Journal of Resources Development and Management
ISSN 2422-8397 An International Peer-reviewed Journal
Vol.87, 2022

Community-Based Watershed Development Processes and Extent of Community Participation in the Northwestern Highlands of Ethiopia

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Abstract
This study describes processes followed and involvement of community members in implementation of community-based watershed development (CBWD) projects in three micro-watersheds (Adef Wuha, Guansa and Tija Baji) in northwest Ethiopia. Data was collected through household survey from systematically selected 114 household heads that possessed farmlands in the study watersheds. Focus group discussion and key informant interviews were also conducted to collect supplementary qualitative information. Participation index (PI) was used to measure the extent of community participation in the different activities of watershed development. The results showed that the extent of community participation could be rated as moderate, with a PI score of about 63%. The communities had actively participated in the selection of members of Community Watershed Planning Teams (CWPT) and in discussions on watershed development plans subsequently developed, identifying problems and prioritizing local needs and in preparations of conservation bylaws. They also actively participated in the implementation of physical soil and water conservation (SWC) (terraces, cutoff drains, water ways, check-dams, hand-dug well and spring development) and biological measures (afforestation, planting trees and grasses, and nursery development). The households received food and hand tools (e.g. spade) in return for their participation. Dependency to food and material support, high expert turnover, low level and partiality of bylaws implementation, shortage of grazing land and fuel wood were the main challenges that affect the sustainability of the watershed development outcomes. In other words, these should be addressed to ensure sustainability of the achievements.
Keywords: Land degradation; community watershed conservation; participation index; Ethiopia
DOI: 10.7176/JRDM/87-02
Publication date: September 30th 2022

1. Introduction

Land degradation is a major environmental problem in the Ethiopian highlands (Bewket, 2003; Amede et al., 2007; Amsalu and de Graaff, 2007; Kassie et al., 2009). Deforestation, soil erosion, and nutrient depletion are the major forms of land degradation in the country (Taddese, 2001; Sonneveld, 2002). Analysis based on historical evidences showed a deforestation rate of over 160,000 ha per year, and this has reportedly led to a dramatic decline in forest cover from an original climatic climax of 40% to about 11% (FAO, 2010). Topsoil loss due to soil erosion in the highlands of Ethiopia ranges from 16 to over 300Mg $ha^{-1}yr^{-1}$, mainly depending on the degree of slope gradient, intensity and type of land cover and nature of rainfall intensities (Tesfaye et al., 2014). Haileslassie et al. (2005) estimated that about 122 kg of N, 13 kg of P and 82 kg of K is lost per hectare per year from Ethiopian highlands. As indicated by the Ethiopian Agricultural Transformation Agency (2013), approximately 41% of the total farmland of the country is acidic. The high level of land degradation has been threatening agricultural productivity, ecological functioning and livelihood of the rural population of the country (Kassie et al., 2009).

In response, the Government of Ethiopia has been implementing several natural resource conservation and management projects by adopting the watershed approach over the past a few decades (Amede et al. 2007; Gebremeskel et al., 2018).

Also by learning from the pitfalls of the past conservation interventions which were top-down and less successful, the recent watershed development projects claim to have created opportunities for the local community to actively participate in the planning, implementation and maintenance of watershed development activities (Swami et al., 2012; Addisu et al., 2013; Chirenje et al., 2013; Mutekanga et al., 2013; Moges and Amsalu, 2017; Gebremeskel et al. 2018), so as to ensure effectiveness and sustainability.

However, evidences from empirical studies on local people's participation are mixed. For example, Moges and Amsalu (2017) reported absence of sufficient community participation in their study in the northwest Ethiopia. In contrast, Adimassu et al. (2015) for Borodo and Galessa watersheds in the upper Awash River Basin and Yigezu (2016) for Alaltu watershed in western Ethiopia reported the presence of active community participation in problem identification, problem prioritization, planning, implementation as well as monitoring and evaluation of activities of watershed development. Some other studies such as Weldemariam et al. (2013) for Kachabirra district (south Ethiopia) and Mulu et al. (2016) for Shola watershed (northwestern Ethiopia) reported the presence of forced participation *in conservation activities. According to these studies, Kebele* administration and local Development Agents (DAs, agricultural extension workers) forced the local farmers to contribute free labor for natural resource conservation works.

One of the conservation projects that is claimed to be community-led is called Managing Environmental Resources to Enable Transitions (MERET) to sustainable livelihoods. The MERET project is implemented in different parts of the country by the Ministry of Agriculture in collaboration with the UN World Food Programme (WFP). As a requirement MERET's implementation plan involves establishment of Community Watershed Planning Teams (CWPTs) constituted of community members, agricultural extension workers (commonly known as development agents, DAs) and the local (*Kebele*) administration, and the active involvement of community members through the entire implementation process. This study investigated on the ground realities of community involvement in three MERET project sites (Adef Wuha, Guansa and Tija Baji) located in the northwestern highlands of Ethiopia, where conservation has been implemented since 2000. The objective was to draw lessons from existing experience which will be useful for up scaling to other parts of the country, given the current effort to cover the entire degraded lands with conservation measures through mass mobilization and free labor contribution of rural people. The following section presents description of the study sites and materials and methods of the study (section 2), and it is followed by the results and discussion in section 3. Section 4 presents conclusions.

2. Methodology

2.1. Description of the study area

The study was conducted in three conserved watersheds (Adef Wuha, Guansa and Tija Baji) located in Enebsie Sar Midir *Woreda* (district) in the northwestern highlands of Ethiopia (Figure 2.1). The sizes of Adef Wuha, Guansa and Tija Baji watersheds are 1492, 1041 and 669 ha, respectively. Tija Baji and Guansa are rivers that drain the area to Feres Meda River, while Adef Wuha enters into Tineshu Meda River. Then, Feres Meda and Tineshu Meda flow into the main Abbay (Blue Nile) River.

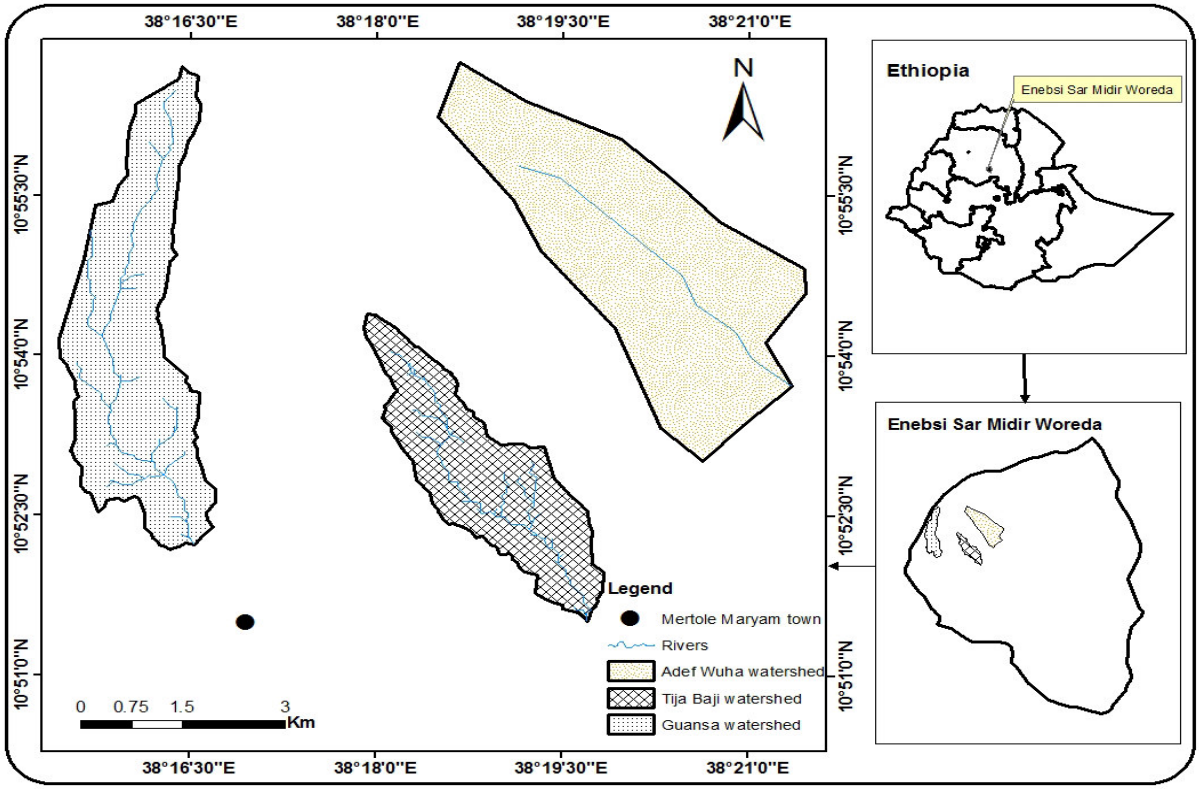

Figure 2.1. Map of the study area

The study watersheds are characterized by complex mountainous and steep slope topography. Altitude varies between 2086m a.s.l at Adef Wuha watershed and 3406m a.s.l at Guansa watershed (EMA, 1998). The dominant soil types in the area are Vertisols, Lithosols and Luvisols (FAO, 1990). According to the Ethiopian traditional agro-climatic classification system which mainly relies on altitude and temperature, the study watersheds fall within *Woyena-Dega* (sub-tropical) agro-climatic zone. For the period 1987-2016, the mean annual rainfall is 1053 mm and the maximum and minimum mean annual temperatures respectively are 25.6^0C and 11.1^0C (NMA, 2017). The rainfall pattern is mono-modal with little rainfall in April and May, and gradually increasing to a peak between June and September (Figure 1.2). About 74% of the annual rainfall occurs in the four months rainy season between June and September, with the highest amount being in July. There is also sporadic rain in April and May, which farmers use for land preparation as well as sowing annual crops that require long rainy seasons, such as maize. The hottest months are from February to May with maximum temperature in March (27.9°C), and the coldest months are from November to January, with minimum temperature in December (9.2^0C). Agricultural land is the dominant land use type in the three watersheds. The vegetation cover of the watersheds is very sparse and some natural vegetation is found mainly along the stream banks and eucalyptus plantations are found around homesteads.

These watersheds are densely populated with an average population density of about 125 persons per km^2 (CSA, 2013). Small-scale mixed agriculture (crop cultivation and livestock rearing) is the main livelihood system in the area. The main crops cultivated are *teff (Eragrostis tef),* wheat (*Triticum vulgare*), barley (*Hordeum vulgare*), maize (*Zea mays*), chickpeas (*Cicerarietinum*) and horse beans (*Vicia faba*), mainly for subsistence needs. Different types of vegetables such as onion and cabbage are also grown using irrigation around homesteads. Cattle, sheep, goat and donkey are the common types of livestock in the watersheds. There are some households engaged in small businesses (e.g., local drink selling, cattle and grain trading) and in handcraft works (e.g., carpentry, weaving and tannery). However, these constitute only a very small proportion of the total number of households in the watersheds.

2.2. Materials and methods

2.2.1. Data type and data collection procedures

Mixed research design, that combined qualitative and quantitative data, was employed in this study. The qualitative data include data collected on watershed management planning and implementation processes and the quantitative data include socioeconomic information and extent of community participation in conservation activities. These data were collected for three conserved watersheds (Adef Wuha, Guansa and Tija Baji) that were purposely selected due to their experience with CBWD implemented by MERET for the period 2000 to 2015.

The data were generated through structured questionnaire, focus group discussions (FGD) and key informant interviews (KII), and were undertaken in January and February 2016. The survey questionnaire had two sections. The first section presented questions on the type of watershed conservation technologies practiced in the watersheds, while the second section contained questions on the indicators of farmers' participation in CBWD activities. We identified indicators from literature review and discussions made with natural resource management experts working at district (*woreda*) and local (*kebele*) levels. The extent of households participation in planning, implementation and maintenance works were rated as low = 1, medium = 2, and high = 3. Other items like bylaw preparation, participation in training, serving as member of CWPT, material and labour contribution, accepting and implementing advice, and visit to model watersheds were developed with two alternatives (1 = yes and 0 = no). The questionnaire was prepared in English and then translated into *Amharic* (the local language), in order to make it understandable to enumerators and then pre-tested and improved. Finally, the pre-tested questionnaires were administered to sampled household heads through trained enumerators. The enumerators were supervised by the lead author of this research throughout the field data collection period.

The size of sample households for each watershed was determined by proportional sampling method since the numbers of households in each watershed were not equal. Accordingly, we selected 42 households from Tija Baji and 36 households each from Adef Wuha and Guansa watersheds using systematic random sampling method. We selected the first household randomly from the first 15 households in the list of households of each *kebele* and then systematically took every 15^{th} household to generate the required sample size for each watershed.

In addition to the questionnaire, we conducted FGDs and KIIs to obtain qualitative information. Information generated using these methods were used to triangulate and supplement results generated from the quantitative survey. We also used this qualitative information to describe processes pursued in implementation of the different watershed management activities (e.g., planning process, type of conservation technologies, etc).

The KIIs were conducted with selected household heads, CWPT members, conservation experts and local government officials both at *woreda* and *kebele* levels. Similarly, three FGDs (one in each watershed) were conducted, and each FGD was constituted of nine participants selected from different social groups stratified by gender, age and economic status. These two methods were used to generate information on participants'

experiences, views, opinions and aspirations on watershed development planning and implementation processes. Discussions were also made on the types of watershed conservation technologies implemented in each watershed, and challenges that they experienced at all levels of the CBWD works. We also collected data from watershed planning documents and other reports organized by Enebsi Sar Mider *Woreda* Agricultural Office. Annual and phase out reports for MERET project were also consulted.

2.2.2. Statistical analysis

The data generated by the structured questionnaire was organized and entered into the Statistical Package for the Social Sciences (SPSS) v20 for analysis. Descriptive statistics (frequencies, percentages, means and standard deviation) were used to summarize respondents' demographic and socioeconomic characteristics and their participation and responses on different CBWD works. A modified participation index (PI) method (Sharma et al., 2011) was used to determine the extent of households' participation in each CBWD activity (planning, implementation, maintenance, bylaw preparation, training, membership to CWPTs, labour contribution, material contribution, accepting and implementing advice and visit to other watersheds). It was calculated using the following formula (Sharma et al., 2011; Bagdi and Kurothe, 2014; Obadire et al., 2014):

$$Pli = \frac{\sum_{j=1}^{n} yij}{\frac{}{k} * 100}$$

Where *PIi* is participation index for i^{th} respondent; Yij is the score of j^{th} item for i^{th} respondent; K is the maximum participation score:

$$PI = \frac{\sum_{i=1}^{n} pli}{N}$$

Where PI is the participation index for the CBWD project; PIi is participation index for i^{th} respondent; N is the total number of respondents.

The overall PI was created by adding values of participation indices in all activities. Categorization of PI value calculated in a particular conservation project can also be categorized into three categories as suggested by Bagdi and Kurothe (2014), based on the normal distribution curve (Table 2.1). The mean and standard deviation (SD) values were used to separate levels of participation into low, moderate or high. The data from interview and FGD were organized into different themes and qualitatively analyzed.

Table 2.1. Measurement on extent of households' participation in CBWD activities as generated from normal distribution curve values

Normal distribution curve range	PI category
< mean – SD	Low
< mean – SD to mean + SD	Moderate
> mean + SD	High

3. Results and discussion

3.1. Planning and implementation processes

The results generated in this study indicated that the processes and steps followed and the time taken to produce watershed management plan and implement conservation practices were more or less the same in the three watersheds. There had been seven major steps that were more or less strictly followed and implemented during the project period (2000-2015) (Figure 2.2). These were:

- Watershed selection: watershed selection was the first step in the resource conservation project studied, and it was made at *woreda* level. For this, a multidisciplinary watershed management team composed of different experts was established at *woreda* level**.** This team selected the three watersheds. These watersheds were selected due to their high level of land degradation, low agricultural productivity and prevalence of food insecurity. According to the Head of Enebsi Sar Mider *Woreda* Agriculture Office, agricultural productivity of these watersheds before the intervention period was not more than two quintals per hectare for major cereals. The watershed selection and planned activities were approved by the *Woreda* Administration Council in February 2000. In this stage, according to KIIs, the community at large did not participate.
- Discussion with *Kebele* leaders and DAs: after selection of the watersheds, the district level watershed management team made reconnaissance visits to the selected watersheds and conducted discussions with *kebele* level authorities and DAs to introduce about the project and watershed based resource management approach. The team also agreed on the watersheds' boundaries with the respective *Kebele* leaders and DAs.
- Meeting with the community: DAs together with *Kebele* leaders held meetings with household heads who

possessed farmlands in the selected watersheds to introduce the principles and benefits of watershed management and the reasons for the selection of those watersheds. Following this, awareness raising discussion was held on the importance of watershed planning and the need to form representative Community Watershed Planning Teams (CWPTs). Then, CWPTs were established by the community members. The CWPTs consisted of 11 members, and were elected from the community members living in the selected watersheds. According to key informants, members of the CWPTs were elected due to their good reputation in their farming activities, educational status (ability to read and write), and high commitment for watershed conservation works. The CWPTs were responsible for undertaking socio-economic and biophysical field surveys to identify problems in the watersheds, prioritize them and prepare intervention plans together with DAs. In addition, CWPTs serve as a bridge linking the community with DAs. The CWPTs conducted monthly meetings on day 21 of every month (of the Julian calendar) at Guansa and Tija Baji and on the 27th day at Adef Wuha.

- Preparation of watershed development plan: watershed development plans were prepared by the CWPTs guided by DAs. Each CWPT received technical support from district level conservation experts. Indigenous knowledge of the community was also considered at this stage. The CWPTs and DAs undertook detailed biophysical and socio-economic surveys to identify the major problems of the community. Based on the information collected, they identified and prioritized the interventions that were believed to bring about desirable change. According to key informants, the sequencing of interventions was done following the watershed management logic. The CWPTs identified intervention areas and described specific technologies (physical SWC measures, soil fertility management, biological soil conservation, gully control, forage development etc) that would be implemented in each specific area (homesteads, communal lands, degraded hillsides and farmlands). At this stage, the draft watershed development plan (WDP) that showed what, where, when and how it would be implemented was completed. The CWPT also estimated the inputs (labour, construction materials, and seedlings) required to implement planned activities and prepared action plans indicating the period of implementation of each activity.
- Discussion with the community: CWPTs held discussions with household heads in each watershed after completion of watershed development plans. This discussion approved the developed plans that were subsequently used as guides for the watershed management intervention. The proposed plan could be revised based on needs of the community and approved by the community at large. The plan was then sent to the district watershed management team for final approval.

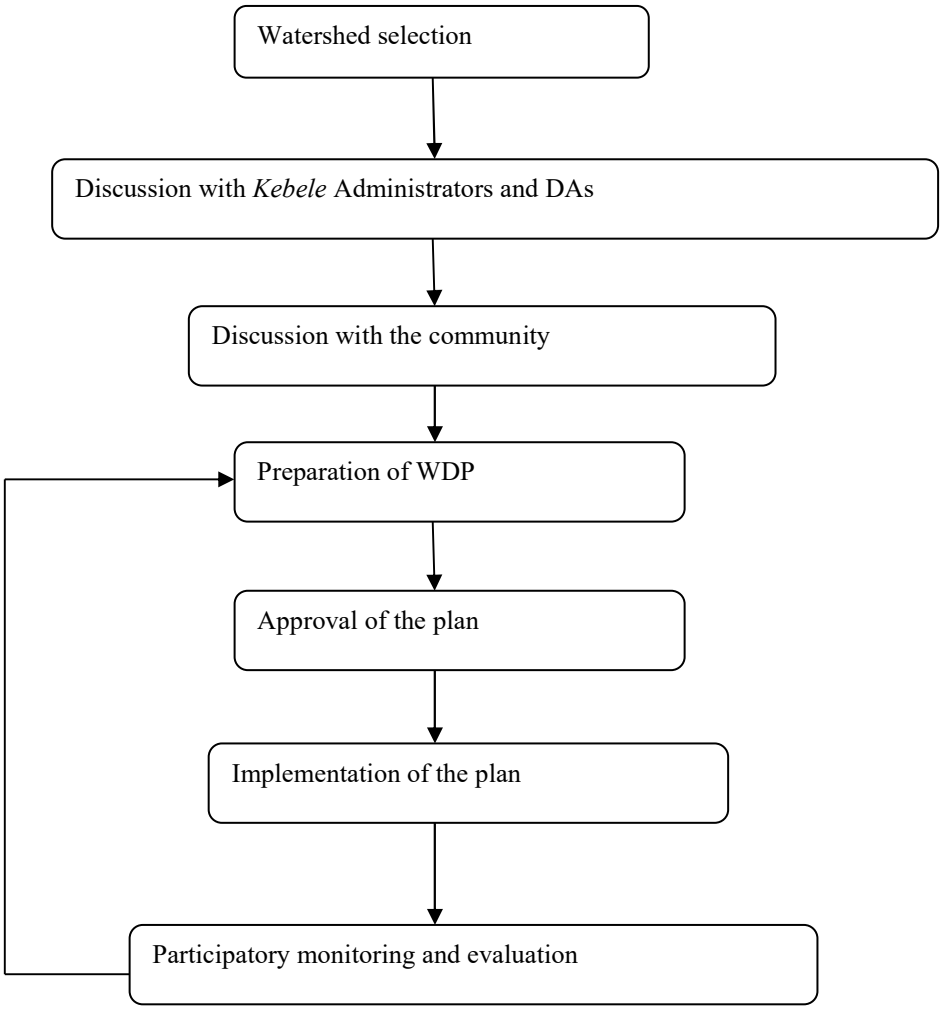

Figure 2.2. CBWD processes/steps in the study watersheds

- Implementation of the plan: implementation started with resource mobilization and provision of trainings on different watershed management technologies. Focused study tours were also used to facilitate successful watershed management practices. These activities were largely facilitated and implemented by *woreda* and *kebele* agriculture offices. In addition to the formal institutions, farmers also used their informal networks and indigenous knowledge to mobilize labour and implement activities. These and other practical activities were started in April 2000 at Adef Wuha and a month later in Guansa and Tija Baji watersheds. Implementation activities were carried out twice a year, physical conservation structures were constructed between February and March, while tree planting was done in June. Provision of different incentives such as food-for-work, distribution of hand tools (e.g. spade), and trainings were the key incentives used during the implementation phase.
- Participatory monitoring and evaluation: monitoring and evaluation is the last step in the CBWD project and it is conducted by the participating stakeholders. According to KIs, the monitoring and evaluation activities investigated how the plan was implemented, whether changes were needed, if expected results were realistic, and whether new alternatives had become available. The information generated was integrated in planning the next cycles. However, the DAs reported that there was weak technical support and follow up. All stakeholders were not fully involved in monitoring and evaluation of the activities at the watersheds. As a result, the status, lessons, impacts and their social dimensions had not been fully documented.

3.2. Major watershed development activities

3.2.1. Physical SWC measures

Terraces, cutoff drains, waterways, check dams and trenches were the major types of physical SWC structures constructed in the three watersheds. Of these, it was terraces that were widely implemented in croplands. The height, width and spacing of terraces were different on different farmlands based on the nature of topography. Most farmers however were not happy with the terraces on their farm plots because of the land space they

occupied and the difficulty the created on farming activities.

Figure 2.3. Conservation practices at Tija Baji (left) and Adef Wuha (right)

Figure 2.4. Conservation structure (left) and hand dug well (right) at Tija Baji

The other physical structures constructed were cutoff drains and waterways. These structures were constructed along farm boundaries and grasslands to divert runoff from entering farmlands. In addition to this, cutoff drains increase rainwater infiltration, and improve groundwater recharge. Check dams were constructed across gullies to prevent their widening and deepening, and trap sediments. Check dams were constructed using locally available materials, such as stones and woods and in some cases gabions. Water supply points such as hand dug wells, community ponds and springs were developed in some areas (Table 2.2; Figure 2.4). However, FGDs indicated that water availability in the three watersheds had shown little improvement; there was water shortage for livestock and household use in many areas as the constructed water points were very few in number.

3.2.2. Biological conservation measures

The biological conservation measures implemented in the study watersheds were afforestation, re-forestation, and area closure for natural regeneration of degraded lands (Table 2.2). Some conservation practices such as tree planting and gully treatment were implemented in the enclosed areas (Figure 2.5). All terraces (100%) in Adef Wuha, 90% at Guansa and 70% in Tija Baji were stabilized by trees or grasses (Table 2.2). Different types of

grasses were also planted along cutoff drains and waterways to stabilize the structures. Vetiver grass was widely planted in Guansa and Tija Baji watersheds, while savanna grass was widely used in Adef Wuha watershed. All gullies treated with check dams at Adef Wuha, 78% at Guansa and 69% at Tija Baji were also stabilized by trees or grasses (Table 2.2). Although it varied from watershed to watershed, enclosed areas and treated farm plots were protected from free grazing (Table 2.2). The success of protection of free grazing of conserved areas was estimated at 64% in Adef Wuha, 65% in Guansa and 70% in Tija Baji. Shortage of alternative livestock fodder and grazing lands were the main reasons for absence of total free grazing control from the conserved areas. Conserved areas were guarded by community members on shift basis. In addition to this, in one watershed (Guansa) conserved areas along hillsides were distributed to youths for animal fattening and apiculture.

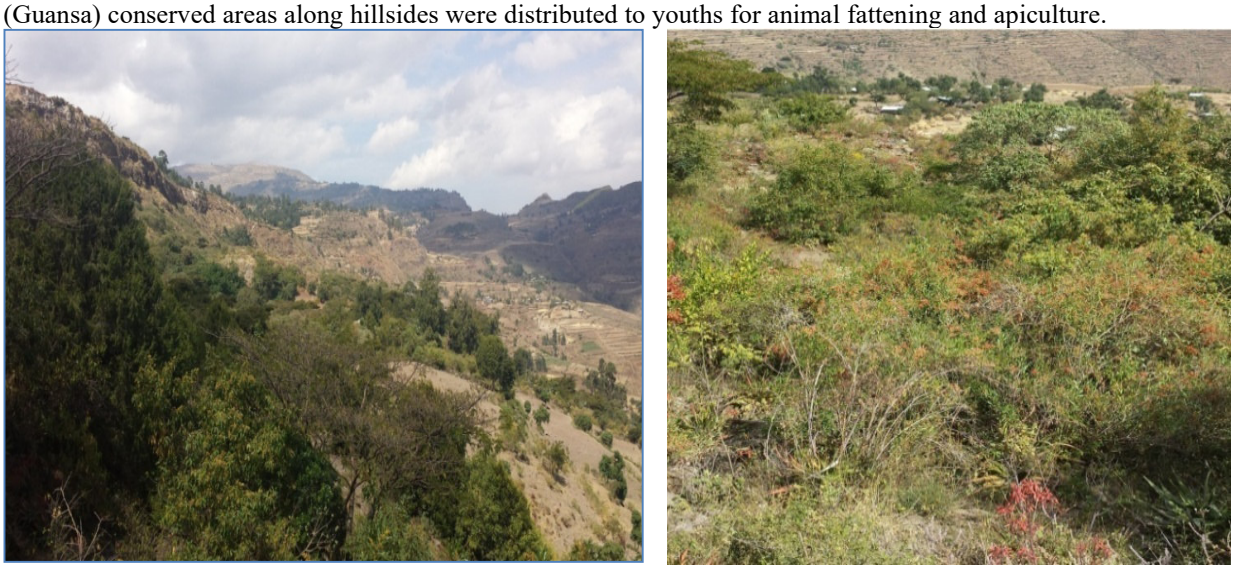

Figure 2.5. Rehabilitated hillsides at Adef Wuha (left) and Guansa (right) watersheds

Table 2.2. Major watershed management strategies implemented during 2000 to 2015

Activities	Unit	Adef Wuha	Guansa	Tija Baji
Farmland terrace	Ha	297.4	329	362
Cutoff drain	Km	4.5	6.1	6.3
Waterway	Km	3	4.5	5.9
Check dams	Ha	18	9	6.5
Tree plantation on bunds	Ha	297.4	298	254
Tree/grass plantation on cutoff drains	Km	4.5	3.9	6
Tree/grass plantation on waterways	Km	3	4	5
Gully treatment with vegetation	Ha	18	7	4.5
Farmland closure	Ha	191.4	213	254
Area enclosure	Ha	91.4	57	25
Hand dug wells	No	8	6	2
Community pond	No	3	0	0
Spring development	No	7	9	8
Nursery established	No	1	0	1

Source: MERET project phase out reports of respective watersheds (ESWAO, 2016)

Nursery development was the starting point for all biological measures implemented in the study watersheds. Tree seedlings were raised by individuals, teams, government institutions and NGOs. In Tija Baji and Adef Wuha watersheds, most households obtained tree seedlings free of charge from CBWD project nurseries (Figure 2.6), while private nurseries were the main source of tree seedlings for households in Guansa watershed. In this watershed, most households bought seedlings from private nurseries developed in the watershed and outside the watershed. According to key informants, farmers with private nursery sites sold seedlings to others at affordable prices. The *Woreda* agricultural office supplied seeds for free to private nursery developers. *Cordia Africana*, *Olean Africana*, *Juniperus Procera*, *Accacia Saligena*, *Rhamnus Prinoides*, *Sesbania Sesban and Eucalyptus* were the tree species dominantly raised in the nursery sites. The establishment of nursery sites in the conserved watersheds had facilitated mass production of seedlings, minimized cost and damage during transportation and the seedlings were well adapted to the area.


Figure 2.6. Land preparation at nursery sites (left: Tija Baji and right: Adef Wuha)

3.2.3. Bylaw formulation and enforcement

Bylaws development and implementation was a component of the project intervention. These bylaws delimit rights and responsibilities of the community and the *Kebele* Administration, including prohibiting free grazing and issues related to sanctions and penalties when violated. Bylaws establishment in Tija Baji and Guansa watersheds was initiated by the *Kebele* Administration and DAs, while in Adef Wuha, it was the community that initiated the bylaw formulation. The bylaws are signed by the community to confirm their agreement. However, these bylaws were not effectively implemented on the ground as confirmed by 23%, 38%, and 43% of respondents at Adef Wuha, Guansa and Tija Baji watersheds, respectively. This was partly because of the low commitment of CWPT members and *Kebele* Administration and due to partiality in its implementation.

3.3. Extent of community participation

Table 3 presents major indicators used to measure farmers' participation in the CBWD activities. Multiple indicators were used to evaluate farmers' participation in the different watershed development activities, and extents of households' participation ranged from about 15% to 100%. Almost all (100%) of respondents participated in labor works, while very few (15%) had visited other model watershed sites. The higher participation of farmers in labor work could be attributed to the incentives given to them for their labor contribution. About 79% of households had contributed different construction materials like stones and wood for the conservation activities.

About 77% of respondents reported to have participated in the planning activities that included problem identification and prioritization, and election of members of the CWPTs. About 76% of household heads participated in maintenance of physical structures, which, however, reportedly declined with the decline in the distribution of the food and material incentives. Several trainings were provided to the community members as part of the watershed development intervention (Table 2.3). As indicated by the participation index, 54% of households participated in different training events that were organized by respective *Kebele* and *Woreda* Agriculture offices. The knowledge gained from the training was rated as high (42% of participants) in Guansa (Siraw et al., 2018). Only about 15% and 35% of respondents had visited model watershed sites and participated in election of CWPTs in the past 15 years, respectively.

Table 2.3. Extent of households' participation in watershed development activities

Activities	PI (%)
Watershed conservation planning	77
Implementation of conservation works	74
Involved in maintenance of structures	76
Bylaw preparation	67
Training on conservation activities	54
Serving as CWPT member	35
Material contribution	79
Accepting and implementing DA advice	75
Labour contribution	100
Visit to model watersheds	15
Overall participation	63

Note: CWPT, community watershed planning team; PI, participation index

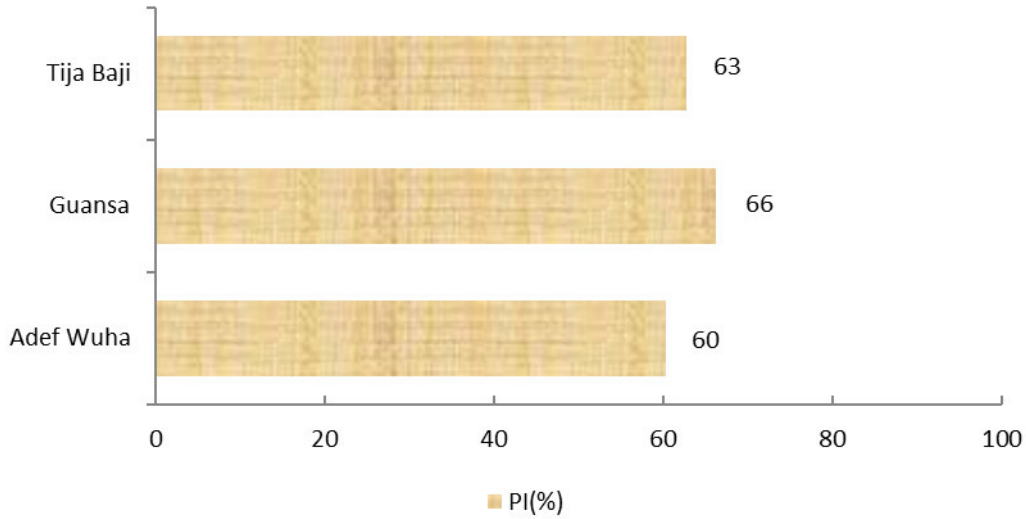

Figure 2.7. Community participation index values at watershed level

The overall participation index value as an average of the ten indicators was 63%, and this indicates a moderate level of farmers' participation (Table 2.3). The PI values for Guansa, Tija Baji and Adef Wuha were 66%, 62% and 60% (Figure 2.7). This finding is in agreement with Adimassu et al. (2015), Yigezu (2016), and Gebremeskel et al. (2018) who also reported 'moderate' levels of community participation in their studies in other parts of Ethiopia.

3.4. Challenges for sustainability

Five major sustainability challenges were identified. Firstly, farmers' showed some degree of dependency to the support provided during implementation, which had ceased after the project support was phased out. It was learned from KIIs that farmers repeatedly asked for food or material incentives for undertaking maintenance works. Secondly, high turnover of DAs and *Woreda* level conservation experts was another challenge. According to KIIs, DAs were always looking for other jobs, often by taking distance-based trainings in other disciplines. Thirdly, low level and partiality of bylaws implementation was a major sustainability challenge. The partiality discouraged others who observed the bylaws. Fourthly, lack of budget to run the nursery sites was the other challenge. According to DAs, the nursery site at Guansa was not functional due to lack of budget to run it. Similarly, the workers at Tija Baji nursery site reported, during the field work, that they did not receive their salary for three months due to the phasing out of the project. Finally, shortage of grazing land and fuel wood were the other challenges. Some community members asserted grazing land and fuel wood had become scarcer due to the project since the land they previously used for these purposes was taken for conservation and no mechanism was devised to allow resource use in the conserved areas.

4. Conclusions

This study describes planning and implementation processes followed and extent of local people's participation for a community-based watershed development project in three micro watersheds (Adef Wuha, Guansa and Tija Baji) in the northwestern part of Ethiopia. Both qualitative and quantitative data were gathered through questionnaires, KIIs and FGDs from sample respondents. The quantitative data were analyzed using the modified participation index (PI) method to determine the extent of households' participation in each CBWD activity and the qualitative data were used to supplement as well as triangulate the quantitative results.

The results show that most watershed development planning and implementation processes followed a commendable participatory process. Farmers, local development agents, *woreda* agricultural experts and *kebele* leaders participated in problem identification, and planning, implementation and governance of watershed conservation activities. At the planning stage, farmers participated in election of members of CWPTs, identifying problems, prioritizing local needs, preparation of intervention plans and formulation of bylaws. During implementation phase, farmers participated in the construction of physical SWC measures (terraces, cutoff drains, waterways, check-dams, hand-dug wells, spring development) implementation of biological conservation measures (afforestation, planting trees and grasses, and area closure for natural regeneration) and nursery development. The level of participation ranged from 15% to 100% across the different watershed management activities. Although it was not effectively implemented the local community had also developed bylaws to protect conservation structures. Dependency to incentives after phasing out of the project, high experts turnover,

low level and partiality of by-laws implementation, shortage of grazing land and fuel wood, and lack of budget to run the nursery sites were the main challenges affecting sustainability of achievements of the CBWD project.

Acknowledgments
We are grateful to Addis Ababa University and Association of African Universities for financing the study. We are also very grateful to the local communities in the study watersheds, DAs and members of community watershed planning teams for their support during the fieldwork.

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