Experience Capitalization of Gudoberet- and Hosanna-Jawe Landscape Restoration Process in Ethiopia

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Acronyms and Abbreviations

Africa RISING	Africa Research In Sustainable Intensification for the Next Generation
BoA	Bureau of Agriculture
CIAT	International Centre for Tropical Agriculture
CTA	The Technical Centre for Agricultural and Rural Cooperation
DA	Development Agent
DBU	Debre Berhan University
ECP	Experience Capitalization Process (ECP)
FAO	Food and Agriculture Organization of the United Nations
GoE	Government of Ethiopia
ICRAF	World Agroforestry Center
ILRI	International Livestock Research Institute
IWMI	International Water Management Institute
M&E	Monitoring and Evaluation
MERET	Managing Environmental Resources to Enable Transitions
MoA	Ministry of Agriculture
MU	Mekelle University
NGO	Non-Governmental Organization
PSNP	Productive safety Net program
SLMP	Sustainable Land Management Program
SNNPR	Southern Nation Nationalities and People's Region
SWC	Soil and Water Conservation

Summary

This study was undertaken in the Gudoberet- and Jawe landscapes located in Amhara and SNNP regions of Ethiopia, respectively. Experience Capitalization (EC) process approach was used to capture a wide range of experiences related to landscape restoration project in Gudoberet- and Jawe landscapes. Although there has been several studies regarding landscape restoration in Ethiopia, the use of EC process in landscape restoration is the first attempt in the country. The approach involves various procedures such as selecting the intervention, setting the boundaries of intervention, gathering information, describing interventions and analysis (filtering lessons). SWC on cultivated lands, gully rehabilitation, exclosure and water harvesting were the major interventions implemented for landscape restoration. Focus group discussion, key informant interview and transect walks were used to gather primary information. The result shows that participants considered economic, environmental, social and gender criteria to assess landscape restoration interventions. Based on the EC process, the following major lessons are identified:

- Since landscape restoration requires multiple interventions, strengthening collaboration and integration of institutions including CGIAR centers is crucial to improve the success of landscape restoration program in the country.
- Although livestock management is considered as an important part of the landscape restoration process in both sites, free grazing affected the adoption of biological SWC measures. The experience shows that there is a long way to achieve complete cut-and-carry system of livestock production mainly due to insufficient biomass production that can be used as cut-and carry system. Unless a complete cut-and-carry system is practiced, investment in landscape restoration mainly soil and water conservation practices will continue indefinitely. Strategies are being explored to reduce the number of livestock and enhance biomass to enhance the adoption of cut-and-carry livestock production system.
- Sectoral integration (crop, livestock, forest, water, etc.) will be crucial for the successful achievement of landscape restoration efforts.
- Creating awareness using various approaches, government focus on landscape management, collaboration among institutions, commitment of project staff and the community contributed for the success of landscape restoration process.

- There is a clear need to integrate income generating options and youth employment schemes into the landscape restoration efforts to sustain the land and water management practices and their benefits.
- Proper linkages between 'research' and development organizations is crucial to bring in win-win solutions focusing on their areas of mandate for the success of landscape restoration efforts.
- Use of cross-site visits, evidence generation, multi-stakeholder integration, community mobilization, linked technologies and use of physical and biological SWC are the major lessons learned for successful restoration. However, this study focused only on two small landscapes with minimum investment in landscape restoration. It is clear that the country has invested heavily in landscape restoration activities through various projects such as SLMP, MERET and PSNP. However, the outcomes in terms of EC are yet to be fully understood under these projects. Hence, a comprehensive EC on needs to be explored for the adoption of successful approaches in landscape restoration process in the country and beyond.

Table of Contents

List of Tables

List of Figures

1. Introduction

Land degradation in the form of soil erosion by water is a serious problem in Ethiopian landscapes not only threatening livelihoods of communities but also water and energy supplies (Gashawet al.2014; Ebabu et al. 2017). Globally, regionally or nationally, there are many ways of controlling or preventing soil erosion. The Alliance of Biodiversity International and the International Centre for Tropical Agriculture (CIAT) – hereafter the Alliance in the Ethiopia office in collaboration with its different partners is engaged in a project associated with ‘‘landscape restoration’’ through land and water management options across Ethiopia to reduce land degradation. So far, evidence generation focuses on measuring effects of land and water management technologies on soil erosion control, biodiversity, productivity, soil properties and soil moisture content (Yaekob et al., 2020; Terefe et al., 2020; Adimassu et al., 2017; Adimassu et al., 2014). For example, study in Gudoberet-Adisghe landscape showed that land management practices implemented at the watershed level reduced soil erosion by up to 74% (Yaekob et al., 2020). Similarly, Adimassu et al (2017b) reported that soil bunds with Desho grass in Jawe landscape reduced soil erosion by up to 60%. Nevertheless, systematized approach involving various stakeholders at different levels has not been conducted.

Drawing the experiences of FAO and CTA, the project intends to conduct Experience Capitalization (EC) of landscape restoration process in Ethiopia with the purpose of capturing a wide range of experiences of different groups that took place in the process of the project in order to learn from the perspective and experiences of all stakeholders who participated in the experience. Experience capitalization (systematization) is an interactive and participatory process through which an experience is identified, analysed and documented, leading to the creation of knowledge (for example good practices or lessons learned), which can be improved, shared, adapted and adopted (Eggens and Chavez-Tafur, 2019; Zhang et al., 2018; CTA, 2019a; CTA, 2019b). The experience capitalization approach helps identify effective innovations and practices, and helps understand the reasons behind the successes or failures seen in the field (CTA 2019a; Ouattara, 2019, Tarimo, 2019, Renuka, 2019). These insights can help improve the ongoing projects, or help prepare better work plans or better proposals (Nyando, 2019; Yilma, 2019; Sancho, 2019). Experience capitalization can also support a project’s

advocacy efforts by providing concrete evidence on a given subject, and by encouraging the involvement of different participants, such as farmers, policymakers, local leaders or the staff of an organisation (Tukundane, 2019; Ostroski, 2019;). The approach is employed in various interventions such as capacity building, rural development, land productivity and natural resources management in Africa and Asia (CTA 2018a; 2018b; 2018c; 2018d). The main purpose of this study was to analyse and document lessons/experiences of landscape restoration processes using Experience Capitalization approach in two watersheds of Ethiopia, namely, in Gudoberet- and Jawe.

2. The Project

The Alliance, Addis Ababa Office in Ethiopia, in collaboration with its different partners is engaged a project associated with 'landscape restoration' through sustainable land and water management options across the country. The overall aim is to implement effective and efficient land, soil and water management options to create multifunctional landscape that are productive and resilience. The Alliance closely works with partners at various levels including various CGIAR centres through Africa RISING program, SLM program and Bureau of Agriculture at different regions as well as local NGOs. The key components of the project that the Alliance involved include evidence generation and capacity building through training, cross-site visits and field demonstrations. The most important stakeholders of the project include CIAT, MoA (Lemu and Basonaworana districts), MoA-SLMP, MU, ILRI-Africa RISING Program, ICRAF, IWMI, ICRISAT, District Administration, Kebele Administrations of the two sites and farmers.

3. Description of Study Areas

As part of the Alliances's landscape restoration project in Ethiopia, this EC exercise was conducted in Gudoberet-Adisghe and Jawe landscapes. Gudoberet-Adisghe and Jawe landscapes are situated in the Ethiopian highlands with an elevation of 2865-3105 m asl and 2110-2800 m a s l, respectively. Administratively, Gudoberet-Adisghe landscape is located in North Shewa Zone of Amhara Region whereas Jawe landscape is located in Hadiya zone of the SNNP region of Ethiopia.

Gudoberet-Adisghe landscape receives average annual rainfall of 1300 mm whereas Jawe receives more than 1200 mm (Terefe et al., 2020; Adimassu et al., 2017b). Both watersheds are characterized by the crop-livestock mixed farming system with their own distinct production systems. Crop production in the two landscapes are distinct that Gudoberet-Adisghe has cereal-based farming system while Jawe has ense- based farming system in which farmers' livelihood depends on enset cultivation (Figure 1)

Figure 1. Enset (Ensete verntricosum) cultivation in Jawe landscape of Ethiopia

(photo credit: Zenebe Adimassu)

4. Procedures in Experience Capitalization

The tool aims to facilitate the documentation process by people who live an important experience or event. Experience capitalization (EC) has four major principles including the process is participatory with multiple stakeholders, learn from reality and based on context and history. According to Eggens and Chavez-Tafur (2019) two major steps are used to capture the EC exercise (Figure3). Generally, preparation and implementation are the two broad steps in EC approach.

In the preparation/planning phase, the facilitators identify the participants in consultation with the project team and based on review of project reports. Again, activities should be identified in consultation with the project staff and document review. Required facilitation team, time, finance and logistics should be identified and planned properly.

In the implementation phase, several steps such as selection of cases, setting the boundaries, information gathering, description and analysis are employed to complete EC processes (Figure 2).

In development and research projects, an experience capitalization process explores various types of experience such as a cross-cutting subject across multiple interventions, a project or programme, a partnership, a set of events (related to each other in some way, e.g. they took place in the same area), a specific methodology, a specific practice (e.g. agricultural inputs management), a community experience, indigenous practice or farmer-led innovation, a specific activity or set of activities.

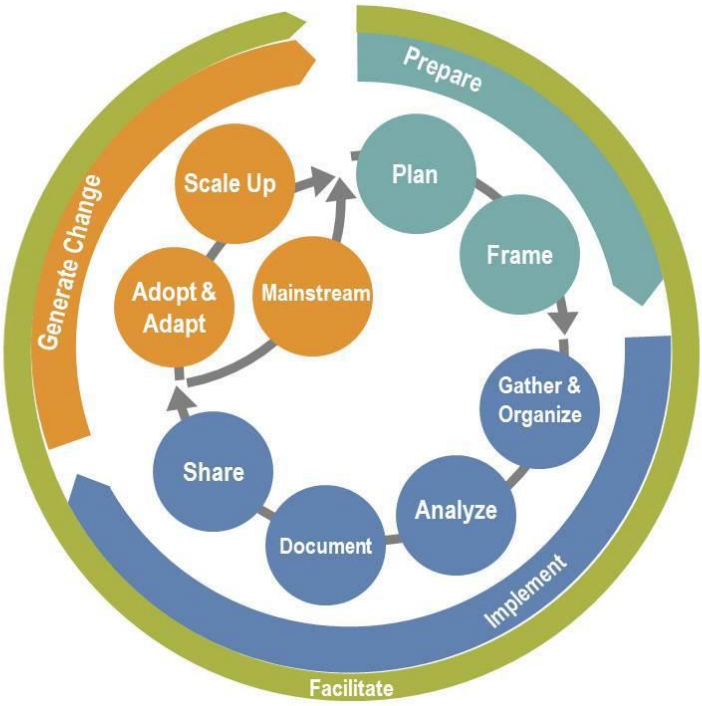

Figure 2. Processes involved in experience capitalization (adapted from Eggens and Chavez-Tafur, 2019; CTA, 2019a)

Involving relevant stakeholders helped us to document the experience learnt from successes and failures, and to inform future activities to be implemented in respective watersheds. This exercise was conducted at different administrative levels including

CIAT project staff, experts at MoA, development agents, Africa RISING site coordinators and farmers.

5. Data Collection Approaches

Data-collection methods employed regarding the EC of landscape restoration in two watersheds includes **document review; transect walks and observation, key informant interviews and focus group discussions.**

i) ***Document review:*** Experience capitalization exercise started with review of documents including Experience capitalization guidelines, Alliance's project reports and relevant scientific articles. Documents related to land degradation, landscape restoration in Ethiopia, outcomes of such restorations, project reports and other communication materials were reviewed.

Table 1. Information on focus group discussion (FGD) and key informant interview (KII) in Gudoberet-Adisghe and Jawe landscapes of Ethiopia

Landscape	Participants	FGD*	KII
Gudoberet-Adisghe	Farmers	1 (14)	3 (2 female and 2 male)
	Experts	1 (12)	3 (3 male)
Jawe	Farmers	1 (16)	4 (1 female and 3 male)
	Experts	1 (6)	3 (3 male)
Researcher of CIAT (Project leader)		-	1 (male)

**Numbers in the bracket indicate the number of participants in one focus group discussion*

ii) ***Transect walks and observation****:* In both landscapes a transect walk was conducted with the local people and development agents to explore the status of major interventions implemented in the project areas. During the transect walk, participants discussed issues which could be of relevance to landscape restoration. The facilitator undertook informal discussion with the local people (Figure 3) and development agents. Moreover, landscape restoration technologies/practices implemented in the two watersheds were observed during the transect walks.

Figure 3. Discussion with farmers during the transect walks in Jawe landscape

(Photo credit: Workineh Dubale).

iii) Key informant interviews

Besides direct observation of the watersheds through transects walks, key informant interview was conducted with key community members, project leaders, development agents and site coordinators who were actively involved in the landscape restoration process. Accordingly, key informant interviews were made with various groups in both sites (Table 2). Key informant interviews were held with Africa RISING site coordinators, kebele administrators and development agents (Figure 4). Moreover, key informant interview with CIAT project coordinator was held in Addis Ababa. Key informant interview helped us in displaying in-depth examination of *the process of landscape restoration and successes of the project.*

Figure 4. Interview with Development agent at Jawe landscape

(Photo Credit: Workineh Dubale).

iv) Focus group discussions

Focus group discussions (FGDs) were held with direct beneficiaries (farmers) and experts at the MoA at various levels (Figures 5 and 6). Generally four focus group discussions/mini workshops were held in the study watersheds at two levels. At the experts' level, discussion was held with subject matter specialists from the zone and district levels at Zonal towns. Accordingly, one meeting at Debre Berhan and another at Hosaena (Figure 5) were held regarding EC of landscape restoration of Gudoberet-Adisghe and Jawe landscapes, respectively. Discussions with key informants and focus group discussants were guided using checklists of topics (semi-structured questions) on which they express their experience and recommendations based on their live experiences regarding landscape restoration interventions.

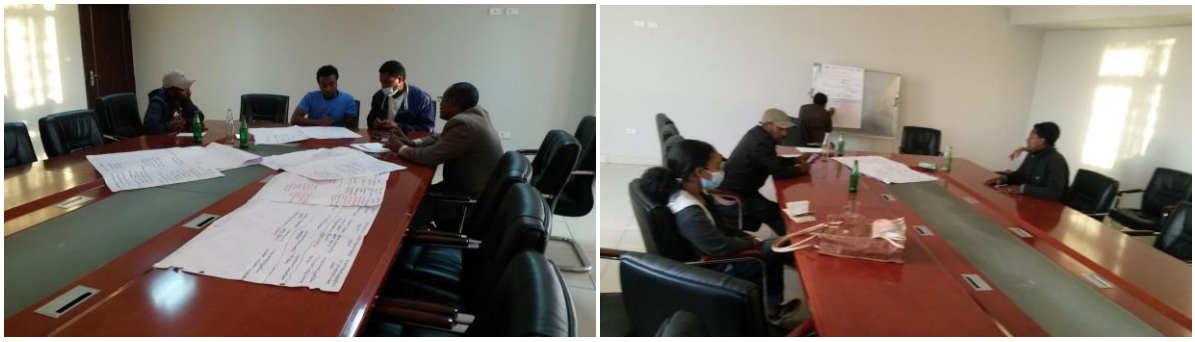

Figure 5. Group discussion with experts at Debre Berhan regarding Gudoberet–Adisghe landscape restoration

(Photo credit: Zenebe Adimassu)

Figure 6. Focus group discussion with farmers at Gudoberet-Adisghe site.

(Photo credit: Temesgen Alene)

6. Selecting and framing landscape restoration interventions

In the begging, the main objectives of experience capitalization was identified and selected by the project leader of CIAT and confirmed by other stakeholders such as MoA experts and Africa RISING site coordinators. Accordingly, CIAT and other partners were interested to employ experience capitalization process of landscape restoration efforts in order to i) document success stories and share with stakeholders, ii) generate qualitative data and stakeholders' views on the success and failure of the activities/project, and iii) scale-out the approach to other areas in the county and beyond. The project manager and other

stakeholders selected and agreed to document the experience capitalization of landscape restoration in Gudoberet-Adisghe and Jawe watersheds (Table 1). The major stakeholders involved in the implementation of this landscape restoration include CIAT, MoA at various levels, SLMP-MoA, District administration, Kebele Administration, ILRI, IWMI, DBU and MU.

Several interventions were implemented to improve overall system productivity and enhance resilience to climate variability, improve soil fertility, and improve crop productivity and animal-feed availability (Table 2). Soil erosion, soil nutrient depletion, low crop productivity and shortage of animal- feed were mentioned as major problems of the two watersheds which are caused by adulated topography (mainly in Gudoberet-Adisghe watershed, deforestation, continuous cultivation and over-grazing.

Table 2. Selecting and framing of the boundaries of the intervention, objectives, problems and causes of the problem in Jawe and Gudoberet Adisghe sites of Ethiopia

The title of the selected case	Location /site	Stakeholders involved	Duration	Objective of the case	Problems	Causes of the problem	Previous attempts
Creating Multifunctional landscapes	Gudoberet-Adisghe	CIAT, North Shewa zonal BoA, Basona district BoA, DAs at Gudoberet and Adisghe kebeles, Gudoberet and Adisghe kebele Administrations, ILRI, IWMI, DBU, MU,	2015—2020	Improve overall system productivity and enhance resilience, specifically reduce soil erosion, improve soil fertility, improve crop productivity and enhance feed availability	-Soil erosion, -soil nutrient depletion, -Water shortage - low crop productivity and shortage of animal- feed	-Adulated topography, deforestation, continuous cultivation, scarcity of water resources and rainfall variability, over-grazing	SLMP project
	Jawe	CIAT, Hadiya Zone BoA, Lemo district OoA, DAs at Jawe Kebele, Jawe Kebele Administration,	2015—2020	Improve overall system productivity and enhance resilience, specifically reduce soil erosion improve soil fertility, improve crop productivity, enhance feed availability and improve water availability	-Soil erosion, -soil nutrient depletion, -Water shortage - low crop productivity and shortage of animal- feed	Continuous cultivation, scarcity of water resources, rainfall variability, over-grazing	None

7. Description of landscape restoration interventions and results

7.1. Interventions in Gudoberet-Adisghe landscape

This section describes major interventions implemented and results in Gudoberet-Adisghe and Jawe landscapes in creating multifunctional landscapes (Table 2). In Gudoberet-Adisghe, the most important interventions in the restoration of degraded landscape include SWC practices on cultivated lands, gully stabilization, exclosure and in-situ water harvesting. Similarly, SWC practices on cultivated lands and ex-situ water harvesting were the most important interventions implemented in Jawe landscape restoration. These interventions have been implemented using collective action of various institutions and farmers, awareness creation through cross-site visits, demonstrations and trainings.

7.1.1. SWC practices on cultivated lands

Since soil erosion by water was one of the key landscape problems on cultivated lands in landscapes, soil and water conservation practices (SWCP) were implemented to control erosion and improve productivity.

In Gudoberet-Adisghe landscape, SWC on cultivated lands were implemented to control soil erosion and rehabilitate degraded landscapes. Soil bunds combined with tree Lucerne (Chamaecytisus palmensis) and Phalaris grass (Phalaris acquatica, Phalaris arundinacea) are the most important SWC practices in Gudoberet-Adisghe landscape (Figure 7). Local government, farmers, MoA, SLMP, CIAT and ILRI were the most important stakeholders involved in the implementation of these practices. So far, about 80 km stone and soil bunds were constructed in Gudoberet-Adisghe landscape (Terefe et al., 2020; Tamene, 2017). These structures reduced soil erosion in the short term and improved crop yield and household income in the long-term. Rodent, weed infestation and reduction of cultivable area are the negative effects of constructing soil/stone bunds on cultivated lands.

Figure 7. Soil and stone bunds combined with tree lucerne (Chamaecytisus palmensis) and Phalaris grass (Phalaris acquatica, Phalaris arundinacea) in Gudoberet-Adisghe landscape.

(Photo credit: Lulseged Tamene).

The development of trees and grasses around soil and stone bunds created opportunities in improving the availability of animal-feed in the system in Gudoberet-Adisghe. Phalaris grass (Phalaris acquatica, Phalaris arundinacea) in Gudoberet-Adisghe landscape is the most important animal feed grown on soil/stone bunds and exclosure (Figure 8). Similarly, development of tree Lucerne on soil/stone bunds increased the availability of animal feed in Gudoberet-Adisghe watershed (Figure 8)

Figure 8. Phalaris grass (left) and tree Lucerne (right) planted on soil bunds in Gudoberet-Adisghe landscape improved the availability of animal feed.

(photo credit: Zenebe Adimassu)

Table 3. Description of the activities and results of landscape restoration project in Gudoberet-Adisghe landscapes of Ethiopia as assed by participants during Experience Capitalization process.

Interventions/activities	Direct beneficiaries	Potential beneficiaries	Short-term positive results	Long-term impact	Negative results	Stakeholders	Methodologies/ strategies used
SWC practices on cultivated lands	Land owners	Downstream farmers	Soil erosion reduced and soil moisture improved	Crop yield increased, household income, improved and ground water availability improved Increased biodiversity	Rodent, weed infestation, reduced cultivable area	Farmers, MoA, SLMP, CIAT, ILRI (tree Lucerne)	Mass mobilization, training, cross-site visit, demonstration using scientific research
Gully stabilization	Land owners	Downstream farmers	Soil erosion reduced, gully rehabilitated	Increased availability of cultivated land, improved ground water, improved household income		Farmers, MoA, SLMP, CIAT, ILRI, MU	Mass mobilization, training, technical support, cross-site visit, provide tools and materials
Exclosure	Landless youths	Honeybee owners, livestock owners	Soil erosion reduced, soil fertility improved, water moisture improved, ground cover increased,	Improved household income, biodiversity (grasses + wild animals)	Harbor birds	Farmers, MOA, SLMP, CIAT, ILRI, MU (percolation pits)	Awareness creation, cross-site visit of successful exclosures areas, training, organizing youths and landless, provision of seedlings and farm tools
In-situ harvesting	Landowners	Downstream users	Improve soil moisture Increase grass cover Increase tree cover on degraded lands	Improve land productivity Increased household income	Water lodging due to trench on cultivated lands	Farmers, MOA, SLMP, CIAT, ILRI, DBU, MU	Mass mobilization, training, cross-site visit, demonstration using scientific research

7.1.2. Gully stabilization/rehabilitation

Gully erosion was the one of the main soil erosion problem dissecting both grazing and cultivated lands in Gudoberet-Adisghe landscape (Figure 9). During the preliminary discussion with farmers on gully stabilization, they were not convinced that such big gully can be stabilized and rehabilitated. Working with the communities and through training, the big gully was stabilized and rehabilitated (Figure 9) using multiple interventions such as reshaping, construction of check dams (730 m^3 wooden check dam and 71 m^3 gabion check dams) and percolation pits, and planting of biological measures (Terefe et al., 2020; Tamene, 2017).

Figure 9. Gully erosion damaging crop land (left) and gully stabilized with stone check dam in Gudoberet-Adisghe landscape.

(Photo credit: Lulseged Tamene)

7.1.3. Exclosure

This system has been adopted in many parts of the country to restore degraded lands and improve vegetation cover. Degraded section of the communal degraded lands was excluded from livestock/human activities and planted with tree Lucerne as well as grasses (Figure 10). Percolation pits and trenches were also constructed in the exclosure area to improve soil moisture and facilitate the regeneration and survival of trees and grasses.

The main challenge of managing tree Lucerne on exclosure was the paradox between the use of tree Lucerne for animal feed and honeybee production. Farmers were advised to harvest the leaves of tree Lucerne for animal feed. However, in the contrary, they were expected to use for honeybee production. Technically, these two management practices are contradicting. Because, when tree Lucerne leaves and branches are harvested for animal feed, there is no flower for honeybee feed. Hence, this requires appropriate business model which can be economically and environmentally sustainable.

Figure 10. Exclosure covered with tree Lucerne in Gudoberet-Adisghe landscape

(Photo credit: Zenebe Adimassu).

7.1.4. In-situ Water Harvesting in Gudoberet-Adisghe

In Gudoberet-Adisghe landscapes, trenches and percolation pits were constructed mainly on degraded lands including exclosure sites and above the gully head (Figure 11). Trenches and infiltration pits were made for improved water infiltration and various multi-purpose trees were planted at the exclosure areas to restore vegetation cover. In-situ water harvesting improved the soil moisture and enhanced the regeneration of trees and grasses on degraded landscapes. Trenches constructed on cultivated lands created water lodging and affected crop production negatively.

Figure 11. Infiltration pits in the degraded landscape of Gudoberet-Adisghe landscape

(Photo credit: Lulseged Tamene)

7.2. Interventions in Jawe landscape

This section describes major interventions implemented and results in Jawe landscapes in creating multifunctional landscapes (Table 3). Participants of the experience capitalization process selected two groups of interventions in the restoration of Jawe landscape. These include use of SWC practices on cultivated lands and ex-situ water harvesting technology as discussed below.

7.2.1. SWC practices on cultivated lands

In Jawe landscape, two major SWC practices mainly Fanya chini with desho grass (*Pennisetum pedicellatum*) and Fanya juu terrace were implemented (Figure 12). The name *Fanya chini* literally means “throw it downwards” in Kiswahili. It consists of trenches and earthen ridges facing down slope. This intervention aims to reduce soil erosion because it breaks down long slopes into smaller sections. Hence, the speed of runoff will decrease and water can infiltrate into the soil between the bunds. It will result in a reduction of nutrient leaching and make more water available for crops. The excavated soil, obtained by digging trenches 50-60 cm deep and 60 cm wide, is placed on the lower side of the contour trenches, facing down slope. This is one of the most important distinguishing characteristic of *Fanya chini* compared to Fanya juu where the excavated soil is relocated upslope. The presence of the bunds ensures the formation of micro-catchments that concentrate the runoff coming from the land upslope of the bunds. In Jawe watershed, Fanya chini terrace is supported with Desho grass (*Pennisetum pedicellatum*) to stabilize the soil bund and increase availability of animal feed in the crop-livestock system.

Figure 12. Fanya chini with desho grass (Pennisetum pedicellatum) on cultivated lands of Jawe watershed (Photo credit: Zenebe Adimassu)

Table 4. Description of the interventions and results of landscape restoration project in Jawe landscapes of Ethiopia as assed by participants during Experience Capitalization process.

Interventions/activities	Direct beneficiaries	Potential beneficiaries	Short-term positive results	Long-term impact	Negative results	Stakeholders	Methodologies/ strategies used
SWC practices on cultivated lands	Land owners	Downstream farmers	Soil erosion reduced and soil moisture improved	Crop yield increased, household income, improved and ground water availability improved Increased biodiversity	Reduced cultivable area	Farmers, MoA, SLMP, CIAT, ILRI (tree Lucerne)	Mass mobilization, training, cross-site visit, demonstration using scientific research
Ex-situ water harvesting	Landowners	Fruit retailers	Improve productivity Improve water availability	Improved household income	Expansion of chat cultivation	Farmers, CIAT, MU, ICRAF	Technical support, training, material support (e.g., geomembrane), cross-site visit

Fanya juu (‘do upwards’ in Kiswahili) terraces are the second important SWC practices implemented in Jawe landscape. ***Fanya juu*** terraces are made by digging ditches and trenches along the contour and throwing the soil uphill to form an embankment (Figure 13). A small ledge or 'berm' is left between the ditch and the bund to prevent soil sliding back. It is very similar to *Fanya chini* since it consists of terrace bunds and ditches along the contour. The main purpose is to prevent water and soil loss and to make conditions more suitable for plants to grow.

Figure 13. Fanya Juu terrace on cultivated lands of Jawe watershed.

Photo credit: Zenebe Adimassu

Like in Gudoberet-Adisghe, Desho grasses were established behind soil bunds to stabilize the structure and improve feed availability in Jawe landscape. Farmers in Jawe planted tree Lucerne in the homestead to improve feed availability (Figure 14).

Figure 14. Desho grass (left) behind soil bunds and tree Lucerne (right) in the homestead to improve the availability of animal feed in Jawe landscape.

(Photo credit: Zenebe Adimassu)

7.2.2. Ex-situ Water Harvesting

Water harvesting is a collection and management of runoff from roofs and/or ground and stored to increase water availability agricultural and demotic uses as well as ecosystem sustenance (Critchley and Siegert, 1991). There are various types of water harvesting structures that can be used in different agro-ecologies and farm households. In this experience capitalization process, in-situ water harvesting in Gudoberet-Adisghe and ex-situ water harvesting in Jawe were assessed.

Water harvesting ponds which are lined with geo-membrane plastic (Figure 15) were introduced to Jawe landscape through the support of CIAT in 2015 to intensify homesteads in Jawe landscape. In Jawe landscape, seven farmers constructed water harvesting ponds in their homestead for homestead intensification. Accordingly, these water harvesting structures were used to store water for supplementary irrigation of high-value fruit and trees such as Avocado (*Persian american*)), coffee (*Coffea arabica*) and *Khat (Chata edulis)*. The stored water also used for the production of seedlings of these high value fruits and trees.

Figure 15. Water harvesting pond lined with geo- membrane at Jawe landscape.

(Photo credit: Zenebe Adimassu)

8. Criteria and indicators for success/failure of interventions

During the analysis of experience capitalization process, participants identified various criteria and corresponding indicators for the success and failure of each intervention (Table 3). As shown in the table, impacts of interventions on economic, environmental, social and gender sensitivity was the most important criteria under various interventions.

i) Economic impact

Participants argued that the use of SWC practices on cultivated lands, gully stabilization, exclosure and water harvesting improved household economy. Increased in yield of crops and increased in the income of farmers due to sell of trees and grasses were major indicators of economic impact of implementing SWC practices on farm lands. Gully stabilization/rehabilitation also increased available grazing and cultivable area which increased crop and feed production. The use of exclosure increased grass and tree biomass from degraded land and increased income of land users' income from the sell of trees and grasses. Water harvesting also brought economic impact of beneficiaries through increased income from high value fruits, seedlings, trees and grasses.

ii) Environmental impact

The most important indicators mentioned by participants related to the environmental impact of interventions include reduced soil loss, reduced runoff, increased tree cover, increased grass cover, improved biodiversity, improved soil fertility and intensified homestead. Evidence generated in Gudoberet-Adisghe landscape showed that use of SWC practices on cultivated lands increased total Nitrogen, available phosphorus, exchangeable K and organic carbon by 70%, 79%, 23% and 33%, respectively (Tefere et al., 2020). It is also shown that water discharge increased from 0.235Ls^{-1} to 1.619 Ls^{-1} due to landscape restoration activities. Similarly, 39 plant species were recorded in exclosure areas as compared to 13 plant species in the adjacent degraded land (Terefe, 2020). This shows that exclosure in Gudoberet-Adisghe landscape improved the biodiversity of landscapes.

iii) Social impact

Farmers understood the advantage of awareness creation and collective action in implementing large scale interventions such as SWC practices on cultivated lands, gully stabilization, exclosure and water harvesting. According to participants, working together and collective decision in landscape restoration become the culture of the community in both landscapes. The experience in ex-situ water harvesting in Jawe also created the demand of water harvesting and production of high-value fruits and trees in the homestead.

iv) Gender sensitivity

In all the interventions issue of gender was taking in to account starting from problem identification, planning and implementing of interventions as well as monitoring and evaluation of activities. Accordingly, men, women and youth farmers participated in cross-site visits, trainings and actual implementation of various interventions such as SWC on cultivated lands, gully stabilization, exclosure and water harvesting. It is also showed that female farmers (e.g. Bekelech in Jawe) benefited from ex-situ water harvesting and demonstrated production of high-value fruits and trees in their homestead. Generally, however, the experience capitalization process shows that benefits from landscape restoration were very limited to youth and landless groups.

Table 3. Indicators of performance of landscape restoration interventions in Gudoberet-Adisghe and Jawe landscapes of Ethiopia assessed by participants of experience capitalization process

Criteria	SWC on cultivated lands	Gully stabilization	Exclosure	In-situ water harvesting	Ex-situ water harvesting
Economic impact	-Household income increased due to yield improvement and sells of trees and grasses	-Increased grazing and cultivable area	--Increased tree and grass biomass	-Increased biomass of grasses in exclosure and grazing lands	-Increase income of household from production of high value crops such as avocado and khat -Diversified homesteads -Increased demand of avocado and enset seedlings
Environmental impact	-Reduced soil loss Increased water discharge Improve soil fertility	- Reduced soil loss - Arrested gully expansion	-Reduced soil loss -Changed tree/grass cover -Improved biodiversity-	- Reduced runoff and soil erosion -Increased vegetation cover - Increased water discharge	-Reduced runoff and soil erosion
Social impact	-Awareness created about the use of soil/stone bunds -Understood advantage of collective action for the success of SWC practices on cultivated lands	-Awareness created about gully stabilization - Understood advantage of collective action in stabilization big gully	-Awareness created about the use of exclosure to restore degraded lands and create job for the youth	-Awareness created about in-situ water harvesting	-Awareness created about ex-situ water harvesting -Increased demand for supporting water harvesting in Jawe landscape
Gender sensitivity	-Women farmers participated in cross-site visits, trainings and actual implementation of SWC	-Women participated in cross-site visits, trainings and actual construction of check dams	-Youth and landless groups benefited		-Women farmers (e.g Bekelech in Jawe) participated on ex-situ water harvesting and planting of high-value fruits and trees

9. Contributing and limiting factors of landscape restoration

9.1. Contributing factors

Approaches used in awareness creation and mobilizing communities: Various participatory approaches were used to create awareness of farmers and mobilize for collective action in landscape restoration. The team conducted empirical research to create awareness on soil erosion and the use of SWC measures such as soil/stone bunds and check dams in controlling soil erosion. The team also devoted its effort on gully stabilization/rehabilitation work where farmers were pesmist about it. Several cross site visits were conducted to convince farmers on how to restore degraded landscapes

Collaboration with other relevant projects: The presence of other relevant projects facilitated landscape restoration through material support and experience sharing. For example, Africa RISING has been working in both landscapes and contributed financial support in the landscape restoration process, Moreover, material support such as gabion helped landscape restoration interventions such as gully stabilization and reclamation in Gudoberet-Adisghe landscape.

Government focus and commitment on watershed management program: The government of Ethiopia in collaboration with its development partners invested huge resources in landscape restoration through Integrated Watershed Management (IWM) program. Therefore, any project related to landscape restoration is welcomed by the different levels of the administration. Government administration at various levels have collaborated and worked with the Alliance mainly in capacity building and e evidence generation of interventions. Community mobilization and day to day follow up of interventions and demonstration were done by the local partners such as extension agents and community watershed committee.

The seriousness of the problems: Land degradation mainly soil erosion by water on cultivated lands was the main problem in both landscapes. This problem encouraged the community to invest in SWC measures such as soil/stone bunds, check dams and exclosure. For example, dissection of cultivated and grazing land due to severe gully

erosion in Gudoberet-Adisghe threatened livelihood of many farmers. This problem motivated farmers to invest in gully stabilization/reclamation intervention in Gudoberet-Adisghe landscape. Moreover, serious water shortage mainly in Jawe landscape contributed for the success of water harvesting intervention.

Exchange visits: The various exchange visits (within and between sites) created awareness and incentivized some communities to adopt technologies. Visits of partners from different projects including from abroad incentoved thje local community and officials to continue devoted engagement in managing the landscapes.

Involvement of PhD and MSc students: As part of their field research, PhD and MSc students were involved in generating evidence regarding land degradation and the role of landscape restoration interventions. They employed field demonstrations to collect scientific evidence and demonstrate relevant stakeholders such as farmers, development agents, policy makers and researchers.

9.2. Limiting factors

Lack of strong leadership at local (kebele) level: By-law in landscape restoration (mainly watershed management) was formulated and enacted by the Amhara Regional Government. Lack of strong leadership at local level was found to be an important factor influencing the enforcement of landscape restoration by-laws that was ratified by the regional government. Weak leadership contributed to the ineffectiveness of by-laws because some of the village leaders are not daring enough and would like to be seen as 'good people'. This way, most offenders are left free, leading to more degradation of natural resources. For example, in both landscapes, this study shows that Kebele Administrators and the Development Unit leaders were not fully implementing the by-laws and did not open any court cases against offenders in accordance with the formulated by-laws for a long time.

Divergent of interest of communities and *benefit capture:* Adequately representing and benefiting all farmers in the landscape restoration process was difficult due to divergent of

interests among farmers. Because of diverse groups in both landscapes, it was tricky to target beneficiaries and benefit of landscape restoration interventions among the communities in the landscape. The first example was Soil and Water Conservation (SWC) intervention. There have been unequal costs and benefits of investing in SWC structures between landless and landowner farmers. Since SWC particularly physical structures require heavy labour, construction of these structures were done through community mobilization regardless of landownership. Nevertheless, the benefits of this investment such as yield improvement as well as reduction of soil loss go to landowners only. The second intervention was cut-and-carry system (restriction of free grazing) in both landscapes. There are divergences of interest in the implementation of cut-and-carry system due to variation in livestock ownership in both landscapes. There were three groups of farmers in the watershed related to livestock ownership: farmers without livestock, with small number of livestock and farmers with relatively large number of livestock. In both watersheds, livestock were grazed on one's own field as well as the lands of others during the dry season after harvest. Due to shortage of animal feed, farmers with large number of livestock tend to continue free grazing system while farmers without livestock advocate cut-and-carry system. Hence, there is divergence of interest in the implementation of cut-and-carry system resulted from the unequal benefits of restricting livestock movement which negatively affects the adoption of the system.

Reduction of cultivable area and water lodging: Reduction of cultivable lands in both landscapes due to the introduction of physical SWC practices such as soil/stone bunds, water ways and trenches is the main limiting factors to adopt physical SWC measures. Moreover, introduction of water lodging in Gudoberet-Adisghe landscape due construction of trench in the cultivated land reduced crop yield and affected the adoption of trenches on cultivated lands.

Expansion of fast growing but environmentally unfriendly tree species: Expansion of eucalyptus (*Eucalyptus camaldulensis*) tree species (*environmentally unfriendly tree species*) in the degraded lands of Gudoberet-Adisghe landscape discourages farmers to grow environmentally friendly tree in the landscape. Instead of planting environmentally friendly

tree such as tree Lucerne, farmers aggressively expand eucalyptus species due to its fast growing nature and high economic return.

Limited adaptability of tree/grass species in Gudoberet-Adisghe landscape: Since the area is located in frost zone of the central highland of the country, there are only limited tree/grass species to be adapted in the area. Moreover, the growth of these trees and grasses is very slow to stabilize the physical SWC measures and generate sufficient biomass for animal feed.

Mismatch between demand and resources: There has been difficulty in governing benefits to scarce resources that cannot be equitably accessed or sufficiently distributed among the community in the landscape. For example, exclosure in Gudoberet-Adisghe and exsitu water harvesting in Jawe landscapes were key examples that farmers complained about the benefit sharing of the these interventions, given the high cost of investments in water harvesting and exclosure. In case of exclosure, high number of beneficiaries (youth and landless) and the size of the exclosure didn't much. In this case, sharing the benefits of the exclosure (grass and trees) was not enough to support their livelihood and introduced high transaction cost compared with the benefits generated.

Donor restriction of investments and high initial cost of some interventions: In the one hand, there has been mismatch between fund release and planting season (e.g. Africa RISING project). In the other hand, there has been lack of long-term plan due to short period funding of projects. These affected the development of learning landscape restoration. For instance, Africa RISING project provides fund every year with new activity while landscape restoration requires continuous engagement of farmers and stakeholders to in a given watershed.

Free grazing of livestock: Although huge efforts were made change the livestock production from free grazing to cut-and-carry system, cut-and-curry livestock system has not adopted in both landscapes. Executing cut-and-curry system of livestock production in Ethiopian highlands is extremely complex. In the one hand, there is high livestock number and in the other hand, animal feed production is not sufficient carry the livestock number available. To

enhance the adoption of cut-and-carry livestock production system, strategies should be explored in reduce the number of livestock and enhancing biomass production.

Long gestation period of land restoration benefits: Most physical landscape restoration interventions (e.g. physical SWC practices) are not attractive for farmers as benefits accrued over long time. This affects farmers' investments in such type of interventions. This requires introduction of technologies that can motivate farmers such as ex-situ water harvesting.

Limited resources: The success of landscape restoration interventions is limited by inability of research centres like CIAT to fully engage in the "physical restoration efforts" . This is mainly due to the fact that such centres are constrained by financial resources for investment in interventions and mostly mandated for research activities.

Weak integration of institutions: Although farmers are the ultimate actors that take decisions regarding investments in landscape restoration process, integration of various institutions enhances successful implementation of interventions. Nevertheless, weak integration among institutions mainly CGIAR centres such as CIAT, IWMI and ICRAF was one of the limiting factors affecting success of water harvesting intervention in Jawe landscape. For instance, seven water harvesting ponds were constructed and demonstrated with the support of CIAT in Jawe landscape to intensify homesteads as well as improve farmers' livelihoods. However, this experience capitalization shows lack of integration among the aforementioned institutions to effectively manage the water soil and fruit trees in the demonstration sites.

10. Lessons learned

1. Use of cross-site visits to create farmers' awareness

In an effort to create awareness of what is possible in landscape restoration, cross site visits were carried out to Abraha We Atsibaha in Tigray region of northern Ethiopia where landscape restoration was successful through land and water management interventions. Farmers from both sites went to Abraha-weAtsibaha for experience sharing on how degraded lands restored and become productive using multiple interventions (Figure 16).This visit had a profound effect on farmers' awareness of what is possible. As stated by one farmer (Abera

at Jawe landscape), “If I had not been to that place (Abraha We Atsibaha), I would not believe that human beings can change such rocky and degraded land to fertile and productive land through land and water management practices.”

Figure 16. Farmers during the cross-site visit at Abreha We-Atsibeha in Tigray

(photo credit: Lulseged Tamene)

2. *Field based evidence generation on landscape restoration: Seeing is believing*

Field based evidence generation through participatory action research facilitated attitude change and awareness creation of farmers by making visible the role of SWC practices that are otherwise difficult to observe. Runoff plot experiments consisting of various SWC structures in Gudoberet-Adisghe and Jawe landscapes (Figure 17) helped to illustrate farmers what is lost from their fields and what is retained as a result of SWC practices (Adimassu et al, 2017;Yaekob et al., 2020). In Addition to runoff plot experiment, working with communities changed their perception on stabilization and reclamation of big gully in Gudoberet-Adisghe landscape. During preliminary discussions with the communities on gully stabilization, farmers stated that stabilizing such type of gully “is impossible.” Given the activeness and big size (up to 100 m wide and 3 m deep) of the gully, farmers were not convinced that such type of gully can be stabilized/reclaimed using collective action and multi-stakeholder engagement.

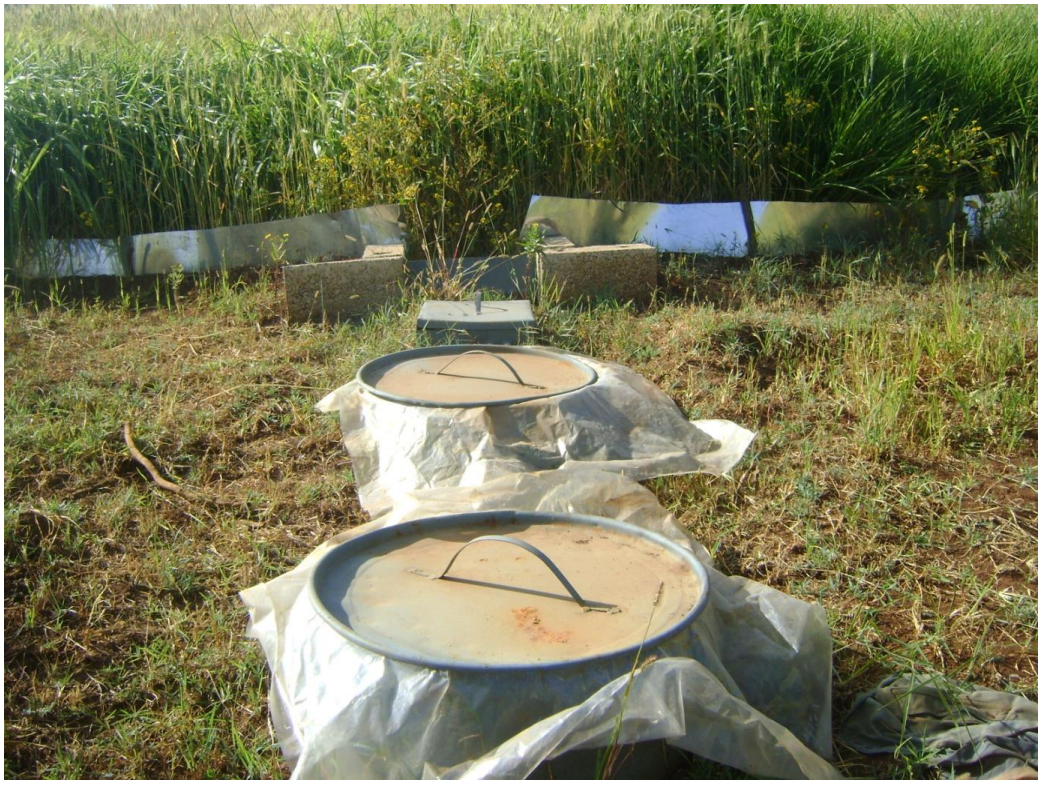

Figure 17. Runoff plot in Jawe watershed to create evidence on the role of soil bunds in reducing soil erosion. **(photo credit: Zenebe Adimassu)**

3. *Use of linked technologies*

Linked technologies were adopted to ensure compatibility between what farmers need and what landscape restoration is demanding. For this purpose, water harvesting was linked with production of high value fruits such as avocado and coffee to enhance landscape restoration and productivity (Figure 8). Individuals or groups of people can only move to higher level goals such as environmental protection when they have satisfied with their primary needs mainly food. This requires linking landscape restoration interventions such as water harvesting with economically important commodities to satisfy farmers' primary needs.

Figure 18. A farmer at Jawe landscape grows high value trees such as avocado (fruit and seedlings), coffee and khat in his homestead to enhance and diversify income.

4. Need for integrating physical and biological SWC practices

It is clear that physical SWC practices reduced the effective cultivable area and introduce a yield reduction at least in the first few years (Adimassu et al., 2017) resulted from reduction in cultivable area. However, integrating physical SWC practices (e.g. stone/soil bunds) with biological SWC measures (e.g. grasses, trees) is effective in increasing productivity of SWC investments.

5. Multi-stakeholders integration is needed for effective landscape restoration

Economic and environmental sustainability of landscape restoration requires support from a wide range of stakeholders, including government organizations, non-governmental organizations, national and international research institutes, private sector, community organizations, and farmers. As different stakeholders have different roles, responsibilities and mandates, no single agency can be successful in landscape restoration. Integration and cooperation among the various stakeholders is key to achieving the sustainability of landscape restoration. Although various stakeholders were involved in the landscape restoration processes in both sites, sectoral integration was not sufficient. Water and high-value tree management activities would have been better integrated with landscape restoration activities such as SWC and water harvesting activities.

6. Mobilize collective action

Generally, landscape restoration involves laborious interventions and requires collective action of institutions and communities. Engaging institutions and local communities in landscape restoration and ownership is critical to ensure that all people in the landscape are represented and participated; interventions meet the needs of the people and resources are accumulated for meeting food and environmental needs. This would also include management of natural resources the use of common forest and grazing lands.

7. Promote diversity in landscapes

Landscapes with high levels of biodiversity are more resilient and better able to mitigate environmental impacts compared to mono-cropped areas. Habitat integrity and connectivity can be maintained by incorporating multipurpose trees on SWC structures, homesteads, water ways, canals, grazing lands and exclosure areas. Incorporating fodder production at different niches of the landscape enable animals to provide sufficient feed and avoid overgrazing and trampling of vulnerable areas. Such diversity creates landscapes that are more resilient and better able to mitigate environmental impacts.

8. *Link research projects with development organizations*

It is clear that landscape restoration activities require huge resources (financial, material, human) and day-to-day follow up for sustainability. Nevertheless, research institutes have

limited and restricted resources to fully engaged in landscape restoration investment. Hence linking the projects with development partners enhance sustainability of the restoration efforts.

11. Conclusion

In this study, Experience Capitalization process approach was used to capture a wide range of experiences of in landscape restoration project in Gudoberet-Adisghe and Jawe landscapes of Ethiopia. The major landscape restoration interventions implemented in these landscapes include SWC practices on cultivated lands, gully rehabilitation, exclosure and water harvesting. Based on Experience Capitalization process of landscape restoration, the following conclusions are drawn.

- Since landscape restoration requires multiple interventions, strengthen collaboration and integration of institutions including CGIAR centers is crucial to improve the success of landscape restoration program in the country.
- Although livestock management is considered as an important part of the landscape restoration process in both sites, free grazing affected the adoption of biological SWC measures. The experience shows that there is a long way to achieve complete cut-and-carry system of livestock production mainly due to insufficient biomass production that can be used as cut-and carry system. Unless a complete cut-and-carry system is practiced, investment in landscape restoration mainly soil and water conservation practices will continue indefinitely. Strategies explored to reduce the number of livestock and enhance biomass to enhance the adoption of cut-and-carry livestock production system.
- Creating awareness using various approaches, government focus on landscape management, collaboration among institutions, commitment of project staff and the community contributed for the success of landscape restoration process.
- Use of cross-site visits, evidence generation, multi-stakeholder integration, community mobilization, use of linked technologies and integrating biological with SWC measures are the major lessons learned from landscape restoration projects. However, this study focused only on two small landscapes with minimum investment in landscape restoration. It is clear that the country has invested heavily in landscape

restoration activities through various projects such as SLMP, MERET and PSNP. However, the outcomes in terms of Experience Capitalization are yet to be fully understood under these projects. Hence, a comprehensive Experience Capitalization needs to be explored for the adoption of successful approaches in landscape restoration process in the country and beyond.

- The two case studies are based on projects and the outcomes of such restoration may not be sustainable unless the restoration efforts are linked with development organizations.
- Experience capitalization approach is the first attempt to draw lessons regarding landscape restoration and related interventions in Ethiopia. This requires advocacy and institutionalization of the approach to be used in supporting the M&E team of various institutions.

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