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## Article

# Factors affecting women's participation in soil & water conservation in abeshege district Southern Ethiopia

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## GENERAL & APPLIED ECONOMICS | RESEARCH ARTICLE

# Factors affecting women's participation in soil & water conservation in abeshege district Southern Ethiopia

Tsegamariam Dula Sherka<sup>1\*</sup>

**Abstract:** The primary industry in Ethiopia that makes a significant contribution to economic growth is still agriculture. Despite making a considerable contribution to livelihoods, the sector continues to encounter difficulties since soil degradation and resource depletion have decreased crop and livestock yields. To curb the effects of land degradation, the Ethiopian government has taken serious measures to expand soil and water conservation (SWC) practices across the country. Despite the efforts made, the participation of women in SWC activities has been low. The study was conducted to investigate women's participation in SWC practices in the Abeshege district of southern Ethiopia. A random sampling procedure was used to select 164 participating and 70 non-participating households from a purposively selected sample of six rural kebeles. Data were collected from both primary and secondary sources using interview designs, focus group discussions, semi-structured interviews, and discussions with key informants. The study found that women participate in various SWC practices, including agroforestry, crop rotation, waterways, stone terracing, and contour plowing, among others. The study findings suggest that education, land size, economically active household members, size of household members, and extension contact were found to significantly affect the participation of women in SWC activities. Therefore, recognize and support women's active involvement in SWC through tailored policies, programs, and initiatives that address the identified factors affecting their participation.

**Subjects:** Agricultural Development; Agricultural Economics; Soil Conservation Technology

## ABOUT THE AUTHOR



Tsegamariam Dula Sherka

Tsegamariam Dula is an accomplished academic and researcher, currently serving as a lecturer and researcher at Wolkite University in Ethiopia. He is also pursuing his PhD in development studies at Addis Abeba University, where he is actively engaged in research and scholarship. Through his career, he has held a variety of leadership positions in academia, including serving as postgraduate coordinator, department head, educational quality assurance coordinator, and research and community service coordinator. These roles have allowed him to develop a deep understanding of the research and academic landscape. Tsegamariam Dula is knowledgeable in socioeconomic research analysis tools. Tsegamariam's research interests are wide-ranging, but he has a particular focus on issues related to development studies, food security, agricultural economics, natural resource management, agricultural extension, and climate-smart agriculture.

Tsegamariam Dula has published numerous scholarly articles on these topics and has been recognized for his contribution to the field.

Tsegamariam Dula's academic achievements include a Master's degree in Rural Development from Hawassa University and a Bachelor degree in Rural Development and Agricultural Extension from Haramaya University.

**Keywords:** Women's participation; soil; and water conservation; probit model; Ethiopia

## 1. Introduction

Agriculture remains the leading sector, contributing enormously to economic development in Africa (Belachew et al., 2020; Collier & Dercon, 2014). More importantly, the sector is being hailed as a key driver of economic growth and poverty reduction across the Sub-Saharan Africa (SSA) region. Despite its significant contribution to livelihoods, the sector is facing a decline due to natural resource depletion and soil erosion (Belachew et al., 2020; Kagoya et al., 2017), phenomena caused by climate change, and a lack of modern or productive input, among other ongoing challenges. Just to name a few. As an agrarian nation, Ethiopia's fast-growing economy faces similar challenges due to ongoing soil erosion and land degradation (Asnake et al., 2018; Fontes, 2020). The Ethiopian government first recognized the impact of soil erosion after the 1973–1974 famine (Haregeweyn et al., 2012).

In many parts of sub-Saharan Africa, women are among the primary workers, running about a third of rural households and contributing up to 70% of household food production. On the other hand, men are decision-makers related to fieldwork activities, while women are decision-makers related to household and child care. However, women assist in a range of fieldwork activities through yield-enhancing agricultural technologies such as SWC, which are often labor-intensive. The additional labor needs are sometimes met by involving women workers in agricultural activities, leading to some share of decision-making that serves as an invisible hand to influence conservation decisions. (Bekele & Drake, 2002; Sharma & Kaushik, 2011)

Women make up more than half of the world's population; they do two-thirds of the world's work; they earn a tenth of the world's income; and they own a hundredth of the world's property, including land, according to the United Nations (2013). Women play an important role in agricultural decision-making and the adoption of agricultural technologies (Tiruneh et al., 2011). If a meaningful change in poverty and welfare is to be brought about in society, particular attention should be paid to women and their problems. Aware of this, the government has taken legislative, political, and socio-economic measures at the national, regional, and Woreda levels that are expected to empower women. Women are seen as equal partners in the rural community. Therefore, participatory development efforts should consider them as equal parts of the rural population. Rural women are responsible for over 50% of all productive activities, even in households where adult men are present. Burke (2017). In African households, women are estimated to do over 80% of farm work (Burke, 2017). They are responsible for planting, weeding, watering, harvesting, transporting, and storing crops. In the absence of their husbands, they do land clearing and soil preparation. Women also have full responsibility for housework.

There are several studies documenting the socio-demographic, economic, institutional, and biophysical factors that influence farmers' decisions to participate in SWC (for instance, Daniel & Mulugeta, 2017; Yitayal & Adam, 2014) and the adoption of improved SWC practices among smallholders (for instance, Muluken et al., 2020). However, they missed taking into account women's role in soil and water conservation. Therefore, this research was planned to fill this gap and methodology gap. Bayu (2020) used the ordered probit model by applying a probit model that provides consistent and asymptotically normal estimates of the parameters, even when the underlying data is not normally distributed. Greene (2003). This study is important for choosing relevant conservation methods and interventions to encourage active participation and designing and executing suitable policies and strategies for women (Asnake et al., 2018). Therefore, this study was carried out to find out factors affecting women's participation in SWC activities in the study area.

## 2. Literature review

### 2.1. Theoretical framework

Women's participation in soil and water conservation (SWC) has become a critical issue due to their significant role in agriculture production and natural resource management in many parts of the world. This theoretical framework provides insight into the factors that influence women's participation in SWC, as well as the benefits and challenges associated with their participation.

The gender and development approach highlights the social construction of gender roles and the impact of gender inequality on women's participation in SWC. According to Kabeer (1994), gender relations are shaped by social, economic, and political factors, which in turn affect women's access to resources, decision-making power, and participation opportunities. In the context of SWC, women's lack of access to land, credit, and other resources can limit their ability to participate in conservation activities (Agarwal & Ramaswami, 1992).

The community-based natural resource management (CBNRM) approach emphasizes the importance of involving local communities in natural resource management. Women's participation in SWC can be enhanced through community-based initiatives that promote gender equity and provide opportunities for women's participation in the decision-making process (Cooke & Kothari, 2001). In addition, CBNRM initiatives can promote the use of traditional knowledge and skills, which are often held by women, in SWC activities.

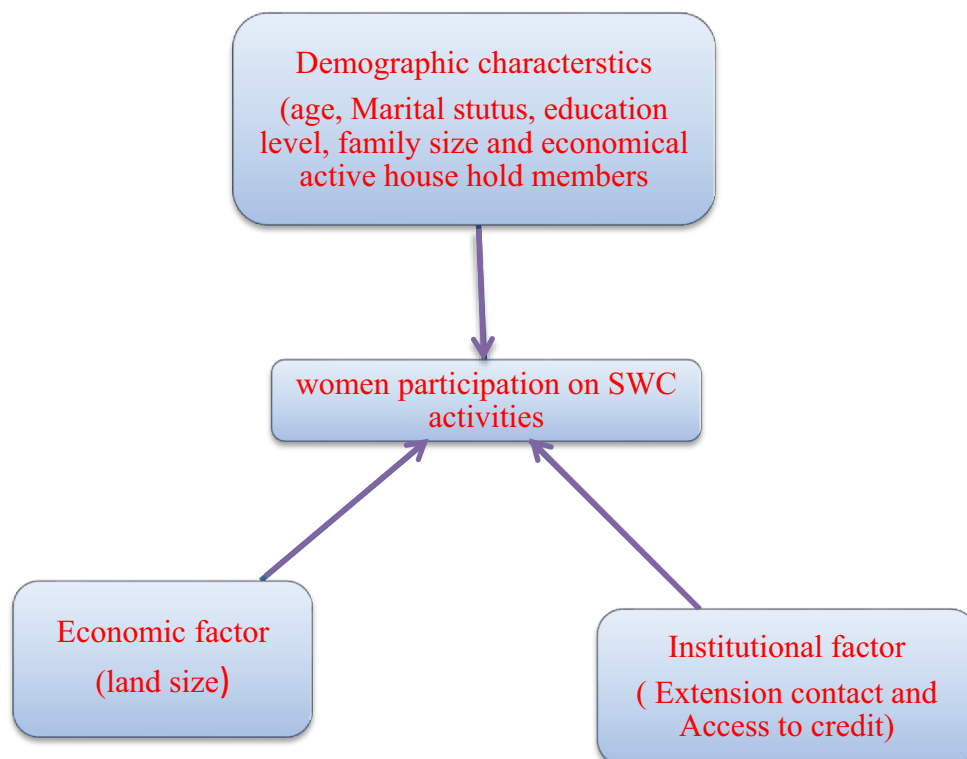
The participatory action research (PAR) approach emphasizes the active involvement of community members in research and decision-making processes. PAR can engage women in SWC activities by promoting their participation in problem identification, planning, and implementation (Chambers, 1994). By involving women in these processes, their knowledge and experiences can be utilized to develop effective strategies that address their specific needs and challenges.

The social capital approach highlights the importance of social networks and relations in promoting community development and resource management. Women's participation in SWC can be enhanced through the development of social capital, which can increase their access to information, resources, and opportunities for participation (Putnam, 1995). Women's involvement in community-based organizations, such as women's groups and self-help groups, can promote the development of social capital and enhance their participation in SWC activities. Women's participation in SWC can result in numerous benefits, including increased food security, improved environmental sustainability, and enhanced livelihoods. Women's involvement in SWC can also promote gender equity and empower women to participate more fully in decision-making processes. Despite the potential benefits, women's participation in SWC can be limited by a range of challenges, including cultural norms, a lack of access to resources, and gender-based discrimination (Quisumbing & McNiven, 2020). In addition, women's multiple roles and responsibilities, including household and childcare responsibilities, can limit their time and availability for participation in SWC activities.

### 3. Conceptual framework

Gender is an important factor that needs to be considered in soil and water conservation (SWC) intervention. In many rural areas, women are the primary caretakers of the household and play a critical role in agricultural production. Therefore, their participation in SWC activities is crucial for the success of these interventions. This conceptual framework aims to explore the factors that influence women's participation in SWC activities. The dependent variable in this framework was women's participation in SWC activities. The independent variables include age, marital status, educational level, family size, land size, economically active household members, distance to farm plots, extension contact, and access to credit (figure 1).

**Figure 1. Conceptual framework.**



## 4. Methods

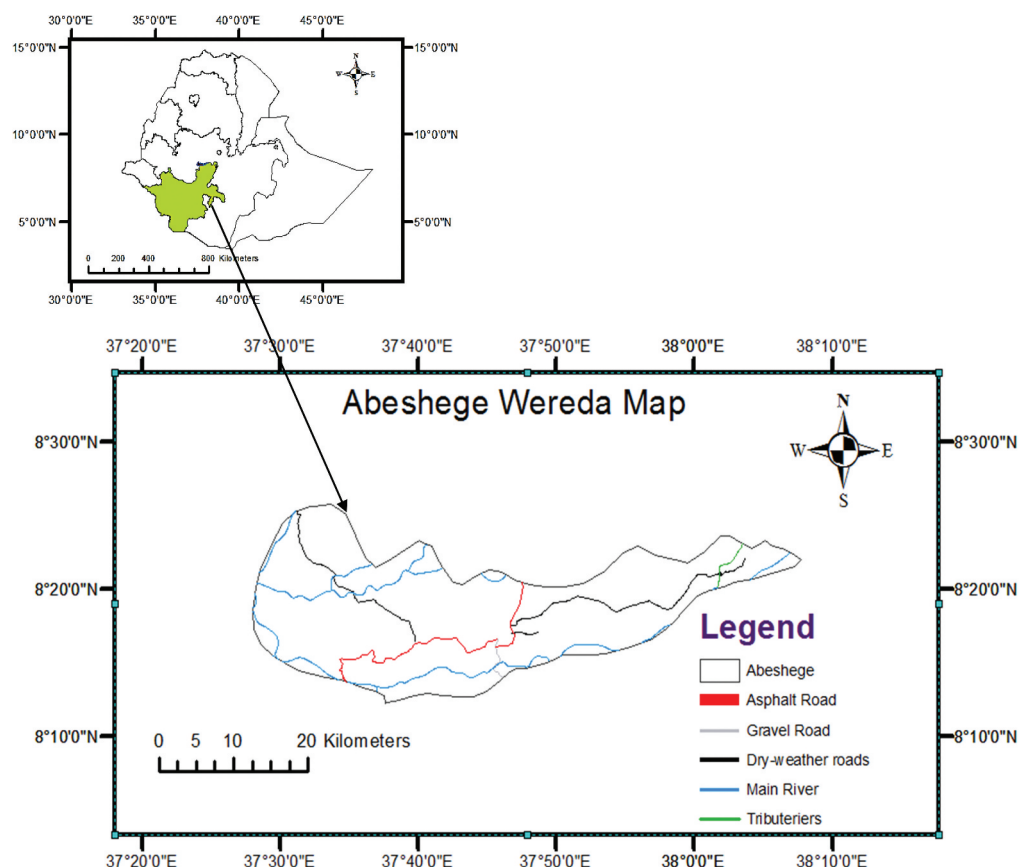
### 4.1. Description of the study area

Abeshege woreda/district, a large unit of administration that is composed of many kebeles (Abeshge contains 26 kebeles), is one of the rural woredas of SNNP located about 155 km south of Addis Abeba along the Adiss Abeba to Jimma asphalt highway and 233 km southwest of Hawassa city (Regional capital of South Nation Nationality and People). The woreda is bounded in the north, south, and west by Oromia regional state and in the east by the Cheha woreda and Kebena woreda. The absolute location of the study area extends from 8° 27'30" N to 37° 45' 50"E (Figure 2).

climate, vegetation, and soil resources; The climate of Abeshsege Woreda ranges from cool to warm. The annual average temperature of the area is 21.25 °C. The annual average rainfall ranges from 801 mm to 1400 mm over the last 10 years. The area receives a bimodal rainfall, with the small rains occurring between March and April, while the main rains mainly occur from July to September. During the main rainy season, all crops grown in the area are grown, including corn, teff, wheat, pepper, haricot beans, sorghum, and millet. Agroecological, The Woreda consists of 75% Kola and 25% Woina Degas with two main seasons namely Belg and Meher, and in some areas e.g. B. Derelafto and Kulito, irrigation is practiced. Wheat, nug, and chickpeas are the main crops grown during the peak season. On the other hand, corn, teff, and sorghum are grown during the slip season. The elevation of the woreda ranges from 1001 to 2000 m above sea level, but most of the woredais at about 1800 m above sea level. Except for some hills, the woreda has arable land in terms of topography. Deforestation and other replanting processes led to significant soil erosion problems, with mudslides occurring in the area (AbeshegeWereda Rural Development office AWARDO, 2021). The dominant soil type of the study area is fine to medium textured sandy loam underlying ancient Precambrian bedrocks on the plains and calcareous soils on the hills.

**Figure 2. Map of the study area.**

Source: Own ARC GIS computing output, 2022



Population; In Abeshege Woreda there are 24 rural kebeles and 2 urban residents' associations with a total of 18,471 heads of households (AbeshegeWoreda Rural Development office AWARD, 2021), of which about 28% are women. Hence it is male-dominated. The Woreda has a total population of about 85,852, of which 33,633 are women in 2009. Young, economically active, and elderly populations accounted for 41.7%, 49.2%, and 9.1%, respectively. The average family size in rural areas was 4.76 people (2011).

### 5. Sampling techniques

Both probabilistic (simply random) and non-probable (purposive) sampling methods were used in this study. Six rural kebele administrations-is a small unit composed maximum of 100 households within one woreda- (namely, Lache, Tatesa, Tachegnaw Geraba, Dire Lafto, Tawela, and Layegnaw Geraba) were selected purposively based on women engagement and high coverage of soil and water conservation practices in Woreda/district-is a large unit of administration that composed many kebeles (in Abeshge contains 26 kebeles). Then, women living for five and more than five consecutive years were identified from the list to which they belong in each rural kebele sample. A study conducted by Anestesian (2017) found that five-year dwellers were significantly more reliable in terms of providing accurate information about the local context than two and one-year dwellers. Finally, 164 participants in SWC and 70 non-participants in SWC were drawn using a systematic random sampling technique based on a probability proportional to the sample size. A total of 234 sample women were then selected for a household survey/scheduled interview (Table 1). The sample size for collecting quantitative and qualitative data for this research was determined by using the Yemane (1977) formula. Yemane sample size determination formula is a useful tool for researchers who need to calculate the sample size for a given population. This formula is preferred over other methods because it is more accurate and takes into various factors, such as population size and variance (Amin et al., 2018). It takes into consideration the minimum



**Table 1. Distribution of sample under the study district**

Sample RKAs	women Total	Participant women		Non-participant women		Total sample
		Total	Sample	Total	Sample	
Dire lafto	101	70	31	32	13	42
Tachegnaw Geraba	72	51	21	21	9	30
Laygnaw Geraba	111	75	32	36	15	46
Tatesa	94	65	27	29	11	39
Lache	85	58	24	26	10	35
Tawela	101	70	29	31	12	42

sample size needed to achieve a given confidence level. The margin of error (e) is specified as the maximum amount by which the sample estimate is allowed to differ from the true population parameter. A smaller margin of error is generally desired as it provides a more precise estimate. For example, a margin of error of 5% should yield a sample estimate that is within plus or minus 5% of the true population proportion with a 95% confidence level. On the other hand, if a margin of 1% is specified, it means that the desired estimate should be within 1 percentage point of the true population proportion with a 99% confidence level. Therefore, The study used the following formula to calculate the sample size;

$$n = \frac{N}{1 + N(e)^2}$$

Where; n =designates the sample size the research uses, N= designates the total number of women in six kebeles, e =designates maximum variability or margin for error of 5 % (0.05); 1=designates the probability of the event occurring.

$$n = \frac{564}{1 + 564(0.05)^2} = 234$$

## 6. Data collection and analysis

Both quantitative and qualitative data were gathered from primary and secondary sources to satisfy the study's aims. Quantitative data were collected via a women's survey, and 234 respondents were given structured interviews. Enumerators familiar with the research region who would conduct the household survey were chosen, and they received training on the objectives, procedures for gathering data, and survey methodology. Before conducting the actual interviews, the household survey questionnaires were pre-tested. Focus Groups Discussions, Key Informant Interviews, casual conversations with farmers, and personal observations were used to gather the qualitative data.

Descriptive statistics such as mean, standard deviation, range, frequency, and percentage were used to describe the socio-demographic situation of the households. In addition, test statistical methods such as the chi-square( $X^2$ ) test were used to compare and test the mean difference between participating and non-participating women on a set of selected characteristics. SPSS version 16 and STATA-12 were the statistical tools used to analyze the quantitative data. The results of the analysis data were categorized, summarized, discussed, and presented in relevant formats (tables and graphs). The qualitative data were partially analyzed during on-site data collection to fill in the gaps in the quantitative data. Any idea that could not be captured by quantitative analysis was analyzed qualitatively based on the ideas from the key interview and



focus group discussion. Additionally, the Probit model was applied to analyze the relationship between selected socio-economic, situational, and personal characteristics of women's participation in SWC practices. Women's participation in SWC practices was assigned a discrete choice variable (yes or no) to indicate whether or not they participated in soil and water conservation practices.

(Ng'ang'a et al., 2020) used the probit model to understand factors influencing farmers' decisions to participate in soil carbon sequestration. Likewise, the binary logit model was used in a study examining the determinants of SWC participation in the Ethiopian highlands (Mekuria et al., 2018). (Asfaw & Neka, 2017) also implemented binary logit to find out the predictors for the introduction of SWC Participation in the Wereulu district of northern Ethiopia. Other empirical works related to the Participation of SWC measures that used binary choice models (i.e. logit/probit) include (Moges & Taye, 2017) in the north-western highlands of Ethiopia; (Nahayo et al., 2016) in northern Rwanda; (Mango et al., 2017) in Malawi and Zambia; (Kimaru-Muchai et al., 2020) in Kenya; (Kagoya et al., 2017) in central Uganda; and (Lasway et al., 2020) in Tanzania. There are also empirical studies using Ordered logit (Teshome et al., 2016) and Ordered Probit (Kpadonou et al., 2017) used to analyze farmer choice/preference for soil and water management in different developing countries.

## 7. Model specification

According to (Oni et al., 2005) the probit model is expressed as  $Y = B_0 + B_i X_i + e_i$ . Where  $Y$  is a dichotomous dependent variable which can be explained as;  $Y = 1$ , if Women participate,  $Y = 0$ , if Women did not participate,  $B_0$  = the intercept, and  $B_i$  = regression coefficients that explain the probability of participation by women farmers,  $X_i$  = Vectors of parameters to be estimated,  $e_i$  = the error term. SWC practices as an occupational technology, the socio-economic and demographic characteristics of Women farmers may influence the extent of their participation in SWC practices Tsegamariam (2017). In this study, participation is regarded as women's participation in one or more SWCs. The independent variables, hypothesized to have a relationship with the dependent variable, were carefully selected based on previous specific studies (Table 2). Before running the probit model, as stated by Gujarati (1995) multicollinearity problem, among continuous variables was assessed using the Variance Inflation factor (VIF). The acceptable value for VIF depends on the context and the specific analysis being conducted. As a rule of thumb, a VIF value of 5 or less is often considered acceptable, while values greater than 10 may indicate a problematic level of multicollinearity. In this study, the maximum value of VIF was 2.5 (family size) and the minimum value was 1.05 (extension contact). Therefore, all variables do have not a multicollinearity problem.

## 8. Results and discussion

### 8.1. Descriptive results

The results of descriptive analyzes of personal and demographic, economic, biophysical, institutional, and behavioral characteristics of the sampled farm households are presented in Table 2. The results showed that 100% of the respondents are Female householders with a very low level of education. However, they have a large family size (an average of 5) and rich farming experience (an average of 26.5 years). It is generally accepted that family size and composition affect the amount of labor available for agricultural, non-farm, and domestic activities. Similarly, more experienced farmers are better at identifying soil erosion problems than less experienced farmers. Looking at economic variables, the data showed that only (an average of 3 of the sample households' members are economically active. The number of economically active household members living and working for the household also determines the labor available in the household, which in turn can determine the type of SWC measures employed by women farm households. The majority of respondents (about 96%) own livestock (TLU).

As for the biophysical properties, it is undeniable that SWC measures require some land that would have been used for growing (cultivating) crops or allocated for other purposes. Therefore, it

**Table 2. Independent variables and descriptive statistics**

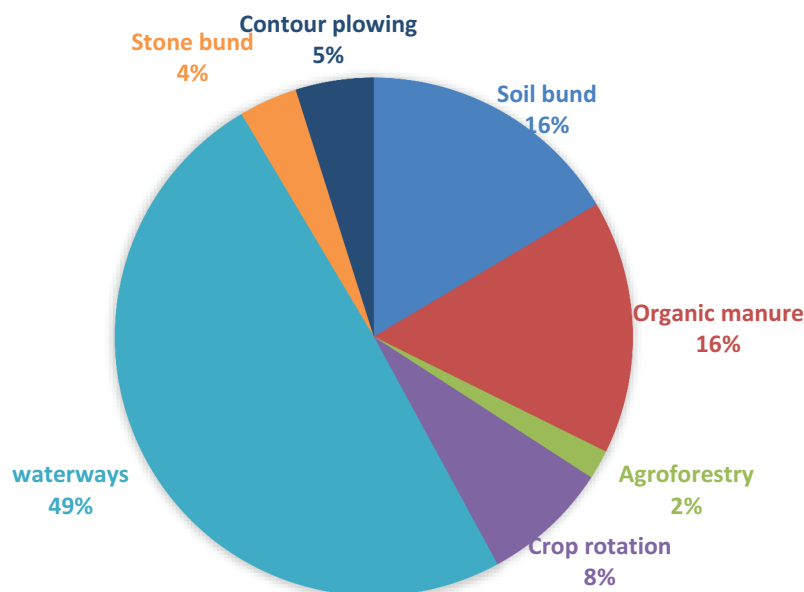
Variable	Mean	Standard deviation
Sex(women) <sup>a</sup>	100.00	
Education Level (years)	2.60	2.5
Farming Experience (years)	26.54	11.9
Family Size(number)	4.9	1.9
Economically Active Household Members (number)	3.2	0.3
Area of the Plot(ha)	0.55	0.15
Distance of the farm plot		
<5min	15.03	
5-10min	33.50	
10-20min	36.00	
>20min	15.47	
Livestock holding (TLU) <sup>a</sup>		
<1	16.20	
1-4	42.32	
>4	41.48	
The slope of the plot <sup>a</sup>		
Flat	16.70	
Medium	52.51	
Steep	30.79	
Extension contact <sup>a</sup>		
Once/month	49.00	
Twice/month	41.50	
>2/month	9.50	

<sup>a</sup>percent (proportions)

is assumed that farmers with larger plot areas are more likely to participate in SWC activities to reduce soil erosion and conserve water on their plots than farmers with small plots Semgalawe (1998). The survey result showed that the average size of agricultural plots for the sample households is 0.55 ha. This indicates that there is a serious shortage of arable land in the study area. Farmers who have farms in areas that are more prone to soil erosion are likely to experience more soil erosion and are therefore more likely to see the effects of topsoil loss than farmers with farms located on gentle slopes. In this study, 16.7%, 52.51%, and 30.79% of the plots were on flat, average, and steep slopes, respectively. Therefore, it is expected that the steeper the slope of the farmland, the higher the likelihood that farmers will participate in SWC practices. The distance between agricultural plots and a homestead is important because a lot of time can be lost walking long distances.

Also, it is easier for farmers to take care of their farms and establish and maintain structural SWC practices and fertilizer applications in fields near their homesteads than in fields far away. As Table 2 shows, about 15.47% of farms are more than 20 minutes away from the homestead. Among the institutional variables considered in this study is contact with extension experts. A good relationship with extension experts helps women farmers to participate in SWC practices to reduce associated soil erosion. The extension expert can provide technical information and advice, as well as training on improved SWC practices. In the survey, I found that about 4% of women interacted with extension experts at least once a month.

**Figure 3. Women participation in SWC practices.**



### 9. Women's participation in SWC practices

According to the FGDs, women-led farmers in the study area actively participate in physical and biological methods of soil and water conservation, such as they participate in the stone bund, soil bund, and waterways SWC practices on grazing land. In addition, more women were actively involved in different types of SWC practices. In addition, The household survey result shows that women were involved in SWC practices for land management, organic fertilizers, agroforestry, crop rotation, waterways, stone trusses, and contour plowing. Waterways were the predominant (49%) SWC practice involving women (Figure 3).

### 10. Women's participation level in SWC

All of the sampled women farmers have participated in soil and water conservation practices on both their farmlands and community SWC sites. According to AWORD, they take part in an annual community campaign at SWC plants on 56 days off without any form of payment. According to FGDs, women choose to participate voluntarily (without pay) in conservation work, but in practice, they are unmotivated to work due to the low livelihood and their emphasis on short-term benefits.

We play a paramount role in soil and water conservation, we are volunteers to participate in the activities. However, we are consuming much time in our day-to-day home activities. such as child care, food preparation, water fetching, and other reproductive roles. These issues discouraged us to engage in soil and water conservation practices in our full effort

During the survey, the women in the sample were asked to rate their extent/level of participation in SWC activities. Respondents were given four choices: poor, average, good, and very good, indicating participation. According to the FGDs, everyone agreed that they play a significant role in soil and water management and conservation.

Most panelists agreed that the level of women is at a very good level. Few members of the group discussion responded that female participation was low. They use various methods of soil and water protection, both traditional and modern; to reduce soil erosion and improve soil fertility, and they also play a role in managing and controlling resource use. According to Gebremedhin (2004), the extent and genuine community involvement in the protection of natural resources depend on the size of the tangible amount of social and economic benefits received by community members as individuals and groups.

**Table 3. The distribution of Women's responses by the extent of participation in SWC practices**

Degree/level of participation	Percent	Chi-square
Poor	3.7	12.1
Average	16.1	
Good	38.5	
very good	41.6	

Determinants of Women's Participation in SWC Activities.

The results presented in Table 3 showed that the majority of women (41.6%) had an experience of participating in SWC, while only 3.7 of the respondents had poorly participated in SWC. A chi-square test was performed to assess the presence of a statistically significant difference between the four responses. The result, chi-square ( $X^2$ ) = 12.1 with  $p < 0.05$ , clearly demonstrated the existence of significant differences in women's participation in SWC.

The determinants of certain socioeconomic, environmental, and individual aspects as well as access to financial resources of particular women's participation in the SWC were investigated using the probit model. The level of significance and genuine association of these impacts were also accurately assessed and presented by the model, along with the logarithmic chance that the explanatory factors would affect the dependent variable. Table 4 empirical estimation of the probit analysis's outcome displays a logarithmic probability of -36.658, Prob > chi2 = 0.000, and pseudo-R2 = 0.741, all significant at the 5 percent level of probability. This indicates that the model fits the data well.

Considering  $p > z$  | The values for all variables included in the model, as shown in Table 4, marital status and educational level were both significant at the 5% level with a 95% confidence interval. On the other hand, family size, Economically Active Household Members, and extension contact were significant with a probability of 1%. It means that the statistical analysis found that these factors were strongly associated with the women's participation in SWC activities and that the likelihood of this association occurring by chance is very low (1%). In addition, The implication of the finding was that increase in the level of any of the explanatory variables with a positive sign

**Table 4. Determinants of women's participation in SWC in the study area**

Variables	Coef.	Std. Err.	z	P> z	Marginal Effects dy/dx
Age	0.166	0.343	0.48	0.628	0.017
Marital Status	0.518	0.216	2.39	0.017	0.053
Education Level	0.467	0.203	2.30	0.021	0.048
Family Size	1.419	0.326	4.35	0.000	0.146
Land size	-1.374	0.279	4.92	0.000	0.142
Economically Active Household Members	0.582	0.193	3.02	0.003	-0.060
Distance of the farm plot	-2.168	1.451	-1.49	0.135	-0.224
Extension contact	1.536	0.433	3.55	0.000	0.283
ACCS_CREDIT	0.553	0.341	1.62	0.105	0.067
_cons	-3.258	1.739	-1.87	0.061	

(marital status, education level, family size, land size, and extension contact) were have a positive effect on the women's participation in SWC.

However, Economically active household members are negatively significant at a one percent significant level; this indicates that it is an important factor towards participation in soil & water conservation but its negative coefficients are at variance with priori expectations and findings Damisa et al. (2007) because, average annual income should measure income generating ability of household; generally, an increase in Economically active household members is likely to increase the probability of participation in SWC; all things being equal; this probably means that, they easily affordable SWC input. In conclusion, some of these findings are contrary to prior expectations and findings by (Damisa et al., 2007; Oni et al., 2005).

**Family size:** Overall family size has a significant and positive effect on women's decision to engage in soil and water conservation at a level of less than 1% ( $P < 0.000$ ). For a one-unit increase in family size, female farmers are 14.7% more likely to be involved in soil and water conservation, with other variables remaining constant. Because household size can affect participation as it is related to work equipment. It is argued that a larger household size enables participatory decision-making on soil and water conservation, both by engaging the required labor force (Croppenstedt et al., 2003) and by allowing additional income to be generated through additional labor invested in non-agricultural activities (Yirga, 2007). The result of this study is similar to the result of).

**Education level:** The result was statistically significant at  $P < 0.05$ . This means that women with high education levels are more likely to participate than women with less education levels formal. Therefore, women with a literacy level and a secondary school diploma or higher have a significantly positive relationship with participation in SWC. Women without formal education typically have outstanding practical knowledge and expertise in all elements of land management supports this conclusion. Here, women without a formal education primarily learn about the area from more senior women and via firsthand experience. Household educational status has also been found to raise awareness of SWC practices and encourage their uptake in Southern Africa, Mozambique, Malawi, and Zambia (Mango et al., 2017). Therefore, it is of paramount importance to promote adult education and training in rural communities to enable them to make informed decisions regarding the conservation of natural resources and their sustainability

**Land size;** has a statistically significant explanatory variable at a probability level of 1%. The positive sign of its coefficient indicates the existence of a positive relationship between farm size and the decision of women to engage in SWC in Abehsege Woreda. For example, increasing farm size by one hectare from the mean increases the likelihood of participation by 14.2%, while keeping other things at their respective mean. The result of this study is consistent with the hypothetical direction of action of these variables. For example, the larger the farm, the larger the proportion of land that is allocated to modern plant varieties.

**Extension contacts** have a statistically significant explanatory variable with a probability of less than 1%. The positive sign of its coefficient indicates the presence of a positive relationship between contact with extension officials and Women participating in SWC. One unit of contact with development representatives increases the likelihood of women's involvement in SWC by 28.3%, with other variables remaining constant. The result of this study is consistent with the hypothetical direction of action of these variables. The study Dilebo (2017) supported this finding by confirming that contact for an extension has a substantial impact on decisions regarding SWC techniques. Increased cooperation between academics and stakeholders or concerned entities promotes the adoption of soil conservation methods, according to a study from southern Italy. Women who have more access to therapy are more knowledgeable about SWC procedures (Biratu & Asmamaw, 2016; Salvia et al., 2018).

**Economically active household members:** is also a highly statistically significant explanatory variable with a probability of less than 1%. Its coefficient shows the presence of a relationship between economically active household members and women's decision to engage in soil and water conservation. For a one-unit increase in Economically active household members, women's likelihood of participating in SWC increased by 58%, while other variables remain constant. The result of this study is consistent with the hypothetical direction of action of these variables. In the Gusha Temela watershed, Arsi, Ethiopia, it was discovered that women's engagement in SWC activities was favorably impacted by the availability of adequate labor (Biratu & Asmamaw, 2016). Generally speaking, household size has also been demonstrated to positively affect the adoption of SWC in the Ghanaian highlands Darkwah et al. (2019), the Gibe Basin in south-western Ethiopia (Mengistu & Assefa, 2019), and Kondoa, Tanzania (Belachew et al., 2020). (Shrestha & Ligonja, 2015).

Log likelihood = -36.658, LR  $\chi^2$  (9) = 210.08, Prob> $\chi^2$  = 0.000, Pseudo  $R^2$  = 0.741

## 11. Conclusion and policy implications

Women's participation in soil and water conservation is crucial for sustainable land management. However, women's participation in SWC decisions is shaped by several factors. To understand the factors affecting women's participation in SWC activities, this study was conducted in the Abeshge district of southern Ethiopia using purposively sampled kebele and randomly sampled women.

The study found that Women participate in various SWC practices including agroforestry, crop rotation, waterways, stone terracing, and contour plowing, among others. In addition, The study findings suggest that education, land size, economically active household members, size of household members, and extension contact were found to significantly affect the participation of women in SWC activities.

The policy implication of the finding is that recognize and support women's active involvement in SWC through tailored policies, programs, and initiatives that address the identified factors affecting their participation. By doing so, we can enhance the effectiveness and sustainability of SWC efforts while promoting gender equality and women's empowerment in agriculture and rural development.

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No potential conflict of interest was reported by the author.

### Availability of data and materials

The data can be obtained from the corresponding author upon request

### Author contribution

The sole Author has written and analyzed all parts of the paper

### Abbreviation

M.A.S.L: meter above sea level, CSA: central statistics agency, MoANR: minister of agriculture natural resource, AWARD: Abeshge woreda agricultural & rural development office, and AWFPO: Abeshgea woreda finance & population office, SWC: Soil and Water Conservation; FGD: Focus Group Discussion.

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