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Full Length Research Paper

Assessment of farmers' perception towards soil and water conservation in Obi Koji Peasant Association, Woliso District, South West Shewa Ethiopia

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The severity of erosion is one of the major factors which calls for various efforts to reduce unsustainable agricultural productivity. But the efforts were fails because of some factors like need of incentives, technology that needs too much labor, reduction of farm size and lack of awareness. The main purpose of this research was to determine the factors affecting farmer's perception to make decision on soil and water conservation practices on their farm land. A total of 36 (20 male and 16 female) household samples from three zones of Obi Koji, West Ethiopia were selected proportionally to the population size, respectively. Data was being collected in the form of interview, questioner and field observations and secondary data from documented files. Direct household survey and formal interview method were used to take sampling. The study was focused on the determinant factors which affect the decision of farmers to adopt soil and water conservation practices in their local conditions. Majority of the farmers have awareness about the introduced soil and water conservation (SWC) and few of them implements it. The rest uses cultural practices such as diversion ditch and water ways. Nonetheless, the sustainability of the implemented structures was unlikely. The study concluded that many of those problems were related lack of real participation of farmers in planning of conservation effort. Lastly, the carefully pursue of a farmer participatory approach especially on planning and fair distribution of training among the zone of Kebeles is a core issue.

Key words: Conservation practices, farmer's perception, soil and water conservation.

INTRODUCTION

The problem of soil erosion in Ethiopia is well known. Increased pressure on land use of the hill slopes since the 1970s has resulted in soil losses in the highlands of Ethiopia (Simeneh, 2015). A large number of studies in

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the highlands of Ethiopia have been carried out on the causes of soil erosion and technical remedial actions have been proposed (Gizaw et al., 2009; Abiy et al., 2015). Soil erosion in association with inappropriate land management practices is one of the main factors causing land degradation. Poor land and water management practices and lack of effective planning and implementation approaches for soil conservation are responsible for strong environmental impact and major economic losses from decreased agricultural production and from off-site effects on infrastructures and water quality by sedimentation process (Yihenew et al., 2012; Pravat et al., 2015).

Soil erosion creates several limitations to sustainable agricultural land use as it reduces on farm soil productivity and cause food insecurity (Tegegne, 2014; Simeneh, 2015). To address this problem, considerable efforts have been made since that time to rehabilitate degraded environments and stop further degradation by the government of Ethiopia (Amsalu and Garf, 2004). By this action huge areas were covered with terraces and millions of trees were planted (Gizaw et al., 2009; Yeshambel, 2013; Tegegne, 2014). Various soil conservation practices applied by farmers on their own farm plots are critical components of natural resource management when the aim is to achieve sustainable agricultural acceptable ecosystem integrity (Tegegne, 2014; Tesfaye and Kasahun, 2015). Soil erosion problem is also common in the Woliso district associated with topography and other determinate factors. Hence, the rate of severity varies from Kebele (ward) to Kebele (ward). Thus, in Obi Koji Kebele (ward) topography of the land, inadequate soil water conservation practice and land use problem is the main prioritized one which accelerates soil erosion (Data of the Kebele extension document un published). Additionally, farmers frequently reject newly introduced soil water conservation practices even when they are aware of the fact that measure protects and improves productivity of the lands. Therefore, assessing the factors which affect the attitude of the farmers towards soil water conservation in Obi Koji Woliso district is necessary.

Statement of the problem

There are significant problems that were observed in the Kebele as a result of lack of farmer's attitude towards soil and water conservation practice such as: inadequate soil and water conservation practice; indicators of serious soil erosion; and decrease in productivity of land.

Objective of the study

The general objective of the study was to identify factors affecting farmer's perception to make decision on soil and water conservation practices on their farm land. The specific objectives were to evaluate local farmers perception of soil and water conservation practice and to assess the impact of incentive for adoption of SWC measures.

Significance of study

The result of this study was certainly being important both for farmers and the government. On this, it (1) helps farmers to identify the area of the problem and to minimize it, (2) enables the farmers to understand the problem of SWC and to discuss on it, (3) helps the farmers to know the factors that affect their perception towards SWC, and (4) enables the expert to know the attitude of the farmers towards SWC practice.

MATERIALS AND METHODS

Description of the study area

The study was conducted during the month of May to December 2015 in the Obi Koji Kebele peasant association (Figure 1). Kebele is located at 115 km from Addis Ababa capital city of Ethiopia and 235 km from Jimma town. The elevation ranges between 2100 and 2600 m.a.s.l. Thus, the area experience subtropical zone (90%) and cool zone (10%) climate with rainfall ranges from 1500 to 2250 mm with temperature minimum 15 to maximum 25, the dominant soil types of the Kebele is 35% Vertisols and 65% clay soil (Kebele Extension Worker Data, unpublished). Agriculture of the area is in rain fed with a subsistence mixed farming system. The major crop grown in Kebele are wheat (*Triticum*), barely (*Hordeum vulgare*), bean (*Phaseolus lunatus*), pea (*Pisum sativum*), teff (*Eragrostis tef*) and lentil (*Lens culinaris*).

The total area of the Kebele is 2100 hectare. There are three zones identified by the Kebele based on the sub watershed, named as Zone I (Obi Osole), Zone II (Balchi) and Zone III (Obi Koji). The total numbers of household are 427, of which 51 are women, 376 are male headed household and it has 2514 people of which 1333 are women and 1181 are male in the Kebele. The major edible food is locally named as "Injera and Dabo (Kebele Extension Worker, unpublished).

Data source and analysis

The data required for the study was generated through formal house hold survey and interviewed with individual farmers and extension workers called development agent (DA), working in the Kebele. The assessment was undertaken between May to December 2015. For the interviewed household survey sample of 36 farmers households from three zones of Kebele were randomly selected and interviewed, of which 16 were female headed. The stratification of sample was depending on the level of farmer's willingness to adopt the introduced SWC technologies. Fast, medium and laggard adopters were taken into consideration. The lists of these farmers were availed by the Kebele (DA), administration of the Kebele and elder group of the three zones.

From the interviewed farmers, 51% were those who adopt the introduced soil and water conservation structure on their farm lands. The survey questionnaires comprised both closed and open

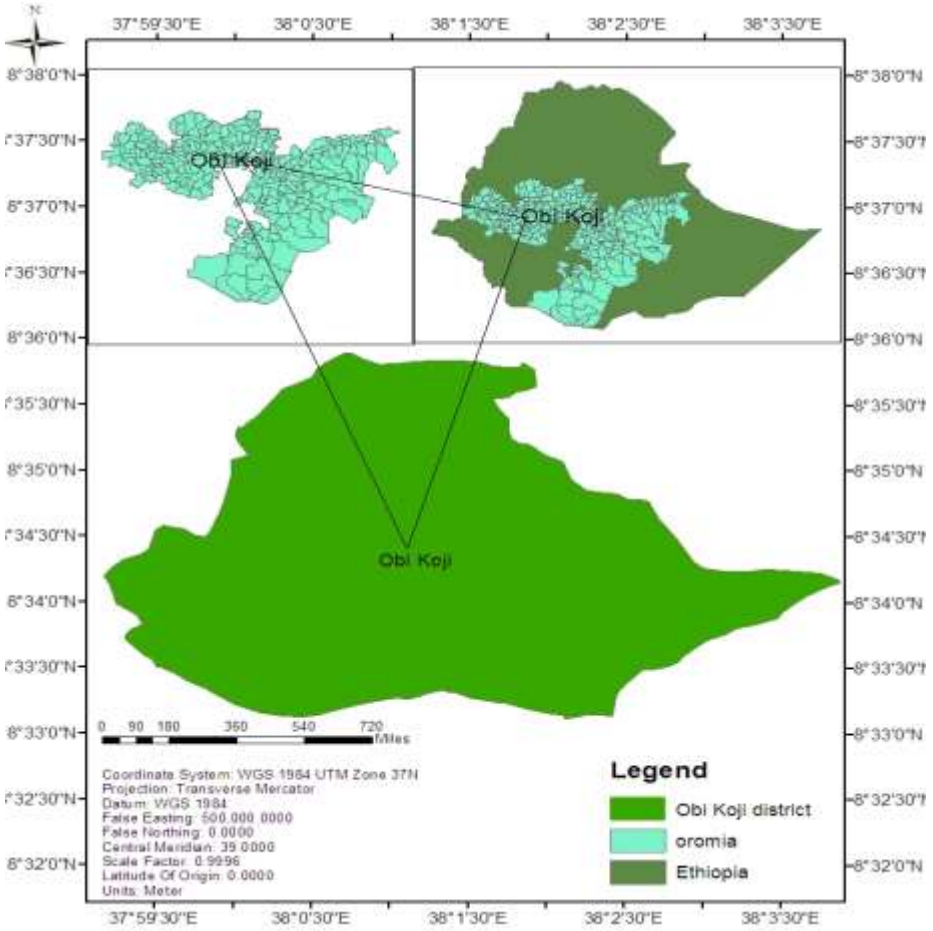

Figure 1. Map of the study area.

ended types of questions. The questionnaires generated information on the extent of farmer acceptance and adoption of the introduced conservation technologies. In reference to their awareness and perception of erosion hazards, labor supply, effectiveness of the technology in controlling soil erosion and improving land productivity, land tenure system and others. Each respondent was informed about the purpose of survey before starting the interview. Thus, they have developed trust to answer the question. Documentary materials available with the DA were also consulted to obtain information on types of the SWC technologies under implementation. Descriptive analysis has been employed in the analysis. Finally, the data generated by the questionnaires were presented by using percentage.

RESULTS AND DISCUSSION

Household farm characteristics

As described in Table 1, the total households in Obi Koji Kebele were 427 of which 376 were headed by males and 51 by females. The total population of these household were 2514 people and 1333 are women and 1181 are male in the Kebele. There were 197 people in the 36 surveyed households. The average family size is five persons (Table 1). The average age of sampled farmer was 48 with a minimum age of 33 and maximum of 63 of the total respondents (44%) were females. Half of the respondents (47%) were illiterates, while the rest are reading and writing through basic education and religious schools. All of the interviewed farmers owned land. The mean holding farm size is about 1.5 ha. The significances variation in the size of land holding among sampled households. The majority of farmer (47%) possessed less than 2 ha of lands where 36% have more than 3.5 ha. During interview, the respondents reported that one household possessed up to six plots of farm lands within the small total farm size or cropland which were rented especially for temporary cultivated without any conservation structures except some traditional ditches. As farmers said, their lands were fast losing their productivity due to lack of attention given by the owner or the one who rent the land.

In rainy season (kiremt), the livestock was dependent on

Table 1. Characteristic of total households and their livestock in the three zones.

Characteristics	Kebele			Total
	Zone-1	Zone-2	Zone-3	
Total house hold	132	124	171	427
Family size	837	787	890	2514
Sample house hold	12	12	12	36

Table 2. Farmers response to the cause of erosion, fertility and product.

Farmer'	Option	Percentage (n=36)
Cause of soil erosion	Lack of conservation structure	51
	Steep land without conservation structure	3
	Damaged conservation structure	31
	Lack of diversion ditch	11
	Other	4

Table 3. Farmer's conservation practice in Obi Koji Kebele.

Management option	Percentage (n=36)
Contour plowing	5
Cultural ditch	31
Soil bunds	39
Stone bund	12
Grass strips	0
Water ways	10
Others	2

heavily degraded (overgrazed) communal land. Some edible weed species from the field were also important source of livestock's feed during the dry season (bega), crop residue (mainly barley and wheat straw) were the main feed. During this season, crop lands as serve as grazing lands. Finally, the respondent said currently fodder availably became a critical factor determining livestock productivity.

Causes of soil erosion, soil fertility and productivity decline

As indicated in Table 2, the major causes of soil erosion in the area mentioned by farmers were steep slope, without conservation structures, lack of conservation structure, damaged conservation structure and others like deforestation, free grazing and lack of income to construct SWC structure. Minor of the farmer said that lack of diversion ditch also contributed to the cause of soil erosion.

Almost all of the farmers interviewed said that the cause of soil erosion of their farm land was lack of conservation structure. Damaged conservation structure was also other major cause of soil erosion, as mentioned by 31% of the respondents. Additionally, other reasons gave little contribution for soil erosion and fertility decline was lack of diversion ditch, cultivating steep land without conservation structure.

As reported by Adimassu (2017) most interviewed farmers believed that, productivity and their land declined because of soil erosion. As mentioned by respondents' soil, erosion was the main cause of fertility decline. On the other hand, repeated cultivation had its own effects on fertility and productivity decline. No respondents said that rainfall shortage is a problem (Table 2). In general, almost all the respondents have a good knowledge of the cause of soil erosion, fertility and productivity decline.

Farmer's conservation practice in Obi Koji Kebele

All the respondents answered that soil and water conservation measures were very helpful for erosion control and better to improve soil productivity. Farmers used terraces, cultural drainage ditch, soil bund, water way and others to control their farm land from erosion.

Traditional ditches locally called "Dandii lolaa" were indigenously practiced by 33% of the interviewed farmers for control soil erosion (Table 3). It is used to drain out excess water from their cultivated lands. The farmers also believed that these ditches were effective especially one cropping season to conserve soil against erosion. They emphasized that "ditches" need less labor, low cost and short time construction as compared to other conservation structure. However, they concluded that ditches have little importance for sustainable land management as compared to other improved soil water conservation technologies. This shows that farmers have a good knowledge's about introduced SWC technologies. Gizaw et al. (2009), also emphasized similar results that is important for effectiveness to implement SWC measure depends upon knowledge and information of farmers. From interviewed farmer, soil bund and stone bund were practiced by 51% for mean of conservation. However, from field observation bund were poorly maintenance specially those who rented land from land holder, farmers does not give attention for maintenance of already constructed bunds due to need of immediate return and they believe that bunds can decrease their farm size. Even long term returns of soil bund were other problems for adopting SWC technologies.

A waterway which is locally constructed alongside of cultivated field was used by 10% respondents. This water way are more wider and deeper than cultural contour plowing also practiced in the Kebele as suggested by 5% of respondent. This measure was practiced culturally. For decrease of traction of animals during plowing on steep as respondent mentioned contour plowing were not efficient alone to control erosion. Furthermore, during interview, crop rotation and planting trees was also mentioned as important mechanisms to control erosion.

Farmer's perception, acceptance and adoption of SWC measures

Since the 1990, implementation of soil and water conservation measured has been taken as part of agricultural extension package of the present government (Bewket, 2003). However, the practice has largely delivery oriented in which the farmer forces to the implemented conservation measures designed for them by technical expert (Simeneh, 2015). All of the respondents believed that the new soil and water conservation technologies have the potential to improve land productivity. The farmers who tried to implement some conservation measures in their plots were interviewed on how they measure the effectiveness of soil and water conservation technologies. They had already observed a better growth and development of crops particularly along the structures felt sediments were trapped. They also evaluated that if that conservation structure were not built, during data collection, participant who treated their land by some conservation structures gave wittiness for us that technology have improved their land productivity.

The farmers were interviewed also what their intensions were regarded using the introduced soil and water conservation technology in the future (Table 4); majority of the respondents expressed their commitment to continue maintaining the established structures. In addition to this form, the interviewed whether they would like to apply the soil and water conservation technologies in the rest of their farm fields (pilots that were not treated by that time); most of the respondents expressed that they had plan to implement SWC measures. However, they intentionally need availability of incentive to implement SWC measures in their land.

According to Mebrahten (2014) and Simeneh (2015), the use of incentives in promoting adoption of soil and water conservation measures under the condition of the Ethiopia high land was necessary. Farmers are unlikely to expect that the introduction of new conservations measures will improve their immediate well beings. They suggested the use of incentives such as food for work and creditors' fertilizers are interring linkage mechanism and adopting soil and water conservation measures. Similarly, the assessed result indicates their attitude towards support need from government or other body, they were asked whether they should be paid for constructing and maintaining soil and water conservation structure in their farm. The minority (44%) responded "no" while majority (56%) answered "yes"; especially materials and money incentives. This shows farmers had an intention for incentives to adopt conservation measures from government and concerned body.

Factors affecting farm level adoption of the SWC technologies

The following section presents details of some factors that influence the farmer's decision with regards to utilization of the technologies as part of their regular land use and agricultural production activities.

Perception of erosion as a problem

Perception of soil erosion as a hazard soil productivity and sustainable agriculture was the most important determinant of effort of conservation measures. On the other hand, when farmers do not accept soil erosion as a problem, they cannot expect benefits from controlling the erosion process and it is highly that they will be by the side against adopting any conservation technologies.

As shown in Table 5, the results support the findings of Biratu and Asmamaw (2016), all the interviewed farmers perceived soil erosion as a problem on their own farm that constraining soil productivity. They said that the most important top soil for crop production activity was deteriorating over time due to erosion processes. Hence, they observed frequently how they lose soil from cultivated fields has been reducing the depth of the top soil throughout the time. Moreover, soil depth decrease or the unproductive soil (stone which is very compacted) will be left. The majority of the respondents reported that the occurrence of rill erosion is dominant erosion feature for all on their farm lands. While gully and sheet erosion is moderate.

From all respondents, almost half of the farmers rated the extent of the problem as sever and some respondents mentioned that the rate of soil erosion has been increasing over the time while small number of respondents believed that the extents of erosion were minor (Table 5). Almost all respondents answered that erosion can be controlled while very small number of respondents believed that erosion was not controlled totally, but it can decrease some degree of its severity.

Farmers were asked to respond on how they knew about soil erosion which occurs on their land in open-ended question part. Some of the respondents said, there was over flow of constructed ditches and it damages their

Table 4. Indicators of acceptance and adoption of SWC technologies.

Farmers response to	Option	Yes (%)	No (%)
Indicators of acceptance	Their knowledge of SWC measures	100	-
	Effectiveness of SWC in arresting soil erosion	100	-
	SWC have a potential to improve land productivity	100	-
Indicators of adoption	Plan to implement the new SWC tech;	72	28
	Plan to maintain the constructed structured	56	44
	Farmers should be paid for constructing and maintain SWC in their farm	56	44

Table 5. Farmer's perception of respondents for soil erosion as a problem.

Farmer's response to	Option	Percentage (N=36)
Occurrence of soil erosion	Yes	100
	No	0
Prevailing from of erosion	Sheet erosion	3
	Rill erosion	85
	Gully erosion	12
Extent of soil erosion (The degree of the extent damage)	Sevier	43
	Moderate	49
	minor	8
The rate of erosion over time	Increasing	53
	Same	0
	Decreasing	47
Can soil erosion be controlled	Yes	86
	No	14

crops when there was siltation in and out of their field mostly at the lower field border. Rills appeared on their field, when the color of soil in the upper part of the field goes to red and compacted stone than lower field. From these responses, it can be concluded that farmers have good perception of erosion as a problem that limits their soil productivity. Hence, there is lack of interest to adapt the technology which cannot be concluded by lack of awareness about erosion as a problem. Bewket (2003) also report similar result from his study that the majority of the farmers had indicated soil erosion as a key agricultural problem yet most of them were not willing to participate in construction of SWC structure. Thus, this implies the perception of erosion as a problem which may be necessary, but not always sufficient condition for adoption of SWC structure on farm level.

As sited by Rehema (2014), property rights claimed to affect adoption of SWC practices at the farm level. This means owner operators have a high tendency to adopt soil conservation practices than individuals who are not land owners driven by short term profit maximization. All (100%) interview respondents answered that land security was not a problem to adopt soil and water conservation practices on their farm land (Table 6). In Kebele, the newly introduced soil and water conservation measures are not a vital problem of awareness, most farmers showed unwillingness to adopt the newly introduced soil and water conservation structures. Most of the interviewed farmers said that some conservation measures like terraces and soil bund were land consuming and labor demanding for construction (Table 6). The other issue that affected their conservation practices was age, lack of income and family size to construct bunds and terraces.

In the data assessment and formal interviews, lack of drained water away from land of each other was the big

Table 6. Farmers reasons for not adopting the newly introduces SWC measures.

Options	Percentage (n=36)
Requires too much labor to implement	34
Land insecurity	4
Decrease farm size and difficult to plow	32
Lack of knowledge	23
Note considering erosion as a problem	0
Other (lack income , age, family size	7

problem raised by the participants. For example, farmers wanted to construct terraces by his/her indigenous knowledge, and if his/her neighbor does not, the runoff will not drain out. As the owner of the down slope fields does not permit to receive the run off since he/she did not construct some conservation measures like the one who did. Based on the above idea the interviewer raised the issue raised to Kebele development agent. They also understood/accept the raised idea was a problem of Kebele. Therefore, they have a future plan to implement soil and water conservation adoption in organized group to enhance the effectiveness of new technology.

Finally, farmers during personal interview were asked to recommend what should be done to improve effectiveness of soil and water conservation measures.

They suggested

(1) Most farmers do not have materials to construct terraces and bunds. Therefore, the concerned body like governments should support in this regards.
(2) Technical support from expert (DA) to design soil and water conservation measures is necessary.
(3) Even though some farmers have awareness to soil erosion problem, continues training and experience sharing and incentives should be given for the community for more understanding and implement the new soil and water conservation measures.
(4) Once conservation structured is constructed, it should be maintained whenever necessary.
(5) Efforts should be taken until farmers show willingness or adopt the technology
(6) If there is accessibility of grass and trees seedling, they have dual purposes for forage and soil conservation measures.

CONCLUSION AND RECOMMENDATION

Generally, from the research conducted, it was concluded that soil and water conservation were not sufficiently implemented as compared to erosion hazards of Kebele. The conservation undertaken in Kebele does not fairly distributed to the three zones of Kebele equally. The effectiveness in controlling depends on perception of farmers rather than using other different approaches to accept farmers. Even though, the farmers of Kebele have a good perception, they consider the structure can consume more land and need labor. The farmer suggested the use of incentives such as food for work and creditors' fertilizers are interring linkage mechanism and adopting soil and water conservation measures. Almost all the farmers have a good perception about erosion hazards, but their willingness to adopt SWC measures depend intentionally on incentives. Almost half of the farmers within the Kebele also practice the local diversion ditch as a means of conservation measures which is believed to be simple, not need too much labor, do not decrease farm size. Land tenure affects farmer's perception to adopt SWC technology. Based on the research, the following future lines of work are forwarded:

(1) Fairly distribution of technical support, training and application of improved SWC technology is necessary across three zones.
(2) Real farmers participatory approach necessary in planning and implementing of SWC to increase their preferences for adopting SWC technology.
(3) Avoiding dependences on incentives by cooperating farmers to implement SWC technology.
(4) Improving market accessibility and exporting potential for local products.
(5) Maintaining and stabilizing constructed SWC technology continuously.
(6) Training should be taken until farmers show willingness/adopt the technology.
(7) Facilitate zero grazing.

CONFLICT OF INTERESTS

The authors have not declared any conflict of interests.

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