

**ONE-INTO-FIVE LABOR-GROUPING FOR WATERSHED MANAGEMENT IN NORTHWEST ETHIOPIA:  
FARMERS' ACCEPTABLE PARTICIPATION AND INFLUENCING FACTORS**

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**ABSTRACT**

This study explores the types of labor-sharing groups and the farmers' acceptable participation in One-into-five labor-groups in *Machakel Woreda* (District), Ethiopia. Data were gathered through field observation, focus group discussion, key informant interview and a questionnaire survey of 135 households. T-test, Chi-square test and binary logistic regression were used in data analysis. *Debo*, *wonfel* and One-into-five labor associations are operating in the study areas. Over 33% of the farmers participate in *wonfel* and One-into-five labor teams. Over 82% of the farmers participate in the One-into-five farmer groupings against their will. Off-farm business, slope of land, *farmland size* and participation in indigenous labor significantly increased farmers' acceptable participation in One-into-five groups. Livestock asset and access to training significantly decreased farmers' acceptable participation in the *One-into-five labor*. It is suggested that the sustainable indigenous labor-sharing associations be promoted instead of focusing on an alien organization that causes doubt in the community.

**Keywords:** One-into-five, Labor-sharing, Watershed conservation, Farmers' acceptance, Ethiopia.

## INTRODUCTION

The economy of developing countries mainly depends on the performance of the agricultural sector. The contribution of the agricultural sector to the overall sustainable development in turn depends on how the natural resources are sustainably managed and used. Unfortunately, in the majority of these countries, the quality and quantity of natural resources are decreasing due to absence of sustainable land management; resulting in more severe droughts and hunger (Assefa, 2009). At the current moment, the non-sustainable agricultural activities in the various less developed countries cause the degradation of land resources such as soil, water and forests. Such unsustainable practices then result in the major ramification of the natural resource bases, the fragmentation of the ecological balances and stagnation of the agricultural development of those countries. Millions of farmers in developing countries are thus struggling to feed their families as they contend with land degradation that damages the sustainability of both protected and [innate ecological](#) systems (World Bank, 2006, 2008).

Land degradation and soil fertility depletion are particularly acute in the dry lands of sub-Saharan Africa (SSA) and cause low crop yields, poverty, hunger (Winterbottom, Reij, Garrity, Glover, Hellums, [Mcgahuey & Scherr, 2013](#)) and untenable livelihoods which are unsustainable development indicators. According to [Gebre & Weldemariam \(2013\)](#), Ethiopia is one of the poorest countries in SSA and its economy is based mainly on unsustainable smallholder agriculture. Land degradation and soil erosion still remain to be major challenges that directly affect the sustainable performance of the agricultural sector (Bewket, 2003) and the overall sustainable development in the country.

In recognition of these challenges, many efforts have been made in Ethiopia to mitigate land degradation, particularly soil erosion, through both traditional and newly introduced soil and water conservation (SWC) approaches by watershed scales. Of the various watershed development interventions, the largest activities were those implemented during the 1970s and 1980s in which the farmers were mobilized through Food-For-Work (FFW) campaign projects ([Shiferaw & Holden, 1998](#); Bewket, 2007; [Assefa, 2009](#)). Nevertheless, the FFW based campaigns were not sustainable, [and hence](#), ended in fiasco because they failed to win the full participation and interest of the farmers (Bewket, 2003, 2007; Amsalu & de Graaff, 2007). Although the food aid has helped to fight hunger in famine-stricken areas, it has not been successful in improving the sustainability of SWC in the long run (Amsalu & de Graaff, 2004; Belay & [Bewket, 2013](#)).

Research releases indicate that land resource management within the natural watersheds enables the sustainable management of all the resources and development projects attached to the watersheds and it [is central](#) to the realization of a sustainable socioeconomic development. The sustainable socioeconomic development in turn inspires the claim for ample data on ecological settings in the watersheds. The activity may require land resource management in the watersheds as a policy component and help the progress of harmonious connection between the watershed conservation functions. The integrated function in general can be taken as a critical policy intervention for sustainable watershed development (Enemark, 2005; World Bank, 2006, 2008).

Watershed based structural SWC development activities are labor-intensive (Bewket, 2007; [Gebre & Weldemariam, 2013](#)). For this reason, the local community obliged to implement those activities in groups. The World Bank (2006) urges that

communal land resources at the watersheds need be sustainably managed through the participation and collective action of the local [stakeholders](#). According to ([Mazengia & Mowo](#), 2013), farmers' group works develop personal relations and create opportunities for more collaboration, especially in labor contributions. For instance, their participation in the labor-sharing groups in the wide range of agricultural activities, including watershed SWC development works helps to solve labor constraint of some farm households. Similarly, [Belay & Bewket](#) (2013) reported that participation in work-sharing groups can help farmers to gain support from community groups, friends, relatives, governments and other agencies. However, previous conservation efforts in the community campaigns failed to respect participatory principles and often were considered as mandatory development works enforced by Rural *Kebele* Administrations (RKAs, lowest administration regions) and Development Agents (DAs) ([Bewket](#), 2003; [Gebre & Weldemariam](#), 2013) and were not sustainable.

In an effort to address these problems, the current government of Ethiopia has introduced a new community labor-sharing paradigm named; "One-into-five" community organization. For this reason, a new 'top-down' oriented community labor organization (One-into-five farmer labor-grouping) has been widely introduced to the watershed development based SWC campaigns in many parts of the country including in the study area. The new One-into-five farmer arrangements are in fact formal social networks introduced to the local community by the top government in order to get various tasks done including land management and other development practices (MWOAE, 2014). Nevertheless, the approach is of a 'command-and-control' type, standing against the recently emerging 'bottom-up' sustainable land management paradigm ([Critchley & Radstake](#), 2017). The process of farmer participation in the One-into-five community labor-sharing groups in the study areas has thus lack genuine community acceptance and fail to retain sustainable resource conservation and community development principles. As far as known to these researchers, the problem was not addressed by previous similar studies, and hence, knowledge gap to intervene.

Indeed, attempts were made to review papers available online regarding labor-sharing group performances in natural resource management and development at the watersheds. Unfortunately, it was not possible to find sufficient related papers on the issue online. Only two papers were accessed from internet. One of these was the methodological memorandum on factors influencing the cooperation and collective action of farmers on natural resources management by [McCarthy, Dutilly-Diané & Drabo](#) (2005) in Burkina Faso. The other was the paper by [Matthews-Njoku, Angba & Nwakwasi](#) (2009) focusing on issues controlling the function of agricultural development based community associations in Nigeria. But, non-of these studies dealt on the issue of One-into-five community labor associations.

The main objective of this study is to identify the types of labor-sharing groups operating and the perceived community acceptable participation in the One-into-five farmer-labor-sharing teams organized by the government for watershed development conservation works in the [Machakel Woreda](#) (District), in the northwestern highlands of Ethiopia. It also describes the factors influencing farmers' acceptable participation in the new One-into-five farmer groupings during watershed development based SWC campaigns.

## THE STUDY AREA AND RESEARCH METHODS

### The Study Area

This study was undertaken in the *Machakel woreda* which is located between 10°19'75" - 10°41' 00" N and 37°16'46" - 37°45'42" E in the northwestern highlands of Ethiopia (Leul, 2011; Fig. 1). The *woreda* is situated at some 330 km northwest of Addis Ababa and 270 km south of Bahir-Dar, the Regional center. Its total area is 795.59 square km and the altitude ranges from 1200 to 3200 m asl (MWoAE, 2014). The mean annual temperature varies between 8°-24°C and the total annual rainfall is between 1500 - 1900 mm. The rainfall pattern is unimodal mainly occurring between June and September. Red soils (Nitisols), black earths (Vertisols), brown soils (Cambisols) and Gray soils (Luvisols) are major soil types covering the study *woreda* (Leul, 2011; MWoAE, 2014).

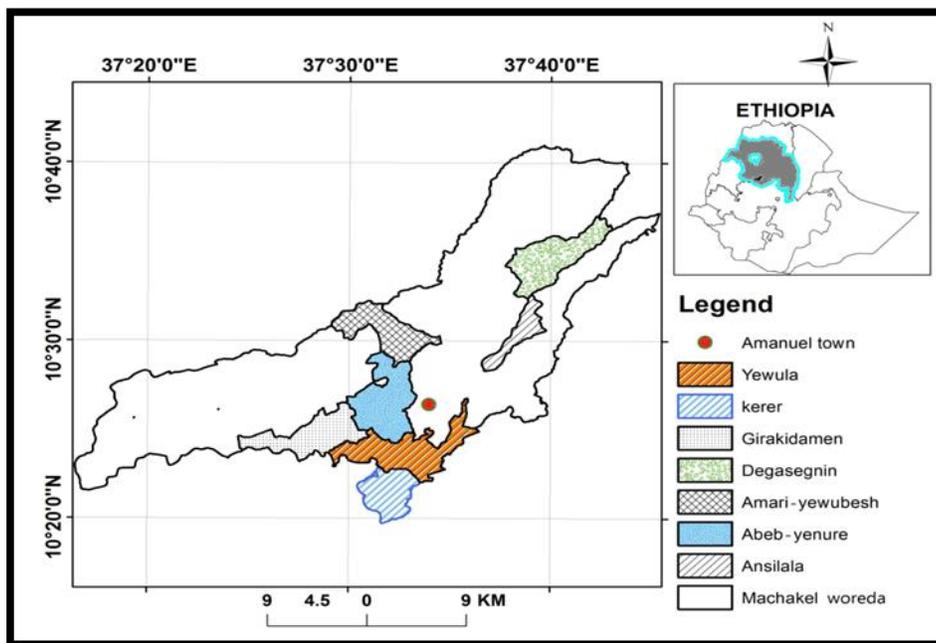


Figure 1 Location map of the study area

According to the Central Statistics Agency of Ethiopia (CSA, 2013), the *woreda* population for July 2017 was 141,574 out of which 70,019 are males and 71,555 females. The male-female sex ratio of the *woreda* is 97.85% indicating that females slightly outnumbered males. Out of the total population residing in the study *woreda*, the majority ( $\approx 89\%$ ) are rural, while the remaining ( $\approx 11\%$ ) are urban dwellers.

Agriculture is the dominant economic activity and the basic livelihood of the majority of residents in the *Machakel woreda*. The farming system is mainly focusing on a mix of crop cultivation and animal husbandry carried out at subsistence scale mostly for household consumption and not geared to market conditions. Land, human labor and livestock are therefore the most important livelihood bases of many of the households. The main crops produced in the area include tef (*Eragrosti tef*),

barley (*Hordeum vulgare*), wheat (*Triticum vulgare*), engido (*Avena spp.*) and maize (*Zea mays*). Oil seeds and pulses are also among the crops grown in the study *woreda*. Cattle, sheep, donkeys, bees and poultry are the common types of livestock raised in the study site (MWoAE, 2014).

#### Methods of Data Collection and Analysis

The data required for this research were generated from a survey of 135 rural households from January to March 2015. Both probability and non probability sampling designs were applied in the process of selecting sample households. Firstly, 24 RKAs found in the *woreda* were categorized into three distinct *strata as Dega* (temperate), *Woyna-Dega* (sub-tropical), & *Kolla* (tropical) traditional climatic zones, consisting of 8, 14, & 2 RKAs, respectively. Secondly, seven RKAs: two from *Dega* (Degasegnen & Ansilala); four from *Woyna-Dega* (Yewula, Abeb-Yenure, Kerer & Amari-Yewebesh); & one from *Kolla* (Gira-Kedamin) were selected based on geographical proximity & transport accessibility. Then 135 sample households were identified using systematic random sampling for the questionnaire survey from a stratified list of households obtained in the RKA offices. Selection was based on proportion from the seven RKAs.

The survey questionnaires comprised both open and close-ended formats. The questions were set to generate information related to extent of farmers' acceptance & participation in the labor-sharing groups, & the contribution of the farmers' labor teams to the SWC development activities, & to the farming systems. The questions were pretested & administered by the lead researcher, extension workers (DAs) & high school graduate enumerators that were recruited from each RKA. The data collected through household survey were then complimented by field observation, informal discussions with fifteen key informant farmers and seven focus group discussions (FGDs) each comprising six participants. One-into-five farmers' development groups, RKA leaders, elders, experts and DAs were also approached and consulted.

Descriptive statistics, Chi-square test, T-test & binary logistic regression were used in data analysis. The binary logistic regression statistical technique was used to show the probability of a dichotomous outcome related to a set of explanatory variables. It was chosen for its ease to manage and handle the nominal data (the dichotomous response variables) with regard to farmers' perceived acceptable participation decisions in the One-into-five labor associations that are intricate to manipulate via the use of linear multiple regression models. Besides, the model is fairly easy to manipulate mathematical operations using the Statistical Package for the Social Scientists (SPSS). Hence, by using the binary logit model, it is easy to verify the variables that influence the acceptable participation in the One-into-five labor teams (accept/participate or not accept but forced to participate in the labor team). The model can be specified as under for the acceptable participation in the One-into-five labor organization:

$$\ln \frac{Y}{1-Y} = A + B_1X_1 + B_2X_2 + B_3X_3 \dots B_tX_t$$

$$\text{logit}(Y) = A + B_1X_1 + B_2X_2 + B_3X_3 \dots B_tX_t$$

$Y$  = probability of participating in the *one-into-five labor-team* by the household (i.e. belonging to category 1)

$$\frac{Y}{1-Y} = odds$$

$A$  = the constant (intercept)

$t$  = number of explanatory factors

$B_1B_t$  = are the slope parameters (regression coefficients)

Accordingly, the above binary logistic regression model was employed in this paper to compute the factors expected to influence the acceptable participation in the One-into-five labor-sharing teams in the study *woreda*. The analysis was done for the whole 135 sample households. In using the regression model, the degrees of explanatory power of the independent variables were first checked using the Chi-square test and T-test. Then, variables that showed significant responses were used further in the regression model. Additional checks of data fitness to the binary logit model were also made using the [Hosmer & Lemeshow \(1989\)](#) goodness-of-fit statistics, Pearson's Chi-square and the classification table releases. Colinearity and multicollinearity between explanatory factors was also checked using correlation matrices and [variance inflation factor \(VIF\)](#). The household survey data were coded and entered into the SPSS (SPSS Version 16) and then run at 95% level of confidence.

Qualitative data collected through FGDs and key informant interviews were concurrently analyzed through qualitative description so as to augment the quantitative results.

Table 1 Definition of explanatory variables

Variables	Hypotheses	Sign
<i>Demographic variables</i>		
SEX	Male headed households are expected to participate voluntarily in One-into-five groups than female-headed households (1 if male, 0 otherwise)	+
AGE (in years)	Aged farmers often participate voluntarily in the One-into-five SWC works, but young farmers participate more sometimes than aged ones.	±
EDUCATION	Acceptable participation in the One-into-five groups increases with educational level of the household heads (1 if literate, 0 otherwise)	+
FAMLYSIZ (number of household members)	Acceptable participation in the One-into-five groups increases with family size of the households, but sometimes households with many family members may decline to voluntarily participate.	±
<i>Biophysical factors</i>		
FARMSIZ (in ha)	An increase in farmland size often encourages farmers' acceptable participation in the One-into-five work groups.	+
WTDIST (in minutes)	An increased walking distance from home to watersheds under SWC discourages farmers' voluntary participation in the One-into-five labor-sharing groups.	-
SLOP	Slope category of lands where the current conservation works are carried on (1 if steep, 0 otherwise)	+
<i>Socio-economic factors</i>		
OFFACTV	Involvement in off-farm activities may enhance or limit farmers' acceptable participation in the One-into-five groups (1 if voluntarily involved, 0 otherwise).	±
LIVSTOK (in TLU*)	Livestock holding of the household may increase or decrease acceptable participation in the One-into-five groups	±
<i>Institutional factors</i>		
CONTDATA	Increased contact with DAs encourages farmers to voluntarily participate in the One-into-five labor-groups (1 if contact with DAs, 0 otherwise)	+
TRAIING	Farmers' access to training on SWC practices motivate their acceptable participation in the One-into-five labor-groups (1 if trained, 0 otherwise)	+
INDLBSHNG	Involvement in indigenous labor- groups may increase or decrease farmers' acceptable participation in the One-into-five groups (1 if involved, 0 otherwise)	±

\*TLU: Tropical Livestock Unit

The dependent variable used in this study is farmers' acceptable participation in the One-into-five labor-sharing groups on watershed based SWC works. It has a dichotomous character representing the observed status of the household in the choice of participation decisions in the labor-sharing group. For that, one (1) stands for voluntarily (acceptable)

participation in the labor-sharing team & zero (0) for the forced (non-acceptable) participation. Explanatory variables expected to influence farmers' acceptable participate in the labor team are presented in Table 1. They are chosen for the study based on literature cited elsewhere above including some others (e.g. Bewket, 2003, 2007; Ertiro, 2006; Amsalu & de Graaff, 2007; Assefa, 2009; Gebre & Weldemariam, 2013; Mazengia & Mowo, 2013). The explanatory variables identified were then classified into four groups of factors: demographic, bio-physical, socio-economic and institutional like what was happened in Belay & Bewket (2103).

## RESULTS AND DISCUSSION

### Types of Labor-sharing Associations

Three community labor-sharing associations (*Debo*, *Wonfel* & One-into-five) were found to be practiced by farmers in the study areas (Table 2). *Wonfel* and *Debo* are indigenous whereas One-into-five is introduced by the current government during the last ten years and it is new to the area. All interviewed farmers reported that they participate either in one or more of the farmer groupings to perform various farm activities. Over 33% of the respondents replied that they participate in both *Wonfel* & One-into-five groupings. Some 27% acknowledged that they participate in all of the groupings to carry out a wide range of agricultural activities including watershed based SWC works. Other 20% interviewed farmers indicated that they participate only in One-to-five groupings & 8.9% showed that they participate in *Wonfel* only. A small number of respondents (2.2%) replied that they participate in *Debo* labor only. Farmers involved in both *Wonfel* & *Debo* account for 3.7%, while 4.4% participated in *Debo* & One-into-five groups.

The result obtained from FGDs is similar with what is reported in the questionnaire survey. FGDs confirmed that all farmers participate in one or more work-sharing groups. However, the FGDs note that the performances of community work-sharing groupings are limited to some agricultural and resource management activities. They believe that *Wonfel* & *Debo* are well established, more preferred and widely operating in different agricultural activities such as in ploughing, weeding, harvesting and threshing. As to FGDs, One-into-five farmer groupings are newly introduced to the area by the existing government not only to develop watersheds, but also, to accomplish several political and administrative tasks.

*Wonfel* & *Debo* are local labor teams temporarily and informally organized by members of the community living in the nearby villages to perform; mainly seasonally emerging agricultural activities so as to complete the work done on time. As confirmed from FGDs, the labor-team often contains a minimum of two farmers and the number can vary from two to even greater than ten depending to the work requirement and availability of farmers ready to participate. Membership is willful and can be dispersed any time when the member farmers feeling discomfort to continue.

*Wonfel* (Table 2) organized when large labor is required by any client farmer in the community to perform **an urgent** agricultural work through asking the cooperation of farmers living in the surroundings. As observed in the study, this labor can be returned based on the need, and if, there are only serious **scarcities for labor** on the part of the client farmer who contributed the labor first. The labor contribution in this scheme may sometimes be free, particularly when required to support people who have labor constraints in the community.

Table 2 Community labor groups operating in the study areas

Community labor-sharing groups	Frequency	Percent
<i>Wonfel</i> only	12	8.9
<i>Debbo</i> only	3	2.2
One-into-five only	27	20.0
<i>Wonfel &amp; Debbo</i>	5	3.7
<i>Wonfel &amp; One-into-five</i>	45	33.3
<i>Debbo &amp; One-into-five</i>	6	4.4
In all groups	37	27.4
Total	135	100.0

*Debbo* is another community labor network (Table 2) primarily arranged on the basis of sharing equal labor when required. So, it is mandatory to provide equivalent labor at the time of need for the client farmer and considered as a debt. According to the Ministry of Agriculture and Rural Development of Ethiopia (MoARD, 2010), *Debbo* is the main type of social-labor network that explains the mutual voluntary labor assistance among client farmers in a community. A land user who seeks *Debbo* assistance prepares local food and drink (*Tella or Areky*) to the client farmers assisting him with their labor in the arranged date. Anyone interested in the community participates in this venture from the view point of getting similar assistance on his turn.

Participants in both *Wonfel & Debbo* are people living in the neighborhood such as neighbours, relatives and friends. As mentioned earlier, they are established and led by farmers themselves with no intervention from government and other outside agents. They are temporary (short-lived), willful, flexible, and informal with no formal leaders and can be soon dispersed at the completion of the work. The number of members in the labor team is not constant and they have no formal leaders, as learned from the FGDs.

Contrary to what is mentioned above, the One-into-five labor is a formally established and introduced to the local community by the top government in order to get various tasks done; including political and security matters. They are the lowest levels of farmer labor organizations introduced by the government and consist of a total of six members with an influential ‘model farmer’ appointed to lead his fellow farmers in the implementation of SWC development activities (MWoAE, 2014) and also other government missions. These arrangements are quite different from the sustainable indigenous labor-sharing groups because they are top-down imposed government

approaches and are totally new experience to the local community. The DAs, Farmers' Development Committees (FDCs) and RKA officials organize all farmers in their villages to form One-into-five farmer arrangements and set rules and regulations to manage the farmers in the labor-groups (MWoAE, 2014) unlike to the indigenous labor groups governed by non-regulated customary laws. This labor organization is formal, long-term and has a formal leader assigned by the local government. Hence, it is not flexible like the indigenous labor teams that can disperse and reorganize when needed. Actually, it is announced and disseminated by the top-government to be established in all parts of the country and in all of the community groups and activities. As can be learned from the government media, it is named: *Yelewut Serawit* or "change army".

In *Debo* and One-into-five labor, each member of the group has equal opportunity for getting shared-labor to perform the watershed based SWC development works. But recently, the farmers are forced to give more emphasis to the One-into-five groups, and hence, the indigenous associations are getting less recognition. Since the One-into-five teams are carried out on scheduled time frames, they are more formal, less flexible and function past the traditions of the local community. They are created by government orders and are alien to the local community. Each One-into-five group comprises a fixed number of members (i.e. six members) of which one is assigned to lead the group, and hence, flexibility is missing. This is against the habit of the people and causes dissatisfaction among the participants. *The labor organization has*, therefore, lost acceptance from the users as learned during the FGDs.

#### **Farmers' *Acceptable Participation* in the One-into-Five Groups**

SWC development work has been a central agenda in the past few decades in many parts of Ethiopia with the objective of restoring degraded environments and to stop more degradation of the watersheds. In recognition of this, the successive governments of Ethiopia organized various community labor campaigns at different times to establish SWC structures on the degraded watersheds. The present government of the country has also launched the new One-into-five farmers' development grouping network as an approach to implement SWC measures on watershed based catchments rather than on individual plot level actions. But, in actual circumstances, the One-into-five groups function not only at the watershed development components, but also, in the villages, local self-help community institutions and ritual ceremonies. The groupings do not disperse after the work done; rather continue as formal micro-community institutions as checked in the field work.

Table 3 Participation in the One-into-five farmer groupings

Type of participation	Frequency	Percent
Voluntary (acceptable)	24	17.8
Forced (non-acceptable)	111	82.2
Total	135	100.0

As to Bewket (2003), voluntary participation of the farmers is one of the most critical elements for the success of SWC interventions. However, the survey in the study *woreda* indicated that only 17.8% of the total farmers were participating willingly in the One-to-five farmers' arrangements that were designed to carry out watershed based SWC development works by the local governments. Conversely, 82% of the farmers were participating in the One-into-five conservation works against their will (Table 3). This implies that the top-down sponsored labor arrangement in the study area has no acceptance by the community. As learnt from the FGDs, One-into-five farmer groups that initially formed to carry out SWC development projects become mere political organizations than being community development groups. Some farmers indicated that they were reluctant to participate in the One-into-five farmers' groups because some political activities are intermingled within the groups. Key informant interviews and FGDs noted that One-into-five human groupings prevail not only in the SWC and agricultural development works. They also operate in the civil service, in the National Army, in the teaching and learning processes at the schools and Universities and even in the manufacturing and business enterprises. As observed during the field work, most people perceive it as a political weapon imposed by the ruling party to handle and run all government activities and to control political affiliations of the people emanated from its desire to stay in power for long. So, most FGDs conclude that One-into-five groups focus on performing political missions than solving community problems.

As observed during the field survey, the task of facilitation and implementation of the watershed based conservation technologies are given to the DAs. The DAs assisted by FDCs and RKA leaders organize the One-into-five rural labor teams through order and often without the will of the farmers and intervene in resolving problems related to absenteeism during conservation working days. Each household (the head or any adult family member) is expected to come for the conservation work on the specified date and time. The conservation works in the study areas underway every week during the dry season of each year usually between January and March when the farmers become less busy in their farm activities. As checked in the field, the technologies that were under implementation included the soil and stone bunds and *fanya juu* terraces, cut-off-drains, water-ways, check-dams and trenches. But, most of the watershed based SWC development works were carried out using forced (unacceptable) One-into-five farmer labor campaigns. Nevertheless, conservation structures implemented through such forced labor campaigns appear not sustainable as is learned from past literature (e.g. see Shiferaw & Holden, 1998; Bewket, 2003). According to these authors, the conservation structures which were erected through the use of forced labor campaigns in the 1970s and 1980s were ended fiasco in most of the drought affected areas of Ethiopia. This had

happened because the structures were built out of the will of the local people, and hence, the farmers themselves destroyed the structures soon after the fall of the then government.

Table 4 Measures taken during failure of participation in SWC works

Measures taken for each day of absenteeism	Frequency	Percent
Paying money set by FDCs	57	42.2
Doing the work on other working days	50	37.0
Exclusion from getting social services	11	8.1
Taken to prison	4	3.0
Nothing happen	13	9.6
Total	135	100.0

Farmers were asked to respond what would occur if they fail to participate in the labor-sharing groups during implementation of watershed based conservation works. This can indirectly measure whether they are voluntarily participating in the One-into-five farmer arrangements in SWC works. Accordingly, the majority of the surveyed households (42.2%) replied that they would be punished to pay Ethiopian Birr (ETB) 50.00 for each day of absenteeism (one US\$≈ 20 ETB during the time of the survey) which was set by the FDCs and the local farmers as compensation for the lost labor; and 37% of them reported that they would be obliged to do the work on other working days. Other 8.1% of the respondents reported that they would be deprived from social services (e.g. during fertilizer distribution) and only 3% of them perceived that they would be taken to prison. For the rest 9.6% respondents, nothing would happen to them (Table 4). As learnt from FGDs, if a household failed to appear in the One-into-five labor-group during watershed based development campaigns for non-valid reasons, he/she would be fined ETB 50.00 for each day of absenteeism. But, if one could present a valid reason for the absenteeism, he/she could be simply made to do the work on another day. Exclusion from getting some social services such as fertilizer distribution was reported by 8% of the households. This has support from other past similar studies. For instance, Belay & Bewket (2013) indicated that DAs focus on ‘model farmers’ through the One-into-five farmer groups during fertilizer distribution in northwest Ethiopia.

### Phases of Participation through the One-into-five Labor during Watershed Development

Farmers’ real participation in the SWC development activities began with soil erosion problem identification and evaluation of the already installed SWC structures. However, farmers’ participation in all SWC development phases showed great variation in the study areas. As shown in Table 5, out of the total interviewed farmers, half of them (50%) reported have no any participation in identification of micro-watersheds affected by soil erosion. About 27% of them indicated that they used to participate rarely. Only 23% of the interviewed farmers reported that they participate fully during the problem identification phase of watershed development projects. More than 78% of the farmers reported that they have no involvement in the planning and designing phases of SWC development works

at the watersheds. In the implementation of watershed based SWC development work plans, the majority of the respondents (85.2%) reported that they participate regularly and 9.6% of them remarked that they used to participate rarely. Others ( $\approx 5.2\%$ ) reported that they have no participation in the One-into-five labor-sharing groups in implementation of watershed based SWC structures. On the other hand, 52.6% farmers reported that they have no participation in monitoring and evaluation of the already installed SWC structures. Other 25.2% respondents indicated that they participate regularly and the rest (22.2%) showed that they have no any involvement in the evaluation stages.

Table 5: Phases of participation through the One-into-five groups

Phases of participation	Responses				
	Frequency	Regularly	Rarely	Never	Total
Identification of soil erosion	Count	31	37	67	135
	%	23	27.4	49.6	100
Planning & designing SWC	Count	11	18	106	135
	%	8.1	13.3	78.5	100
Building SWC structures	Count	115	13	7	135
	%	85.2	9.6	5.2	100
Monitoring & evaluation	Count	34	30	71	135
	%	25.2	22.2	52.6	100

The finding of this study indicates that farmers' participation in watershed based SWC development works through the One-into-five development groups was limited to **only implementation** of the structures that were designed by the DAs and RKA officers. The result is in line with Bewket (2001) in a study conducted at Chemoga watershed. The report noted that SWC practices did not respect participatory principles, and were non-sustainable conventional top-down types. Therefore, farmers' real participation in the One-into-five farmer arrangements beginning with problem identification to monitoring and evaluation is an important precondition for sustainable use of SWC structures. But, the finding here indicates that the majority of the farmers participate only during implementation of the watershed development structures through the One-into-five labor but not during the problem identification, planning, monitoring and evaluation phases (see Table 5). This is the sign of unsustainable labor organization and watershed development approach.

### Factors Influencing Farmers' Participation in the One-into-Five Labor-sharing Groups

***Demographic factors:*** Sex, age, education and family size were the demographic factors assessed affecting farmers' participation in the One-into-five labor-sharing **groups**. **Accordingly**, of the total 24 households, who voluntarily participated in the One-into-five groups during watershed based SWC development works, 87.5% were male-headed and 12.5% female-headed. On the other hand out of 111 households who participated against

their will in the One-into-five labor group, 88.7% were male-headed and the rest 11.3% female-headed (Table 6). This indicates that the proportion of male-headed households was very high (>87%) in both the forced and voluntary participants of the One-into-five farmer groups. The result of the Chi-square test showed that there is no statistically systematic relationship ( $\chi^2 = 0.012$ ,  $p > 0.05$ ) among male and female-headed households regarding participation in the One-into-five groups.

The minimum and maximum ages of household heads were 23 and 73, respectively and the average age was 43 years with a standard deviation of 10.12. The independent-sample T-test result showed that the mean age of voluntary participants was higher ( $\approx 47$  years) and lower for forced participants ( $\approx 42$  years) indicating a statistical difference ( $p < 0.05$ ) between the two groups. This indicates that there is a significant mean age difference between voluntary and forced participants in the One-into-five groups during watershed development based SWC implementation (Table 7).

In this study, education level of household heads was divided into two groups as shown in Table 6. Out of the total sample household heads, about 79% of voluntary and 47% of forced participants were unable to read and write (have never been at school) which was similar with what reported in [Gebre & Weldemariam \(2013\)](#). This indicates that the agricultural sector of the study area is still dominated by illiterate farmers. About 21% of voluntary and 53% of forced participants in the One-into-five groups were able to read and write. The result of the Chi-square test also showed a statistically significant association between literacy status and participation in the One-into-five labor-sharing groups during SWC development campaigns ( $\chi^2 = 7.827$ ,  $p < 0.05$ ).

The minimum and maximum family sizes of surveyed households were two and nine, respectively. The average family size was 5.04, which is almost nearer to 5.6 reported in [Belay & Bewket \(2013\)](#) in northwest Ethiopia. The T-test result showed that the mean family size of voluntary participants was higher (5.88 members) and lower for forced participants (4.90 members) indicating a statistical difference ( $p < 0.05$ ) between the two groups (Table 7).

**Table 6** Chi-square comparison between voluntary and forced participants of the One-into-five groups

Categorical variables	Categories	Type of participation		$\chi^2$ Value
		Voluntary % (n=24)	Forced % (n=111)	
Sex of household head	Male	87.5	88.3	$\chi^2 = 0.01$
	Female	12.5	11.7	P = 0.914
Education level of heads	Illiterate	79.2	46.8	$\chi^2 = 7.83$
	Literate	20.8	53.2	P = 0.005
Land slope where SWC is adopted	Gentle ( $\leq 15\%$ )	50	78.4	$\chi^2 = 8.13$
	Steep ( $> 15\%$ )	50	21.6	P = 0.004
Participation in off-farm activities	Yes	8.3	51.4	$\chi^2 = 14.84$
	No	91.7	48.6	P = 0.000
Contact with DAs	Yes	91.7	66.7	$\chi^2 = 6.00$
	No	8.3	33.3	P = 0.014
Training access	Yes	70.8	22.5	$\chi^2 = 21.49$
	No	29.2	77.5	P = 0.000
Involvement in <i>Wonfel &amp; Debbo</i>	Yes	62.5	89.2	$\chi^2 = 10.70$
	No	37.5	10.8	P = 0.001

**Biophysical factors:** three variables, farmland size, watershed distance from home and land-slope were main biophysical factors evaluated here. As indicated in Table 7, the minimum and maximum land holdings of surveyed households were 0.25 & 3 ha, respectively (excluding lands contracted from others). The mean holding size is 1.28 ha which is smaller than 1.7 ha reported for Beressa watershed by Amsalu & de Graaff (2007) but nearer to 1.42 ha recently reported for northwestern Ethiopia in Belay & Bewket (2013). The T-test result (Table 7) showed that the mean farm size holding of voluntary and forced participants was different 1.68 and 1.24 ha, respectively ( $P < 0.05$ ).

Farmers' participation in the One-into-five groupings on the SWC development works was examined by travel distance of the watersheds (in minutes) where conservation activities were carried on from their residences. As indicated in Table 7, the minimum and maximum travel distances of watersheds from home were five and 35 minutes, respectively. The average travel distance of watersheds was 21.7 (in walking minutes) with standard deviation of 6.92. The T-test result showed that the mean watershed distance from home was almost similar for voluntary & forced participants (an average of 22 minutes for both,  $P > 0.05$ ) indicating a non-statistical mean difference between the two groups.

The response of farmers showed difference among voluntary and forced participants in the new One-into-five farmer arrangements with regard to the perceived slope of land where watershed based SWC structures were installed. As shown in Table 6, the proportion of farmers that implemented SWC on steep lands was higher (50%) for voluntary participants than the forced ones (21.6%). However, the proportion of farmers who implemented SWC on gently sloping lands was higher (78.4%) for forced participants compared to voluntary ones (50%). Chi-square test result showed a statistically significant association between voluntary and forced participants across the conserved land slope ( $\chi^2= 8.127$ ,  $p < 0.05$ ).

Table 7 T-test comparison between voluntary & forced participants of the One-into-five groups

Continuous variables	Voluntary		Forced		T-test results	
	Mean	SD	Mean	SD		
	Voluntary	Forced	Mean	SD	t	P-value
Age (years)	47.4	9.5	41.9	9.8	2.52	0.01
Family size (number)	5.9	1.2	4.9	1.8	2.55	0.01
Livestock holding (TLU)	4.8	1.7	5.6	1.7	-2.00	0.05
Farmland size owned ( ha)	1.7	0.6	1.2	0.7	2.97	0.00
Walking distance to watershed (in minutes)	21.7	6.7	21.7	7.0	0.03	0.98

**Socioeconomic factors:** The socioeconomic factors studied here include off-farm work and livestock ownership in TLU. One of the major interests of the survey was to investigate if there was relationship between farmer participation in the One-into-five groups and off-farm activities. Out of the total forced participants, the majority (51.4%) were involved in various forms of off-farm activities like petty trading, weaving, livestock fattening, preparing and selling local alcoholic drinks (*Areki & Tella*), daily labor and collecting and selling of firewood. The remaining (48.6%) of the forced participants were not involved in any of those off-farm activities. Conversely, the majority of voluntary participants (91.7%) were not involved in any of the off-farm activities (Table 6). The result of the Chi-square test showed statistically significant relationship between voluntary & forced participation in off-farm activities ( $\chi^2 = 14.285$ ,  $p < 0.001$ ). The result is in line with Assefa (2009) in a study at Koga watershed, northwest Ethiopia.

Livestock are major assets of households in the study *woreda* and play important role in crop production. Survey results show that average holding of livestock in the study areas is 5.42 TLU. This is much larger than the mean TLU (3.66) reported in Belay & Bewket (2013) in northwest Ethiopia. Mean TLU for voluntary and forced participants are calculated 4.8 and 5.6, respectively. T-test comparisons indicate that there is statistical livestock holding difference between voluntary and forced participants ( $p < 0.05$ ) of the One-into-five groups (Table 7).

**Institutional factors:** Contact with DAs, access to training and participation in indigenous labor-sharing groups are also important variables discussed in this paper. Most of the respondents in the study areas had contact with DAs. As shown in Table 6, the majority of the farmers who had no contact with DAs were participating against their will in the One-into-five farmer groups for watershed based SWC development works. Among farmers that were participating willingly, over 91% had frequent contact with extension agents. The proportion of farmers who had no contact with extension agents was higher (33.3%) for forced participants than the voluntary ones (8.3%). Chi-square test results ( $\chi^2 = 6.004$ ,  $p < 0.05$ ) showed statistically significant association between farmer participation in the One-into-five groups and the perceived contact with DAs. This finding is in line with a study by Ertiro (2006), in Anna watershed, Hadiya Zone, Ethiopia.

In the study areas, the *woreda* office of agricultural extension (MWOAE, 2014) has made efforts to motivate farmers through providing training related to SWC development practices and the benefit that could be earned from them. As can be seen in Table 6, the proportion of farmers who received training about soil erosion and structural SWC practices was higher (70.8%) for voluntary and lower for forced (22.5%) participants of the One-into-five farmer groups. Conversely, the proportion of farmers who had no training access was higher (77.5%) for forced participants than the voluntary ones (29.2%). Chi-square analysis indicated that there is statistically significant difference ( $\chi^2 = 21.489$ ,  $p < 0.05$ ; Table 6) in receiving training between voluntary and forced participant of the One-into-five farmer groupings in the watershed based SWC development campaigns.

Comparisons were made to see the relationship between the One-into-five and indigenous labor participation. The result indicated that the proportion of respondents who had *Wonfel* or *Debbo* party was higher (89.2%) for forced participants compared to voluntary ones (62.5%). On the other hand, out of the total respondents who were not involved in the indigenous labor groups, the percentage share of voluntary participants in the One-into-five farmer groupings was higher (37.5%) than that of the forced participants (10.8%). The Chi-square test (Table 6) also revealed that there is statistically significant relationship between the two groups ( $\chi^2 = 10.701$ ,  $p < 0.05$ ). In addition, during FGDs, farmers revealed that their participation in the indigenous labor parties was good enough to ease labor shortages and carry out various farm activities. This indicates that the majority of farmers were not happy to participate in the new One-into-five farmer groupings. Their reason was the One-into-five farmer groupings turned into political organizations in which the existing government executes some political activities at the back of the development projects. Contrary to the politically promoted One-into-five farmer organization, the indigenous labor-teams are organized by the farmers themselves based on will and with no push from external pressure. They are often made-up of close relatives, neighborhood farmers, close acquaintances and friends and perhaps perform better and are effective and sustainable.

### **Major Determinants of Farmer Participation in One-into-Five Groups**

Tables 6 & 7 above presented comparisons and descriptive statistics about voluntary and forced participation in the One-into-five farmer groupings for watershed based SWC development works. There appears to be significant

differences between voluntary and forced participants in respect of the following: age and education level of the household heads, family size, livestock asset, slope of the land treated, farmland size owned by the household, participation in off-farm activities, training access, contact with DAs and participation in indigenous labor-sharing groups, and hence, used in the regression analysis (Table 8). Sex of the household heads and the watershed distance from home showed non-significant statistical responses in the Chi-square and T-tests, and hence, denied further inclusion in the regression analysis like what was done in Belay & Bewket (2013).

The logit regression analyses was run using the above mentioned ten predictor variables for 135 householders to predict the farmers' perceived acceptable participation in the One-into-five labor groups (Table 8). The assessment of the packed model for the predictors distinguished as voluntary (acceptable participation) and forced (non-acceptable participation) in the One-into-five farmer groups ( $\chi^2 = 56.845$ ,  $df = 10$ ,  $p < 0.001$ ) was found statistically significant. The Nagelkerke  $R^2$  from the model summary ( $R^2 = 0.565$ ) indicate a moderate association between the prediction & the grouping variables. In a perfect model, the overall correct prediction can be 100%. In this study, the overall success of the prediction was 89.6% (62.5% correctly classified for voluntary and 95.5% for forced participants) indicating a statistically significant fitting model. Our Hosmer-Lemeshow goodness-of-fit statistic also indicated a significance of  $P=0.97$ , which is a statistically non-significant value implying a good fitting model to our data.

Table 8 Model Summary of the Binary Logistic Regression

Explanatory variables	B	S.E.	Wald	Sig.	Exp(B)
AGE	-.051	.048	1.105	.293	0.950
EDUCATION	.955	.771	1.534	.215	2.599
FAMLYSIZ	.040	.274	.021	.884	1.041
FARMSIZ	1.145	.685	2.799	.094*	3.143
SLOP	1.213	.681	3.171	.075*	3.365
OFFARM	2.492	.953	6.839	.009***	12.083
LIVSTOCK	-.551	.213	6.707	.010**	0.576
INDLBSHNG	2.017	.765	6.956	.008***	7.513
CONTDA	-.787	.964	.666	.414	0.455
TRAINING	-2.199	.754	8.517	.004***	0.111
Constant	-.497	1.982	.063	.802.	0.608
Model- $\chi^2$		56.85		0.000	
-2 Log likelihood		69.51			
Overall prediction		89.6			
Forced		95.5			
Voluntary		62.5			
Hosmer-Lemeshow statistic				0.98	
Nagelkerke R <sup>2</sup>		0.57			

The results of the binary logistic regression for the ten factors influencing farmers' participation in the One-into-five farmer groupings in the watershed based SWC development works are presented in Table 8. A positive coefficient in the binary logistic regression model implies increased probability of farmers' willful involvement in the watershed based SWC development activities through the One-into-five farmer groupings. Conversely, negative coefficient in the model implies decreased probability of farmers' willful involvement in the One-into-five farmer groupings. The directions of influence of almost eight of the variables entered in the model were fitting our priory expectations. But, the direction of influence of two predictors (training access and contact with DAs) that were hypothesized to encourage farmers' participation in the One-into-five labor-sharing groups was found negative. Out of the total 10 variables that were hypothesized to influence farmers' participation in the One-into-five farmer groupings and included in the binary logistic regression model, only four (TLU, off-farm activities, involvement in indigenous labor-sharing groups and training access) were found significant at  $P \leq 0.05$  level. Other two variables (farmland size and land-slope) were also found to contribute a moderate significant influence on the criterion variable (at  $P \leq 0.1$  level). The rest four variables (household heads age and literacy status, family size and contact with DAs) were found non-significant even at  $P \leq 0.1$  level.

**Livestock:** Livestock was hypothesized to have a dual influence on farmers' decisions to participate in the One-into-five labor-sharing groups. The result was found to be significant ( $P=0.01$ ) but negative (Table 8). Its negative coefficient implies that an increase in livestock would decrease the probability of farmers' willful participation in the One-into-five farmer groupings during SWC development works by a factor of 0.576. Households with large livestock heads would focus on their herds instead of involving in SWC development works and this might have hindered their participation in the mentioned labor-sharing groups. Similar negative influences were reported in the studies of Amsalu & de Graaff (2007) and Anley, Bogale & Hial-Gabriel (2007) in central and western Ethiopia, respectively. The result has thus support from previous studies.

**Off-farm activities:** Farmers' involvement in the off-farm activities was hypothesized to influence their participation in the One-into-five farmer groupings during watershed based SWC development campaigns in either direction. The direction of influence of this variable was then found positive and significant (Table 8). The positive coefficient of this factor indicates that farmers' willful participation in the One-into-five groupings increases by a factor of 12.1 with a unit increase of their involvement in off-farm activities. This has support from the study of Kahsay (2011) that reported environmental friendly income generating activities viewed as incentives to positively influence households' participation on land management in northern Ethiopia. Contrary to this, involvement in the off-farm work appeared to decrease farmers' decisions to involve in the SWC in central and western Ethiopia (Amsalu & de Graaff, 2007; Anley *et al.*, 2007). These studies noted that farmers involved in the off-farm works never get time to apply SWC structures.

**Participation in indigenous labor-sharing groups:** Involvement in indigenous labor-sharing groups is the second strongest variable with a Wald value of 6.956 that influences farmers' participation in the One-into-five groupings during implementing watershed based SWC development works. The direction of influence of households' involvement in indigenous labor-sharing groups was found to be positive. This indicates that farmers who involved in the indigenous labor-sharing groups were more likely to participate willingly in the One-into-five farmer groupings during SWC works at a factor of 7.513 (Table 8). This is probably due to the fact that farmers who benefited from indigenous labor-sharing associations may be encouraged to participate in the new One-into-five farmer groupings expecting better achievements from the new labor organization. Belay & Bewket (2013) indicated that 80% of the households in three RKAs in northwest Ethiopia were involved in *Wonfel & Debo* to access labor support from community groups.

**Training access:** Training was anticipated to significantly increase farmers' participation in the One-into-five labor-sharing groups expecting that they could be motivated by agricultural experts and political cadres during the training. Accordingly, the binary logistic regression result (Table 8) showed an odds ratio of 0.111 for farmers' training access and a Wald value of 8.517 which indicates the strength of its influence on farmers' participation decisions in the One-into-five labor-sharing groupings for watershed based SWC development works. Farmers' training access was thus found significantly influencing farmers' participation decisions in the One-into-five labor-sharing groups. But, unexpectedly its direction of influence was found negative. This indicates that farmers who gained training access were more likely to be reluctant to participate in the One-into-five farmer groupings during SWC development works at a factor of 0.111. Perhaps because of those trainings provided for farmers may not inspire and convince them to participate

genuinely in the community labor-sharing groups for watershed based SWC development works. In the FGDs and key informant interviews participants reflected their deeper suspicions on the real objectives of the One-into-five groupings. Most believe that its indirect political mission is stronger than its achievements in the SWC development works. Hence, most consider it as a hidden political mission. Due to this, farmers who frequently receive training and regularly meeting with DAs might have clearly felt the indirect mission of the One-into-five organization and would have decided not to voluntarily involve in the action. For instance, Belay & Bewket (2013) noted that DAs frequently use the One-into-five farmer organizations to distribute agricultural inputs.

***Farmland size:*** The size of the farmland held by the households was found to be moderately and significantly influencing farmer participation in the One-into-five farmer groupings at 10% level (Table 8). The Wald value of 2.799 indicates the strength of this predictor to influence farmers' participation in the One-into-five groupings for watershed based SWC development works. Its positive coefficient implies that an increase in the land holding size would increase the probability of farmers' willful participation in the One-into-five groupings during SWC development works by a factor of 3.143. This is in agreement with Amsalu & de Graaff (2007) and Anley et al. (2007). In their study they noted that, farmers who held large farmlands were found to be more likely to invest in SWC development works.

***Slope of land:*** The slope of land under conservation was also found to be significant at 10% level (Table 8). Its direction of influence was found positive and matches our prior expectation. This means, an increase in slope of the land to be conserved would also increase the probability of farmers' willful participation in the One-into-five farmer groupings by a factor of 3.365. The slope of land appeared significantly and positively influencing farmer participation in the development of SWC in western Ethiopia (Anley et al. 2007). Amsalu & de Graaff (2007) also reported that farmers' conservation decisions were decreasing with gently sloping lands and significantly increasing with steeply sloping fields.

## CONCLUSIONS

This paper was aimed at identifying the types of labor-sharing associations and the farmers' acceptable participation in the One-into-five farmer groupings for watershed based SWC development works in Machakel Woreda, Ethiopia. It also tried to evaluate the factors influencing farmers' acceptable participation in the new labor organization. It was based on FGDs, key informant interviews, field observations and a questionnaire survey of 135 households in seven RKAs. The results revealed that only 17.8% of the farmers participated willingly in the One-into-five farmer groupings compared to 82.2% farmers who participated in the labor-groups against their will. The majority of the farmers consider the SWC activities operating in their villages as mandatory development works running through the One-into-five farmer labors. Most farmers perceive the One-into-five groupings as political weapons of the ruling party.

The most important factors influencing farmers' participation in the One-into-five farmer groupings in the watershed based SWC development works were off-farm activities, involvement in indigenous labor-sharing groups, training access, farmland size, livestock asset and slope of land. Participation in Wonfel & Debbo, off-farm business, farmland size and perceived land-slope significantly and positively influenced One-into-five labor participation. Conversely, farmers' access

to training and livestock holding showed a statically significant negative influence in the One-into-five labor-sharing participation.

The study also showed that extent of farmers' participation in One-into-five farmer groupings in watershed based SWC development works was mainly focused on implementing the structures that were designed by DAs and RKA officers. Farmers' real participation in all phases of [planning](#), monitoring and evaluating of SWC projects was generally limited; hence, such practices did not respect participatory and sustainable development principles. It is concluded that locally established and sustainable indigenous labor-sharing teams be promoted into firm community institutions instead of focusing on alien and unsustainable organizations that causes doubt in the society.

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