cover in the region, restoring degraded lands and forests, and increasing their contributions to local communities and society at large.

However, the current state of forest development, management, and utilization is unsatisfactory, and improvements are required. Deforestation and degradation rates remain high around remnant high natural forests and in the region's dry forests and woodlands. The regulatory wings of the forest administration and respective law enforcement agencies must do more to reduce deforestation and degradation and the illegal movement of forest and tree products. There are also large areas of bare hills and mountain slopes, suffering from high rates of soil erosion and land degradation that require large scale rehabilitation and afforestation efforts. The overall situation calls for concerted efforts to identify and address the causes of land and forest degradation, and explore opportunities for forest sector development. In doing so, it is important that we identify effective forest management practices and scale them up, to enable the region and the nation to achieve the targets of the Climate Resilient Green Economy (CRGE) strategy document. Thus, a regional strategy is required to scaling up selected effective forest management practices.

To meet this need, CIFOR, in collaboration with the Ministry of Environment and Forest (MEF) and other relevant federal and regional institutions, initiated and implemented a project to identify effective forest management practices, and enabling conditions for scaling them up. The study in Tigray focused on enclosure management. The findings of the study were used as inputs in the write-up of this strategy.

Our regional bureau has been actively engaged in the writing and review of this document. Thus, we will do our level best to implement the proposed strategy and to use it in developing plans, programs and projects that will foster the development of the forest sector in general, and the wider use of selected forest management practices in particular. Finally, I would like to thank the authors of this strategy for producing such an important document, and CIFOR and MEF for initiating and implementing the project, by involving experts from our bureau and other institutions in the region. The region will make use of this strategy in its effort to significantly enhance the role of the forestry sector in building a climate resilient green economy.

Ato Hafta Kiros

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Tigray National Regional State, Mekelle

10 September 2015

## PREFACE

In addition to their direct contributions to household economies through wood and non-timber forest products, forests contribute significantly through their services to the environment and to various sectors of the national economy (i.e. agriculture, energy, water, health, tourism, etc.). Nationally, the forestry sector provides essential environmental goods and services, contributes to employment generation and income diversification, earning of foreign currency through export, and savings through import substitutions. The sector's ecosystem services for agriculture are well documented, although it is difficult to determine their economic value. Forests are, and will continue to be, important in the sequestration of carbon.

Unless growing demands for wood and other forest products and services are met, the rate of deforestation and degradation will continue to rise. Horizontal expansion of agriculture will result in the conversion of forests, woodlands, and bush lands to agricultural fields, if techniques to promote sustainable intensification are not implemented. Therefore, deforestation and degradation are major environmental challenges for Ethiopia. Thus, effective management of forest resources is critical. Identifying and scaling up effective forest management practices is key to significantly enhance the forest sector's contributions to local livelihoods, the national economy and the environment. Wider adoption of good forest management practices enhances the contributions of the forestry sector by building a climate resilient green economy. CIFOR, in collaboration with federal ministries and regional and federal research and higher education institutions, implemented a project that focused on identifying effective forest management practices for scaling up.

The study focused on the following forest management practices: exclosure management (based in the Tigray region), smallholder plantations (based in the Amhara region), agroforestry (based in the SNNPRS), PFM (based in the Oromia region), and the management of dry forests and woodlands (based in the Benishangul Gumuz region). Our team worked in Tigray and critically assessed experiences in exclosure management, in view of identifying good practices. The study also examined the limitations and weaknesses of this type of forest management, and identified a number of improvement measures. The team also considered other forest management practices, based on the findings of the teams working in the other four regional states. Specific suggestions were also made to further improve selected management practices. In selecting and proposing effective forest management practices for scaling up, the teams benefitted from a series of discussions with communities and senior experts from the region, and from national progress reviews and planning meetings. This strategy document was informed by the findings of our field and desk-based research, the results of graduate students' thesis research, and the comments and suggestions of participants at all levels.

The authors of the document would like to thank several individuals and institutions that contributed to the preparation of this strategy. In particular, our thanks go to the CIFOR Ethiopia office, for initiating this project and engaging us in its implementation. We thank our respective institutions for allowing us to be involved in the project and work on the write-up of this document. We are also grateful to the staff of the Woreda (district) offices, regional bureaus, the regional research institute, Mekelle

University, the Relief Society of Tigray (REST), German Technical Cooperation (GIZ) and other NGOs operating in the region, for taking part in the series of discussion sessions that we held. Their contributions have improved the content and relevance of the strategy to the region. It is our hope that this strategy will be implemented, and will serve as a basis to plan and implement further work to develop the forestry sector in the Tigray region.

## **The authors**



## ACKNOWLEDGEMENTS

This publication is an outcome of a project entitled “Enhancing the Role of Forestry in Ethiopia’s Climate Resilient Green Economy: A Knowledge, Action Research and Innovation Project”, which was implemented between September 2013 and August 2015. The project was designed and implemented by CIFOR in collaboration with its national partners, including the Ministry of Environment, Forest and Climate Change (MEFCC), the Ministry of Agriculture and Natural Resources, the Ethiopian Environment and Forestry Research Institute, Wondo Genet College of Forestry and Natural Resources and other higher education institutions and federal and regional research institutes. Over 25 senior experts from 16 organizations were engaged in the project. The intended outcome of the project was to identify effective forest management practices for scaling up, focusing on: area enclosure in Tigray; PFM in Oromia; smallholder plantations in Amhara; the management of dry forests and woodlands in Benishangul Gumuz; and agroforestry in Southern Nations, Nationalities and Regional States. The major project outputs are strategies for scaling up selected practices for each of the five regions as well as a national road map for the MEFCC to support national efforts to enhance the role of forestry sector in building a climate resilient green economy.

This strategy was prepared for Tigray National Regional State, and was produced with the support of senior experts from the MEFCC, Tigray Bureau of Agriculture and Rural Development, Tigray Agricultural Research Institute, and Mekelle University. We gratefully acknowledge the contributions of all individuals and institutions in providing information that facilitated the writing-up of this strategy. We gratefully acknowledge the contributions of all individuals and institutions in providing information that led to writing-up of this strategy. The draft of this strategy document was improved by feedback from experts and senior officials from the region.

The CIFOR Ethiopia office is grateful to members of the National Project Advisory Committee, which oversaw the project, to ensure its relevance and timely completion. I am particularly thankful to His Excellency Ato Kebede Yimam, State Minister of Forest, Ministry of Environment, Forest and Climate Change, for chairing the Project Advisory Committee for over two years. He attended all planned meetings and provided guidance to the project. He also took note of project findings, and encouraged researchers to generate policy and practice relevant findings, and better inform the activities of the Ministry and relevant regional bureaus. Members of the Project Advisory Committee included: the Dean of Wondo Genet College of Forestry and Natural Resources, the Director General of Oromia Forest and Wildlife Enterprise, Head of Amhara Forest Enterprise, Natural Resources Management Process Owners in the regional Bureaus of Agriculture of the five regions, and heads of the Natural Resources Research wings of regional agricultural research institutes operating in the five regions. Our sincere thanks also go to the authors and their respective institutions for their role in the write-up of the strategy, as well as to the respective regional bureaus for actively taking part in reviewing and approving the strategy document.

Our thanks also go to the SCIP Fund for financing the project. The SCIP Fund is financed by the UK, Norway and Denmark. To meet the emerging needs of our national partners, we revised the project activities twice in two years. I would like to recognize the SCIP Fund Management Team for their support with this. With their help, the team managed to plan and implement additional activities without increasing the project budget. We hope that this document will assist national efforts to develop the forestry sector, specifically related to the selection and wider adoption of effective forest management practices. It was also our intention that the process would help to build human and institutional capacity of national partners, which the project funders were particularly keen to achieve.

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## ABBREVIATIONS, ACRONYMS, SIGNS AND UNITS

AFE	Amhara Forest Enterprise
BoANRD	Bureau of Agriculture and Natural Resources Development
BoARD	Bureau of Agriculture and Rural Development
CBO	Community Based Organization
CRGE	Climate Resilient Green Economy
DADPTC	Debesaye Agricultural Development and Processing Technology Consultancy PLC
EBS	Ethiopia Bureau of Standards
GDP	Gross Domestic Product
GIZ	German Technical Cooperation
GO	Governmental Organization
GOE	Government of Ethiopia
GTP	Growth and Transformation Plan
FAO	United Nations Food and Agriculture Organization
Ha	Hectare
MEF	Ministry of Environment and Forest
MEFCC	Ministry of Environment, Forest and Climate Change
NGO	Non-Governmental Organization
NTFPs	Non Timber Forest Products
OFWE	Oromia Forest and Wildlife Enterprise
PES	Payment for Ecosystem Services
PFM	Participatory Forest Management
RDPS	Rural Development Policy and Strategies
REDD+	Reducing Emission from Degradation and Deforestation
REST	Relief Society of Tigray
SNNPRS	Southern Nations Nationalities and Peoples Regional State
TNRS	Tigray National Regional State
USD	United States Dollar

## SUMMARY

Most of Ethiopia's rural landscapes are characterized by high rates of deforestation and land degradation. Over the last decade, rehabilitation of degraded lands and degraded forests has become a priority on Ethiopia's natural resource management agenda. Among others, exclosures have been recognized as a successful means of restoring degraded landscapes. Although exclosure as a land restoration tool is practiced in various parts of the country, it is widely practiced in Tigray National Regional State (TNRS). Other regions, such as Amhara Regional State, also practice exclosure. In Tigray, over 1.2 million ha of land is currently managed through exclosure. Though TNRS has made significant efforts to promote wider use of exclosures, the efforts have not been guided by a management plan. Success rates vary from site to site, affected by geographic and management related variables. Thus, wider promotion of exclosure in the region and across the nation, should be guided by a scaling up strategy, formulated on the basis of lessons drawn from effective exclosure establishment and management practices. The scaling up process should be informed by empirical study of the successes and failures of past efforts.

Five national technical teams, each composed of five senior experts drawn from relevant Ministries, regional bureaus, universities and research centers, studied forest management practices, with the aim of identifying effective practices for scaling up. The forest management practices and regions chosen were: exclosures in TNRS, smallholder plantations in Amhara, participatory forest management in Oromia, agroforestry practices in Southern Nations Nationalities and Peoples Regional State (SNNPRS), and management of dry forests and woodlands in Benishangul Gumuz Regional State. This strategy was drafted based on the report of the team that studied exclosure in TNRS. The reports of the other four research teams were also consulted, so as to include other forest management practices relevant to the region. The team working on exclosures identified nine candidate exclosure sites in Tigray, in three major agro ecological zones: three each from Dega, Woinadega and Kolla ecological zones. The information generated was used to develop this regional scaling up strategy. It is hoped that this strategy will guide regional efforts to scale up effective forest management practices in general, and those related to the establishment and management of exclosures in particular, thereby enhancing the role of the forestry sector in building a climate resilient green economy in Ethiopia.

In this document, we define the term 'exclosure' as a method of rehabilitating land by protecting an area from the interference of animals and human encroachment for limited period of time, depending on site capacity and vegetation re-establishment. The aim of exclosure is to rehabilitate degraded lands within a given watershed (horizontal), and at regional and national level (vertical), in view of enhancing the ecological and socioeconomic benefits (functional expansion) of landscapes. Improvement measures should be identified, tested and applied to exclosure management before selected practices are scaled up, to increase the economic and ecological benefits of exclosures. This strategy also provides recommendations to guide the scaling up of good practices in the establishment and management of exclosures. It is recommended that the general approach to scaling up of effective exclosure practices should be made by piloting demonstration sites, to test the strategy's recommended improvement measures, and

incorporate other measures that community members may propose to further improve livelihoods and environmental benefits of selected practices. This will facilitate the wider adoption of promising options, and the elimination of less successful ones. In relation to governance, the federal government is responsible for issuing relevant national laws and acts. It is important that regional governments enact regional proclamations and directives that support the enforcement of national laws and acts. The strategy suggests that awareness creation activities should be planned and implemented, to train and better engage communities, experts, and administrators, and feedback should be systematically gathered and forwarded to policymakers, both at the regional and federal levels. The strategy underlines the need to align scaling up efforts with existing natural resource management initiatives. In line with this, it is recommended that the scaling up of exclosures is considered a key element of natural resources management, which can restore degraded sites in any given watershed.

The scaling up of effective practices related to the establishment and management of exclosures (hereafter referred to as effective practices in exclosure) should be aligned with national goals set in the Climate Resilient Green Economy (CRGE) strategy document of the Government and global declarations such as the New York Climate Summit Pledge. Furthermore, the strategy recommends that in managing exclosures, a wide range of products and services should be promoted, to support the livelihoods of local communities. Plans for the management and use of exclosures should consider fodder for livestock and bees, wood for construction and energy, and fruit trees for communities. The strategy also emphasizes that community participation at all levels of the scaling up process, is a key issue. The participation of different socioeconomic groups, aggregated by income, age and sex, is recommended. The strategy further suggests that the participation of communities should be encouraged at all stages, from planning to utilization. Bylaw formulation and approval should also involve the active participation of community members. There is also a need to assign qualified experts at all levels and continuously upgrade the knowledge and skill levels of experts, DAs, administrators and farmers through training. Both the Regional Bureau and the Federal Ministry need to work together in this regard. The strategy also indicates that successful scaling up cannot be ensured without an institutional arrangement dedicated to this specific task. Accordingly, the establishment of appropriate institutions at all levels (i.e. region, zone and woreda) is recommended. Moreover, the roles of various state agencies and non-state actors should be synergized. The scaling up process should be supported by up-to-date technologies generated by researchers. Hence, the strategy recommends that the regional office responsible for scaling up should work closely with research institutes, both at the federal and regional levels.

The strategy emphasizes the need to engage the private sector. As the private sector could play a key role in product marketing and value addition, there is a need to formulate legal frameworks that provide incentives for private investors. The strategy also proposes mechanisms to be used when approaching potential, private investors. It also stresses the need to establish a strong regional forestry institution. Furthermore, rigorous reporting and communication mechanisms are required. The strategy also elaborates on the benefits of establishing a regional forestry institution and linking it with the Federal Ministry. In addition to recommendations to guide the scaling up process, a number of

improvement options are proposed. For example, broadcasting with treated seeds of native flora could enhance species richness, density, average height and the growth of seedlings in exclosures. In arid areas, constructing in-situ water harvesting structures has been identified as the best means of enhancing water availability, and thereby improving the survival of seedlings. Enhancing site-specific post-planting care is also vital to improving the survival and growth of planted seedlings. Management related challenges in most exclosures include lack of objectives, and the absence of a management plan to guide the achievement of objectives during the establishment phase. The strategy emphasizes that the long and short-term objectives of exclosure establishment, and the management plans to support the achievement of these objectives, should be clearly decided in a participatory way. Furthermore, as fragmentation represents a significant management challenge, the strategy recommends the establishment of corridors to align area exclosures with nearby sources of germplasms to maximize their biodiversity, and ensure multiple environmental benefits. These corridors interconnect systems, which facilitates the easy movement of genetic material, minimizes inbreeding and broadens the gene pool of the entire system. The strategy proposes that the best ownership model is one that fits the local context. For instance, in some parts of Tigray, it is generally accepted that use rights can be granted to individuals organized in cooperatives (i.e. individuals nested within cooperatives/unions).

The strategy also recommends the development of generic bylaws that place less emphasis on punitive actions, and are instead tuned to achieving the socioeconomic and environmental goals of exclosures. While enriching exclosures by planting high value and marketable tree, shrub and grass species help in improving productivity, performance based benefit sharing mechanisms are required to ensure equity. In addition to this, carbon trading schemes and ecotourism represent opportunities to increase economic incentives, and thereby realize the sustainable management of exclosures. This strategy also addresses forest management practices, other than exclosure, that can be scaled-up in Tigray. These include Participatory Forest Management (PFM), agroforestry, smallholder plantations and the management of forests and woodlands in dryland areas. The strategy also describes key issues such as strategic directions for scaling up. It identifies key stakeholders and their roles, as well as potential risks and possible mitigation measures. Monitoring and evaluation mechanisms to accompany the scaling up processes are also recommended. The strategy document concludes by indicating the key issues that should be considered during the scaling up of effective forest management practices at national level.



# 1 BACKGROUND

## 1.1 Introduction

Deforestation and degradation of forests, woodlands and agricultural lands are significant challenges to natural resources management in Ethiopia, which undermines landscape productivity. Hence, the rehabilitation of degraded lands and forests is a priority on Ethiopia's natural resource management agenda. PFM has been recognized as an important mechanism to engage communities in the responsible management and use of natural forests. The government is also engaged in the rehabilitation of large areas of degraded lands through area exclosures. Smallholder farmers are also expanding their woodlot plantations. In Southern Ethiopia, traditional agroforestry practices enable communities to intensify and diversify production, while also maintaining high vegetation cover of the landscape. Exclosures have been recognized as successful instruments for restoring degraded landscapes. Although exclosure has been practiced as a land restoration tool in various parts of the country, it is in Tigray National Regional State (TNRS) that it is officially pursued by the regional government for the longest time. Other regions, such as Amhara and Oromia Regional States, also promote exclosures. A report by Tigray Regional Bureau of Agriculture and Rural Development (BoARD, 2013) indicates that approximately 1,288,445 ha of land in the region is managed through area exclosure. Although TNRS has expanded exclosures on hillsides and degraded communal lands, these rehabilitated exclosures were not guided by management plans. Success rates are variable from site to site, affected by geographic, managerial and administrative variables. Future exclosure interventions in Tigray and other regions, should be guided by a scaling up strategy formulated on the basis of lessons drawn from selected practices. Scaling up and wider adoption can be guaranteed by a strategy informed by empirical study of the successes and failures of past efforts. However, thus far, no systematic national studies have been conducted to identify good practices among these initiatives, and document enabling conditions for scaling them up.

A joint project by CIFOR and the Ministry of Environment, Forests and Climate Change (MEFCC) was implemented between September 2013 and August 2015 to help fill these gaps in knowledge. In 2014, five national technical teams were established to identify effective practices in five forest management areas, and their impacts on livelihoods and the landscape. This strategy document was produced by one of these five teams, which focused on identifying effective practices in the management of exclosures in TNRS. The information generated from field research, and a series of consultative meetings with experts and communities, was used to develop this scaling up strategy. This information was also used in the write-up of a section of the national road map for scaling up effective forest management practices in Ethiopia, on establishing and managing exclosures. Research reports from the other four research teams were also consulted in proposing other effective forest management practices (i.e. PFM, agroforestry, the management of dry forests and woodlands, and smallholder plantations) to be tested and scaled up. This strategy aims to guide forest development initiatives, and support the scaling up of effective forest management practices, particularly the management of exclosures, in order to significantly enhance the role of the forestry sector in building a climate resilient green economy by 2030.

## **1.2 National and regional context**

### **1.2.1 Country profile**

As a result of its long history of farming on hillsides, and its largely rural, agriculture-dependent population, Ethiopia is faced with high rates of deforestation and land degradation. Commonly cited causes are: extensive forest clearing for agricultural use; overgrazing; and the exploitation of existing forest for fuel, fodder and construction materials (Bishaw 2001). Poor conditions are more pronounced in northern Ethiopia, where land degradation has been accelerated by long-standing human impacts, including changing land use and deforestation (Hurni 1988; Nyssen et al 2009), and significant demand for biomass for the ever-increasing human and livestock populations (Tekle 1999). The most effective countermeasures taken to halt this process include planting trees, and assisting natural regeneration by excluding human and animal interference in the form of exclosures (Pohjonen and Pukkala 1990; Tekle 2001). Exclosures aim to contribute to the overall objectives of environmental rehabilitation and poverty reduction. Exclosures refer to formerly degraded communal grazing lands that are protected from human and animal interference, to promote natural regeneration of plants, reduce land degradation (Mekuria et al. 2009), and increase the biodiversity of indigenous species. Exclosures have been reported to be effective in restoring native plants (Mengistu et al. 2005; Aerts et al. 2007), improving soil attributes, and reducing soil erosion (Descheemaeker et al. 2006a, 2006b).

### **1.2.2 Tigray Regional State**

In Tigray, resource degradation and rainfall variability are major challenges to agricultural development. Agricultural production in northern Ethiopia, specifically in Tigray, has a long history, and there has been significant anthropogenic influence on the natural vegetation. The ever-increasing need for arable and grazing land, has meant that forests have been limited to marginal lands. Deforestation has now reached such a level that even forests in less accessible and marginal lands are being cleared. Most farmland is characterized by excessive utilization of biomass (e.g. crop residue is removed from crop fields soon after harvest for animal feed or for fuel). In addition to this, soil erosion has resulted in shallow soil. Grazing lands are overgrazed, which results in high levels of soil erosion, low vegetation cover and diversity, and declining productivity. Environmental degradation, drought, and socioeconomic instability are common in contemporary Tigray (TFAP 1996).

Through the use of exclosures, degraded sites are demarcated and managed using agreed upon management and plan between the community and the State on one hand and among community members that are establishing and managing exclosures. Access is limited through the use of social fencing. Exclosures have been widely promoted, especially in the northern and central highlands of Ethiopia. For example, in TNRS alone, close to 1.3 million ha are reportedly under area exclosure (BoARD, 2013). Exclosures have helped to rehabilitate degraded lands and have significantly increased vegetation cover in the region. They improve the availability of animal feed, wood for energy and construction, and enhance regeneration. They also play important ecological roles in: biodiversity conservation; preventing soil erosion and sediment deposition; enhancing water infiltration and stream and groundwater recharges; and reducing flooding (Aerts et al. 2008). In addition to this, they offer important cultural services, have aesthetic value,

can be used for educational purposes, and contribute to above and belowground carbon sequestration. In recognition of the economic and environmental roles that exclosures could play at national level, the Government of Ethiopia (GoE) has made plans to put millions of hectares of degraded forests and communal lands under exclosure. However, information on effective practices in the establishment and management of exclosures, and options to enhance their economic and ecological benefits, remain limited. Furthermore, improvement measures to enhance the performance of these practices, as well as enabling conditions to support their scaling up, have not been identified. Such information serves as key input for developing a scaling up strategy that is responsive to specific socioeconomic and ecological set-ups. Thus, the main objective of this document is to identify best practices in the establishment and management of exclosures, and propose measures to scale up these practices at regional and national level, thereby significantly enhancing the role that the forestry sector plays in supporting the efforts of the GoE to build a carbon neutral economy by 2030.

### **1.3 Overview of the forestry sector in Ethiopia**

#### **1.3.1 The forest resource base and management**

Ethiopia is endowed with various ecosystems that are composed of diverse fauna and flora. The vegetation of Ethiopia comprises over 7000 species, of which, 1150 are endemic to the country. It also harbors diverse fauna including 240 species of mammals and 845 species of birds, of which, 22 species of mammals and 24 species of birds are endemic (Teketay et al. 2010). The landscape, which ranges from low altitudes in the northeastern lowlands to a chain of mountains in the northern highlands, forms the basis of Ethiopia's diverse ecosystems. The northwestern part of Ethiopia supports the country's high forest ecosystem. The central highlands also support dry montane forests, which harbor economically important tree species. The forest ecosystems in Ethiopia's southwestern and central highlands are useful, not only for the supply of wood, feed, energy and environmental goods and services, but also as habitats for rich biodiversity, including endemic birds and other wild animals.

Many Ethiopians are dependent on goods and services obtained from forests. Forests provide firewood, which is a major energy source for rural and urban households. National demand for firewood is estimated to be 20% higher than the combined demand for all other forest products, which is estimated to be approximately 109 million m<sup>3</sup>yr<sup>-1</sup> (EFAP 1994; Teketay et al. 2010). The majority of demand for construction wood is met by natural forests. Several edible and medicinal plant parts are collected from forests. Major farm implements are made of wood that is extracted from the surrounding natural vegetation. Most household furniture is locally processed from indigenous tree species growing in natural forests. A considerable number of rural people earn their income from sale of fuelwood and charcoal.

Despite the significant services provided by forests, reliable information on Ethiopia's vegetation resources, including information on: their spatial coverage; distribution; changes over time (i.e. deforestation or re-growth); growing stock in the standing vegetation; and regeneration and recruitment status, are scattered and inconsistent (Teketay et al. 2010). According to a census by the Woody Biomass Inventory and Strategic Planning Project (WBISPP 2004), a total of 59.7 million ha of Ethiopia's land is covered by woody vegetation. Of the total woody vegetation, 6.8% is high forest (approximately 4.07 million ha), 49%

is woodland (29.24 million ha), 44.2% is shrub land or bush land (26.4 million ha), and plantations cover an estimated 955,705 ha. In terms of regional distribution, the three regional states that account for the largest areas of high forest in the country are: Oromia (62.5%); Southern Nations, Nationalities and Peoples Regional State (SNNPRS) (19%); and Gambella (9%), while the regional states that account for the largest areas of woodlands and shrub lands/bush lands are: Somali (33%); Oromia (32%); and Amhara (10%) (WBISPP 2004).

### **1.3.2 Significance of forestry to the national economy and local livelihoods**

Ethiopia's forest resources play a significant role in the livelihoods of local communities and the national economy at large. Their direct roles include the provision of: energy, construction poles, timber, and non-timber forest products (NTFPs), which are highly valued for their food, medicinal and commercial values. Accurate valuation of the direct and indirect values of forest resources is limited by the lack of a reliable and consistent database and a proper forest accounting system. Therefore, estimates of the economic contributions of forest resources are usually based on case studies and site specific assessments. There are several case studies that indicate the significance of forest resources.

For example, 90% of the households in Bench Maji, Kaffa and Sheka zones in the southwest of the country, reportedly harvest NTFPs, including forest coffee, forest honey, wild forest spices (e.g. Ethiopian cardamom, long pepper and turmeric) and bamboo (Heckett and Aklilu 2009). The same study indicated that households earn 73% of their annual cash income from sale of NTFPs. According to Forum for the Environment (FFE) (Heckett and Aklilu 2009), a conservative estimate of the value of NTFPs, including forest coffee, is approximately USD 249,638,556 per year. According to FAO (2006), the sum of the values of firewood, industrial wood and NTFPs is estimated to be USD 752,869,000 per annum, with fuelwood representing 85% of this value. The contribution of the sector was estimated to represent approximately 6% the total GDP of USD 12.7 billion. However, this figure increases when the indirect values of various ecosystems are taken into account. For instance, based on an estimate of 4 million ha of high forest and global environmental values of forests, FFE (Heckett and Aklilu 2009) estimate that the Ethiopian high forest provides ecosystem services worth approximately USD 6,276,000,000. Regardless of the accuracy of the accounting systems used, the presented figures suggest that the forest sector has significant actual and potential value. Forest products that could be utilized under a sustainable management plan include: semi-processed wood products, charcoal, bamboo, natural gum, ecotourism, spices and forest coffee.

### **1.3.3 Sectorial policies and strategies**

Over the past few decades, the Ethiopian government has put several sectoral and cross-sectoral policies, strategies and programs in place, with the aim of enhancing the socio economic and environmental contributions of the sector. These include the Rural Development Policy and Strategies (RDPS), the Forest Conservation and Utilization Policy and Strategy, the Federal Forest Law, the Environmental Policy of Ethiopia, three successive five-year development plans, the CRGE Strategy, and Ethiopia's REDD+ Readiness Program. These policy provisions and key programs are summarized briefly in the following sub-sections.

**Environmental policy (1997).** This is one of many policies that directly relate to forest development and conservation. Ethiopia's environmental policy was approved in 1997, and aims to improve quality of life through sustainable development and utilization of natural resources. It also aspires to conserve traditional resource management practices. The policy includes provisions for: soil management and sustainable agriculture; forests and tree resource management; and genetic, species and ecosystem diversity conservation and management. These provisions play important roles in guiding efforts to promote afforestation and re-afforestation.

**The Rural Development Policy and Strategy (2001).** The RDPS document was issued in November 2001. This document underlines the need to rehabilitate and restore the country's degraded natural resources. It advocates for well-planned tree planting initiatives. Specifically, it emphasizes the integration of tree planting in agricultural landscapes. This policy led to a number of encouraging achievements related to exclosures, sustainable land management initiatives, and watershed management programs. However, achievements related to afforestation and re-afforestation remain limited. A lack of implementation instruments, such as regulations, directives, and relevant, well-resourced institutions, are key factors that undermine success. For example, Lemenih and Woldemariam(2010)reportthatoverthelastdecade,theforestrysectorhasreceivedlessthan10% of the overall budget allocated to the Ministry of Agriculture, both at federal and regional levels.

**Forest Conservation and Utilization Policy and Strategy (2007).** The formulation and enactment of this policy reflect the government's commitment to enhancing the nation's forest resource base. The main objective of this policy is to increase the economic contributions of the forest sector, and satisfy the nation's demand for forest products, by promoting sustainable forest management and utilization practices. The policy also encourages the engagement of the private sector and local communities in the management of production and protection forests. The policy introduces an incentive mechanism in the form of reduced land taxes, to promote the establishment and development of private and community-owned forests. The policy recognizes the need to certify forest use rights, which is important to enhancing afforestation and re-afforestation programs. Furthermore, the policy supports the management of dry forests and woodlands in a way that allows the conservation and sustainable utilization of native trees and shrubs. However, key provisions in the Forest Conservation and Utilization Policy and Strategy have not been clearly translated into binding legal articles, nor are there concrete implementation directives. Exclosure as a tool to promote natural regeneration of native trees and shrubs could benefit from this policy.

**Forest Development, Conservation and Utilization Proclamation (2007).** The Forest Development Conservation and Utilization Proclamation number 542/ 2007 is the most recent national forest law. It provides legal grounds to the Forest Conservation and Utilization Policy and Strategy of 2007. The proclamation recognizes two types of forest ownership, i.e. state, and private (which pertains to both communal and individual/private ownership). The proclamation has been criticized by lawyers for focusing mainly on penalties to curb wrongdoing and less on incentives and supports to encourage good behavior. Furthermore, a lack of regulation to ensure the effective implementation of the

proclamation has been described as a significant bottleneck.

**The 2011-2015 Growth and Transformation Plan (GTP) and the 2011 CRGE Strategy.**

The Ethiopian Government launched the 2011-2015 GTP with the intention of making Ethiopia a middle income country by 2025. The GTP envisages that the country's GDP per capita will grow from 378 USD in 2010 to 1271 USD in 2025. The GTP stresses the need to strengthen natural resources conservation and management. In line with this, the major forestry sector activities proposed by the first GTP include: the rehabilitation and restoration of degraded lands through enclosure; multipurpose tree planting; and the development of management plans for priority forests and tree seed collection and distribution. The CRGE is Ethiopia's recent green growth development strategy. The plan has identified four pillars, one of which is forestry, and emphasizes the protection and re-establishment of forests, in recognition of their economic and ecosystem services, including as carbon stocks. The CRGE has set a target to sequester more than 40 million tons of CO<sub>2</sub>e by 2030, through the afforestation and reforestation of 3 million ha of land, and the sustainable management of 4 million ha of forests and woodlands. Moreover, at the New York Climate Summit, Ethiopia made a pledge to restore 15 million ha of degraded forests and land by 2030, which is evidence of the government's determination to restore degraded lands. This strategy represents an opportunity to scale up successful examples of tree planting, enclosures, PFM and other forest management practices.

**The National REDD+ Program.** REDD+ provides incentives for developing countries engaged in forest conservation and carbon sequestration. This global carbon offsetting mechanism provides a financial flow to forest dwelling communities. REDD+ will be embedded in the national CRGE implementation strategy. Ethiopia aspires to reduce deforestation and forest degradation by addressing their underlying drivers and immediate causes. Strategic interventions include the sustainable management of existing forests and the creation of new forests. Ethiopia considers REDD+ to be a promising opportunity, and a viable source of sustainable finance for investment in forest management, conservation, and restoration. This represents a way of enhancing the multiple benefits of forests, including carbon sequestration and biodiversity conservation, watershed management, increased resilience to climate change, improved livelihoods and reduced poverty. Therefore, REDD+ is expected to create opportunities for the forest sector to further contribute to the overall, national goal of sustainable development.

**1.3.4 Links between the forestry sector and other sectors**

Several sectoral policies and functions may directly or indirectly link with the forest sector. Sectors with interacting functions must be managed well to ensure sustainable development. Successful integration ensures the complementarity of the various sectors' activities, and facilitates the achievement of the nation's development goals. Sectors that are closely linked with the forest sector are briefly discussed in the following section.

**Agriculture:** Agriculture is closely linked to the forest sector. Successful afforestation and re-afforestation programs positively affect the productivity of agricultural landscapes, by preventing soil erosion and downstream flooding. Forests maintain a healthy

hydrological cycle, ensuring recharge and replenishment of ground water. Moreover, if firewood is widely available, crop residue can be used to fertilize farmlands rather than for cooking and heating. On the other hand, a desire to increase grain production may trigger the expansion of agricultural lands, and the conversion of forests and forest lands to crop fields. The livestock sector is also closely linked to the forest sector. Free grazing is a practice that hinders the natural regeneration and survival of seedlings. In countries with high livestock populations, such as Ethiopia, free grazing creates a considerable problem for the forest sector. On the other hand, forests are significant sources of fodder for livestock, especially during the dry season. This is particularly true in arid and semi-arid areas, where trees also serve as shade for livestock.

**Water and Energy:** Both the quality and quantity of a catchment's water supply is largely dependent on vegetation cover. Afforestation and re-afforestation of upper catchments, using appropriate tree species, guarantees a regular flow of clean water. However, tree species with high transpiration rates may deplete the water resources of a catchment. Thus, the tree species that cover catchment areas must be managed in order to maintain a positive water budget. The energy sector is also closely linked with forestry. Trees planted in the upper catchments are vital to safeguarding hydroelectric power projects. The forest cover in the upper catchment ensures downward infiltration of water, and minimizes downstream runoff and silt. Moreover, a continuous flow of tributary rivers within the catchment area of hydroelectric mega projects, ensures a sustainable water supply and uninterrupted power generation.

**Tourism:** Forests have positive impacts on tourism, as they serve as habitats for wildlife and create attractive green landscapes. Income from tourism can be used to fund the management and development of forests. However, tourism can also negatively affect forests. Felling trees for the development and construction of hotels and restaurants reduces forest cover. In addition to this, camping tourists may cause forest fires.

**Roads:** Road development often requires the felling of trees and may affect important forests. On the other hand, roads also facilitate access for those responsible for managing forests. Roads improve access and reduce marketing costs of inputs and products, and this may encourage the engagement of the private sector that has the potential to contribute to the overall development of the forest sector.

## 2 THE FORESTRY SECTOR IN TIGRAY NATIONAL REGIONAL STATE

### 2.1 Forest resource base of the region

Tigray is a region with long history of agriculture, and located in the northernmost part of the country. Most of the region is arid or semi-arid. Due to its varied topographic features, the region has diverse and distinctive agro ecological zones that make it a center of diversity. The vegetation of the region is also diverse, and ranges from Afro alpine to desert. However, the biological resources of the region have been seriously depleted as a result of anthropogenic factors. Land degradation is a notable phenomenon in the region. Historically, land degradation, including deforestation, was prompted by early settlement and agricultural practices (Argaw 2005). For example, soil erosion as a result of vegetation clearing in the highlands of Tigray, is believed to have begun in the Middle Holocene (Bard et al. 2000). Deforestation and degradation of natural forests are major problems that influence ecosystem health in many parts of the region. During the Early Holocene, the northern Ethiopian highlands were characterized by a humid climate and dense vegetation (Bard et al. 2000).

Evidence suggests that significant human impacts on northern Ethiopia's Podocarpus-Juniperus forest began in the last 3000 years (Darbyshire et al. 2003). Some of the natural forest remnants (e.g. Hugumburda forest, church forests) indicate that the northern highlands were once covered with high canopy forest. The main forest relics of the region are found in protected areas near churches and in inaccessible areas such as river gorges, and they are highly fragmented (Aerts 2006).

Tigray Regional State has a total area of 5,170,225 ha. The region has divided the land into: areas that can be developed (4,459,204 ha); areas to be conserved by mass mobilization and projects (1,870,421.5 ha); total conserved area (2,953,237.3 ha); and untreated areas (1,505,969 ha). Approximately 37% of the land in the region is agricultural land, followed by shrub land (27%), forest/dense shrub land (19%), bare land (10%), mixed *Boswellia* and other trees (3.5%), grassland (1.8%), *Boswellia* woodland (1.3%) and approximately 0.08% is covered by bodies of water (DADPTC 2014). In Tigray, there are five state forest priority areas, and one federal forest priority area that are located across 12 woredas (Table 1). The vegetation of the region's highlands is primarily Afromontane forests (White 1983). The dominant species among the natural forest remnants are *Olea europaea* ssp. *Cuspidata* and *Juniperus procera*, while *Acacia etbaica*, *Euclea schimperii*, and *Dodonea viscosa* are commonly found in degraded forests and exclosures. *Boswellia-Commiphora* woodlands cover most of the western lowlands.

Table 1. Forest Priority Areas in Tigray Regional State.

Name state forest	Area
Hermi	30,987
Wujgmahgowaren	17,376
Hugumbrga Gratkahsu	21,564
Asimba	4,253
Waldba	94,000
Desaa	97,300
Total	265,480



Other forests such as Kafta Mesil are in the process of being designated as forest priority areas. Ethiopia has 14 national parks. There is a need to increase this number, as well as the size of existing national parks. Tigray's Kafta Sheraro National Park (KSNP) is one of Ethiopia's newest parks, and harbors a wide range of wildlife.

## **2.2 Governance**

The Federal Democratic Republic of Ethiopia's constitution apportions responsibility for the development of laws on natural resources governance to the federal government, while the administration of natural resources is the domain of regional states. Thus, major legal frameworks are developed at federal level, while regulations and provisions to support enforcement can be developed regionally, on the basis of federal government laws.

There are isolated pockets of forest development success in Tigray that have yet to be scaled out. These successes need to be supported by appropriate policy and governance. Though the 2007 Forest Policy proposes tax incentives for farmers who are planting trees, thus far there are no well-formulated frameworks to translate this policy into practice. There are also no legal tools to support the region's efforts to enforce national laws (e.g. Forest Proclamation Number 542/2007 as National Forest Act has not yet been issued), which limits the region's ability to take legal measures to develop and conserve its forest resources. There is a communication gap between forestry technical experts and lawyers because of the lack of such instruments, as well as a notable lack of robust legal support to encourage the participation of the private sector.

Thus, there is a need for well-articulated, comprehensive policy and governance, to ensure farmers' engagement in forestry development in general, and in scaling up exclosures in particular. There is increasing interest in exclosure development to increase rural productivity, and as a climate change adaptation mechanism, due to the role of exclosure in the CRGE. Ethiopia, as a country that prepares itself to benefit from REDD+ initiatives, will also benefit from the promotion of exclosures as vehicle to sequester carbon. It is also important to develop appropriate policy and governance options to promote the scaling up of exclosures in the region. In general, forest policy and governance in the region should identify the major policy challenges to the development of exclosures, and should recommend ways to enhance the role of exclosures in supporting climate smart agriculture and green development economic pathways.

## **2.3 Major drivers of deforestation and forest degradation and mitigation measures**

In Tigray Region, deforestation and subsequent unsustainable agricultural management, as well as the use of dung and crop residues for energy, have resulted in: the reduction of soil organic matter and nutrients, hydrological disequilibrium, reduced primary productivity, and low biological diversity (Solomon et al. 2002; Lemenih and Teketay 2005). Deforestation and land degradation reduce the ability of the land to support the delivery of these vital ecosystem services (Bishaw 2005). This has severe consequences on the livelihoods of rural populations. The major drivers of deforestation and forest degradation in the region include: illegal resettlement, expansion of farming, free grazing, forest fires, pests and diseases, and unwise utilization. Illegal resettlement, seasonal migration from the region's highlands (i.e. 'wofer zemet'), and free grazing are

common drivers instigated by pastoralists in the dry Afromontane natural forests and western lowlands. Forest fires are common in the western lowland forests. The major threat to *Boswellia* woodlands is the unsustainable utilization of this resource. Shifting cultivation is another major driver of deforestation in the lowlands of western Tigray, which is a significant ecological zone for the growth and development of *Boswellia* and other woodlands. Pests and diseases are common in *Olea africana*-dominated dry Afromontane forests and *Boswellia*-dominated woodlands. Moreover, abiotic stresses and various diseases have been observed in *Eucalyptus* plantations. Moisture deficiency and poor soil fertility are among the common natural factors that limit the growth and development of trees and shrubs.

The major factors driving the loss of forests are primarily anthropogenic. These factors have left most parts of the region devoid of vegetation. In response to land degradation caused by natural and anthropogenic factors, communities in the region began to establish exclosures approximately three decades ago. Communities continue to practice exclosure due to their strong conviction that this practice protects the environment, improves the climate, improves the water balance and the groundwater table, and supports the production of wood, which is required for household energy, furniture, and construction purposes. These presumed ecological, social and economic benefits contribute to the wider acceptance of exclosures and their dissemination in Tigray.

## **2.4 Challenges and opportunities for forestry development in the region**

### **2.4.1 Major challenges**

The challenges hindering the development of the forestry sector in Tigray can be categorized into: policy related, institutional, extension system related, market related, information system related, and other challenges. The following section describes these challenges in detail.

#### **(i) Bio-physical challenges**

Most of the region is covered by drylands. There are also large tracts of hilly topography. This topography, combined with a lack of moisture and poor fertility pose a challenge to the growth and development of trees. In many cases, the prevailing biophysical challenges lead to the poor survival of planted and regenerated seedlings.

#### **(ii) Policy related challenges**

**Unclear tenure status of forest lands and tree resources:** In many cases, rights to trees are separate from rights to land, and both land and tree tenure insecurity may discourage people from making or continuing long-term investments, such as exclosure development, agroforestry practices, woodlot development and other forestry practices. If people do not hold official land titles, there is a perception that investing in trees is futile, as it can take a long time for benefits to materialize. There are government restrictions on harvesting tree products from certain indigenous species, to ensure their protection. In many of Ethiopia's regions, forest regulations inhibit tree growing on farms, as there are restrictions on harvesting, cutting and selling the products of some species. For example, the regional government in Tigray restricts the use of nine species, such as *Boswellia papyrifera*, even on private land. Alternatively, the Regional Bureau of Natural

Resources may control the management and harvesting of trees by issuing permits, which prevents the farmers who plant the trees from managing the products as they wish. In some cases, the bureaucracy surrounding this process makes the permits very difficult to obtain, and in other cases, harvesting may be completely forbidden. Although these regulations are usually well-intentioned, they often discourage farmers from planting and protecting naturally regenerating seedlings. Some of the natural forests, such as Hugumbrda, are not well demarcated. Many natural forests, such as Desaa, fall between two regions and this could jeopardize the effective management of such forests.

**A lack of payments for environmental services (PES):** Forestry/exclosure generates significant ecosystem services, such as watershed protection, soil and biodiversity conservation, carbon sequestration, and the minimization of climatic and financial risks. Yet, without government involvement in the provision of greater incentives, the level of private investment in forestry may be less than expected. Well designed and implemented forestry interventions at landscape level have many benefits that contribute to the sustainability of the ecosystems upon which people depend. However, these environmental and economic services are not valued by the market, meaning that development actors and farmers have to assume the costs of production and land use systems that benefit the nation. Introducing PES, including carbon financing, to forest landowners and managers, provides a means of obtaining additional income, may promote more widespread forest development and conservation practices, and adds value to existing forests. A lack of incentivemechanisms(in the form of PES) may limit the forest development efforts of the region.

**A lack of financial support for small and large-scale forest development:** There are no strong financial institutions that provide long and short-term loans for forestry development and utilization activities. Favorable credit terms are in place for certain agricultural crops, but not for trees and forests.

**A lack of certification:** Some tree based products, such as medicines, fruit juice, and other products require certification from the Ethiopian Bureau of Standards (EBS). EBS is mandated to certify all products before consumption or use. However, most tree based products and their derivatives are not certified. Similarly, trade in medicinal plants is not controlled, and there is no robust legal framework to regulate the production and marketing of traditional medicine in the country and the region. This lack of a legal framework prevents producers of traditional medicines and other products from fully benefitting from this trade, as their products are undervalued by both farmers and vendors/traders. Therefore, this affects the potential development of value chains for forest products.

### (iii) Institutional challenges

**Lack of adequate human resource capacity:** The generation of technologies and management practices for forestry is a relatively new undertaking, and is therefore underdeveloped compared to agricultural innovations. Unlike annual crop production, technologies for forests require more time to generate and demonstrate. A skilled workforce is also important for the successful production and marketing of products. Forest development and conservation activities should be guided by trained foresters

working at all levels. A lack of adequate human resources and frequent turnover represent additional challenges. For example, there is a lack of forestry development agents at Kebele level.

**Poor access to tree seed and germplasm:** One of the greatest constraints to forestry development in Ethiopia is the limited availability of good quality seeds and planting materials in sufficient quantities. While established institutions and private sector players already exist to ensure the propagation and distribution of annual crops, there is no dedicated institutional structure to make tree seeds available to users at district and Kebele levels.

**Lack of adequate research and extension capacity:** The extension system at regional level has very limited experience in forestry extension, except in the distribution of seedlings. Forest extension efforts in the region are limited by a lack of appropriate and locally adopted extension packages focusing on trees, agro forestry and forestry, a lack of training for extension workers; and unclear responsibilities among existing forestry institutions. Limited efforts in forestry extension and research have tended to emphasize planting trees, with little regard for demand and market values.

**Forestry as an orphan enterprise:** Forestry had a de facto “orphan” status in the Ethiopian agricultural research and extension system until the establishment of the MEF in 2013. In principle, forestry is important to many sectors, including the water, energy, and agriculture sectors. However, the region does not have a specialist forestry institution. Units of the Bureau of Agriculture and Natural Resources Development (BoANRD) dealing with forestry have historically had relatively limited resources, and have often played a policing rather than advisory or facilitator role. More recently, forestry has received greater attention, due to its role in climate change adaptation and mitigation strategies, and is now managed by the BoANRD. Frequently, the relevant bureaus do not have capacity to support forestry in a meaningful way at the community level, and must rely on external funds for implementation. However, inter-sectoral planning and resource sharing is very rare. There is also uncertainty regarding whether the regional government would prefer to keep forestry activities under BoANRD, or to establish a separate bureau. This should be decided soon, in order to actively support the development of forestry in the region.

#### (iv) Extension system related challenges

**Emphasis on annual crop husbandry:** Forestry practices are knowledge intensive and require long-term commitment. Thus, they are not disseminated as quickly as agricultural technologies. Existing forestry extension emphasizes on seedling raising, tree planting and silviculture using conventional forestry development methods, copied either from developed countries or from the humid tropics. The methods have not been customized to the prevailing conditions of the region. In many cases, forestry extension agents are unavailable, or agencies are so understaffed that they cannot easily meet their commitments to provide training for farmers on new silvicultural methods. Most extension agents are trained in general natural resource management with a focus on soil and water conservation. Most of the efforts of agricultural extension agents focus on short-term monoculture cropping systems, and place less emphasis on the potential for improved varieties in multispecies forestry systems. Breeding of trees and shrubs for commercial and protection forests received relatively little attention. This has slowed down the pace of development for new

technologies suitable for local farming systems, and has limited the development of the sector.

**Limited knowledge of the multifaceted advantages of forestry:** Although studies have demonstrated that forests increase household incomes, particularly in poor and female-headed households, and generate environmental benefits, these facts have not been widely disseminated. Many success stories in forest development have only been disseminated at a local level, and their significance and potential for wider adoption have not been systematically studied and reported. Failure to disseminate this information has created the perception that practices in forestry are expensive, location specific and not widely replicable. Limited experience and the low capacity of forestry institutions may prevent farmers from adopting forestry innovations quickly and widely, due to limited exposure and minimal support.

#### (v) Market/investment related challenges

Delayed returns on investment and under developed markets: While agricultural crops destined for export or domestic markets generate immediate returns, incomes from forestry investments come years later, due to the long gestation periods of forest development projects. Also, unlike most agricultural crops, the management of trees and forests for commercial purposes is required to observe and achieve certain ecological objectives. However, with the exception of land tax exemption in some regional states, those investing in forestry receive no specific support or incentives. This, coupled with a lack of well-developed markets for forest products, may reduce the attractiveness of investing in forestry. Market information systems in the region often do not include tree products. As such, markets for tree products are both less efficient and less developed than for crop and livestock commodities, and value chains related to forestry systems receive little support. Small scale farmers and entrepreneurs usually lack business management and marketing skills, have limited access to forest product market information (e.g. volume and quality demanded, price levels, etc.). In addition to this, innovations in forestry related technologies and management practices are limited. It is, therefore, unsurprising that these endeavors face high marketing risks and costs. There is also an absence of quality assurance schemes for forest products and services, as well as support for enhancing production and marketing. Furthermore, trade of some products is over-regulated (e.g. on-farm timber), while in other cases, it is under-regulated (e.g. herbal medicines).

**Limited value addition of tree products:** There is very little processing and value addition by producers of forest and tree products, and most farmers in the region sell raw products. The government has not provided sufficient assistance to farmers in terms of adding value to their products and making links to domestic and international markets. The limited availability of adoptable technologies, and underdevelopment of infrastructure (roads, communication, etc.) result in high transaction costs.

**Lack of quality standard guidelines:** Currently, there are no clear standard guidelines on the description (i.e. physical properties) and quality (e.g. chemical composition) of some tree based products. Examples include products derived from *Moringa* and *Jatropha*, which are sold in markets with no standards or quality control mechanisms. Many forest products, such as

timber, are also imported and sold in the country, with limited control over quality and standards. This inability to set and enforce standards could make buyers suspicious of the quality of certain products, and may eventually result in the reduction or loss of markets for some commodities.

**Weak coordination of key stakeholders supporting tree-based enterprises:**

Coordination between players involved in forest and tree based enterprises remains weak. For example, many players are involved in the production, marketing and processing of Moringa, Boswellia and other species, but there is no mechanism to strengthen coordination and collaboration between these players, facilitate the sharing of information, and support the development and strengthening of value chains.

**(vi) Information system related challenges**

There has been a shift towards “quick fixes” for major problems, and the generation of technologies that render immediate benefits. The limited innovations in the field of forestry that do exist, are not well documented, and are poorly communicated to smallholder farmers. The medium and long-term benefits of forestry technologies for individuals and the public have not been well communicated to various stakeholders. Over dependence on conventional agricultural methods and inadequate knowledge of sustainable approaches limit the interest of policymakers in forestry development. Additional challenges include a lack of documentation, robust data collection, analysis and reporting.

**(vii) Other challenges**

Some of the major challenges constraining the development of the forestry sector include:

- Poor understanding of why farmers in the region practice enclosure as a land use strategy: There is very little research on how, why, and where farmers practice enclosures. There is no systematically documented information on why prefer one practice or technology over others.
- The absence of empirical information on various enclosure practices for each of the major agro-ecological zones and farming systems in the country: There is inadequate information on the biology and behavior of most indigenous trees and shrubs that are regenerated, or have the potential to regenerate, in Ethiopia’s various agro-ecological zones and farming systems.
- Wide ranging diversity in agro-ecological and socioeconomic settings: The complexity and variety of agro-ecological and socioeconomic systems in Ethiopia make the efforts of researchers to develop adoptable technologies much more challenging. It is particularly challenging to develop tree and forest based technologies as they require long period and cost more than producing prototypes that fit each of the prevailing agro-ecological zones, particularly when working with tree and shrub species.
- A lack of validated enclosure establishment and management procedures that can be adjusted to local contexts: A mechanism is required to facilitate the modification and adjustment of innovative systems, to make

them appropriate for specific farming and livelihood systems. The lack of such a mechanism hinders the development of site-specific enclosure technologies that could provide solutions for the prevailing problems at each site. There has been slow progress in the development of relevant technologies related to objective based enclosure compared with other agricultural and forestry technologies in the region.

- A lack of adequate data to inform policy and practice in enclosure research and development: Information on enclosure is haphazardly distributed among, and owned by, various individuals, as there have been no attempts to systematically and spatially compile available data.

Other challenges include:

- uncoordinated and unsupervised mining on rehabilitated sites
- the expansion of invasive species into rehabilitated and protected areas such as *Prosopis juliflora* and *Lantana camara*.
- a lack of post-enrichment management inadequate law enforcementthe
- lack of proper land use plan.

#### **2.4.2 Opportunities for forestry development**

The following represent opportunities that could support forest sector development:

- New initiatives of the government encourage free mobilization by the community.
- Every farmer in the region is expected to dedicate 40 days of free labor to participating in the rehabilitation and management of degraded lands and other community projects.
- Various policy documents encourage tree planting and forest development.
- There is increased awareness among policymakers and the public at large regarding the role of trees and forests in watershed management, land rehabilitation and climate mitigation and adaptation, which is instrumental in promoting enclosure projects and forestry development more broadly.
- REDD+ activities have the potential to support enclosure/forestry development, mainly through the carbon market.
- Rising human and livestock populations have led to increasing demand for timber and NTFPs such as fodder. Supply must now meet demand, which represents an opportunity to expand and intensify the sector.
- Experts at various levels, and the region at large, are gaining useful experience in planning and managing the nation's Sustainable Land Management Program. Several local and international NGOs are working on land rehabilitation, enclosure and forest conservation and development.
- There are huge tracts of degraded communal lands and hillsides that could be redistributed to potential developers (e.g. youths, women, landless individuals, etc.). However, one risk associated with this is that in some areas, youths that acquire such land may leave the area fearing that these enclosures may not generate sufficient income to support their families.
- Ethiopia is training large numbers of college and technical school

graduates in natural resource management, forestry and agroforestry.

There are also tens of thousands of development agents trained in natural resources management and stationed at each kebele. Some 90,000 Farmers' Training Centers (FTCs) established in the country could also be used as venues for demonstrating innovations in enclosure and forestry.

- The GoE's land registration and certification schemes, which accord land use rights to farmers, encourage investment in land management, enclosure establishment and tree planting.
- Major national programs are in line with enclosure objectives, including an initiative to plant 100 million *Faidherbia albida* trees, and a pledge to restore 15 million ha of degraded forests and forested land by 2025. These initiatives have already created awareness among the public regarding the significance of forestry, and have prompted local communities and decision makers at various levels to adopt effective practices in enclosure.
- Infrastructure development and distribution continues to improve.
- There is a culture of free community mobilization and there are a number of organized community groups to respond to challenges.
- Peace and stability in the country facilitate the successful implementation of forest management practices. The establishment of the MEFCC, and the Environment and Forest Research Institute represent excellent opportunities for scaling up enclosure practices across the country.



### 3 EFFECTIVE FOREST MANAGEMENT PRACTICES FOR SCALING UP

#### 3.1 Enclosures

##### 3.1.1 Global trends and relevant experiences

The rehabilitation of degraded lands is being practiced in most rural societies around the world. Rotational grazing and deferred pasturing, which allow vegetation to regenerate during the rainy season, have been practiced in Tunisia, Algeria, Niger, Somalia and Ethiopia for many centuries (FAO 1979; Birhane 2002). In Ethiopia, the practice of enclosure has been exercised for centuries, through the restricted use of forests around churches (Mengistu 2001; Birhane 2002). Enclosure is also practiced in Ethiopia to allow crop or grazing lands to rejuvenate, and increase productivity. In the 1980s, government institutions began promoting enclosure as a means of managing degraded land, and the practice became an integral part of soil and water conservation work. Enclosure allows degraded lands to rest for several years and this encourages the regeneration of natural vegetation (Bendz 1986).

Northern and central Ethiopia, in particular, have experienced widespread land degradation, due to: deforestation; overgrazing (Bishaw 2001); major land use changes due to the pressures exerted by its growing population (Hurni 1988; Nyssen et al. 2009); and the growing human and livestock populations' significant demands for biomass (Tekle 1999). The most important countermeasures taken to halt this process include the planting of trees, and assisted natural regeneration through the restriction of human and animal interference (enclosure) (Pohjonen and Pukkala 1990; Tekle 2001), to achieve social, environmental and economic benefits.

##### 3.1.2 Identifying effective practices for scaling up in the region

To restore degraded lands, designated areas are closed off and massive soil and water conservation works are carried out. The major challenge of the natural process is that reclamation takes a long time, particularly in dry climates where moisture is scarce. Many of the enclosures in Tigray support pioneer shrubs like *Acacia etbaica*, *Euclea schimperii*, *Dodonea viscosa*, and a number of grass and herb species that provide foliage, and protect the soils from accelerated erosion. Many developers of degraded lands consider the presence of pioneer species to be a good indicator of land reclamation.

However, although pioneer species colonize degraded lands quickly, their growth rate is very slow, and it takes many decades for them to be replaced by climax plant communities. As a result, the contribution of even some of the oldest enclosures in the northern highlands of Ethiopia in terms of biodiversity and soil fertility is said to be below expectation. Therefore, it is important not only to identify effective practices, but also to propose improvements, so that the scaling up of enclosure packages might produce more successful results. Scaling up of effective enclosure management practices may represent a means of rehabilitating degraded lands and enhancing ecological and socioeconomic benefits.

Nine sites, demonstrating successful enclosure management, were selected for this study in accordance with a defined set of criteria and indicators and based on the recommendations. Farmers and experts recognized these sites as having superior ecological, social and economic impacts. Thus, these sites were identified as examples of best practice in enclosure management, from which lessons could be drawn to

inform the scaling up of exclosures. Concrete information, useful to the formulation of a scaling up strategy, was gathered through the evaluation of the ecological and socioeconomic impacts of these sites, and the identification of key institutional, legal, economic and social factors influencing their success, as well as major challenges and gaps.

### **3.1.3 Recommended improvement measures**

Improvement measures were identified, evaluated ex-ante, and proposed, to improve the outcomes of exclosures in the nine selected sites recommended for scaling up. The improvement measures are categorized as ecological, management and socioeconomic improvement measures.

#### **Improvement measures for ecological services**

The main challenge to exclosures is the slow rate of rehabilitation across agro-ecological Zones. It takes a long time for impacts to emerge after putting an area under exclosure, and measures to enhance rehabilitation are required. Broadcasting with native flora that have undergone seed treatment, is likely to enhance species richness and growth in exclosures. If the objective is to increase biomass, enrichment planting of suitable species may be the most effective measure. Another challenge to exclosures is moisture deficiency, which affects the survival and growth of regenerated or planted seedlings. In arid areas, where survival of seedlings is limited by water scarcity, water conservation is an important factor. Constructing in-situ water harvesting structures has been identified as the best option to enhance water availability, and thereby improve the seedlings' chances of survival. The low survival rate of seedlings is another challenge to the establishment of more productive exclosures. Seedling survival rates are determined by a number of factors, including: seedling quality, nursery life span, and species selection. Implementing site-specific pre and post-planting care is vital to enhancing the likelihood of survival and growth of planted seedlings.

#### **Measures to improve management of area exclosures**

Most exclosures meet their rehabilitation objective. However, other objectives to be achieved after rehabilitation, are rarely articulated and agreed upon. Management related challenges in most exclosures relate to a lack of well-articulated objectives and corresponding management plans during the establishment phase. The management goals of exclosures should be defined at their establishment, and these objectives should be negotiated and agreed up on by all major stakeholders. Landscape rehabilitation, production, protection/conservation, or a combination of these are major objectives in establishing and managing area exclosures even though the level of degradation of the site to be put under exclosure often determines the major objective. Protection-focused management is useful for improving species richness and ecosystem stability, whereas production-focused management aims to increase economic gains. Therefore, the long and short-term objectives of establishing exclosures should be clearly defined using a participatory approach. A landscape can also be categorized and subdivided into compartments, where exclosures with different objectives could be established, based on the physical condition of the site and the needs of the community. The second management-related challenge is a lack of on and off-site monitoring system to better quantify impacts. Time series data is essential for an effective monitoring system. Making the gap between two sets of time series data longer could increase the level of

applicability, but make the data less reliable. That is to say, time series data collected every seven years is more applicable, but less reliable, than time series data collected every three years. Time series gaps should not be too long, to ensure the generation of reliable data, and thereby improve the exclosure monitoring system, the team recommends that time series data should be collected every five years as part of the periodic monitoring of exclosures. Fragmentation represents another challenge to the successful management of exclosures. Corridors should be established to link fragmented exclosures, and enhance species richness. The corridors should link exclosures with other types of forests, such as remnant natural forests and plantations. Corridors can connect different systems, which facilitates the easy movement of genetic material, minimizes inbreeding and broadens the gene pool.

### **Measures to increase socioeconomic benefits**

Farmers and other stakeholders complain that the benefits obtained from many years of putting an area under exclosure remain minimal. This is a major challenge that must be addressed urgently. Exclosures are usually communal. Dwellers contribute to the establishment and protection of exclosures, but their ownership rights are not well defined. The scaling up of exclosures should take the need for defined ownership into account. Exclosures could be owned by cooperatives/unions, or distributed to individuals (working with, or without, the assistance of a cooperative). The best model is one that suits the existing situation and meets community expectations and long term societal needs. Some parts of Tigray Region are beginning to ensure use rights for individuals organized in cooperatives (i.e. individuals nested within cooperatives/unions). Clear ownership is required to ensure the sustainability of exclosures.

Current bylaws related to exclosures mainly focus on penalizing wrongdoers, and do little to reward achievements. During consultations, farmers suggested that these bylaws should be more balanced, to achieve not only conservation, but also economic objectives, by facilitating effective and sustainable utilization. The bylaws for a particular exclosure should be closely aligned with the objectives defined at the outset. The adoption of generic bylaws, which are often punitive, should be avoided, and bylaws should be aligned with the goals of the exclosure. In addition, bylaws on the management of exclosures should be constitutional and acknowledged by the judiciary, to ensure their effective enforcement.

Unclear benefit sharing mechanisms that are applied to the products and services obtained from exclosures, are common sources of conflict. The lack of a clear benefit sharing mechanism limits the adoption and scaling up of exclosures. A fair benefit sharing mechanism, based on contribution, should be implemented. Sharing benefits among all beneficiaries, on an equitable basis, increases participants' sense of ownership over the exclosure, and encourages the community's participation in its management. Performance based benefit sharing triggers competition which enhances the productivity of the exclosure. Although context will determine the most appropriate benefit sharing arrangement, performance based benefit sharing should be implemented wherever possible.

As there should be sufficient benefits to be shared among community members,

diversifying products and increasing income from exclosures is vital. The scaling up of exclosures should aim to diversify products, and increase their volume and quality. The inability of exclosures to provide attractive economic returns represents a major challenge. Exclosures should grow high-value species that are appropriate for the site and meet subsistence and market needs, to provide greater income to the local community. Activities that enhance the value of exclosures as tourist attractions should be introduced in appropriate sites. This would allow exclosures to become economically attractive land use options, in addition to their ecological functions.

Income diversification from exclosures can be ensured through proactive and flexible management. Farmers should embrace emerging opportunities to diversify their income from exclosures. Exclosures could also be planned and managed with the aim of pursuing carbon finance opportunities such as REDD+ and the Clean Development Mechanism (CDM). Carbon trading schemes and ecotourism could represent opportunities to ensure the sustainable management and utilization of exclosures.

In addition to the diversification of products and services, an appropriate value chain must be established in order to sustain the benefits of exclosures. It is critical that existing value chains for marketable products are improved. Value chains should be strengthened for products and services obtained from exclosures at local, regional, national, and international levels. Future efforts to scale up exclosures should consider the improvement measures proposed in this strategy. Pragmatic improvement measures, which have been tested on pilot sites, should be considered in addition to those suggested in this strategy.

#### **3.1.4 Potential areas for scaling up**

The country in general, and Tigray in particular, has large degraded areas. There are large tracts of hilly landscapes that are barren and exposed to degradation in almost all agro-ecological zones. Priority in establishing exclosures could be given to degraded remnant forest lands. Exclosures should be promoted to connect fragmented natural forests, to ensure the easy flow of genetic material and promote landscape level re-greening. Exclosure should be used as a strategy to enrich the density and quality of remnant, dry, Afromontane forests in Hugumbrda, Desaa, Wujig Mahgo Waren, Mugulat, and Asimba; dry forests such as Hirmi and Waldiba; and the *Boswellia-Commiphora* forests in the west and northwest of the region. Exclosures should be established to enrich and improve the vegetation cover of Kafta Sheraro National Park, which is an important wildlife reserve.

Exclosure as a management practice can easily be scaled up across the region. Religious institutions and other organizations can support their landscape re-greening activities through the use of exclosures. Exclosures could also be used to rehabilitate and develop the upper catchments of significant lakes and dam sites (e.g. Tekeze Dam catchment, Hashenge Lake in the South Zone, May Nigus Dam in the Central Zone, Gumselasa Dam in the Southwest, Serenta Dam in the Northwest Zone, Korir Dam in the Eastern Zone, and in the newly constructed Mihitsab Azimati Dam in the central zone), to protect them from siltation and flooding.

The practice should be scaled up in areas that are prone to siltation, such as Alamata in the Southern Zone. In Alamata, farmlands are frequently abandoned due to constant siltation from the upper catchments. Exclosures should also be established in areas prone to landslides, such as the Deguea-Tembien District in the Southeast Zone, as a preventative measure. Exclosure technology could also be extended to degraded and abandoned farmlands. Extensive grazing lands could also be restored and rehabilitated through exclosure. Areas that are abandoned as a result of mining, irrigation, road construction, commercial farming/plantations, etc., could be set aside as exclosures, to promote their restoration. Exclosures also have the potential to create jobs for youths in rural areas where there is high population density, such as in the highlands of the region. The practice is agro ecology independent and requires minimal labor and technical inputs. With a proper management plan in place, exclosure can be extended to any area where deforestation and degradation is a problem.

## **3.2 Other forest management practices for scaling up**

### **3.2.1 Managing dry forests and woodlands**

#### **3.2.1.1 Global trends and relevant experiences**

Deforestation and forest degradation pose a significant threat to dry forests in Ethiopia. Dry forests and woodland resources are at risk due to: the expansion of crop cultivation (both small-scale and large-scale, commercial agriculture), overexploitation (e.g. for charcoal), re-settlement, road construction, and overgrazing. Dry forests and woodlands usually grow under limiting climatic conditions. Climatic variability, which accompanies climate change, aggravates resource degradation. For instance, fire frequency in tropical dry forest areas is likely to continue to increase due to climate change and associated warming and drying (Timberlake et al. 2010; Meir and Pennington 2011). Dry forest and woodland ecosystems are highly fragile, and as a result, rehabilitation costs can be very high. Hence, there is an urgent need to develop options for the sustainable management and utilization of these resources.

Dry forests are one of a number of forest types in TNRS, and are found in the north and northwest of the country. The dry forests of TNRS are composed of economically important tree species such as *Boswellia papyrifera*, *Acacia senegal*, and *Sterculia setigera*. *Boswellia papyrifera* is one of the most economically important tree species, and is known globally for producing 'Tigray type' frankincense that is widely used in church services. However, alarmingly, the productivity of *Boswellia papyrifera* forests is declining. A lack of natural regeneration threatens the existence of this species. Efforts to address this issue have included planting cuttings. However these trials were not as successful as expected. Thus, the regeneration of this important species remains a challenge. The conversion of dry woodlands into large-scale agricultural investments represents another factor driving the depletion of this resource. Due to the lack of a sustainable management plan to guide utilization, many of the trees are over tapped. Moreover, harvesting is performed using traditional tapping methods that could be harmful unless regulated. *Acacia senegal* is a tree species that produces gum arabic. This species covers large areas of the region. However, there is limited information available on the tapping techniques used, the resource base, and this species' potential for production and distribution. *Acacia senegal* could be used to minimize pressure on *Boswellia papyrifera*, as it can grow easily from seedlings. In this case the production will

be gum Arabic and not frankincense. Promotion and marketing are important to make *Acacia senegal* economically valuable to communities, the region and the country at large.

### **3.2.1.2 Selected dry forests and woodlands management practices for scaling up**

Sustainable management and utilization practices should be introduced in TNRS's dry forests. Gum producing tree species, such as *Acacia senegal* and *Sterculia setigera* could be planted to promote the rehabilitation of degraded lands in the lowlands of the region. Value addition on gum arabic should be supported to increase national and international market share, and benefits from exporting frankincense. Gum and resin based dry forest management using PFM has reportedly been successful in Benshangul Gumz Regional State. Managing forests through PFM has been successful due to a range of factors, including: less harmful tapping techniques; support for marketing; increased employment opportunities along the value chain; and improved collaboration between government actors. However, this system could be a risk due to a lack of management planning. Specifically, this system lacks harvesting guidelines, enrichment planting, and forest protection activities, such as fire and pest control. Successful gum and resin based management should seek to promote: a cross-sectoral approach (e.g. soil and water conservation); the mainstreaming of climate change; product diversification; participation; and motivation and awareness creation among local communities. Benefit sharing among community members is a critical issue that must be adequately addressed in future attempts to scale up PFM in dry forests and woodlands. The potential to successfully scale up bamboo based (i.e. lowland bamboo) dry forest management should be considered given its potential for economic and ecological benefits. Other species, such as *Hyphaene thebaica* (locally known as Laka), are used in mat making, basketry and for their fruit (Ackat in Tigrigna). These could be promoted as income generating activities for youth and women's groups in the dry areas of the region.

### **3.2.1.3 Recommended improvement measures and potential areas for scaling up**

New improvement measures to conserve and protect existing dry forest resources, and ensure and enhance existing benefits, should be given priority. Improvement measures, including: value addition of products, value chain establishment, improved silvicultural practices, etc., should be considered. Dry forests should be used to take advantage of emerging opportunities, such as carbon trading. Improvement interventions should focus on identifying and promoting commercially important species, such as *Boswellia papyrifera*, *Acacia senegal*, Lowland bamboo, and *Hyphaene thebaica*. Organized youth and women's groups should be encouraged to use and market the products and services obtained from these forests. Any improvement measures should seek to implement an effective benefit sharing mechanism, to ensure that benefits are shared fairly among the users that protect and conserve these forests. The domestication of selected species with significant socioeconomic and ecologic importance should be prioritized and integrated into the farming system. Gum producing trees could be scaled up in lowlands in the west, center and south of the region.

### **3.2.2 Agroforestry practices**

#### **3.2.2.1 Global trends and relevant experiences**

Agroforestry can be a tool to achieve sustainable development, improve the quality of life of rural communities, and reverse the process of environmental and land degradation. Available evidence clearly indicates that agroforestry systems sustain food and wood security, enhance livelihood diversification, and offer a number of ecosystem services (Sanchez 1996; Kang and Akinnifesi 2000; Neupane and Thapa 2000). Diversity in agroforestry systems can enhance soil conservation and nutrient cycling; facilitate integrated pest management; and increase resistance to diseases, all of which have positive effects on farm production (Beer et al. 1998). Hence, agroforestry systems allow for a high level of progressive adaptation, simply by increasing the structural and temporal diversity of production systems (Montagnini and Nair 2004). As a climate change mitigation tool, agroforestry systems reduce the outward flux of CO<sub>2</sub>, N<sub>2</sub>O, and CH<sub>4</sub>, and act as long-term GHG sinks (Verchot et al. 2007). The carbon sequestration potential of agroforestry systems is estimated to be between 12 and 228 Mg C ha<sup>-1</sup>, with a median value of 95 Mg C ha<sup>-1</sup> (Albrecht and Kandji 2003). For smallholder agroforestry in the tropics, potential carbon sequestration rates range from 1.5-3.5 Mg C ha<sup>-1</sup> yr<sup>-1</sup> (Montagnini and Nair 2004).

#### **3.2.2.2 Selected agroforestry practices for scaling up**

Agroforestry practices provide various products, including fuel, food and feed. The role of agroforestry is particularly significant in areas such as Tigray, where biomass is the primary source of energy. Efficient agroforestry practices may support the sustainable supply of firewood from the agricultural landscape. A study conducted in SNNPRS as part of the same project, showed that woody species grown in agroforestry systems are used as major source of energy. The study showed that many households are energy self-sufficient, as 94.7% of their energy demands are met by wood harvested from agroforestry components. Lessons from such practices can be customized and scaled-up.

Traditional *F. albida* agroforestry practices, common in TNRS, represent one such example. Farmers plant *F. albida* in their home gardens to benefit from the various products that can be obtained from this species. The planting of this tree is incentivized by a project supported by Irish Aid. This performance based incentive mechanism requires farmers to demonstrate that their seedlings have survived, in order to receive financial rewards based on the number of surviving seedlings. This practice should be assessed and further expanded if proven successful. Various examples of farmers planting trees that produce edible wild fruits (e.g. *Balanites aegyptiaca*, *Tamarindus indica*, *Ziziphus* spp. and *Cordia africana*), have also been identified as encouraging practices. Apple based agroforestry systems have recently been introduced in the highlands of the region.

#### **3.2.2.3 Suggested improvement measures and potential areas for scaling up**

Improvement measures should be specific to each agroforestry practice, system and technologies and should fit into each agro-ecology and farming system. Improvements to fruit based agroforestry systems in the region should be encouraged at household level. Fruit bearing species should be planted in home gardens, farm boundaries, and grazing areas. The promotion of fruit based practices should be backed by research

findings. Research institutions should generate and share information on: species-site matching, the optimum number of trees to be planted per unit area, and other silvicultural practices useful to improving the system. Multipurpose species such as *Sesbania sesban* and pigeon pea should be promoted, due to their value as fodder and firewood. These species can be integrated into the landscape as boundary trees, planted in home gardens, and used to support the rehabilitation of gullies. Many farmers have accepted these species, and the practice is expanding in some areas. Fruits such as apple should be integrated into farming systems in highlands such as: Endamehoni, Ofla, Alaje, Deguea Tembien, Atsbi, Ganta-Afeshum, Tahtay Maychew, Laelay Maychew, Laelay Koraro, Welkayt and Tsegede districts.

Apple based agroforestry systems could be complemented with highland bamboo and other suitable tree crops. Farmers should focus on planting improved varieties of fruit tree, and trade should be supported by appropriate market linkages, value addition, and value chain development. The coffee-fruit based practices in Raya Azebo and Raya Alamata could also successfully undergo expansion. Research should inform the selection of components, in order to optimize the benefits to be obtained from the promotion of this system.

Trees on croplands (i.e. parkland systems) are common in the region, and measures to improve the performance of these parkland systems need to be identified, tested and disseminated. Trees such as *Faidherbia albida*, *Moringa stenopetala*, *Ziziphus spina-christi*, *Balanites aegyptiaca*, *Tamarindus indica*, *Cordia africana*, *Mimosopis kummel*, and *Ximenia americana* are species that could be successfully expanded in the lowland to midland agro ecological zones of the region. Improvement measures should include optimizing: tree density per unit of land, planting techniques, silvicultural practices, and tree-crop interaction.

### **3.2.3 Participatory Forest Management**

#### **3.2.3.1 Global trends and relevant experiences**

PFM or co-management is an approach whereby multiple parties (generally local populations and the state) negotiate a management plan for a given forest, to clarify by-laws, incentives and compensation mechanisms (Borrini-Feyerabend et al. 2004). Broader goals include joint authority in decision-making, shared resource management and use rights, conservation of biodiversity, and community livelihood support. Associated benefits include reduced forest management costs, increased utilization efficiency, and enhanced equality and community rights (Borrini-Feyerabend et al. 2004). PFM has the potential to promote good forest resource governance and sustainable forest management.

Many developing countries, including Ethiopia, recognize the importance of the involvement and participation of local communities in resource management. Since the mid-1990s, a number of pilot projects have been initiated in the central, southern and southwestern forested regions in Ethiopia, where, for the first time, attempts have been made to transfer responsibility for forest management from the government to forest adjacent communities (Winberg 2010). In the last decade, the number of organizations participating in PFM has grown to include local NGOs and government agencies.



### **3.2.3.2 Selected PFM practices for scaling up**

PFM as a forest management approach has a very short history in TNRS. Over the last four years, PFM has been introduced to better manage forests in three kebelles, namely Wujig, Mahgo Waren and Agew. Across these sites, an area of about 17,000 ha is now under PFM. There has also been an attempt to implement PFM in the Hirmi natural forest, and in three kebelles located near the affected forest area. This practice should be scaled-up in other areas.

Certain conditions facilitate the promotion of PFM. PFM could be a particularly appropriate management tool in areas where there are people residing in or near forests, who are dependent on the resources they provide. Local communities can be actively engaged in buffer plantation, and other tree management practices, such as pruning. In some cases, communities utilize the grass from forests, through a cut and carry system. A regional forest fund could serve as source of finance in the early stages of PFM.

### **3.2.3.3 Recommended improvement measures and potential areas for scaling up**

Scaling up should focus on awareness creation, ensuring inclusive participation in decision making, and equitable responsibility and benefit sharing arrangements in the management and use of forests. Efforts should also support enrichment planting (to increase stock and productivity), and the diversification of income generating activities, to increase economic incentives that encourage communities to responsibly manage and sustainably use forest resources. PFM should be scaled-up in areas identified by the region. Training has already been provided for kebele administrative bodies, development agents and woreda experts. Areas identified for the scaling up of PFM include: Wejig, Mhago Waren, Hirmi, Hugumbrda Gratkahsu, Desaa, and other national and regional priority areas. These improvement measures should be integrated with non-forest activities that offset the communities' economic dependency on these forests. The production and management of selected non wood forest products should be supported within these forests, including activities such as: apiculture; wild fruit production; ecotourism; carbon trading; harvesting of medicinal plants, mushrooms, and wood products; and zero grazing.

## **3.2.4 Smallholder plantations**

### **3.2.4.1 Global trends and relevant experiences**

Although plantations containing a mixture of species are common in some parts of the world, most plantations contain a single tree species. Between 2000 and 2010, the total area of all types of forests around the world declined by an average of 5.2 million ha/year (FAO 2010), mainly due to the clearing of native forests. In contrast, plantation areas increased by an average of 4.9 million ha/year (FAO 2010). This trend is expected to continue, and the total plantation area is anticipated to rise to approximately 300 million ha by 2020 (FAO 2010).

In the early 1970s, Ethiopia established, with the support of Sweden, a number of large-scale industrial plantations, with the primary purpose of supplying industrial round wood for the production of sawn wood, wood based panels and wood pulp. The area of forest plantations was estimated at 189,000 ha in 1990 (FAO 1990). The area of plantations, in relation to the total forested area of the country, increased from 3.2%

in 1990 to 3.8% in 2005 (FAO 2005). Although there is a lack of accurate data, estimates indicate that the area of plantations increased from 216,000 ha in 2000, to 419,000 in 2005 and 972,000 in 2010 (Bekele 2011). Of the total area of plantation forests, only 20% are classified as commercial plantations that produce timber for sawn wood and for poles. The most prevalent species in these plantations are Eucalyptus species (56% of the total), Cupressus lusitanica (32%), Juniperus procera (2%), Pinus patula (1.8%) and other species (8%).

#### **3.2.4.2 Selected practices in managing smallholder plantations**

The cover of small and large-scale plantations in TNRS is considerably lower than in other regions. According to the regional Bureau of Agriculture and Rural Development (BoARD), commercial plantation cover in the region is estimated at 18,000 ha. In spite of the efforts of model farmers in the region, small scale tree planting has not expanded as it has in other regions, such as Amhara. Large-scale plantations are also limited in number. Although there are some communally owned plantations, these are not supported by appropriate management plans.

There is significant potential for both large and small-scale plantations in the region. There is considerable, local demand for fuelwood, as fuelwood is currently supplied by neighboring regions. The demand for poles and posts for construction is also high, both locally and in neighboring Sudan. TNRS also has a chip-wood factory, which demands a large supply of wood, and has shown interest in establishing an out grower scheme. Thus, farmers should be encouraged to plant fast growing species.

Community woodlots should also be promoted on communally owned lands. Community woodlots are not new concepts for many Ethiopian farmers. Their history goes back to the late 1970s, when they were introduced largely as food-for-work projects in Ethiopia's drought-affected areas (Alemu 2000). Tree planting by farmers in the region is limited due to very low survival rates, estimated to be between 5 and 10% (based on 20-30 year data). Limitations are related to biophysical factors and a lack of acceptance among farmers, rather than a lack of technical know-how. Moreover, poor pre-planting handling and management and post-planting care significantly contribute to the low survival rates of tree seedlings in the region. To address these issues, farmers' perceptions, needs, and their attitudes towards tree planting must be understood. It is important to identify constraints, in order to satisfy the needs of farmers in ways that are acceptable to them.

A team of experts assessing plantations in Amhara identified the planting of *Acacia decurrens* by smallholders as a very good practice, which is being adopted more widely, and should be systematically scaled up regionally and nationally. According to their report, farmers have planted this species in wide areas, mainly for the production of charcoal. It takes 5 to 6 years for this species to be ready for harvest. Therefore, a pilot demonstration for this species should be planned. Planting *Eucalyptus* spp. should also be promoted in appropriate sites, as planting this species in water deficit areas and around water points is not recommended. Other fast growing species should be identified by regional and federal research institutions.

Large-scale plantations could help to reduce the considerable costs of importing timber

and other wood products. The emergence of forest industries within Tigray, and in other regions, will create market opportunities for large-scale plantations. There is growing demand for wood products, which is currently being met by imported products. This suggests that there is a significant, potential domestic market. Large-scale plantations can be promoted in various ways. The first option is through the establishment of government owned forestry enterprises. Experiences from Oromia Regional State's Oromia Forest and Wildlife Enterprise (OFWE) and Amhara Forest Enterprise (AFE) can inform the efforts of other regions in the planning and establishment of regional enterprises. Encouraging the participation of the private sector and forest cooperatives could represent another option. However, this may be a challenging proposition, as many investors want a quick return from their investments. Government owned enterprises could also serve as platforms to demonstrate scientific tree planting and management skills to potential private investors, cooperatives and individual farmers.

Large-scale tree planting could take place in existing state owned, priority forest areas. Priority forest areas, such as Hugumburda (21,000 ha), Dessa (118,000 ha), Wejig (17,000 ha), Hermi (30,000 ha) and Asimba (5,000 ha), can be supplemented with large plantations, and become state owned commercial forests. Financial resources from the regional forest fund and/or allocations from the region could be used for this purpose.

### **3.2.3.3 Recommended improvement measures and potential areas for scaling up**

Small-scale practices, including woodlots, can be improved through the promotion of efficient market linkage activities. Value addition of products should be enhanced. Moreover, small-scale forest producer associations should be established and expanded. Community forests should also be promoted on communal lands. Technical support should be provided to small-scale forest producers. Incentive mechanisms should be established to encourage small-scale tree planting at various levels. Large-scale plantations should primarily be expanded through government owned enterprises. The regional government should establish a regional forest production and processing enterprise. In all these endeavors, the domestication of drought resistant, fast growing indigenous and exotic species should be given priority. Technical support should also be provided to strengthen the capacity of both small-scale and large-scale plantations in the following areas:

- use of selected seed sources and improved seedling production techniques
- stand management
- quality seedling production
- improved site selection and preparation
- improved tree planting and post-planting operations
- alternative planting seasons (planting during the short rainy season- Belg) and planting methods such as broadcasting
- introduction of alternative, high-value tree and shrub species
- adoption of appropriate harvesting and coppice management techniques
- promoting the planting tree seedlings with annual and leguminous crops
- value addition and product diversification
- provision of market information and strengthening of market linkages
- enhancing environmental sustainability

- establishment of strong organizational set-up with defined roles and functions
- Encouraging private forest investments.
- Certification
- Species based extension system

## **4 STRATEGY FOR SCALING UP EFFECTIVE PRACTICES**

### **4.1 Rationale and objectives of the regional strategy**

In Ethiopia, the practice of enclosure has been traditionally exercised for centuries, through the demarcation of forests around places of worship as sacred or religious sites, examples being church forests (Mengistu 2001; Birhane 2002). However, modern, technical approaches to area enclosure were first implemented in the 1980s, as part of a development package to promote soil and water conservation. Using these techniques, degraded lands are allowed to rest for a number of years, which promotes the regeneration of natural vegetation (Bendz 1986).

Although enclosure has been practiced as landrestoration tool in various parts of the country, it is widely disseminated in TNRS. The regional government's economic policy has identified poverty reduction as a central economic and social priority. It has been decided that the strategy for addressing this priority issue rests on promoting economic growth through a market based economy, and the rehabilitation of the degraded environment (Birhane 2002). As a result, in 1991, the regional government launched a massive community-based environmental rehabilitation program (BoANRD 2000). The program mainly concentrated on soil and water conservation activities, and the rehabilitation of degraded sites, by protecting them from animal and human interference, until a certain degree of vegetation coverage is attained. According to a report by the Tigray Regional State BoARD (2013), approximately 1,288,445 ha of land is managed through area enclosure in Tigray Region.

Though TNRS has conducted a number of scaling up and promotion activities, rehabilitated enclosures were not guided by a management plan. Success rates are variable from site to site, affected by geographic and administrative factors. A scaling up strategy, formulated based on lessons learnt from examples of best practice, should guide future enclosure interventions in Tigray and other regions. Successful scaling up and wider adoption can be ensured if efforts are guided by a strategy that is informed by empirical study of the successes and failures of past efforts. Therefore, this regional scaling up strategy has been developed based on a research report of the nine best enclosure practices studied in Tigray Regional State. This strategy aims to guide forest development initiatives and the scaling up of effective forest management practices, with an emphasis on enclosures in Tigray Regional State. The strategy thereby seeks to enhance the role of Ethiopia's forestry sector in building a climate resilient green economy.

### **4.2 Strategy development process**

Five national technical teams, each composed of members from federal ministries, federal and regional research institutes, and higher education institutions, were established in November 2013. Between late 2013 and mid-2015, these teams set out to identify effective management practices in: enclosure (focusing on Tigray), agroforestry (focusing on SNNPRS), PMF (focusing on Oromia), smallholder plantations (focusing on Amhara), and the management of dry forests and woodlands (focusing on Benishangul Gumuz). The teams also sought to identify enabling conditions for scaling up these practices, with the aim of developing a regional strategy, and a national roadmap for scaling up selected forest management practices. The team members that studied

exclosures were drawn from the MEFCC, Tigray Region BoARD, Tigray Agricultural Research Institute, Wondo Genet College of Forestry, and Mekelle University. The team conducted literature review of national and international experiences in the practice of exclosure, and compiled a bibliography of abstracts. Based on the results of the review, and taking into considerations key points raised by regional experts as well as accounting for the regional and national interests, the team developed criteria and indicators to be used in identifying effective practices in the establishment and management of exclosures, in view of identifying good practices which could be scaled up at regional and national levels. Procedures were developed to assess the impacts of these practices on the landscape (i.e. biophysical and conservation outcomes), and on people (i.e. livelihood benefits and other socio economic outcomes).

The team conducted a series of consultative meetings with experts working in GOs and NGOs in Mekelle, and in the districts where candidate sites were identified, to gather relevant data and record the views and perspectives of experts in the region. These views were incorporated into the list of criteria and indicators used to select effective practices. The selection of criteria and indicators focused on the ecological, socioeconomic and institutional factors that impact effectiveness and sustainability. After determining the criteria and indicators, the team presented its findings to relevant stakeholders in the region and obtained their feedback. This was used to refine the criteria and indicators used in the selection of effective practices. The regional consultation meeting was also used to identify candidate sites to be visited and evaluated. Field visits were then conducted to assess the sites based on the selected criteria and indicators. The team attempted to record community members' opinions on the selected criteria and indicators, using household surveys, key informant interviews (KIIs) and focus group discussions. A second consultative meeting with relevant actors was organized in February 2014, to select candidate sites for an impact assessment study. More than 20 candidate sites were identified during this consultative meeting, based on the predefined criteria and indicators.

Following this, the team conducted field visits, to perform onsite evaluations of the proposed candidate sites. During these field visits, data collection tools such as transect walks, field observation, key informant interviews and group discussions were utilized. These tools were employed to select sites demonstrating the best practices for impact assessment.

Selection of the best exclosures was conducted using the predetermined, and agreed-upon criteria and indicators. The identified criteria and indicators were designed to assess practices from ecological, socioeconomic, institutional and management perspectives. 23 criteria were used to assess the proposed exclosures and select the best examples for detailed impact assessment studies. Finally, the 20 candidate exclosures were further evaluated in the field, and the 9 best exclosures were identified: three each from the highlands, midlands and lowland areas, based on the established criteria and indicators.

The socio economic and ecological impacts of the nine best exclosure sites were studied. Standard scientific procedures were followed in the impact studies.

Following this, improvement measures were identified, subject to ex ante evaluation, and the promising ones were proposed to be part of the selected practices in the establishment and management of exclosures, to enhance their positive impacts.

Discussions were also conducted with experts working in various institutions in the region. The findings of the study were summarized and reported. This report was key in developing this scaling up strategy and the national road map. The research reports of the four remaining research teams were also consulted to identify good practices in PFM, agroforestry, smallholder plantations and the management of dry forest and woodlands, to be tested and promoted in Tigray.

In addition to their cultural services, including their aesthetic value and use for educational purposes, the contributions of exclosures to above and belowground carbon sequestration are well recognized. A study by Mekuria et al. (2009) showed that differences in ecosystem carbon stock between exclosures and grazing lands varied between 29-61 Mg C ha<sup>-1</sup>, and increases with exclosure duration. Over a period of 30 years, carbon dioxide sequestered as a result of exclosure was measured to be 246 t/ha (Mekuria 2013). Therefore, the establishment of exclosures on degraded communal lands in Ethiopia's northern highlands represents a viable means of restoring ecosystem carbon stock. Exclosures could play an important role in meeting the national goal of achieving green economic growth. Moreover, in line with the national goal of poverty reduction, exclosure based carbon projects can serve as a source of finance, to compensate the restoration efforts of local communities and ensure income diversification. Moreover, species diversity, density, basal areas, regeneration status, and species composition of all woody plants, were higher in exclosures than in open grazing lands, indicating improved ecosystem services. In Ethiopia's northern highlands, indigenous species, which were previously at risk of extinction, are now more widely distributed thanks to exclosures. Both the height and diameter class of woody plants in exclosures showed an inverted J-shape distribution, indicating the potential for exclosures to restore degraded lands. The potential value of the carbon trade in exclosures was estimated to be 35% higher (USD 345.5/ha) than that in open grazing lands (USD 122.23/ha). Thus, the identified exclosure sites have higher capacity to generate carbon revenue, to improve the livelihoods of local communities. As a result, exclosure as a practice for rehabilitating degraded lands should be scaled up widely.

### **4.3 Scaling up effective forest management practices**

#### **4.3.1 Scope/pathways, guiding principles and key steps**

In this document exclosure is defined as a method of rehabilitating demarcated land by protecting the area, mainly through social fencing, from livestock grazing and human interference through tree cutting or encroachment of farming for limited period of time, depending on site capacity and vegetation re-establishment. Thus generally speaking exclosures are areas selected for natural regeneration. In steep and degraded areas with shallow soil, restoring the natural vegetation is the preferred means of land reclamation as it promotes regeneration, and fosters natural ecological succession, for the rehabilitation of deforested areas or degraded forests. Thus, the main objective of exclosure is site rehabilitation/reclamation even though production objectives could also be important depending on the site. Exclosure is currently one of the most widespread forms of re-greening in Ethiopia.

Two types of enclosure management were observed during this study. The first involves no additional management activities, other than protecting the area, to allow natural regeneration through naturally dispersed seeds. The second type, which is the most common, involves planting seedlings (exotic or indigenous species), aerial seeding, and the construction of soil and water conservation structures, to speed up succession through the modification of microclimatic and soil conditions, in view of enhancing economic returns.

#### **4.3.2 How to scale up?**

Effective practices in the establishment and management of enclosures were identified based on their ecological and socioeconomic impacts. Sites selected were those where enclosures proved to have significant increases in total biomass, vegetation carbon and soil carbon stock. The team has proposed an initial stage to pilot effective practices, to facilitate the successful establishment and management of enclosures in new sites and in wider areas. The implementation of the scaling up strategy should be flexible, in order to account for variations in socioeconomic, environmental and political factors. A phased approach is recommended for the implementation of this strategy. The scaling up of effective practices in the establishment and management of enclosures are expected to consider improvement measures that were proposed by the team. These measures need to be tested and fine-tuned. As a result the process should start with selecting pilot demonstration sites and actively engaging communities to agree on the objectives of having enclosures, and on benefits and responsibly sharing arrangements. Piloting creates an opportunity for co-learning but also enables us to integrate farmers' views and suggestions for enhancing ecological and socio-economic benefits that could be gained from enclosures. Piloting should be carried out at all levels (i.e. regional, district and kebele level) by relevant organizations, such as the MEFCC, the BoANRD of each region, the Ethiopian Environment and Forest Research Institute, universities, and other stakeholders.

Technical and managerial options that are accepted by the local communities, based on their observed and perceived economic and ecological impacts, should be further promoted. Thus, participatory piloting should represent the starting phase. The length of the pilot phase may depend on several factors such as agro ecology, the slope and level of degradation of the site, and agreed upon objectives for establishing enclosure. Capacity building in the form of technical training should be provided to all actors, particularly during the pilot phase. Promoting enclosures at a wider scale needs to be based on the lessons learnt during the piloting phase. Experiences gained and lessons learnt be used to identify issues that may require technical, institutional or legal amendments that may be required as the space of scaling up expands.

The regional bureau mandated to plan and execute area enclosure in general and sections responsible for scaling up should work closely with research institutes, both at the federal and regional levels. The regional office and the federal ministry should formulate research agenda, or generate topics, to be addressed by the research and higher education institutions. An appropriate platform to facilitate the link between the regional office and research institutions should be established. The regional bureau needs to play more



proactive role with research institutions and Universities starting from defining the research problem to ensure that the most significant development problems are researched, and solutions are identified. The scaling up process should be implemented in close consultation with researchers. Moreover, higher education institutions should be consulted, to ensure that pertinent experts are trained in the required areas. Producing qualified experts demands the active participation of the regional office in the development and review of the curriculum.

In addition to this, the scaling up strategy should create platforms, where existing investment opportunities can be discussed, and the engagement of the private sector is encouraged. During the scaling up process, the private sector can play key roles in: technology multiplication, facilitating value addition, and input and product market development. It is important to formulate legal frameworks that incentivize the involvement of private investors. However, the establishment of legal frameworks alone cannot automatically ensure that targets are met. A mechanism is required to reach out to potential investors. The collaboration of the regional trade office and the Chamber of Commerce (and any other relevant office) should be encouraged, in order to identify potential investors and provide support for interested individuals, including support with feasibility studies.

#### **4.3.3 Opportunities and challenges for scaling up**

There are a number of opportunities that facilitate the scaling up of best practices. These opportunities include the significant commitment of the government to implementing the identified best practices. There are also a number of strategies and guidelines in place that support the scaling up of the identified best forestry practices. In addition to this, the participation of motivated stakeholders could facilitate the promotion and popularization of the best practices. There is also reasonably good organizational structure in place to support the implementation of the identified practices. The considerable demand for forest products requires the identification of best practices to ensure adequate supply. The wide range of ecological zones in the region facilitates the diversification of forest products that could potentially be marketed.

As the establishment and management of area enclosures requires the protection of a given area from grazing and cultivation, there are a number of associated challenges. These include:

- difficulty in arriving at agreements on: the demarcation of boundaries, the choice of participating households, objectives and subsequent management plans
- Difficulties in creating interest in enclosure among all members of a community, and actively engaging them in their management and use. Some community members may trespass, in spite of community agreements, which poses a threat to the effectiveness of enclosures
- Ensuring that the process is inclusive, but manageable. Not all community members may be involved in, affected by, or benefit from the process to the same degree
- controlling free grazing

- fear by some downstream communities that there will be a decline in the flow of water
- limited access to grazing lands and watering points by non-participant households
- fear that exclosures will eventually harbor wild animals that affect crops and livestock
- The focus on enhancing the regeneration of indigenous plants and shrubs, many of which have slower growth rates and lower economic returns. Thus little attention was paid to economic returns
- difficulties in clarifying and enforcing: ownership, access to, management, and the use of benefits from area exclosures
- uncertainty regarding the quantities of products produced by exclosures (e.g. timber, fuel wood, fodder, etc.), and whether these will be sufficient to meet local demand
- availability of reliable data on exclosures to make informed decisions and plans at all administrative levels.

#### **4.3.4 Creating enabling conditions for scaling up**

##### **4.3.4.1 Aligning with on-going plans and initiatives**

The CRGE Strategy has set a target to sequester more than 40 million t of CO<sub>2</sub>e through afforestation, reforestation and the sustainable management of forests and woodlands. The strategy sets a target to restore 3 million ha through afforestation and re-forestation by 2030. The scaling up of successful exclosures can contribute towards meeting these targets. Ethiopia's New York pledge to restore 15 million ha of land by 2025 requires the promotion of good practices in exclosure, further justifying the relevance of this scaling up strategy. Thus, it is important to align scaling up efforts with the national and regional governments' existing natural resource management initiatives. Currently, a watershed based natural resource management program is being implemented through massive public mobilization. The proposed scaling up options for exclosures should be considered in a key element of ongoing natural resources management, which aims to restore degraded sites in a given watershed that is being, or is to be, rehabilitated.

The region should contribute to these national targets and international pledges, and create opportunities to divert the flow of carbon finance to local communities. The scaling up of exclosures should be promoted in sites identified by the region, to contribute to national commitments. Exclosures can also provide a source of income and employment opportunities for youths and women. This is also in line with the government's overall socioeconomic development goals. The scaling up of exclosure practices can be aligned with the major government goals of poverty reduction and the enhancement of food security. In this regard, the scaling up of effective practices in exclosure should focus primarily on addressing poverty and food insecurity. Enhancing the productivity of exclosures could provide additional household income, which could be enhanced through product diversification, value addition and improved market chains.

#### **4.3.4.2 Improving governance in the forestry sector**

An appropriate governance system should be implemented to ensure the successful scaling up of effective exclosure practices. As the federal government is responsible for formulating national laws, it is important to enact regional regulations and directives that assist the enforcement of national laws and proclamations pertinent to exclosures. Existing policies, strategies, laws, regulations and directives should be clearly communicated with the actual implementers working at all levels. Awareness creation activities should be planned and implemented to enable community members, experts, and administrators to understand the legal framework. Following this, feedback should be compiled and forwarded to policymakers, both at the regional and federal levels. Based on the existing legal framework, detailed guidelines should be produced to govern and lead efforts to establish and manage exclosures for production, conservation, or both (as is often the case). At the grassroots level, however, detailed bylaws should be drafted, reviewed and endorsed by the local communities. Existing, traditional bylaws should be considered and customized, taking into account the new economic (i.e. emerging demands and market opportunities), social and environmental realities. Regulations, directives and bylaws should facilitate the development and implementation of incentive mechanisms to reward communities that manage exclosures successfully.

#### **4.3.4.3 Strengthening cross-regional and region-federal collaboration in forestry**

The implementation of this scaling up strategy relies heavily upon the establishment of strong, regional forestry institutions at all levels. The section of the regional office mandated to promote exclosure should be closely linked to the MEFCC. Strong reporting and communication mechanisms should be developed and implemented. The regional office should benefit from technical support and guidance of the Ministry. The Ministry could also serve as a bridge, to support the region's efforts to establish global partnerships to secure technical and financial support. Strong regional-federal links also ensure that the planning of short and long-term regional programs are aligned with national strategic plans and goals. The Federal Ministry can provide platforms for all of the country's regional states to share their experiences and exchange lessons.

#### **4.3.4.4 Building capacity and enhancing the role of local government institutions**

The effective scaling up of exclosures requires adequately trained experts working at all levels. Experts should be equipped with the technical and social skills required to support the establishment and management of exclosures. Experts should be assigned at regional level. Experts from the region, together with experts from the Ministry, should plan and implement regular technical training for sub-regional experts, DAs, administrators and farmers. Training should address both socioeconomic and biophysical factors. Both short and long-term technical capacity building efforts are required. Training should include experts from NGOs and representatives of CBOs as well. The successful scaling up of exclosures cannot be ensured without an institutional arrangement dedicated to accomplishing this specific task. Appropriate sections for scaling up exclosures, and other effective forest management practices, should be established at all levels (i.e. region, zone and woreda). These sections should be staffed with experts in forestry and forest extension. Moreover, the region should allocate

adequate financial resources to cover the costs associated with the scaling up activities. Other financing sources should also be explored, in close collaboration with the Federal Ministry.

#### **4.3.4.5 Enhancing the role of the private sector and other non-state actors**

Synergizing the roles of non-state agencies is very important to ensuring the successful scaling up of effective practices in exclosure. The scaling up program should be supported by up-to-date technologies, generated by public and private institutions. The regional office should guide the engagement of non-state actors that play a role in the establishment and management of exclosures in particular, and in forest management practices in general. The office should develop a mechanism to establish a network of non-state actors working in exclosure management, and other natural resource conservation and development initiatives. The network should guide the consolidation of the efforts of various stakeholders. The network should also make efforts to prevent duplication, and ensure learning and complementarity.

#### **4.3.4.6 Linking with the livelihood strategies of communities**

The scaling up of exclosures should take into account the existing livelihood strategies of local communities. In pastoral communities, for instance, the scaling up of exclosures should focus on promoting forage species, either through enrichment planting or assisted natural regeneration. For communities engaged in trade, scaling up should emphasize the integration of species with high market value that bear commercial products, such as edible fruits, construction wood and firewood, medicinal plants, gum and resin and other NTFPs such as honey. In general, however, the production of wood and fodder should be integrated into initial objectives for the management of exclosures.

#### **4.3.4.7 Ensuring the active participation of communities and increasing their benefits**

Community participation at all levels is one of the key issues to be considered in the scaling up of exclosures. The participation of different segments of the community (i.e. in terms of ethnic group, socioeconomic status, gender, age, etc.) should be encouraged from the outset. The participation of community members should be ensured during decision making (e.g. on demarcation, membership, objective setting, management plan preparation, bylaw formulation, responsibility and benefit sharing arrangements, etc.). Benefit and responsibility sharing mechanisms should be proposed primarily by the community, and should be designed to encourage performance. They should also be transparent and must have a clearly defined set of criteria.

## 5 IMPLEMENTING THE STRATEGY

### 5.1 Strategic directions

The success of this scaling up strategy greatly depends on the extent to which the relevant regional bureaus take ownership of it, and recognize it as fundamental to guiding the short and long-term efforts to promote good forest management practices in the region. It is important to have a strong forestry institution that works in close collaboration with the MEFCC, to enhance the economic and environmental benefits of forestry sector development for local communities and the country at large.

The regional institution should be vertically linked to institutions at woreda and kebele levels, as the Region and the districts are in ensuring the successful implementation of this scaling up strategy. Links between regional and federal institutions are important to improving the effectiveness of interventions to promote forest sector development and poverty reduction, particularly in light of the supportive policy and governance roles that could be played by the federal government. There is also a need to devise a mechanism to strengthen cross-sectoral links. Mutually supportive links should be established with other sectors, such as agriculture, energy, water, transport and tourism. Initiatives to create awareness of this scaling up strategy, among all direct and indirect stakeholders and the general public, should be planned and implemented. Detailed long and short-term plans for scaling up should be prepared with the involvement of experts, relevant bureaus, administrators, and community based organizations.

### 5.2 Preparing operational plans

The relevant bureau at the regional level, in consultation with the relevant federal ministries, should be responsible for developing regional short and long-term strategic plans. Planning should start from the lowest level, with the active engagement of the community. The bureau should also develop an objective monitoring and evaluation framework to be effected at zonal and woreda levels. The monitoring and evaluation framework should serve as a tool to facilitate communication between practitioners at various levels. It should also ensure the engagement of all stakeholders and promote cross-sectoral links. A cross-sectoral approach could be adopted by establishing an inter-sectoral steering committee to oversee regional forest extension and technology dissemination interventions. Members of this committee should be selected from higher education institutions, research institutions, cooperatives, and sectors such as energy, water, tourism, road, environmental protection, and agriculture. Strong and direct links with the MEFCC are very important. This enables the region to benefit from technical and financial support via the Ministry, through the various links it establishes with local and international partners.

### 5.3 Addressing organizational, human resources and financial requirements

A strong regional, institutional set-up is critically important to ensure the effective implementation of this scaling up strategy. The regional bureau should establish a section for forest extension and technology dissemination, composed of senior experts from the fields of forestry, soil and water conservation, marketing, and environmental law. The regional forest extension and technology dissemination section should be a coordinating body that supports initiatives at all levels. In particular, this section should establish very strong links

with the forestry research departments of regional forestry research institutes and higher education institutions. These links should facilitate the implementation of a mechanism to promote science-based, forest development planning and implementation. They should also serve as a platform for sharing feedback on disseminated technologies, to determine which issues require further study. Similar arrangements should be established at zone and woreda levels. The function and size of the institutions at the zone level should be determined by the region, and should be suited to the type and size of the resource base. The structure at woreda level should provide regular support to the interventions in kebeles. Performance should be actively monitored and evaluated based on the regional level framework. The structure at zone level should mainly focus on supporting, coordinating and monitoring interventions straddling two or more woredas. Both the zone and woreda level experts should take an active part in the long and short-term planning of this scaling up strategy.

#### 5.4 Identifying and engaging key actors and negotiating their roles

Synergy between stakeholders is vital for the successful implementation of this strategy, and the sustainability of the recommended interventions. Synergy promotes efficiency, reduces duplication of efforts, and facilitates the alignment of targets, goals and planning at various levels. Table 2 presents a broad summary of the major state and non-state stakeholders that will play a role in the implementation of this strategy. Please note that neither the list of stakeholders indicated below, nor their proposed responsibilities, are comprehensive. Thus, this list should be updated and refined as needed.

Table 2. Key institutions and their responsibilities.

Stakeholders/institutions	Responsibilities
<b>Government</b>	
MEFCC	Providing policy direction, coordination, package development, capacity building, technical backstopping, monitoring and evaluation, and fund mobilization from donors
Regional bureaus	Awareness creation, package development, training, providing direction, coordination, capacity building, technical backstopping, implementation, budget allocation, monitoring and evaluation
Zonal advisors	Coordination, backstopping woredas, monitoring and evaluation
Woredas and kebele	Training, awareness creation, implementation, follow-up
Research and HLI	Providing technical support, impact assessment, providing technologies, advisory service
Other sectors (agriculture, energy, water, road, tourism, environmental protection, etc.)	Collaboration in planning, implementing and monitoring and evaluation of interventions

<b>Non-governmental actors</b>	<b>Responsibilities</b>
NGOs	Training, capacity building, implementation, project development, developing and supporting incentive mechanisms, facilitation of experience sharing
Civil societies	Training, capacity building, implementation, project development
Community based organizations	Participation, facilitation, implementation
Private sector	Supporting the strategy through investment

### 5.5 Potential risks and mitigation measures

Table 3 presents some potential risks to this strategy and proposed mitigation measures.

Table 3. Potential risks and proposed mitigation measures.

<b>Potential risks</b>	<b>Mitigation measures</b>
Lack of strong regional forestry institutions	Lobby regional decision makers based on concrete evidence of the importance of such institutions
Lack of capacity to add value to products and establish market links	Non-state partners interested in this intervention should be encouraged to assist
Lack of proper implementation of land use plans	Relevant institutions should play a role in the planning and implementation of scaling up efforts
Lack of skilled and motivated personnel	Specific, short-term training opportunities should be organized by higher education institutions. Experts at various levels must take ownership of the strategy, and performance-based incentive mechanisms should be put in place
Poor community motivation (may be due to a lack of management interventions in exclosures)	A strong awareness creation mechanism should be developed. Existing, government-formed one to five units should be supported, and performance-based incentives should be introduced
Environmental impacts of interventions (e.g. on biodiversity)	Environmental impact assessments should be conducted, and planned interventions accordingly amended to minimize negative impacts
Lack of equitable benefit sharing	Transparent and participatory responsibility and benefit sharing mechanisms should be developed, agreed upon, and implemented
Climate variability	Meteorology and early warning institutions should be consulted in the planning and implementation of preventive measures

## **5.6 Monitoring, evaluation, reporting and improvement strategy**

A detailed framework for the monitoring and evaluation of scaling up interventions should be developed during the planning phase. The monitoring and evaluation of scaling up initiatives should be based on objectively verified variables and indicators of progress and impacts. Indicators showing changes in income, livelihoods and environmental wellbeing should be considered. A baseline assessment should be conducted prior to the scaling up of interventions. Monitoring and evaluation should be conducted at various levels. The MEF should also carry out quarterly or bi-annual monitoring, and mid-term and terminal evaluations. Periodic monitoring and evaluation should be conducted by the relevant section of the bureau. The regional steering committee should conduct both field and report-based follow-up of the interventions. Sections at zonal and woreda levels should also conduct monitoring and evaluation based on regional operational plans and the regional monitoring and evaluation framework. The regional bureau, in consultation with the MEFCC, should recommend improvements and amendments based on periodic monitoring and evaluation. A reporting channel to link all levels, from the MEFCC to kebele, should be developed. The MEFCC should develop a national format for the regions. Accordingly, regions should develop a format for zones, woredas and kebelles. Regions should submit reports on a quarterly basis. Zones, woredas and kebelles should report to their respective, superior bodies on a monthly basis. Terminal reports should be prepared by woreda, zone and regional offices at the end of each scaling up intervention. Reporting should primarily focus on major targets, achievements, challenges faced, measures taken, lessons learnt, and recommended improvement measures and procedures. An independent team composed of senior experts from relevant federal and regional institutions should evaluate the completed interventions, and prepare and submit a report to the MEFCC and the regional bureaus. Feedback should accordingly be communicated to lower level implementers.



## 6 THE WAY FORWARD

The selection and scaling up of effective forest management practices represents a potential means of enhancing forest development, as well as the forest sector's contributions to local livelihoods and the national economy. The scaling up of identified best practices should be implemented in areas with similar ecological, social and economic contexts. Several issues should be addressed before scaling up planning commences. The existing resource base and socioeconomic context of the community should be examined, to ensure successful adoption and wider dissemination of the proposed practice. The existence of appropriate institutions and adequate financial and human capacity should be ensured. In addition to this, a market for products should be identified to ensure the sustainability of scaled-up interventions. Variations, in terms of the enforcement of existing policies and legal frameworks, may impact the effectiveness of scaled-up interventions. Therefore, national level selection of practices for scaling up should be performed carefully, taking these factors into account. Depending on the outcome of this assessment, appropriate amendments should be made before examples of best practice are scaled up.

At the regional level, attempts have been made to maximize the benefits of exclosures, including the promotion of beekeeping, and the implementation of a cut and carry system for livestock feed. These efforts should be further strengthened. In addition to this, the bureau recently began distributing farm implements to exclosure managers, to support the thinning and pruning of selected tree species, to improve tree growth. These efforts should be informed by research, to identify appropriate tree species and density to the site and to recommend better silvicultural practices. Research should support the overall aims of enhancing the economic and ecological benefits of exclosures. The regional bureau has also requested further assessment of available options to enhance economic returns from existing exclosures, and support the commercialization of forestry at large. This assessment should take into account international experiences and domestic and international market opportunities, including carbon financing.

National-level scaling up of selected interventions will also promote the exchange of effective practices between regions. Practices from other countries can also be tested, packaged at national level, and disseminated to various regions. Knowledge transfer and the national level scaling up of interventions must be supported by the establishment of full-fledged regional forestry institutions. Thus, the MEFCC should lobby for, and support regional governments in the establishment of, such institutions. The National Forest Act must also be finalized to allow regions to develop detailed guidelines. Such strategies require the development of detailed manuals to facilitate their implementation, and the well-planned training of experts at various levels to acquaint them with laws, acts and guidelines. The MEFCC should conduct regular assessments of existing practices in the country, in order to continuously select effective innovations, and assess and refine its scaling up strategy. Moreover, successful practices elsewhere should also be examined, and selected practices should be customized to suit to the different socioeconomic, environmental and political contexts of the regions where they are to be implemented. The MEFCC should also strengthen its capacity to actively support regional forestry institutions. For instance, the

development of mega-projects on best practices could represent a key strategy for supporting regions. In addition to this, the MEFCC should establish global partnerships, in order to mobilize financial and technical support. More importantly, the MEFCC should work closely with relevant stakeholders, in order to create favorable conditions for promoting forest industries. These industries create market opportunities for forest products, which can encourage not only communities, but also the private sector, to play a role in the development of the forestry sector.

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