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Full Length Research Paper

Collective Efforts in Soil and Water Conservation: Insights from the Gununo Watershed in Southern Ethiopia

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Collective action was initiated to manage soil and water conservation in Gununo watershed in southern Ethiopia. General problem exploration was conducted initially and issues requiring collective action were identified through group discussion and community meeting. Similarly local institution that could effectively lead the collective action was selected and collective action was run for two seasons (2005 and 2006). The conservation measures implemented were soil bund and fanya juu on which elephant grass and banana were planted as bund-stabilizer. Group and individual interviews were used to assess farmers' perceptions on the benefits of the measures taken. Participatory monitoring and evaluation was conducted at different stages of the implementations. Descriptive analysis was used to interpret the results. Close to ten kilometer length of structures were constructed in the two seasons. Farmers also adopted and constructed additional length of soil conservation structures individually and also planted additional bund-stabilizer. The soil condition was improved and crop productivity increased within short period. In general, farmers' participation in decision making and integration of feed and food crops with soil conservation structures as soil bund stabilizer increased adoption of soil conservation exercise. However, the achievements were associated with challenges mainly attached to dependency of farmers to food-for-work.

Key words: Bund stabilizer, collective action, fanya juu, local institution, soil and water conservation.

INTRODUCTION

Low soil fertility is one of the major problems affecting agricultural productivity in Gununo Watershed which is located in southern Ethiopia (SNNPR). The major problems regarding soil resources in SNNPR include severe soil erosion due to cultivation on steep slopes, over grazing in mid and highlands, deforestation and planting of eucalyptus causing low moisture stress (BOPED, 1999). The major cause of low soil fertility in Gununo watershed is soil erosion due to runoff and lack of application of adequate inputs such as fertilizer and organic matter. As a result, crop productivity in the watershed remains very low and this has initiated some farmers to register even for migration (AHI, 2004).

Although experimental results in Ethiopia reveal that soil loss could be reduced as much as 80% (Grunder, 1992), farmers have not adopted construction of soil and water conservation structures. The major factors influencing adoption of physical soil conservation measures around Gununo watershed include farmers' perception of erosion problem, technology attributes, the number of economically active family members, farm size, family size wealth status of the farmers and the location of the farm land (Tadesse and Belay, 2004). The average land holding in Gununo area is very low as a result of population pressure and thus soil conservation technologies, which take some land out of production, like construction of soil conservation structures, have little acceptance by farmers in the area (Tadesse and Belay, 2004).

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Public policy plays a major role in soil conservation for both public and private lands (Terrence et al., 2002). Although the principal responsibility for soil conservation lies with those who use the land, the public has assumed a joint responsibility with both land owners and users. Soil conservation practices vary in cost, return and effectiveness (Fredric et al., 1999). The easiest of practices to promote are those like a good fertilizer program that will both conserve soil and return a profit within a short time. The benefits of longer-term practices like terracing may not show results within a short period. The economic value of many conservation practices is further complicated by benefits that accrue to persons other than those who install the practices. According to Stonehouse and Profz (1993), consideration of externalities shows that many conservation practices are economically desirable for society as a whole even though their costs exceed the on-farm benefit.

A study conducted in Ethiopian highlands showed that the problem of soil erosion is compounded by the fact that some farmers dismantled the conservation structures built through food for work initiatives (Shiferaw and Holden, 1998). Until the early 1990s, farmers were not allowed to remove these conservation structures. However, the introduction of economic reform program in 1990 and subsequent liberalization of the economy brought freedom and results in the structures being removed based on the wish of the land user. The factors influencing adoption of physical soil conservation measures around Gununo watershed area include farmers" perception of erosion problem, technology attributes, the number of economically active family members, farm size, family size wealth status of the farmers and the location of the farm land (Tadesse and Belay, 2004). The average land holding in Gununo area is very low as a result of high population pressure and thus soil conservation technologies, which take some land out of production, like construction of soil conservation structures, have little acceptance by farmers in the area (Tadesse and Belay, 2004).

In general, previous efforts to address soil and water conservation through food for work programs failed mainly due to minimum participation of farmers in planning and implementation stages. The approach followed was a top-down approach (Yohannes, 1992). The community of Gununo watershed prioritized soil conservation as one of the watershed management issues (AHI, 2004). Hence, this study was conducted to enhance adoption of implementation of soil and water conservation using collective action and linked technologies for integrated natural resource management (INRM). The specific objectives were to 1) initiate collective action in soil and water conservation and understand associated challenges and lessons 2) find ways of making soil and water conservation structures stabilized and productive and 3) enhance adoption of soil and water conservation practices. The initial hypothesis of this study was that farmers" participation in decision making and integration of feed and food crops with soil conservation structures as soil bund stabilizer will increase the adoption of soil conservation practices and enhance collective action.

METHODOLOGY

Description of the study area

Gununo Watershed is one of the benchmark sites of the African Highlands Initiative (AHI) eco-regional program which is working in collaboration with Areka Agricultural Research Centre. It is located in a densely populated area of Wolayita zone in Southern Nations, Nationalities and Peoples" Region (SNNPR) of Ethiopia. The area of the watershed is 544 ha with over 622 household residents. Its altitude ranges between 1937 and 2040 m above sea level and the annual rainfall of the area was 1350 mm. The soil is predominantly acidic nitosols. Natural resource degradation and lack of coordination to manage communal resources were among the major problems of the watershed. Collective action (CA) was not common in managing natural resources. Based on consensus made by the community, the current CA was initiated and conducted to conserve soil and water for a total of thirty two days in two seasons in 2005 and 2006.

Approaches and steps followed

Step 1

A research team was established mainly from research and development partner organizations – Areka Research Center and Bloso Sore District Office of Agriculture. The responsibilities of the team were to facilitate planning, implementation and participatory monitoring and evaluation of collective action (CA) in natural resource management, train farmers on how to construct conservation structures, facilitate negotiation to solve challenges arising during the construction of conservation measures, supply farm implements and biological bund stabilizers and document processes, challenges and lessons on action basis. In all case, local leaders were involved in arranging and facilitating community meetings and assigning specific working days in a week to avoid overlap of the CA with working days of other government development activities and lead the CA.

Step 2

Issues whose solutions require collective action were identified through group discussion over five villages (20 farmers in each village). Brain storming and open discussion was employed to identify the issues. The output from group discussion was validated by community meeting at watershed level.

Step 3

Group discussion was held with farmers in five villages to identify local social institutions that could effectively lead CA in managing communal resources in general and soil and water conservation (SWC) in particular. A total of 100 (20 per village) farmers participated in the group discussion. After identifying the local institutions, vote was used to prioritize their importance to lead the CA. Participatory planning and empowering of local institutions to

Table 1. Farmers" ranking of potential contributions of local institutions for collective action in soil and water conservation [n=100].

Type of local institution	Service given by local institution	# of members	# of votes against ranks (1^{st} to 5^{th})					Rank
			1^{st}	2^{nd}	3^{rd}	4^{th}	5^{th}	
Amba Idir	Funeral	>80	-	31	59	13	8	3
Hera	Share labor for different activities	20-30	12	62	-	-	-	2
Shufua (Iqub)	Money saving	15-25	-	7	41	60	11	4
Zeye	Share labor for different activities	15-20	-	-	-	27	81	5
Mengistawi Budin	Development work	50	88	-	-	-	-	1

1^{st} = very important; 5^{th} = less important.

lead the CA were used as way to enhance the CA.

Step 4

Training was given to farmers on how to construct soil and water conservation structures (which were mainly soil bund and fanya juu) before commencing the CA. The training was given village by village. Awareness was created to farmers on the importance of soil degradation and the necessity of soil and water conservation. Controversial issues on constructing conservation structures raised by farmers were discussed. Orientation was also given to farmers about the benefits of planting different crops and shrubs of their choice on the conservation structures as bund stabilizer.

Step 5

Collective action was run to construct conservation structures in four villages. Structures were constructed on individual land lots based on voluntary basis. The decision wheatear to construct bunds and the length of interval was made by the land owner or the land user. No enforcement was made to construct bunds. Elephant grass (*Pennisetum purpureum*) and banana (*Musa domestica*) were distributed and planted as biological bund stabilizers. A total of 5684 man-day labor was involved for constructing the SWC structures on 32 working days in two years. The number of working days allotted per week was two days conducted over two consecutive months per year. An individual worked within a range of 1.6 to 2.5 m length of structure per day.

Step 6

Participatory monitoring and evaluation was conducted throughout the implementation of the collective action in the construction of conservation structures. Participants in the monitoring were Research and Extension institution partners together with local leaders of respective four villages. Corrective measures were made following a series of monitoring.

Step 7

After conducting the CA for two seasons, group interviews (n = 40) were employed to assess farmers" perceptions on the SWC structures and the CA, evaluate improvements observed on soil condition and crop yield by estimating changes observed before and after the implementation of SWC and assess adoption of conservation measures. Indicators used to estimate adoption of SWC exercise were existence of the bunds for at least two years, emergence of copy farmers, request of farmers for technical assistances and CA, similar approach used by extension agents, maintenance of bunds and farmers" effort to stabilize bunds using different biological stabilizers. The interviewed farmers were selected by local leaders and they were composed of 20 elders, 10 women and 10 youth. The overall steps followed in this study were described in the following conceptual frame work (Figure 6).

RESULTS AND DISCUSSION

Identification issues that require collective action and local institution to lead the collective action

It was realized from group discussion that there were five issues whose solution require collective action. These were soil erosion, spring management, eucalyptus management, porcupine damage and input shortage. Soil erosion has been problem for crop production particularly in four of the five villages. Shortage of drinking water is a serious problem of the community and farmers lose more than 2 h per day to fetch water. Porcupine devastates most of crops but the problem remained unresolved. Eucalyptus tree plantation is expanding very fast competing for farm land and drying water points. Farmers said that individual efforts to solve these problems were not effective and were rather sources of conflict in the community. To alleviate problem of soil erosion (the focus of this paper), collective action on soil and water conservation was selected and implemented.

Result of group discussion revealed that there were five main social institutions that serve the community for different purposes (Table 1). Amba Idir is a social institution for funeral purpose and has relatively many members from different villages. Hera and Zeye serve for labor sharing (exchange) to perform different labor demanding activities such as planting, weeding, harvesting, house construction and wedding. Hera and Zeye are established based on proximity with in a village and their members are small in number although Hera has more members than Zeye. Each member has to contribute labor in both cases but failure to do so leads to punishment in the case of Zeye only. On the other hand,

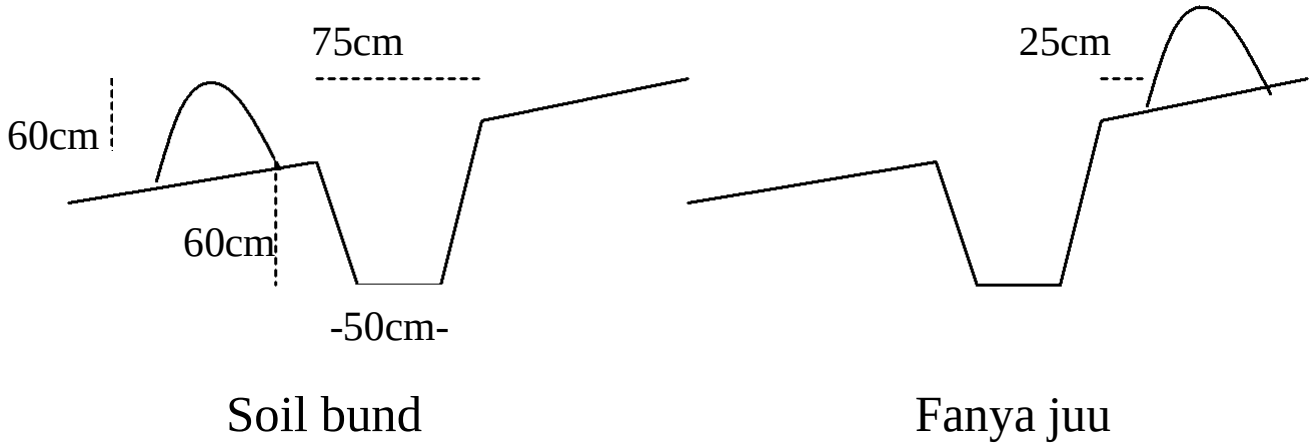

Figure 1. The designs of soil bund and fanya juu structures.

Shufua serves as money saving institution where by each member contributes money (either weekly or monthly based on agreement) to provide the collected money to each member through turns. In the same manner, women use the same institute to contribute butter to build their financial capital. Mengistawi Budin is a governmental development unit at village level comprising 50 household heads. In general, the type and structure of the social units was not significantly different over villages. Men and women organized the above social units except Zeye which is organized only by men. All of the local institutions, excluding Amba Idir, have no written bylaws.

The order of importance of social units in affecting CA towards addressing NRM was related to their enforcing power or respect given by most farmers, number of participants and their area coverage (Table 1). *Mengistawi Budin* and Hera as social unit were identified by farmers as the best unit to lead CA in natural resources management. *Mengistawi Budin* was more accepted by farmers as it is attached to government structure and has more enforcing power. Hera is characterized by having small number of members (20-
30) who are very close to one another and manageable for coordination. Other local institutions are less powerful to lead CA in NRM effectively. Farm lands of different farmers are situated on different positions on the landscape and thus the degree of soil erosion varies over farms which in turn affect the degree of farmers" cooperation in CA. Therefore, from farmers" point of view,
Mengistawi Budin is more powerful to organize farmers from different landscapes for CA. For that reason, Mengistawi Budin was selected and used as local institution to lead the current CA in SWC.

Each Mengistawi Budin had its own leaders which coordinate and monitor the implementation of the CA based on village level schedule. As suggested by most farmers in all villages, the convenient working months to conduct the conservation structures were November and December when farm lands were not covered with annual crops and when farmers were relatively less busy. After running the CA, however, January was found to be the most convenient working month as the soil was moist and more workable due to the onset of rainfall.

Achievements in building conservation structures

Construction of soil bund and „"*fanya juu"* was selected by the watershed community as a solution for soil loss due to runoff. Farmers selected this conservation measure based on observation they had from plot level study on soil and water conservation which was conducted through the support of African Highlands Initiative (AHI) eco-regional program. The design of both soil bund and „"*fanya juu"* is the same except that the excavated soil in the case of „"*fanya juu"* is placed upward (Figure 1).

Close to 10 km length of conservation structure was constructed in four villages in two seasons or years (Table 2). One hundred households were direct beneficiaries of the conservation work. Direct beneficiaries were those who had conservation structures on their plots. However, the conservation measures taken on the upper landscape also indirectly benefit the bottom lands and this would increase the total number of beneficiaries. The area of farm land conserved per household ranged from 0.06 to 0.75 ha which on average was 0.37 ha. However, additional conservation structures were constructed on grasslands.

The slope of most cultivated lands was less than 15% although in very few places it was as high as 41%. Thus the types of conservation structures constructed were level (but graded on steep slopes) „"*fanya juu"* (66.9%)

Table 2. Type and total length (m) of conservation structures constructed over villages in Gununo (2005, 2006).

Villages	Type of structure			
	Soil bund	Fanya-juu	Cut off drain	Total
Ofa	330	1490	30	1850
Gegecho	890	2942	--	3832
Lower Busha	1565	1241	232	3038
Lay Busha	250	995		1245
Total	3035	6668	262	9965

and soil bund (30.5%) depending on the texture of the soil. On light and fine soils, „"*fanya juu"*, whereas, on coarse soils, soil bund were constructed. In addition, cut off drain (2.6%) was constructed on farm boundaries and grass lands where runoff was sever. The contour distance or the distance between two consecutive bunds was determined based on the slope of the land and farmers" interest. Farmers decided the contour distance through discussion after the research team measured and showed the recommended contour interval to them. In the formal extension service, however, the recommended interval must be used. The contour distance ranged between 7 to 30 m. Factors considered by farmers to determine the contour interval were their farm size, the contour distance from farm boundary, availability of previous soil bunds and availability of permanent plants. According to most farmers" interest, the contour interval should allow draught oxen turn while plowing. Farmers who had relatively small farms required wider contour intervals to avoid further fragmentation of their farms. Most farmers needed the conservation structures to lie along farm boundaries and on previous structures.

Changes in soil condition and crop yield after conservation

The benefits of larger-term practices like SWC may not be recognised within short period (Stonehouse and Profz, 1993), however, after observing the benefits of SWC for about two years, all (100%) of the interviewed farmers (n = 40) reported that they observed improvement in soil fertility after SWC which in turn resulted in increased crop yield (Table 3 and Figure 2). All of the interviewees said that the soil color changed from red to brown which might have been due to increase in organic matter transported through runoff mainly from upper lands where house refuses were usually disposed. The organic matter prior to the project was taken away from farms. Most (82%) of them realized increase in soil depth while others (73%) ascertained improvement in water holding capacity and workability of the soil. On the other hand, the leaves of crops in the field changed from light to deep green and the vegetative growth was more vigorous. Before the conservation measure, sown seeds were washed away by runoff and crops stands were not uniform, whereas after conservation, farmers realized that soil loss was minimized tremendously and crop stands were uniform. Observing the changes in color and uniformity of crop stands on her plot, a farmer from Gegecho village predicted by saying “I hope that I am going to eat enough from today on wards” justifying the importance of the conservation structures. Farmers estimated yields of different crops before and after conservation measures (Table 3). The productivity of most crops increased by two fold as a result of the conservation measures. Farmers observed relatively higher improvements on crops like haricot bean and sweet potato for which they do not usually apply chemical fertilizers. The productivity of the crops increased mainly due to the improvement of the soil fertility as a result of accumulation of organic residues.

Because of the improvement in the productivity of the soil, some farmers started growing new crops like maize which has never been cultivated on their plots because the soil was extremely poor in fertility. Therefore, farmers who were registered for migration (such as Mr. Temesgen Mena from Ofa village) and those who were migrating for causal labor for about 6 months in a year (such as Dawit Sengago from Gegecho village) started settled life investing their labor more on their farms. These two farmers said that the land now pays for our labor invested on it which has never been before.

Bund stabilizers and their benefits

Seedlings of about 34,000 elephant grass and 1588 banana were dispatched to farmers and planted on bunds as stabilizer and to address feed and income shortage at the same time. Based on orientation given to farmers they planted additional crops like sugarcane, sesbania, sorghum and cassava to increase the stability and productivity of the bunds. However, it was realized that most farmers had no interest to plant crops (such as banana and sugar cane), which are liable for theft, on their farm lands far away from homestead. Because of

Table 3. Improvement in crop yield as estimated by farmers before and after soil and water conservation.

Crop	Yield, kg/ha		Yield increment due to SWC (%)
	Before	After	
Haricot bean	303	707	133
Wheat	382	576	51
Tef	396	543	37
Maize	444	667	50
Barley	1111	2222	100
Sweet potato	2761	6372	131
Average	899	1847	105

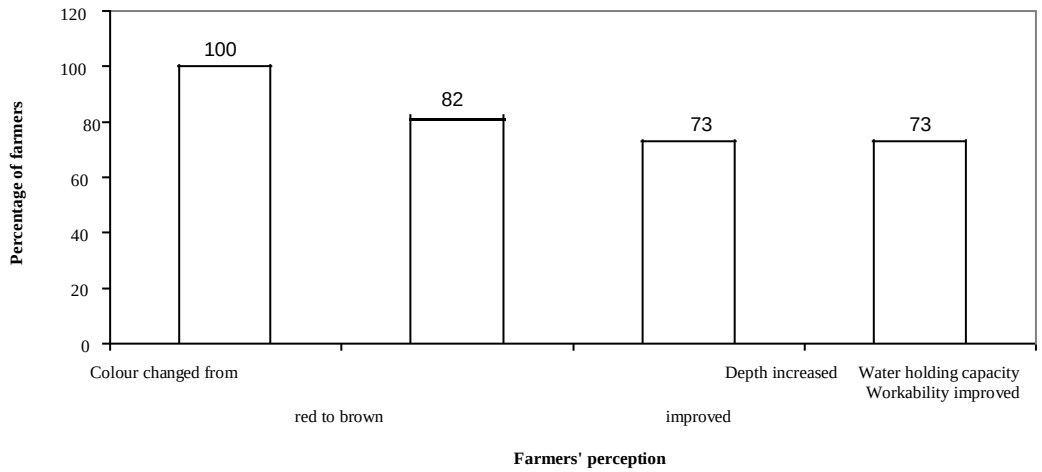

Figure 2. Farmers"Fig2perception.Perceptionto soiloffarmerschange toaftersoilSoilchangeandwateraft conservationil and water(n=40)conservation.

that few farmers planted the bananas around their homestead where there were no conservation structures.

Among the bund stabilizers, farmers preferred elephant grass for its adaptability and performance on the soil bunds (Table 4). Elephant grass showed very good establishment (90%) and performance including dry months in a year even as compared to local grasses. It could be harvested twenty times a year while banana and local grasses (not shown in the Table) harvested utmost twice. It was realized from the study that although banana needs more water, the soil bunds did not hold sufficient moisture resulting in stunted banana growth. Elephant grass is also more palatable to cattle and it increased milk productivity of a cow by 2 to 3 folds as compared to feeding the cow local grasses. According to farmers estimation a cow feeding on local grass gives one cup (about 0.3 L) of milk per milking. Women usually spend minimum of two hours per day to collect grasses for their cattle. Because of the introduction of elephant grass, women now spend 15 to 20 min to fetch elephant grass and this has reduced women"s burden considerably. Two farmers also started using elephant grass to generate income by selling it in local market.

Farmers' perception on soil and water conservation

All farmers (100%) farmers in the group discussion revealed that there was no organized effort made in soil and water conservation in the watershed prior to the current study. Although there was some effort to construct conservation bunds in the area long ago, the bunds have been demolished and before this study there was no any structure on any of the farms in the study area except there was plot level soil and water conservation exercise with five farmers in one village (Gegecho) through the intervention of African Highlands Initiative (AHI), which supported the current study. On the other hand, few farmers in villages like „Gegecho" and „Lay Busha", where there was severe soil erosion, have individually tried slant furrow opening using oxen plough to reduce runoff. In some cases, few farmers (2%) from Ofa village practiced cut-off drains and banana stem as bund to protect soil erosion. Very few (1%) farmers from Ofa, Gegecho and Laybusha villages have also individually practiced construction of soil bunds. Nevertheless such individual practices have not been effective, accelerated soil erosion and initiated conflict

Table 4. Comparison of two bund stabilizers using farmers" criteria.

Criteria	Banana	Elephant grass
Establishment	Poor (50%)	Very good (90%)
Growth	Grows slow and exposes soil bunds to erosion for long period	Grows fast and protects soil bunds from erosion relatively better
Moisture requirement	Requires high moisture and cannot get enough moisture on the bunds	Perform good with low moisture even during dry season
Space requirement	Requires more space and compete with other crops for land, nutrient and light	Requires less space and it competes less with other crops
Relation to pest	Harbor mole rat	Harbor mole rat
No. of harvest per year	Once	20 times
Other benefits		Lessen women burden to collect
Over all compatibility to the system	Low compatible	fodder More compatible

with neighbouring farm owners who were not using such practices on their farms. Therefore, farmers realized the benefit of collective action to alleviate challenges of individual implementation of soil and water conservation.

Interviewed farmers, who were direct beneficiaries of the conservation measures, had different perception on the pros and cons of SWC prior to the current CA (Figure 3). Majority (60%) of them had no idea of the benefits of SWC measure whereas 26% of them had expectation of some benefits based on their crude observation on plots of other farmers using SWC in other localities. In contrast, few of them considered SWC as an exercise implemented to get food incentive while others said it is a practice wasting land fearing that it will further fragment their scarce farm lands. After experimenting for two years, however, all of the interviewed farmers realized and witnessed the importance of SWC in improving soil fertility and crop yields (Table 3 and Figure 2).

Farmers' perception on collective action for SWC

Before the implementation of the current CA, farmers had different perception on the practicality of CA in their locality (Figure 4). Most (73%) of the interviewed farmers said that there was no culture of collective action for natural resource management issues like SWC although the community used to work together for social affairs like funeral and for farm activities that demand labor. To some (27%) farmers, it was assumed impossible to conduct CA for issues like SWC. Indeed, lack of cooperation to manage communal natural resources was one of the problems of the watershed (AHI, 2004). For few of them, collective action for SWC is an activity to get food aid as they have seen programs providing food incentive for similar work.

After conducting the current collective action, however, farmers" insight on CA was somehow improved (Figure 5). Majority (73%) of them understood the benefit of CA to implement SWC. They realized that their previous individual efforts to conserve soil and water were futile exercise as compared to the achievement made with the current CA. Some (9%) farmers suggested that such CA should be done without food incentive for its sustainability. Farmers also forwarded different views as to how such CA could be sustainable in the future. Some (9%) believed that the intervention of government bodies in the process of implementation will make the CA sustainable. Some others (9%) said that as the land holding is variable over households, the degree of individual farmer"s cooperation for such CA will be variable and this requires other alternative solution that attracts or binds all the beneficiaries to work together. Still some (9%) suggested food incentive to continue as most development programs in the area are being conducted through aid.

Adoption of conservation measures

In the beginning of the CA, some farmers were reluctant and did not volunteer to have conservation structures on their plots. To avoid destruction of built conservation structures and increase adoption of soil conservation structures, none volunteer farmers were not enforced to

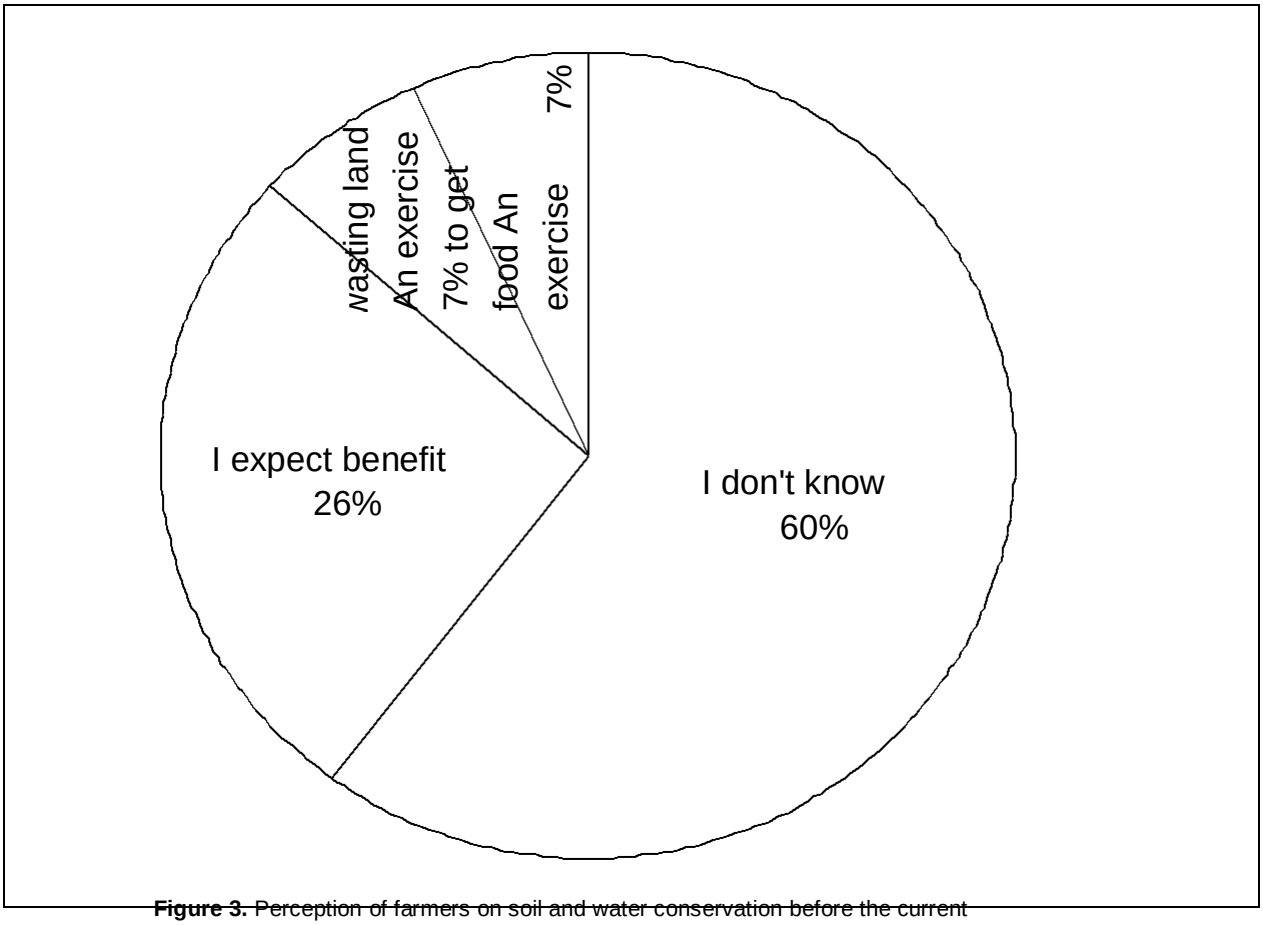

Figure 3. Perception of farmers on soil and water conservation before the current exercise (n=40).

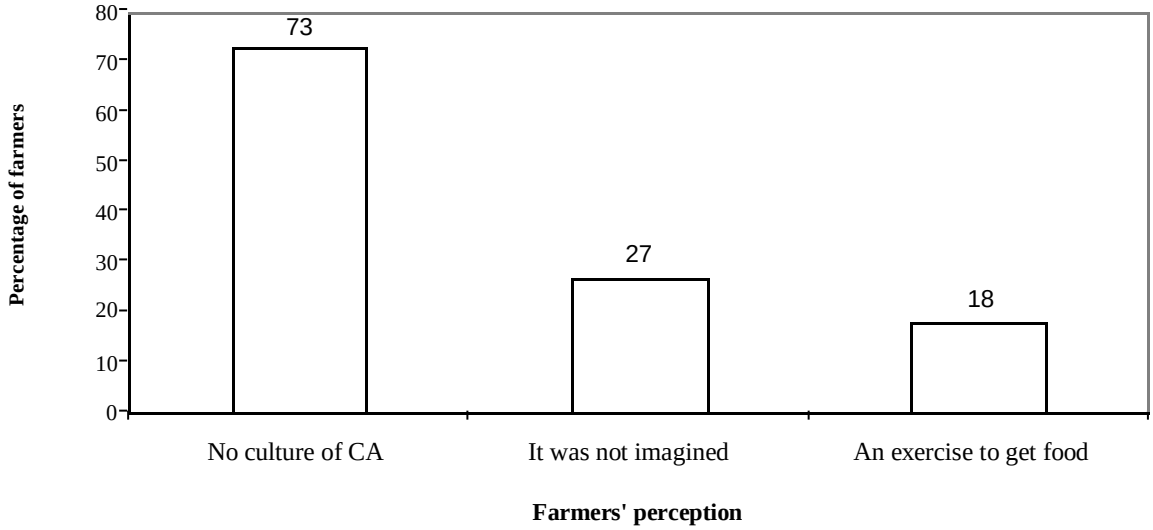

Figure 4. Farmers" perception to collective action in soil and water conservation before exerc ise (n=40).

Fig 3. Perception of farmers to collective action for soil and water conservation before exercise

construct conservation structures during the CA. Some of them became volunteered immediately after advised by the research team. Farmers did not deliberately demolish the constructed structures even after two years and this

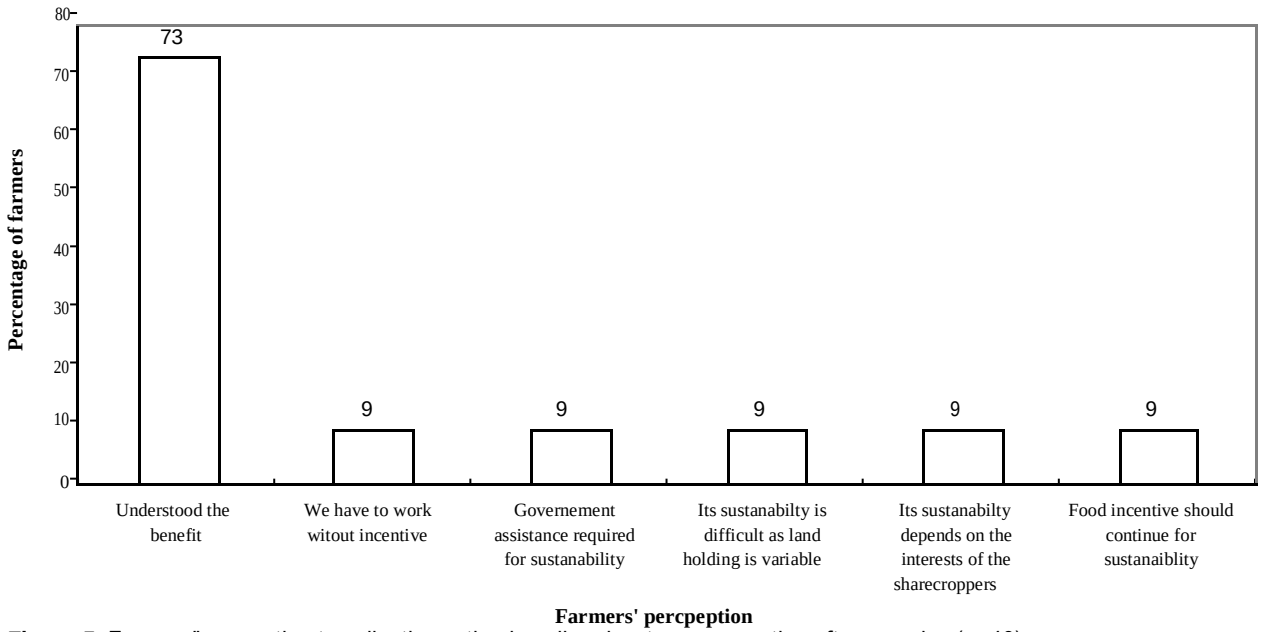

Figure 5. Farmers" perception to collective action in soil and water conservation after exercise (n=40).

Fig 4. Perception of farmers to colective action for soil and water conservation after exercise

was admired even by higher local official during field day ceremony. Destruction of conservation structures by farmers was an indicator of the failure of the previous conservation programs through Ministry of Agriculture.

Understanding the benefit of the conservation structure through observation from their neighbours, most none volunteer farmers personally insisted that research team expand CA on their farms. Ten farmers started constructing new structures individually copying the design of the structures built through the CA. Based on their request to build conservation bunds individually, farmers like Mr. Dagne and Mr. Demeke from Ofa Village got technical assistance from the research team in measuring the contours. Even the extension agents in the neighboring watershed also started copying the same participatory approach (empowering farmers in decision making) instead of enforcement which was widely practiced previously. Over 29% of the beneficiary farmers maintained the damaged structures. The achievement made through the CA has become also demonstration sites for trainings organized by the Bureau of Agriculture. Over 100 trainees visited the sites in two seasons.

Initially, most farmers were reluctant to take and plant elephant grass as they did not know its benefit. However, later on they changed their views after observing the advantage of elephant grass. Currently demand was created by farmers even outside of the watershed and thus the grass is expanding from farmer-to-farmer as bund stabilizer beyond the watershed mainly through gift. Following the advice given by the research team, many farmers planted different crops (sugar cane, cassava, faba bean sorghum, sesbania, etc) on the conservation structures which are signs of adoptions.

Challenges on implementation of conservation measures

Some challenges were encountered at different stages of the CA although some of them were resolved mainly through negotiation or discussion (Table 5).

Dependency to aid

At planning stage, farmers" dependency to aid greatly affected the CA. Firstly, farmers raised a question of food for work which was a reflection of their previous experience as the introduced soil and water conservation measures, which were started in Ethiopia in 1970s, were conducted with the assistance of development food aid (Dessalegn, 1998). Discussion was held with Gununo farmers to make them realize that the failure of the previous conservation programs was mainly because it used food as incentive. Realizing the severity of soil erosion in the area, farmers were convinced and decided to work collectively without food incentive. Secondly, farmers requested provision of implements to excavate terraces since their farm implements are less effective and most of them have no spades. This was also a sign of dependency and thus agreement was reached to provide some implements but not to be owned individually. However, a tendency to privatize the communal implements was observed during the implementation of the CA. Some farmers who were given to handle the implements sold and hide the implements. Such behaviors might have resulted from the severity of poverty in the area.

Table 5. Challenges of collective action on soil and water conservation at different stages and resolutions made.

Stages	Challenge	How solved	Resolution
Planning	Request of farmers for food aid	Discussion with the community	Farmers decided to work without food grain aid
	Request of farmers for implements	Discussion and aid from AHI	The research team promised to provide some implements
	Re-request for food aid	Negotiation with local leaders	Divert some money from PSNP to SWC
	Allocating working days and starting time	Discussion with the community and local leaders	Allotted 2 days for collective action and time fixed based on interest and religion
Implementation	Difficulty of controlling the quality of the work	Orienting better farmers	Better farmers assigned to follow others
	Resistance of land users to SWC	Negotiation between land owners and users	SWC resumed in most cases

Allocation of working days

Another challenge at planning stage was allocation of days in a week for the CA. Three days per week have had already been allotted as development days for government development programs and thus it was difficult to assign the rest days of a week (on which farmers undertake individual routine farm activities) for the CA. Through discussion with the local leaders and development agents, two days from the already scheduled three days were allotted for the CA. Because of variable interests of farmers in different villages, it was challenging to determine the starting time in a day. Up on discussion at village level, however, agreement was reached to start at 6:00am for some villages while 7:00am for others based on their interests. Some villages preferred to start at 9:00am for one day and 7:00am for the rest day due to religious reason.

Intervention of development programs with food aid

Initially CA was smoothly run as planned. However, immediately when a new program, Productive Safety Net Program (PSNP) of the government started operating, farmers re-initiated the question of food incentive to run the CA although they initially agreed to work for free. PSNP was launched by the government in 2005 as a main component of Food Security Program where chronic food insecure families receive cash or food transfer, either „for work" (through a public work program to employ beneficiaries in building roads and other infrastructures) or „for free", on a regular predictable basis for five years (FAO/WFP, 2007). Community meeting was held to discuss the issue raised by farmers; however, they confused the mission of PSNP with the current CA. As provisional solution, the research team discussed with local leaders and development agents and some PSNP budget was allotted to run the CA although it affected the original plan.

Interventions of programs like PSNP are usually designed to enhance development so as to improve the livelihoods of communities. However, due to the deep rooted dependency on food aid, farmers used to miss interpret the objectives of such programs. Betru (2003) also reported that although food appears to be an appropriate development incentive for food insecure areas and labor intensive rehabilitation programs, farmers in different parts of the country misconceived the payment for conservation work on their land as legitimate right and such perception certainly affected the objective of food for work programs.

To understand the status of dependency of farmers to PSNP, discussion was held with local leaders. The number of beneficiaries of PSNP is over one thousand. After three years of aid, it was only 20% of the farmers who showed slight improvement in their livelihoods. About 70% of them did not show any change. But the livelihood of about 10% of them is declining because they deliberately misused the food aid so that the aid continues. Because such food for work programs will have negative impact on future self initiative CA, discussion was held with twenty farmers on how to improve CA. Seventeen of them suggested that food aid should be separated from development works and development works must be compulsory while food aid should be optional. Therefore, food aid should be targeted to food insecure individuals without attaching to any kind of development work.

Lack of interest by land users and local leader

Most land users were reluctant to have conservation

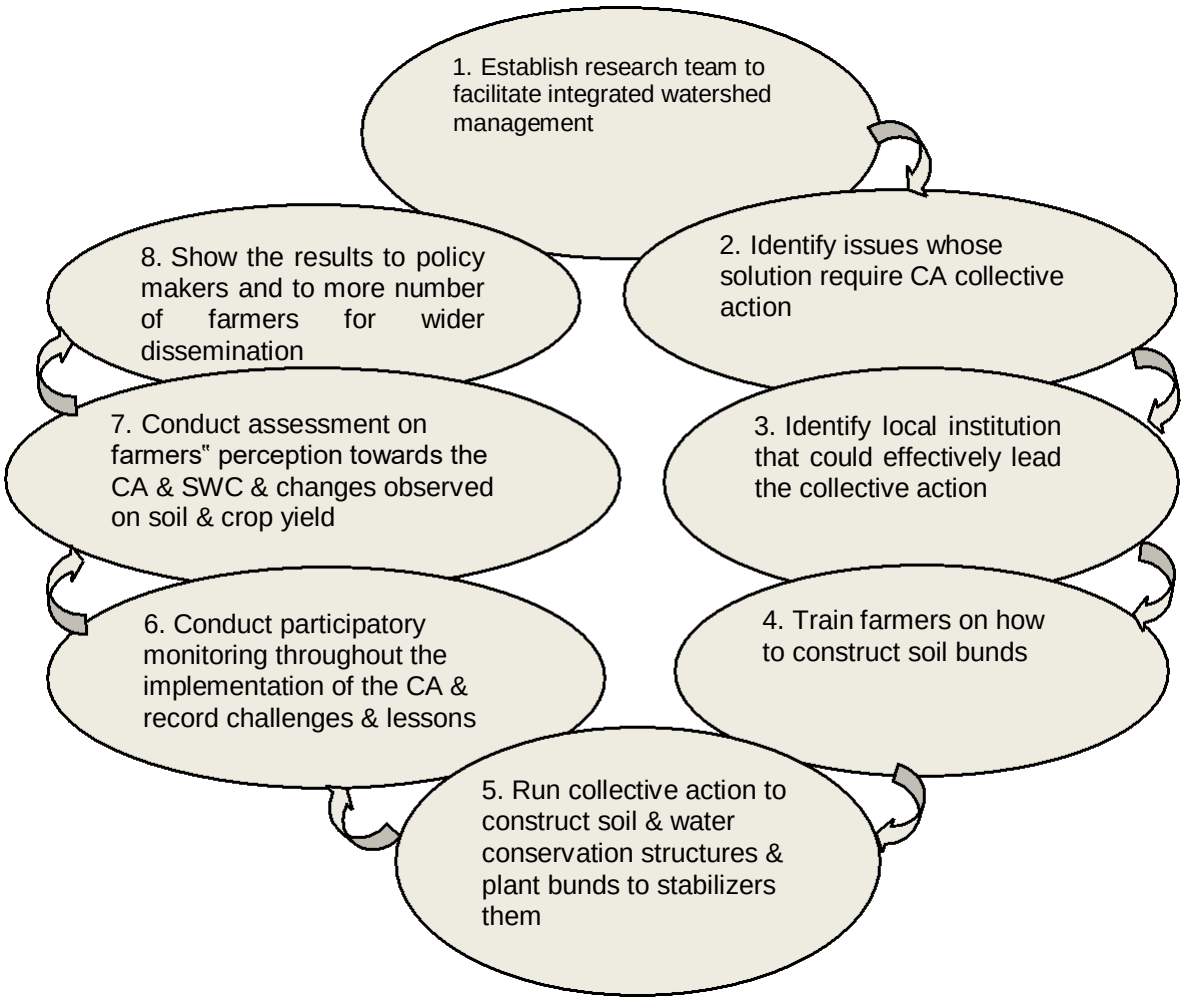

Figure 6. Conceptual frame work to facilitate collective action in soil and water conservation.

structures on the land they were using as share cropping. These farmers did not plant biological bund stabilizers. They want to maximize produce out of the land for certain period of time and do not mind about the futurity of the land. Land owners on the other hand had high interest for conservation measures. Women and poor men farmers, who usually give out their lands for sharecropping, were forced to follow the decisions of the land users. Most women and poor men farmers have shortage of labor and draught oxen to plow their farms. They have also shortage of cash to buy inputs, such as improved seeds and fertilizers. Thus a lady farmer called Ayelech Tanga said “I have interest for soil conservation measures and I tried to plant elephant grass as bund stabilizer but the share cropper refused all of these practices and I was forced to accept the interest of the sharecropper as I have no the capacity to manage my farm and I have a number of children to feed”. This challenge was partially solved through giving advice and facilitating negotiation between the land owners and the land users (sharecroppers).

Reluctance to accept technical recommendations

Most farmers did not accept the horizontal distance suggested by the research team justifying that the recommended distance is too narrow to allow oxen turn while plowing and the conservation structures consume and fragment their land. In addition, farmers need the contour to follow their farm boundaries and the existing traditional soil conservation measures (biological and physical). This has affected the implementation of the recommended contour interval. In some farms, the contours lie on growing annual crops which hindered the construction of soil bunds continuously across land escape. However, in a few cases, the working group convinced the crop owners and construction resumed by uprooting the crops. Although flood starts from the top of the hills, some farmers residing on top of the hills opposed the conservation structures justifying they had no severe soil erosion problem on their farms. However, most of them were convinced through discussion.

The major challenge after the implementation of

conservation structures was that most farmers had poor culture of maintaining the conservation structures individually. An assessment conducted in one village after one season showed that 29% of the interviewed households have maintained the structures on their private lands. The reasons of poor maintenance of the structures were attached to the perception of farmers to consequences of erosion, farmers" age, land ownership and family size. In most cases who rent land were less inclined to maintain structures. Most of the interviewee responded that they still need CA even to maintain the structures. However, the heterogeneity of the problem over the landscape, variability in the size of landholding per household and difference in perception to soil erosion are challenges of the success of the CA. Such challenges were also previously reported by different authors (Tadesse and Belay, 2004; Yohannes, 1992).

Loose partnership

Weaknesses were also observed with participation of external stakeholders in facilitating the collective action. The reasons for poor participation were overlap of office activities, unscheduled activities from higher level offices, lack of individuals" interest, high staff turnover and lack of commitment by partner institutions. Partner institutions gave more attention to their respective institute assignments. Although the involvement of local leaders in spearheading the CA was important, some of them were found to be responsible for weakening the participation of farmers in the CA. The local leaders themselves insisted that they be offered special incentive to coordinate the CA. For the reason that their interest has not been met, they intentionally attempted to overlap the working days of other development plans with the CA. Some local leaders were also reluctant to coordinate the CA on farm lands of individuals who were in conflict with them.

Lessons

Dependency of farmers to food aid could affect the perception of farmers to initiate similar natural resource management issues requiring collective action. In the current study, even though farmers were aware of the severity of soil erosion in their farms, they showed some reluctance to accomplish the soil and water conservation work collectively and this might be a reflection of the cumulative effects of food for work programs prevailing in the area.

Involving community leaders and outsiders in the planning and implementation of the collective action was found to be very important in breaking the poor culture of cooperation in the watershed to manage such natural resources requiring group work. Although, farmers have other traditional institutions like *Idir*, which serve mainly for funeral purpose and *Hera* for implementing farm activities and house construction, they do not use them to manage communal resources. If a farmer has an activity that calls for collective action through one of the traditional institutions, he has to invite the participating farmers and such invitation has currently become beyond the capacity of the farmers as food is becoming scarce. This hindered farmers not to work collectively in a large number. While implementing the current collective action, however, this tradition was broken mainly due to the involvement of local leaders and outsiders in the process of planning and implementation. Farmers realized the challenge and suggested for the future that the government should be involved in breaking poor cultures of the community that waste money and time and hinders natural resource management.

Farmers" interest for collective action in soil and water conservation was variable based on the severity of the problem they have experienced. Some farmers showed high interest to conserve their soil while others were reluctant. Most farmers whose lands were seriously affected by erosion were relatively highly interested. Such farmers were those whose farms were in the hill bottoms. Whereas those farmers having their farms on the hill tops were less affected by erosion and thus showed less interest for the collective action. Farmers" interest was also affected based on the farm size and land ownership. Farmers who had relatively larger land and who were land owners were highly interested as compared to those who had small land and those who were land users.

Farmers" attitude to soil and water conservation could be changed over time after they observe the improvement in soil fertility and crop yield as a result of conservation measures. This was proved by the newly emerging non-CA farmers who individually started constructing soil bunds on their farms. In addition, because their lands were not productive, some farmers used to exercise sharecropping on other farmers" lands to get additional produce. These farmers also started investing their labor on their private farms after understanding the benefit of conservation measures.

The degree of cooperation for collective action differs over villages depending on farmers" exposure to previous soil and water conservation measures. Therefore, farmers near the previous soil and water conservation structures of the AHI pilot sites were highly interested and cooperative than those far away. The reason might be that farmers in the vicinity of AHI pilot site have been more exposed and have drawn lessons from the benefits of the conservation measures.

Crop yields showed considerable improvement starting from the first year of implementation of conservation measures. The increase in yield was more observed in highly degraded soils. This shows that the productivity of the soil can be improved wit in a short period of time if properly maintained. Because of this, some farmers were

observed starting settled life instead of migrating to other places either to get fertile land or to look for casual labor. A farmer called Temsgen Wolebo who had a highly degraded land said “there is no bad soil as long as it is properly managed”.

Conclusion

Most farmers have realized the importance of collective action for implementing soil and water conservation. Thus most of them understood that their previous individual efforts to construct soil bunds were futile exercise as compared to the current collective action. They have also understood the importance of the conservation measures after observing the improvement in the soil productivity. As a result of conservation measure, crop yields showed considerable increase, particularly in highly degraded soils. This proved that with proper management, the productivity of the soil can be improved within short period of time. Thus, most farmers, including those who were reluctant to construct conservation measures, changed their perception on soil and water conservation and some of them have adopted and started exercising soil and water conservation individually.

However, the collective action was highly affected mainly by the dependency of farmers to aid coupled with other multiple factors. The food security program of the government involving food/cash incentives for work has primarily affected the smooth implementation of the collective action. Such programs may have negative implication on wide use of collective action for managing different natural resources. Interviewed farmers have also appreciated the challenge and suggested that there is a need to separate development works from food aid. Continuous training should be given to the community to avoid this dependency syndrome and develop self reliance in managing communal natural resources. The degree of cooperation was variable over villages mainly as a result of previous exposure to similar works. Thus cross site visit on successful farmers" plots would help to convince more number of farmers. Lack of binding norm was one of the weaknesses observed while implementing the current collective action. Because of that few farmers were reluctant to participate in the collective action mentioning various personal reasons. Hence it will be very important for future exercise to establish community based bylaws to enhance the implementation of similar issues requiring collective action. The involvement of local leaders in leading the collective action was also found vital in enhancing the collective action. Moreover, it was possible to realize that government attached local institutions like *Mengistawi Budin* has acceptance by farmers.

Local social institutions like Hera could be used to enhance co-management of natural resource through training farmers to build their capacity and bring attitudinal change towards collective action. Although women and poor men farmers, who usually give their lands to other farmers for share cropping due to input and labour shortage, have shown high interest for soil and water conservation, the decision to implement conservation measure depended on the wish of the partner sharecropper who had no interest in soil and water conservation. Therefore, these groups of the society should be given special support to build their financial capacity for the success of a program like soil and water conservation.

In previous times, farmers used to accomplish development works through enforcement. Nevertheless, experiences using such approach have been unfruitful and unsustainable. In the current study, however, farmers were empowered to decide on the planning and implementation aspects of the collective action and this has relatively improved the success in soil and water conservation. Making soil bunds productive and stabilized by planting crops on the bunds had also important role in the success. Therefore in line with the initial hypothesis farmers" participation in decision making and integration of feed and food crops on soil conservation structures as stabilizer would increase adoption of soil conservation exercise. Nonetheless, such exercise should go hand in hand with proper soil fertility management which the current collective action lacks.

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