

Unveiling the shift of smallholders' Cash Crop Farming from Coffee-orchard to Khat in Sidama region, Ethiopia

Garedew Aweke^{*1}, Kiflie Worku², and Yodit Abebe³

¹ Department of Economics, Dilla University, Dilla (Ethiopia);

² KU Leuven, Public Governance Institute (Belgium);

³ Department of Public Administration and Development Management, Dilla University, Dilla (Ethiopia)

*Corresponding author: email awekegar8@gmail.com

Received: 27th July 2023

Accepted: 13th September 2023

©2023 Dilla University. All Rights Reserved

DOI: 10.20372/ejed.v05i1.01

Abstract

The study unveiled the recent competing shifting of cash cropping smallholders' farmland use from coffee and orchard fruits to khat farming based on the empirical evidence collected from the Sidama region, Ethiopia. Despite the national economic and sociocultural importance of coffee in Ethiopia, large tracts of coffee farmland are being cleared and converted to khat cropping in Sidama, Ethiopia. A mixed research design with both quantitative and qualitative approaches was used. The sampling technique was multistage. The multistage sampling technique that combined purposive, stratification and simple random sampling techniques was used. Two woredas, namely Dara and Aleta Chuko were purposely selected, and from Dara, 190 respondents were randomly selected from three kebeles, and from Aleta Chuko, 192 respondents were selected randomly from three kebeles, and a total of 382 farm households were selected from the study area. Primary data was collected using survey questionnaires, interviews, observation, and focus group discussions. The logistic regression technique was used to identify the determinants of farmland shift from coffee and orchard fruit farming to khat farming. The study revealed that in one district of the study area, khat plantation coverage increased from 86 hectares in 2018/19 to 170 hectares in 2019/20. In this district, from twenty-four kebeles (the smallest administrative unit), sixteen kebeles were coffee producers. Currently, three of them are converted by khat cropping. Among other factors, market bureaucracy, market access, and income strongly contributed to the shift of coffee farmland into khat farming. Furthermore, the study revealed that the shift is poverty-induced and is an alternative to the ever-challenging smallholder's livelihood, and the expansion of khat farming brought negative sociocultural and political consequences to the local community. On the contrary, the government follows non-involvement farmland use policy to khat production and marketing for undefined reasons. We confirmed some actors, such as local state authorities, brokers, and traders have networked interests in khat production and marketing. The study contributes to policy debate, dialogue, and inputs on cash crop farming.

Keywords/Phrases: Cash Cropping, Coffee, Khat, Farmland Use, Sidama-Ethiopia, Smallholders

1 Introduction

Regardless of the changes in terms of policy and regime, since the 1950s, the agricultural sector has been recognized as the center for economic development, but declining agricultural development records. That is why the controversy over the claim of economic growth and the inability of 80% of the total

agrarian community to access the necessities of life has been continuing (Berhanu, 2014; Lie & Mesfin, 2018). According to Rahmato (2009), more than two-thirds of the country's population practices agriculture while still it is undergoing a slow but steady process of decline, which is evidenced by diminishing resources, increasing vulnerability, and rural

poverty. The sector can neither develop and transform itself nor transform the peasant livelihoods and lifestyles.

Coffee is one of the firstborn cash crops in Ethiopia and symbolizes the country as the origin of the genetic diversity of *Coffea arabica*. It grows in Kaffa, Illubabore, and Wellega, known for their premium qualities and unique coffee names; Yirgacheffe, Sidama, Jimma, Nekemnt, Harar, and Limu of global coffee markets and some amounts in other parts of the country. Ethiopian coffee is seen as “black gold” for the national economy, which has been and remains the leading cash crop and export commodity which accounts for more than 4% of the national GDP, 10% of agricultural production, and more than 37% of total export earnings (see also Degaga, 2020; Ward et al., 2016). Where 95% of the national coffee production comes from smallholder farmers, more than 4.3 million smallholder farmers are involved in coffee farming and 25% (15 million) of the Ethiopian population directly or indirectly depend on coffee production, processing, and marketing (Mekuria, Neuhoﬀ and Köpke, 2004; Tefera and Tefera, 2013; Ministry of Agriculture [MoA], 2016) is worth \$836.6 million 2.8% of world annual coffee export value in 2018/19. Coffee has different sociocultural values like serving to welcome guests with the exceptional ceremony “*Buna kella*”, where coffee is made with butter in Sidama, Oromo, Wolayta, and Gamo Gofa, cultural event commemoration. Such traditional coffee drinking ceremony for different public gatherings is essential for the social value of sharing ideas, a symbol of harmony and strengthening relationships, and discussing a solution to community problems in addition to the economic benefits to the smallholders in Ethiopia.

Cash crop farming in Ethiopia faces pressing challenges of institutional constraints, unfavorable policy frameworks, imperfect credit markets, corrupted marketing environment, inappropriate choice of cash crop varieties, and illegal market interlinks, which increase smallholders’ debt burden by village money lenders (Berhanu, 2014; Debela, 2007). Recently, Khat (*Catha edulis*) has become the most competitive threat to coffee and orchard fruit farming (Wassie & Pauline, 2018). Nevertheless, 61% of national export is gained from coffee, the expansion

of khat plantations setbacks coffee production (Siddiqui, 2015), and the threat of endangered unique coffee species. Khat plantation brought a variety of socio-cultural and economic crisis to the smallholders and local communities (Siddiqui, 2015). Khat plant coverage dramatically increased in Ethiopia; in 1954, it only covered 3000 hectares of national land and by 1961, it had grown to 6997 hectares. After 37 years, in 1998, the total area of land under khat cultivation was estimated at 78,570 hectares, which dramatically increased to 163,227 hectares in 2008, 204,648 hectares in 2011, and 248,964 hectares in 2015 (Binalfew, 2017). According to the official reports of the districts and field observation, from the total farming land in the two woredas, 17,842 hectares of land is covered by coffee, 14,357 hectares of land is covered by Khat, and 4976-hectares of land is covered by fruit farming.

The total land cover of the khat plantation multiplies more than 82 times within a half-century. The growing demands for marketing and consumption of khat have become a major concern for Eastern African countries, particularly Djibouti, Somalia, and Ethiopia (Binalfew, 2017). Ethiopian coffee production and marketing, on the other hand, have increased marginally at a rate of 0.3 percent (Tefera & Tefera, 2013), as evidenced by a decrease in Ethiopian contribution to global coffee market shares from 4.35 percent (2010/11) to 2.8 percent (2018/19).

Despite coffee’s national economic and socio-cultural importance in Ethiopia, large tracts of coffee farmland are being cleared and converted to khat cropping. Preliminary observations in one of the study area’s districts indicate that khat was recently introduced as a cash crop in a district previously known for having the highest coffee production. However, currently, smallholders in this area have specialized in chat production, and chat plants now cover over 10,000 hectares of farmland. Nonetheless, Sidama is one of Ethiopia’s most renowned coffee producers; however, its smallholder farmers recently dramatically switched to khat plantations. To this end, the primary objective of the research is: why Sidama smallholder farmers are shifting from coffee and orchard fruits farming to khat cropping. The paper addresses this question and investigates the

extent to which determinant factors contribute to the change of coffee and orchard fruits into khat cultivation agribusiness dynamics in Sidama, Ethiopia.

2 Materials and Methods

2.1 Description of the Study Area

Sidama is the 10th regional state in Ethiopia since June 2020. It is located approximately 275 km south of Addis Ababa. Sidama became the tenth regional state in November 2020; formerly, it was one of the administrative zones of the Southern Nations Nationalities and People's Regional State of Ethiopia. It is found between 6°10' to 7°05' North latitude and 38°21' to 39°11' East longitude. It is bordered by the Oromia region in the southern, northern, and eastern directions; the Gedeo zone and the Oromia region in the southern direction. Their system of production largely contributed to maintaining environmental conservation and sustainability, mainly in the highlands and midlands. The Sidama livelihood strategies are mixed agriculture where major crops growing are Enset (*Ensete ventricosum*), coffee, orchard fruits, maize, wheat, teff, barley, haricot bean, and khat more recently (CSA, 2007; Lemessa, 2002). Then, the Dara and Aleta Chuko districts ('woredas') of the Sidama are selected purposively to achieve the research objectives. These two woredas were selected purposively based on coffee production and the current massive farmland changes from coffee and orchard fruit into khat cropping. These woredas were considered strata as identified using the production and shift classification.'

Aleta Chuko and Dara woredas' main agricultural products are Coffee, Enset ('*kochoo*'), pineapple, and khat. These woreda has an irrigational dam on the Gidawo River that supports the agricultural production of major fruits like mango, pineapple, orange, and avocado, among others and contributes to the region, the nation, and exporting. These woredas' altitude is from 1400 to 2300 meters above sea level, and their mean annual temperature ranges from 10 to 26 °C with an average annual rainfall of 1100 to 1400mm per year.

2.2 Data and Methodology

The study applied both quantitative and qualitative data-collecting methods. Quantitative data was

collected from smallholder farmers of the Dara and Aleta Chuko districts (woredas) of the Sidama. These two woredas were selected purposively based on the coffee production and the current massive farmland changes from coffee and orchard fruits into khat cropping. The smallholder farmers' household survey was conducted on 382 smallholders chosen by a multistage sampling strategy. These woredas were considered as strata as identified using the production and shift classification. From each stratum, the lowest administrative unit called '*kebele*', namely, Setamo, Kumato & Sofa (from Dara woreda), Mangudo, Teso, and Debicha (from Aleta Chuko woreda) were ranked and selected from the highest to lowest coffee and khat production volumes with the help of senior experts at woredas. Then, the survey questionnaire was distributed to kebeles using proportional distribution mechanisms.

The survey was conducted by data collectors and enumerators with the Paper Assisted Personal Interview (PAPI) technique at six kebeles under the supervision of researchers. 352 observations were used for analysis, and the remaining 30 survey questionnaires were discarded because of incompleteness. The quantitative data was analyzed using the probability model of the logit regression technique to examine the significance of contributing factors to determine the decision of smallholder farming switched from coffee farming to khat cropping.

Qualitative data was gathered using focus group discussions (FGDs) with smallholders, government officials, and woreda senior experts and officials with field observation farmland. We conducted two FGDs with senior experts, one from each woreda, and two FGDs with smallholder farmers, one from each woreda. So, a total of four FGDS were undertaken. To get evidence-based information, two FGDs with higher government officials and senior experts were made. The officials and experts were selected from woreda-level administration. So, two FGDs (one FGD in Darra with 3 participants and another FGD in Aleta Chuko with 4 participants) with high government officials and senior experts were undertaken. Moreover, farmers also participated, and two additional FGDs with farmers (one FGD in Dara with three farmers and 1 FGD in Aleta Chuko woreda with three farmers) were conducted.

The interview data was obtained from higher woreda officials, and a total of three semi-structured interviews were conducted. The qualitative data was analyzed using thematic content analysis and narrative analysis to triangulate, supplement, and verify the quantitative data results. In analyzing the data, the income implication of changing farmland from coffee to khat production is used to measure the livelihood resilience of farm households. The three authors were equally responsible for writing the full research report.

2.3 Sampling Techniques and Sample Distribution

The households' sample size is taken from Dara and Aleta Chuko woredas. The total sample size of smallholders determined by using the following (Kothari, 2004) formula.

$$n = \frac{Z^2 \cdot p \cdot q \cdot N}{e^2(N-1) + Z^2 \cdot p \cdot q} = \frac{1.96^2(0.5)(0.5)(64,775)}{0.05^2(64,774) + 1.96^2(0.5)(0.5)}$$

$$n = 382$$

Where: N = total population, n = expected sample size, e = accepted error margin, $q \cdot p$ = standard deviation, & Z^2 = standard deviation at a given confidence level.

The P-value assumes 50 % (0.5), an assumption is also made for any particular outcome to have a 5% marginal error and 95% confidence interval of certainty ($\alpha=0.05$). Accordingly, by inserting an N of 64,775 households, e of 0.05, and Z of 1.96 from the statistical table at a given confidence level, a sample size of 382 smallholder farmers was taken. This sample was distributed proportionally using the following formula:

$$nx = \frac{NX \cdot n}{N}$$

Where: nx = sample size in x woreda, n = Estimated final sample size, Nx = Total number of households x woreda, and N = Total number of households in two woreda's.

Accordingly, Nx in Dara and Aleta Chuko woredas were 32, 335, and 32,440 respectively. Therefore, by inserting Nx of 32,335 and 32,440 for Dara and Chuko woreda and n of 382 and N of 64,775, the selected sample of Dara and Aleta Chuko woredas' are 190 and 192 respectively. Then, 6 kebeles of Dara and Aleta Chuko correspondents (from each kebeles) were selected using a proportional sampling technique.

Table 1. Distribution of sample respondents

Woreda (District)	Kebele	Total Households	Sample Households
Dara	Qumato	32,335	64
	Setamo,		61
	Safa		65
Aleta Chuko	Tesso	32,440	63
	Debicha		65
	Mangudo		64
Total		64775	382

Source: Authors' calculation based on a survey (2021)

2.4 Theoretical Framework of the Study

Countries have different sociocultural backgrounds and historical experiences. The development policy, strategies, and priorities should accommodate such diversities. Ethiopia has diversified communities with differentiated historical and sociocultural

setups and different ecological, topographical, and agroecological resources. Therefore, development approaches and strategies in Ethiopia are expected to address such diversities. This study used the rural sociology area growth approach (Shortall, 2004) and structural functionalism which take into account multiculturalism, the sociological backgrounds of

a specific area, and local contexts of development bring a shift from relying on sectoral policy (agriculture) alone into spatial (rural) policies which emphasize the development of a rural society based on the bottom-up path (Riggs, 1964; Shortall, 2004) which expedite rural smallholders to improve their livelihood & living conditions from local contexts & sociocultural backgrounds and attain socio-economic development. Santini et al. (2012) argue that an area-based development approach is a breakthrough point to sustainable economic growth by targeting a defined geographical area that is characterized by common sociocultural setups, complex development problems using a learning process and people-centered development endeavors aimed at sustaining and widely diffused improvement of social welfare and nation-building. According to Fonjong, (2004) and Hassan et al. (2002), context aligns with government agricultural policy choices; farming incentives, agricultural financing, and marketing infrastructure networking strongly affect the productivity of rural farmers.

Structural functionalism and area-based development approaches enable the specific geo-location, rural smallholder farmers, to improve cultivation land-use techniques and conserve the environment (Riggs, 1964; Santini et al., 2012), aligning with their sociocultural and historical backgrounds. The indigenous techniques will be flourishing to empower rural residents for effective management from farmland to market and consumption processes and establishing specific banking industries with the help of strong state institutional supports and the highest commitment for comprehensive agricultural development project financing and financial services, including insurance packages which ultimately strengthening the community well-being in augmenting productivity and profitability of smallholders.

2.5 Empirical Model of the Study

To identify the factors that affect the decision of smallholder farmers to change their farmland use from coffee to khat farming, the probability model of logit regression function is applied as follows:

$$Z_h = \beta_{xh} + e_h \quad (1)$$

Where $Z = 1$ if a farmer changes his part of farmland from coffee and orchard fruit crops into khat crop farming, $Z = 0$ otherwise, β = vector of parameters to be estimated, x = vector of explanatory variables and e = is the error term.

According to Gujarati & Porter (2004), binary choice models are well-established models often used to analyze the adoption probability as they assume occurrences between two alternatives (in this case, a household switched into khat farming and a household that didn't change). The linear probability model, which is expressed as a linear function of the explanatory variables, is computationally simple. Following (Gujarati & Porter, 2004), the logistic regression technique is specified as follows:

$$P_i = E(Y = 1|x) = \frac{1}{1 + e^{-(\alpha + \beta_1 x_1)}} \quad (2)$$

For the case of explanation, we write (1) as;

$$P_i = E(Y = 1|x) = \frac{1}{1 + e^{Z_i}} \quad (3)$$

Where: $Z_i = \alpha + \beta_1 x_1 + \beta_2 x_2 + \dots + \beta_n x_n$

The probability that a given household decision to change is expressed by (3) while the probability of not is:

$$1 - P_i = \frac{1}{1 + e^{Z_i}} \quad (4)$$

Therefore, we can write;

$$\frac{P_i}{1 - P_i} = \frac{1 + e^{Z_i}}{1 + e^{Z_i}} = x' \beta + e \quad (5)$$

Now, $(\frac{P_i}{1 - P_i})$ is simply the odds ratio in favor of changing farmland from other coffee and orchard fruit farming to khat farming;

Where: P_i : represents the probability of that i^{th} household making a certain choice for the given explanatory variables (X_i), e : represents the base of natural logarithms (2.718), X_i : represents the i^{th} household explanatory variables, n_i : represents the number of explanatory variables, $i = 1, 2, 3 \dots, n$, and, β represents regression parameters to be estimated, and β is the coefficients of X_i .

Hence, to know the factors that affect the decision of smallholder farmers farming changes into khat farming, the following final model is presented and estimated by using a binary logistic regression model;

$$\begin{aligned} \text{chan}_h = & \beta_0 + \beta_1 \text{gend} + \beta_2 \text{age} + \beta_3 \text{edu} + \\ & \beta_4 \text{fams} + \beta_5 \text{land} + \beta_6 \text{exjob} + \beta_7 \text{exp} \\ & + \beta_8 \text{mark} + \beta_9 \text{burea} + \beta_{10} \text{incent} + \varepsilon_h \end{aligned} \quad (6)$$

Table 2. Definition and measurement of dependent and independent variables

Variable	Code	Measurement	Variable type
Change of farmland from coffee/ orchard fruits into khat	chan	=1 if a farmer changes farmland from coffee/ orchard fruits into khat and =0 otherwise	Dummy
Gender	gend	=1 for men and = 0 for women,	Dummy
Age-	age	Yearly age of the farmer	Continuous
Education level	edu	Last class completed	Continuous
family size	fams	Family size in number	Continuous
Land size	land	Land size in hectare	Continuous
Extra Job	exjob	having an extra job, =1 if a farmer has extra job beyond farming and = 0 otherwise	Dummy
Market access of coffee	Mark	=1 if the farmer can have market access for coffee at any time and = 0 otherwise	Dummy
bureaucratic procedures in coffee marketing	burea	=1 if the coffee marketing if bureaucratic for the farmer and = 0 otherwise,	Dummy
Agricultural policy incentives for coffee farming,	incent	=1 if there is an incentive for the coffee farmer and = 0 otherwise	Dummy

Note: β - are vectors of parameters to be estimated and ε_h - error term

3 Results and Discussions

3.1 Socioeconomic characteristics of the respondents

The randomly selected farm households' gender distribution, educational level and whether they have extra job beyond cash crop farming are presented in table 3.

As presented in the table, 82.7% of the farm households were male farmers, and 17.3% were female farmers. As it is common in Ethiopia and the study area, most of the household heads are male farmers. In our survey, the farm respondents' educational status was also presented: 44.4% of the farm households are illiterate, 30.4% of the respondents completed grade four, 16.5% of the respondents completed grade eight, 6.8% of them completed grade twelve and the remaining 1.9% of them are com-

pleted degree and above. This result implies that most of the farm households did not finish the primary level of education. So, the national and regional government should design a framework where farmers at least can complete basic schooling in their community because farm productivity and income level of cash crop farmers increase with an increase in years of schooling of those farmers. In our study, the farmers who have additional jobs beyond cash crop farming and those who did not have any additional jobs were determined. According to our survey, 80.7% of the farm households did not have any additional jobs beyond cash crop farming and were not generating any additional income. However, the remaining 19.3% of the farmers have extra jobs, which were additional income-generating activities. These types of economic activities are known as off-farm activities.

Table 3. Socio-economic characteristics of the respondents

	Type	Number	Percent
Gender of Respondents	Male	291	82.7%
	Female	61	17.3%
	Total	352	100.0%
Educational Status of Respondents	Illiterate	156	44.4%
	Grade 1-4	107	30.4%
	Grade 5-8	58	16.5%
	Grade 9-12	24	6.8%
	Degree and above	7	1.9%
	Total	352	100.0%
Additional Job	Respondents having extra job	68	19.3%
	Respondents with non-extra job	284	80.7%
	Total	352	100.0%

Source: Own survey, march 2021

3.2 Types of Cash Crops and Land use Coverage

According to the official reports of the two districts' agricultural offices and researchers' field observations (2021), the study areas are the potential producer of different cash crops in Ethiopia. The main cash crops produced by smallholder farmers of Aleta Chuko and Dara districts are coffee, khat (introduced in half of the 1990s and currently the most preferable plant), avocado, mango, pineapple, papaya, banana, sugarcane, apple, and buckthorn. From the total farming land in the two woredas, 17,842 hectares of land is covered by coffee, 14,357 hectares of land is covered by Khat, and 4976 hectares of land is covered by fruit farming.

3.3 Factors Determining Smallholder Farmers Shift into Khat Cropping

The Sidama smallholders grow coffee plants and orchard fruits in connection with their sociocultural values and experiences, just as their forefathers did. They have recently shifted to khat cropping. For Sidamas, particularly, coffee is the sociocultural crop that commemorates different communal ceremonies, communal rituals, and artifacts that serve as decorative guests welcoming coffee ceremonies, strengthening relationships and friendships among them. Due to the coffee market fluctuation, decreasing farm-land sizes, and limitation of livelihood alternatives,

smallholder farmers' livelihoods have been facing different challenges from time to time, and the existing livelihood strategies couldn't accommodate smallholder farmers switching to khat plantations. As Mengistu et al., 2009; Southern Nations (2001) reported, most of the time, the Sidama lowland areas are vulnerable to the food-insecurity crisis has prevailed and become more pronounced since 2002, up to 58.8% of farmers are food insecure in some areas along with the increasing population pressure results to fragmentation of farmlands, land degradation, reduction of fallow periods and shifts in cropping patterns. This scenario forces smallholders to look for different alternatives to cash crop production.

Nowadays, smallholders in the study area are continually shifting from coffee and orchard fruits to khat cropping. We found that, currently, cash crop production choices in smallholders are determined by the yield and revenue generated from it. For instance, comparing coffee and khat cropping, khat can generate frequent and higher income than coffee farming. For the smallholder farmer who farms coffee, the maximum estimated income would be \$429 per hectare with a 5-6 quintals per hectare productivity ratio. On the other hand, in the same smallholder farmer farms khat, the estimated income could surpass \$2857 per hectare within a year. In concurring with this finding, Govereh et al. (1999) confirmed the profitability of growing a particular crop rela-

tive to other crops & the market structure number of competing buying firms in the market particular crop relative to other crops. For example, in Dara district khat plantation increased from 86 hectares in 2018/19 to 170 hectares in 2019/20. The following (figure-1 below) shows the coffee-fruits farmland use change dynamics as figure-1 A(1) and A(2) show the productive khat farmland in the study area as figure-1 B(1) and B(2). Smallholders cleared orchard fruits (except avocado) farmland.

Recently, smallholders have been attracted to produce avocado because it has become the main industrial raw material for oil production at Yirgalem Integrated Agro-Industrial Park. After this industry started its operation, for instance, in Dara Woreda, the avocado farmland size increased from 68 hectares in 2018/19 to 168 hectares in 2019/20 only in one fiscal year. Therefore, if smallholders can get incentives and attractive market access, they can sustain to produce orchard fruits and coffee.



Figure 1. Khat Farmland Expansion in Sidama Smallholder Farmers [Photo credit: Researchers' during fieldwork (March 2021)]

The logistic regression result (Table below) presented having extra jobs beyond farming, coffee market access, and coffee marketing bureaucratic procedures were found to be strongly significant in affecting the farmers' land-use decision to switch to khat farming. Having extra jobs beyond farming, positively affect farmers' decision at a 1% level of significance. This result implies that the probability of the decision to switch to khat farming significantly increases as a farmer has an extra job and decreases with those farmers who haven't an extra job. Due to the shortening of alternative livelihood strategies, smallholder farmers' attitudes shifted to khat cropping as the livelihood mechanism. The coffee price fluctuation at local and world markets aggravated the

situation of debilitating farmers' survival (Lemessa, 2002). Coffee market access affects the farmers' decision to change their part of the land use from coffee and fruit farming to khat farming negatively at a 1% level of significance.

This result implies that the probability of changing from coffee and fruit farming to khat farming reduces reliable coffee market access and vice versa. The coffee market access differs from farmer to farmer due to other exogenous variables such as membership in agricultural unions and others. The smallholders who could not provide their coffee products to the market (local or international) market themselves without brokers are discouraged to grow coffee and shift to khat cultivation. Thus, market distortion

could substantially affect coffee production. The bureaucratic hurdle of the coffee marketing process is also affecting farmers' decisions to switch to khat farming at a 1% significance level. Coffee farmers face bureaucratic hurdles in the coffee marketing process compared to khat marketing procedures, which could be sold without any procedures.

Favorable coffee market opportunities incentivize smallholders to grow coffee. For example, due to coffee price increased from US \$0.4/kg to US \$0.93/kg in 2019/20, smallholders were motivated to replant coffee and orchard fruits. Again, the Ethiopian government enacted a new proclamation in January 2019, which enabled smallholders to export coffee to the foreign market through their coffee brand and licenses to motivate them to grow coffee. However, as the district's senior official stated, "The enforcement of the proclamation has exposed to rent-seeking behavior among local state authorities, previous coffee exporters and middlemen/brokers. The previous exporters and brokers tried to own the coffee exporting license as they have their coffee farmland."

On the other hand, when there is the availability of conducive market and pricing systems with the establishment of local resource-oriented industries like Yirgalem Integrated Agro-Industrial Park, motivate smallholders to revisit their land-use choices. The fundamental reason for smallholders to shift to khat plantations is poverty-induced and endangered livelihood status. In this regard, (Binalfew, 2017) present khat enjoys a relatively stable price in the domestic and international markets, while coffee suffers from fluctuating export volumes and prices. With market incentives and ever-increasing khat demand, Ethiopian smallholders were forced to allocate their scarce farmland to khat production. Similarly, the poor coffee farm management systems and failure to inject new technologies into coffee production, inadequate extension services, and lack of designated institutions that provide technical support from farm to marketing on coffee, a significant number of farmers switched to khat production over the past years, and khat become more owing to the high demand as well as price (Tefera & Tefera, 2013) locally and internationally.

Table 4. Estimates of binary logit regression model shows factors affecting farmers' change from coffee and orchard fruits into Khat farming

Dependent variable (Chan)	$\epsilon \pm SE$	z-value	p-value
Gend	-0.6876093 $\pm$ 0.3554021	-1.93	0.053
Age	-0.1606995 $\pm$ 0.181697	-0.88	0.376
Edu	-0.0672717 $\pm$ 0.1551356	-0.43	0.665
Fams	0.007839 $\pm$ 0.0840846	0.09	0.926
Land	0.187541 $\pm$ 0.2040173	0.92	0.358
Exjob	1.215888 $\pm$ 0.336921	3.61	0.000
Exp	-0.0007471 $\pm$ 0.0015466	-0.48	0.629
Mark	-1.584274 $\pm$ 0.3974704	-3.99	0.000
Burea	2.49584 $\pm$ 0.3447292	7.24	0.000
Incent	-0.4905375 $\pm$ 0.4896925	-1.00	0.316
Constant	0.7869545 $\pm$ 0.9466739	0.83	0.406
Logistic regression			
Number of obs = 352		Wald chi2(10) = 119.51	*significant at 5%
Prob > chi ² = 0.000		PseudoR2 = 0.3975	**significant at 1%

3.4 Marginal Effects of the Logistic Regression

Sidama is one of the highest coffee producers in Ethiopia. More recently, coffee production has become endangered, and a lot of coffee farmlands have changed into khat plantations. Previously, in

Dara worda, from twenty-four (24) kebeles, sixteen (16) kebeles were coffee producers. However, currently, three kebeles (Kumato, Safa, and Adamie) are switched into khat cropping. The same is true in Aleta Chuko worda, where khat has been intro-

duced in Aleta Chuko as a cash crop. Nowadays, the smallholders specialize in khat production are more than 10,000 hectares covered with khat plants. Instead of the local state authorities not officially recognizing khat cropping as the cash crop and not providing technical assistance and agricultural extension services, khat cultivation increased radically. The senior expert who has carefully understood the existing cash cropping change dynamics of Sidamas smallholders expresses and termed khat “Green Cash”, which means that it can generate frequent highest income and plantation dramatically expand without considering the Sidamas ancestral sociocultural coffee plants which are known as “Black Gold” which refers to the color of roasted coffee which has the

highest national economic importance.

The predicting effect of independent variables on the decision to change farmland uses into khat farming is possible by using marginal effects. The partial differentiation concerning each independent variable in the changing farmland function indicates the effects of a unit change in those explanatory variables on the expected value of changing farmland decisions. As the empirical evidence shows, having extra jobs that potentially generate income for households, market access for coffee, and the bureaucratic process of coffee marketing are found to be significant in affecting the probability of changing coffee and fruit farming into khat farming.

Table 5. Marginal effects of independent variables on decision to change plot of coffee and orchard fruits farmland to khat farming

Variable	dy/dx	Standard error	z-value	p-value
Gend	-0.1678502	0.08636	-1.94	0.052
Age	-0.0392279	0.0443	-0.89	0.376
Edu	-0.0164215	0.03779	-0.43	0.664
Fams	0.0019136	0.02053	0.09	0.926
Land	0.0457801	0.04968	0.92	0.357
Exjob*	0.2946717	0.07632	3.86	0.000
Exp	-0.0001824	0.00038	-0.48	0.629
Mark*	-0.3751847	0.08225	-4.56	0.000
Burea*	0.5411587	0.05561	9.73	0.000
Incent*	-0.1213686	0.12173	-1.00	0.319

(*)dy/dx is for discrete change of dummy variable from 0 to 1

Source: Model output from STATA12 (2021)

The marginal effect result of the logistic regression presented (Table 5 above) revealed that keeping other explanatory variables constant, having an extra job in addition to farming increases the expected probability of changing part of the land from coffee and orchard fruits to khat by 0.2946. Hence, the availability of alternative livelihood mechanisms increases khat farming. This change might be due to additional income that can finance the initial huge cost of switching the farmland use to khat farming. Similarly, the bureaucratic process of coffee marketing increases the expected probability of changing coffee and orchard fruits to khat farming by about 0.5411 times. Furthermore, keeping all other explanatory variables constant, for farmers who have simple, convenient,

and easiest coffee marketing access at any time, the probability of changing coffee to khat farming is very low. Smallholder farmers don't beneficiary from coffee farming vis-à-vis their production volume due to middlemen intervention during marketing (especially during harvesting seasons) and fluctuating coffee marketing, which discouraged them from staying on coffee production.

3.5 Socioeconomic Implications of Khat Cropping in Sidama, Ethiopia

As discussed in the earlier sections, the radical expansion of khat plants is the new phenomenon of smallholder farmers in Sidama. The introduction of

khat as a cash crop in the study area has different socioeconomic implications.

3.6 Economic and Livelihood Dynamics of Khat Plantation

Because of declining farmland sizes, increasing population, inflation of food items, and consumption of goods-services prices, smallholder farmers' livelihoods become threatening and sometimes depressingly challenging. Smallholders are the first-line victims of this scenario whose ways of life are subsistence and restricted with limited livelihood strategies. Sidama smallholders' livelihood strategies largely depend on coffee, Enset and orchard fruits, and lim-

ited staple food production systems. Recently, khat cultivation has emerged as a new livelihood alternative. Khat is relatively productive compared to coffee and fruits, which generate high income with a small plot of farmland size.

A smallholder who produces coffee might get 5000-6000kg/hectare per annum, which generates a maximum of US \$171/year. If a farmer cultivates khat, he earns an estimated total income of US \$571 to \$857/quarter with an estimated total income of \$US 1714 to 2571 per annum from the half (0.5) hectare of land. Khat cropping provides immense contributions to generate income, which significantly affects the smallholders' livelihood status.

Table 6. Economic and livelihood dynamics of Khat plantation

Type of cash crops their income return per year			
Cash crop type	Land size	Revenue return per year	Preference for farmers and their choices
Coffee	1 hectare	171-175 USD	Second
Khat	0.5 hectare	1714-2571 USD	First
Income from Khat production and income shares:			
Cash crop type	Total income per year	Share for a small holder farmer	Share of income for Illegal money lenders
Khat	2857 USD	1714 USD (60%)	1143 USD (40%)
Khat production and its public revenue contribution for the local government			
District	Khat Sale by loading trucks per year	Revenue per one loading truck	Total income for the local government
Aleta Chuko	1880	228 USD	428, 571 USD
Dara	1350	225 USD	303,750 USD

Because of the economic comparative advantage of khat, smallholders skewed into khat plantations to secure their livelihood. Unattractive coffee market mechanism (market bureaucracy), which benefits the exporters, the richest merchants, and brokers (farm-market), coffee diseases, weather conditions variability, and the highest coffee production costs are the driving factors to khat cropping. In this regard, FGD participant farmer stated;

I often observe the government continuously deceptive and misunderstand the realities of coffee and our livelihood on the ground. As the income of the traders [exporters] and the national government's foreign currency gain increases, the government considers our income to increases

as well. But the reality is completely different in that we aren't the beneficiaries as per our production and efforts rather middlemen and coffee exporters are the beneficiaries even after the establishment of the Ethiopian commodity exchange.

Though khat generates the highest income, the net income which goes to the smallholders (particularly, the poor) will be a maximum of 60-75% of the gross market value of the khat. During the off-harvest season, or khat plantation stage, poor farmers face a severe shortage of income and are challenged with food insecurity. The brokers use this as an opportunity to consult the main traders (the shadow khat

traders at the centers), who can borrow money from the smallholders with a precondition of allocating a plot of farmland to grow khat as a bond. If agreed, borrowing money will be facilitated without written agreement. During harvest season, the moneylender will immediately collect the debt, or the smallholder is expected to sell at a cheaper price, as can be observed in table 6 above. If the khat generates the estimated US \$2857 revenues per annum, the smallholder gets a maximum of US \$1714 (60%) of the total revenues. The remaining amount will go to the illegal money lenders' accounts to refund debt at a high-interest rate. The role of brokers is to facilitate borrowing from central traders to smallholders and negotiate to produce khat. Even though the khat is economically productive, most smallholders' livelihood remains in a vicious circle of poverty, "most smallholders are still eating roasted grain with coffee." Furthermore, the smallholders' saving culture is poor as a participant explains;

Most of my residents have got the highest income from khat. However, they spent almost all income on immediate consumption & local alcohol drinking instead of saving and investing in productive expenditures. Not only this but most of the time, the household head is the male and is not supposed to give money to his wife for the necessary household items and expenses. I recommend the state should establish a forced saving institute for cash crop income in our contexts.

On the other hand, some self-sufficient smallholder farmers who endure the influence of brokers and central traders in producing and marketing khat enormously improve their families' livelihood and transform their economic activities. Khat production and marketing is also one of the major sources of public revenue for the local governments of Sidama. As you can see from Table 6 above, only in the Aleta Chuko district, the local government collects an estimated amount of US \$428571/annum from 1880 loading trucks (lorries) with the rate of US \$228 per loading truck. Though the local government does not officially recognize that as a cash crop, the "cadres", [political leadership] want smallholders to stay on khat production since "officials are chewing khat indirectly, they are beneficiaries during cash transactions through undue networks with khat mar-

keting. "khat marketing and tax collection system is not consistent and most of the time it is exposed to corruption and its marketing and taxation system is exposed to rent-seeking behaviors among actors (local state authorities, dealers, transporters, brokers). The actors in khat production and marketing systems have vested interests, and it got little attention from the government. The overall assessment of the study showed that khat cropping yields more productivity compared to other cash crops in terms of the economic point of view. So, the government of Ethiopia should give due attention and work for a transparent taxing system and penalize those officials who are participating in corrupt activities in the market. Moreover, the government should subsidize those farmers who are producing coffee, which is one of the main export items that bring foreign currency from abroad.

3.7 Sociopolitical Dynamics of Khat Cropping

The government gives inadequate attention to coffee farming. However, coffee production contributes 25% of the GDP, 37% of national export earnings, and 25% of the population's livelihood to the Ethiopian economy (MoA, 2016; Siddiqui, 2015; Tefera & Tefera, 2013). We have found that agricultural experts are available at kebele levels but not in the case of coffee farming. In each district, there is at least one expert at a kebele level for cereal crop & horticulture farming but not for coffee farming. The attention given by the government to coffee farming is rhetorical in the provision of technical and strategic support for coffee smallholders. The professional extension service packages are unavailable in the study area. Such as traditional compost preparations, best coffee seedling, prevention and control of coffee diseases, plucking and control coffee noxious weeds, coffee processing technology, credit facilities, a conducive marketing environment, and eliminating of trading barriers, including middlemen interference with coffee farming unavailable in the study area.

As we discussed earlier, the above factors and economic comparative advantages of khat plantations are expanding in the study area, which is a disaster for the coffee sector. This expansion has brought different sociocultural and political consequences to society. After the introduction of khat as a cash crop

into Sidama smallholders in the last two decades, the availability of khat to the market has increased, and a significant number of youths and even teenagers have started to consume (chewing) khat, local socio-cultural values overlooked & changed, social disciplines undermined, ethical behaviors violation becomes common, theft activities (crime committing) expanded, health association and psycho-social problems emerged crises. In line with this, WHO 2006; Abdelwahab et al., 2015; Gunaïd et al., 2007; Hassan et al., 2002) found that the health effects of khat consumption are gastrointestinal system and central nervous system dysfunctionalities, diabetes mellitus, severe cancer, anxiety, and irritability.

Regarding expansion of khat production in the area, a cash crops farmer explains;

Previously, except for khat, we planted them not as a means of livelihood but rather as the tradition of sociocultural plants that symbolize us [Sidama]. Nowadays, due to the decreasing of our farmland size, limitation of our livelihood mechanism alternatives, and inflation, it has become the main means of our livelihood strategies. Nowadays, our livelihoods rely on its production and marketing.

The smallholders are spraying different harmful chemicals to accelerate the growth of khat, which are harmful to human health, and chemicals affect the land fertility, and the farms are no longer used for cultivating other crops. Khat consumers directly take these chemicals, which affect their health status alongside its narcotic and drug addiction effects. However, the explicit effects of those chemicals should be examined by laboratory/experimental for further explanation. The social crisis and debt burden risks also worsen. A participant during a focus group discussion at Dara Woreda explains his experience with condolence:

The son of our neighbor harvested the khat plant and sold it at the market without his father's being informed....as soon as his father knew about his son's theft act... his father's suicide. When we investigated the case, we found that the farmer was in debt, which would be repaid during harvest season, and his son was addicted to different drug abuses.

The other farmers also stated his point of view on the sociocultural effects of khat cropping, the farmer emotionally expressed;

We aren't fond of khat planting since our children are victims, we lose our socio-cultural values, and we are losing our social capital. ... we feel as if we betrayed our hereditary legacy, and our children don't want to go to school rather than asking us to buy a motor bicycle for khat trading-transportation purposes, we are losing youth generation because of the availability of khat at each corner of farmland or local towns ... What do we have to do?! ...we are forced to grow khat for survival and respond to our endangered livelihood status.

The Ethiopian government has given little attention to the farmland use policy of khat production, marketing, and consumption. The government has a policy of non-engagement, which does not give a clear policy to either encourage or discourage it. Empirically, the study found that the state does not officially recognize khat cropping and provide extension services and technical support to khat smallholders as agricultural activities, but an annual plan on khat's plantation, production, and marketing transactions is prepared. Again, local governments collect a significant amount of public revenue from khat marketing. Here, we can understand that the political economy (power and authority economy) of the state, which affects the economic choices of the society, does not pay due attention to farmland use policy sustainability and all-inclusive development of smallholders. The inappropriateness of policy and political decisions favor the political elite and actors' interest in the production, marketing, and consumption of khat. In such a way, the state political economy could not contribute to a deeper understanding of the pro-poor development, rather astute to political power sustenance not fostering underlying political and economic processes shaping development targeted to build sustainable and holistic development for the smallholders in particular.

4 Conclusion

This study is an effort to analyze the factors that affect farmers to change their part of farmland from coffee and fruit farming to Khat farming in Sidama,

particularly in the Aleta Chuko and Dara districts, using the logistic regression technique. Moreover, the study presented livelihood changes and sociopolitical dynamics of khat production in the study area. Khat cropping is radically expanding in the study area, and smallholder farmers are switching from coffee and orchard fruit farming to Khat plantations. The result of the binary logistic regression showed that having extra jobs in addition to farming and bureaucratic coffee marketing processes are found to be significant in affecting the farmer's decision to change their part of the land from coffee and fruits farming to Khat farming positively. However, good coffee market access for farmers is adversely affecting the decision to shift coffee and fruit farmlands to Khat farming and is strongly significant in the study area. The marginal effect result also shows that having extra jobs in addition to farming and the bureaucratic coffee marketing process increases the expected probability of changing part of the land from coffee and orchard fruits to Khat farming. However, good coffee market access for farmers decreases the expected probability of changing part of the land from coffee and orchard fruits to Khat farming.

According to the qualitative data collected from interviews and FGDs, these cash-cropping changes from coffee and fruit farming to khat farming are fundamentally poverty-induced changes and khat farming is giving relatively high revenue for the farmers, and Khat enjoys stable production and marketing opportunities. Recently, coffee farming faced and will be facing a looming condition due to the expansion of khat plantation vis-à-vis stymied adverse spillover effects of khat on the sociocultural values of the society.

The competitive advantage with attractive market incentives of khat cropping interspersed actors' interest, and the vicious circle of smallholder farmers' livelihoods brought poverty-induced farm land-use changes into khat crop plantation smallholder farmers in the study area. However, the government rhetorically claims and continuously considers coffee as the strategic cash crop of Ethiopia, and coffee production is its priority sector while practically provisioned integrated extension service packages are unavailable. The coffee sector still did not have coffee agriculture experts even at the woreda level, no

incentive packages for coffee smallholders such as interest-free or low-interest rate credit facilities, provision of expertise coffee production, seedling, warehousing, and packaging including (value addition) consultancy services and creating conducive marketing environment which eliminates trading barriers including middlemen's interference and farming inputs supplies at the ground are almost nonexistent.

Acknowledgments

We are grateful to the farmers and experts who participated in this study for their honest and cooperative responses to all the questions solicited in this research. We would also like to thank Dilla University, Research, and Dissemination office for the financial support we received to carry out the research project on which this article is based. However, any errors that remain in this article are our intellectual responsibility.

Conflict of Interest

The authors declare that there is no conflict of interest.

References

- Abdelwahab, S. I., Alsanosy, R. M., Rahim, B. E. A., Mohan, S., Taha, S., Mohamed Elhassan, M., & El-Setouhy, M. (2015). Khat (*Catha edulis* Forsk.) Dependence Potential and Pattern of Use in Saudi Arabia. *BioMed Research International*, 2015. <https://doi.org/10.1155/2015/604526>
- Agriculture, Ministry of Ethiopia. (2016). (GTP II) Growth and Transformation Plan II. *National Planning Commission*, I (Gtp II), 236. http://www.npc.gov.et/web/guest/gtp/-/document_library_display/48Gh/view/58840
- Berhanu. (2014). *The Political Economy of Agricultural Extension in Ethiopia: Economic Growth and Political Control*. 32, 197–213.
- Binalfew, T. (2017). The Expansion of Production, Marketing and Consumption of Chat in Ethiopia. *International Journal of Research in Agriculture and Forestry*, 4(3), 16–26. <https://www.doi.org/10.22259/ijraf.0403003>

- Central Statistical Authority (CSA). (2007). *Summary and Statistical Report of the 2007 Population and Housing Census Results*. Addis Ababa, Ethiopia.
- Debela, A. T. (2007). Policy reforms, soil fertility management, cash cropping and agricultural productivity in Ethiopia. *Norwegian University of Life Sciences* *university of Life Sciences*.
- Dechassa, L. (2002). Ethiopia: Uncertain food security situation for farmers in Sidama Zone due to lack of access to farm inputs. 2002, 1–10. <https://reliefweb.int/report/ethiopia/ethiopia-uncertain-food-security-situation/farmers-sidama-zone-due-lack-access-farm>
- Degaga, J. (2020). Review on Coffee Production and Marketing in Ethiopia. *Journal of Marketing and Consumer Research*, June. <https://doi.org/10.7176/jmcr/67-02>
- Fonjong, L. N. (2004). Changing Fortunes of Government Policies and Its Implications on the Application of Agricultural Innovations in Cameroon *. *Nordic Journal of African Studies*, 13(1), 13–29.
- Govere, J., Jayne, T. S., & Nyoro, J. (1999). Cash cropping and food crop productivity: synergies or trade-offs? *Agricultural Economics*, 28(1), 39–50. <https://doi.org/10.1111/j.1574-0862.2003.tb00133.x>
- Gujarati, D. N., & Porter, D. C. (2004). Basic econometrics. *McGraw-Hill*. Irwin, a Business.
- Gunaid, I. M., Hassan, & Murry, L. (2007). Khat(*Chata edulis*): Health Aspect of Khat Chewing. *Eastern Mediterranean Health Journal*, 13, 706–717.
- Hassan, N. A., Gunaid, A. A., El-Khally, F. M., & Murray-Lyon, I. M. (2003). The effect of chewing Khat leaves on human mood. *Neurosciences*, 7(3), 184–187.
- Lie, J., & Mesfin, B. (2018). Ethiopia: A Political Economy Analysis. *Norwegian Ministry of Foreign Affairs*, June, 1–58.
- Matewos, T. (2019). Climate change-induced impacts on smallholder farmers in selected districts of Sidama, Southern Ethiopia. *Climate*, 7(5). <https://doi.org/10.3390/cli7050070>
- Mekuria, T., Neuhooff, D., & Köpke, U. (2004). The Status of Coffee Procurement and The Potential for Organic Conversion in Ethiopia. *Deutscher Tropentag Conference on International Agricultural Research for Development*, 9. <http://www.tropentag.de/2004/abstracts/full/293.pdf>
- Mengistu, E., Regassa, N., & Yusufe, A. (2009). *The Levels, Determinants and Coping Mechanisms of Food Insecure Households in Southern Ethiopia DCG Reports*. 55, 2009.
- Rahmato, D. (2009). *The Peasant and the State: Studies in Agrarian Change in Ethiopia 1950s - 2000s*. <http://books.google.com/books?id=OW5oPgAACAAJ&pgis=1>
- Riggs, F. W. (1964). Administration in developing countries; the theory of prismatic society. *Boston, Houghton Mifflin*.
- Santini, F., Matus, S. S., Louwagie, G., Guri, G., Bogdanov, N., & Paloma, S. G. (2012). Facilitating an area based-development approach in rural regions in the Western Balkan's. *JRC Scientific and Policy Reports*.
- Shortall, S. (2004). Social or economic goals, civic inclusion or exclusion? An analysis of rural development theory and practice. *Sociologia Ruralis*, 44(1), 109–123. <https://www.doi.org/10.1111/j.1467-9523.2004.00265.x>
- Siddiqui. (2015). Kalim (2015) Agrarian Crisis and Transformation in India. *Journal of Economics and Political Economy*, 2(1), 3–22. <http://eprints.hud.ac.uk/id/eprint/23843/> <http://eprints.hud.ac.uk/>
- Southern Nations, N. and P. R. (SNNPRS). (2001). *The Socioeconomic Profile of Southern Nations, Nationalities and Peoples Region*. Hawassa, Ethiopia: SNNPR. 1–2.
- Tefera, A., & Tefera, T. (2013). *Assessments of commodity and trade issues made by USDA staff and not necessarily statements of official U.S. government*. 1–9.

- Ward, M., Smith, G., & Tran, Q. (2016). *This Report Contains Assessments of Commodity and Trade Issues Made By Usda Staff and Not Necessarily Statements of Official*.
- Wassie, A., & Pauline, N. (2018). Evaluating smallholder farmers' preferences for climate smart agricultural practices in Tehuledere District, northeastern Ethiopia. *Singapore Journal of Tropical Geography*, 39(2), 300–316. <https://doi.org/10.1111/sjtg.12240>
- World Health Organization. (2006). WHO expert committee on drug dependence. *World Health Organization Technical Report Series*, 973, 1–26.

Plant-pollinator interactions of three selected plant species in Gullele Botanic Garden, Addis Ababa, Ethiopia

Talemos Seta

*Department of Biology, College of Natural & Computational Sciences, Dilla University, Ethiopia
Email: talemos.seta82@gmail.com; P.O.Box. 419 Dilla, Ethiopia*

Received: 02nd August 2023

Accepted: 04th September 2023

©2023 Dilla University. All Rights Reserved

DOI: 10.20372/ejed.v05i1.02

Abstract

*Assessment of plant-pollinator interaction in three selected naturally grown plant species (*Rosa abyssinica*, *Hypericum revolutum*, and *Vernonia leopoldi*) was conducted using pollination observation method in the Gullele Botanic Garden, Addis Ababa, Ethiopia. Critical observation of pollinators was conducted while visiting the floral parts of each species, capturing a photo of each pollinator on the floral part, and at the same time recording the time and giving the general name of pollinators. This observation activity was conducted by walking along the garden, choosing any flowering individual for about 30 min observations for five flowers. Data was collected in five weeks between November and December 2021 about the plant-pollinator visits, pollinators' diversity, number of visits to each species, and pollinators' preferred time in a day were analyzed using descriptive analysis. A total of six functional groups (bees-Hymenoptera, beetles-Coleoptera, flies-Diptera, moths and butterflies-Lepidoptera, and bird) were recorded from pollination observation. Bees were the most flower-visiting/pollinating insect group for the three species. Beetles were the second most visited insects on the flowers of the three species, followed by flies, moths, butterflies, and birds. Plants attracted a range of insects, with bees as the most abundant visitor/pollinator, accounting for 88% of the total visits. The rate of insect flower visits for the three species indicated a decrease from the first to the fifth week of floral blooming. For mutual benefit and sustainable conservation of selected flowering plants and pollinating insects, it would be important to promote the botanic garden by establishing a pollinator garden as part of the thematic garden.*

Keywords/Phrases: Functional groups, Gullele Botanic Garden, Insect-flower visitation, Plant-pollinator interaction

1 Introduction

In the plant-pollinator interaction, the pollinators feed from the flower (nectar and pollen). In return, the plant benefits as the pollinator moves from one flower to another, transferring pollen as it forages for food rewards. Plants invest in the production of pollen and nectar for the benefit of pollinators. In the process of plant-pollination interaction, pollen allows the plant to reproduce and exchange genetic information with other plants (Nicolson & Wright, 2017). Plant-pollinator interactions can be assessed by methods such as pollination observations, bag-

ging, and cage experiments to indicate the effectiveness of specific pollinators. Pollination observations, among others, have been the widely used method in pollination ecology (Yamaji & Ohsawa, 2016). Pollinators ensure seed production and provide for healthy plants grown in gardens and urban and rural areas. Pollinators are essential components of the habitats and ecosystems that many wild animals rely on for food and shelter. Moreover, it has been a natural extension of the work of botanic gardens, conservatories, and arboreta dedicated to plants. Worldwide, over 100,000 species of invertebrates and 1,000 species of vertebrates act as pollina-

tors (FAO, 2018). For reproduction, 75% to 95% of the world's flowering plants, including one-third of our food crops, depend on these animal pollinators (Ollerton *et al.*, 2011).

Flowers of different plants are visited by animal pollinators to collect or consume rewards. However, animals do not visit them with the express purpose of pollination. Rewards obtained from flowers include nectar (consumed by insects, bats, birds, and non-flying mammals) as a source of sugar; pollen (used by most bees that collect it for provisioning their larval cells, and beetles, flies, birds, and some bats and non-flying mammals that feed on it) for protein, vitamins, fatty acids and minerals; oils (collected by certain bees for provisioning their larval cells), and resins collected by various bees for use in nest construction (Woodcock *et al.*, 2014). The major animal pollinators important for plant reproduction are insects (e.g. bees, butterflies, moths, flies, and beetles), and nearly 290,000 flower-visiting insect species have been reported worldwide (Nabhan & Buchmann, 1997). Insect pollinators are very important in determining the mating opportunity of plants, and they are a keystone process in both human-managed and natural terrestrial ecosystems. The biggest groups of insects for pollination are solitary bees, bumblebees, and honeybees because of their sufficient body hair and behavior patterns (Du Toit, 1988). The main food resource of bees is nectar and pollen, which they get from flowers of different plant species. Both plants and pollinators could have co-evolved, such that flowers of different plants would require specific bee pollinator(s) for effective pollination to occur (Michener, 2000). Moreover, bats, birds, butterflies, beetles, flies, moths, wasps, small mammals, and most importantly, bees are pollinators. These insects visit flowers of flowering plants to drink nectar or feed off pollen and then transport pollen grains as they move from one flower to the other. As moisture, sunlight, and soil fertility, the availability of pollinators is essential to the reproductive success of nearly half the world's flowering plants (Nabhan & Buchmann, 1997).

With few exceptions, beetles and wasps have short tongues and cannot exploit nectar in deep tubular flowers. They are recorded most frequently as components of the visitor fauna of generalist flowers

with a shallow perianth and exposed nectar. Moreover, many examples of nectar-producing flowers are specialized for pollination by beetles and wasps (Johnson, 2005; Shuttleworth and Johnson, 2006). Besides the food that we eat, pollinators are essential in supporting healthy ecosystems that clean the air, maintain soil ecosystems, protect from severe weather, and support other wildlife. Across the heterogeneous landscapes and ecosystems of Africa, the contribution of animal pollinators to biological diversity is inestimable.

Very recently, urban greenery, as part of the Green Legacy campaign launched by the Ethiopian government, is getting new attention. The green legacy, which includes plantation and reforestation, has been practiced to maximize biodiversity recovery, enhancing carbon sequestration, reducing air pollution, beautification, and climate change mitigation, and soil and water erosion control. In developed countries, greening urban and sub-urban areas has included the benefits of pollinators with the potential that urban areas and gardens could act as an extensive network of pollinator-friendly habitats (Baldock, 2020). There are a great many different plant species and cultivars available to the gardener, which plants are most attractive to flower-visiting insects in the developed world. This is not true in countries like Ethiopia and other similar countries. Studies conducted about which pollinators prefer which plants, insect-flower visitation rate, and plant pollinators' interactions are lacking in Ethiopia in general and in Gullele Botanic Garden in particular. Because of the gaps in the knowledge of pollinator diversity, plant-pollinator interactions, and pollinator gardens, there has been no information regarding the conservation of both plants and their pollinators in the Gullele Botanic Garden. Thus, the present study was conducted to identify the functional groups of pollinators/visitors and their visitation rate, timing preference for pollination, and interactions for the sustainable conservation and management of pollinators and flowering plants. The selected plant species for the present study are the naturally grown indigenous and endemic ones, such as *Hypericum revolutum*, *Rosa abyssinica*, and *Vernonia leopoldi*. These plant species have unknown visitation rates and plant-pollination interaction. The selection was made based on the plant availability for sampling,

flowering season, germination failure, proximity, and they are indigenous to the country.

2 Research Methods

2.1 Description of the Study Area

This study was conducted in Gullele Botanic Garden (Figure 1), which was established in 2010. The GBG was established with the objective of research-based conservation of plant species, particularly, endemic, endangered, and economically important (3E) ones, among others. The GBG is located on the outskirts of northwestern parts of Addis Ababa, Ethiopia. Geographically, it belongs to the central plateau of Ethiopia with coordinates extending between latitudes of 8°55'N and 9°05'N and longi-

tudes of 38°05'E and 39°05'E. It is located in the northwestern direction of Addis Ababa city, 4km away from the center. The GBG was established in the slopped and semi-slopped topography of Addis Ababa. The average annual rainfall is between 1100-1300 mm and an annual temperature of about 15-18 °C. February is the hottest month (20.7 °C), and December (7.5 °C) is the coldest month regarding the weather in the area. GBG is part of the green lung of Addis Ababa city, where varieties of collections of plants from various parts of the country exist. The garden area is silicic in rock types and the nitosols, cambisols & vertisols in soil type. Historically, the GBG was dominantly covered by the *Eucalyptus globulus*, *Juniperus procera*, and a combination of many other species.

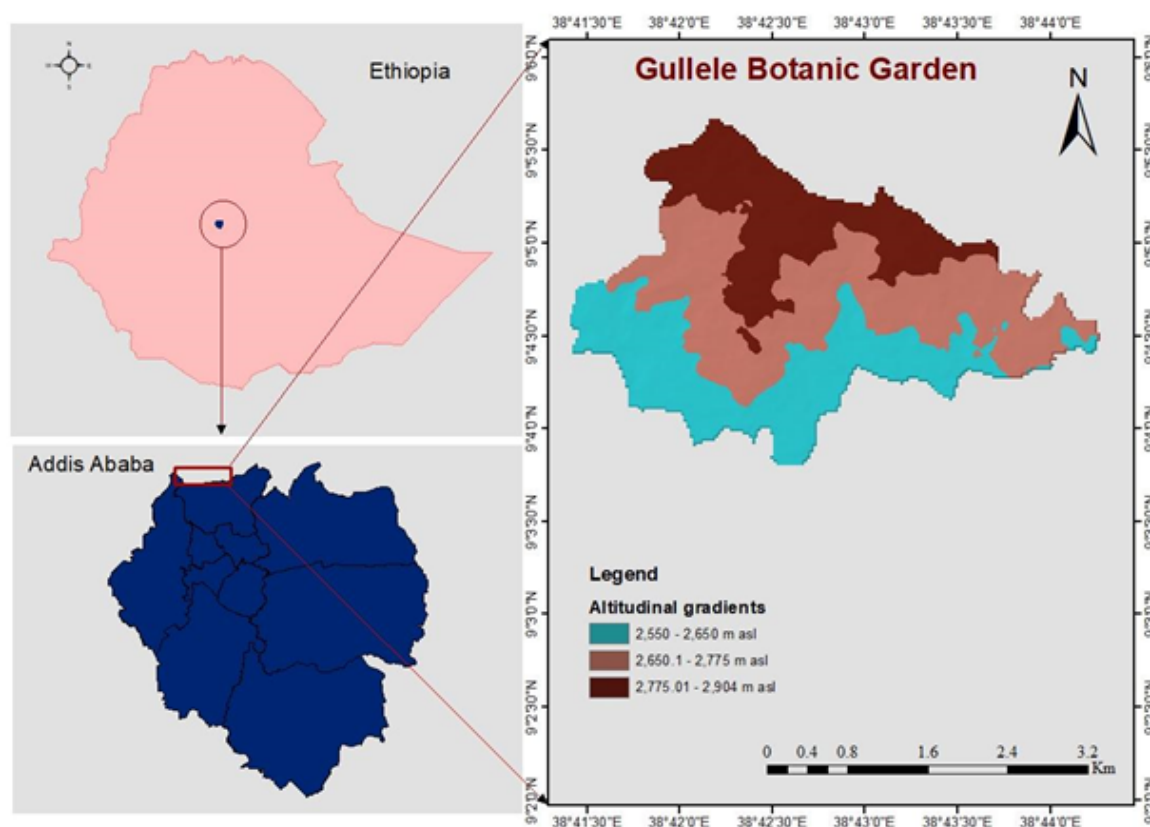


Figure 1. Map of Gullele Botanic Garden where the study was conducted

In terms of vegetation classification of Ethiopia, the study area belongs to the Dry Afromontane forest, and it has many naturally grown plant species (Table 1).

Table 1. Some of the plant species in the Gullele Botanic Garden

Scientific Name	Family Name	Scientific Name	Family Name
<i>Juniperus procera</i>	Cupressaceae	<i>Apodytes dimidiata</i>	Icacinaceae
<i>Carissa spinarum</i>	Apocynaceae	<i>Myrica salicifolia</i>	Myricaceae
<i>Rhus glutinosa</i>	Anacardiaceae	<i>Smilax aspera</i>	Smilacaceae
<i>Olinia rochetiana</i>	Oliniaceae	<i>Rosa abyssinica</i>	Rosaceae
<i>Maesa lanceolata</i>	Myrsinaceae	<i>Erica arborea</i>	Ericaceae
<i>Hypericum revolutum</i>	Hypericaceae	<i>Osyris quadripartita</i>	Santalaceae
<i>Jassminium abyssinicum</i>	Oleaceae	<i>Maytenus arbutifolia</i>	Celasteraceae
<i>Rubus steudneri</i>	Rosaceae	<i>Nuxia congesta</i>	Loganiaceae
<i>Olea europaeae</i> subsp. <i>Cuspidata</i>	Oleaceae	<i>Vernonia amygdalina</i>	Asteraceae
<i>Dovyalis verrucosa</i>	Flacourtaceae	<i>Vernonia leopoldi</i>	Asteraceae
<i>Bersama abyssinica</i>	Melanthaceae	<i>Buddleja polystachya</i>	Loganiaceae

2.2 Selection of plants for pollination study

Several naturally growing plants are found in the botanic garden, including climbers, lianas, and herbs to large trees. However, their flowering, fruiting season, and seed-forming time varies from species to species. For the present study, the three plant species: *Hypericum revolutum*, *Rosa abyssinica*, and *Vernonia leopoldi* were selected to identify their dominant pollinators and visitors. They were selected due to the same flowering seasons (October to December), fruiting seasons (January to March), and their floral structures, which are very attractive to pollinators and visitors. Besides, we have personal information that these species have a low level of propagation by seed. However, there has been evi-

dence from our nursery that propagation by cutting is not as successful as was expected, particularly for *Hypericum revolutum*. For the sake of observation, five flowers/individuals were sampled for each species, totaling 15 observations for the three species.

2.3 Description and ecology of the selected plants

2.3.1 Ecology of *Rosa abyssinica* Lindley (Family: Rosaceae)

Rosa abyssinica is an endemic rose in Ethiopian highlands locally called ‘Arbeq’, ‘Qega’, ‘Kega’, ‘Engocha’, ‘Qegga’ in Amharic and Abyssinian Rose in English (Figure 2).

**Figure 2.** *Rosa abyssinica* (Photo taken by Talemos Seta, Nov. 2021)

The plant is a creeping or climbing shrub forming a small tree up to 7 m, with prickly stems usually curved from a wide base and evergreen leaves. Leaflets of abyssinian rose are ovate to almost lanceolate with toothed margins. Flowers are sweet-smelling with white or pale yellow petals and numerous yellow stamens.

Flowers are sweet-smelling white-pale yellow and are usually 3 to 20 in dense heads, each stalked, the sepals long, narrow, and hairy, soon fall, and have five petals about 2cm long, tip rounded to square, with many stamens. The fruits are green at first but later ripen to orange-red. The fruits are edible and

collected and eaten by children (Flora of Ethiopia, Vol.3). There is a report that indicates the fruits are being used against hookworms. The plant flowers throughout the year and honey bees visit the flowers for pollen. Habitat: rocky places, dry grassland, and riparian formations; also in different types of man-made habitats, sometimes standing alone as a small tree; 1900-3300 m altitudes (Fichtl & Adi, 1994).

2.3.2 *Vernonia leopoldi* (Sch. Bip. ex Walp.) Vatke (Family: Asteraceae)

An erect shrub or rarely woody herb, covered with soft hairs, growing to 2.5 m high (Figure 3).

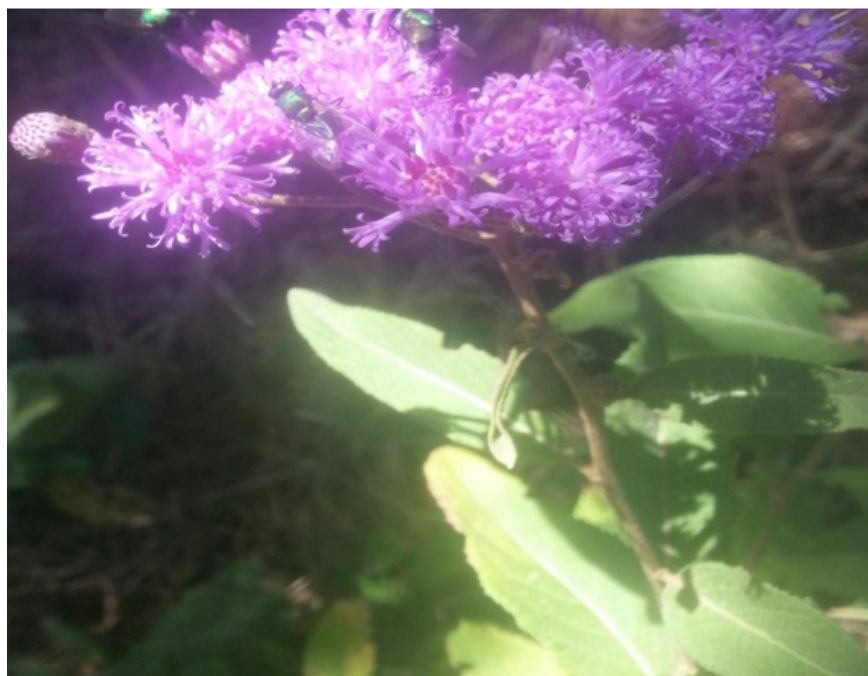


Figure 3. The *Vernonia leopoldi* with its pollinators (Photo by Talemoss Seta, Dec 2021)

Leaves grey-green with crenate margins, glabrescent, pilose or shortly strigose above with denser hair, especially on the veins beneath, base obtuse to decurrent, petiole (2-) 3-6(-8) mm long. Flower heads are purple and in large terminal corymbs. The leaves and flowers are used for dressing wounds. The roots are used against gastric disorders. Flowering from October to January, honeybees collect pollen and nectar from the flowers very frequently, and in dense stands, it can provide a good nectar flow. It grows in open forest margins such as Acacia wooded grassland with scrub of Maytenus, *Rosa abyssinica*, and Carissa on shallow soil, often in ravines, roadside

thickets, and wasteland at altitudes between 1850 and 2850 m.

2.3.3 *Hypericum revolutum* Vahl. (Family: Guttiferae)

A plant locally called 'Amija' in Amharic and Curry bush in the English language. It is a shrub or tree up to 12 m tall, bushy or slender and glabrous (Figure 4). It is evergreen, with leaves opposite, closely spaced and crowded at the ends of branches, c. 20 × 5 mm, green to slightly glaucous, sessile, clasping at the base.



Figure 4. *Hypericum revolutum* (Photo by Talemos Seta; Dec.2021)

Flowers of this plant are terminal solitary, 35-80 mm in diameter, and showy, very attractive, bright yellow color. Its yellow, radially symmetric flower has five nectaries, and nectar is presented as a tiny drop at the base of each petal. Flowers usually last about 2 days with cumulative nectar production exceeding 19 μ l per flower (Bartos^ˇ *et al.*, 2012). According to studies conducted by Janec^ˇek *et al.* (2012), *H. revolutum* is frequently visited by sunbirds, which, however, contribute only negligibly to its pollination. It grows in open forest; forest margins montane savannas, and grassland, often with *Erica arborea* and/or *Hagenia abyssinica* at an altitude of 2250-3650 m a.s.l. The plant occurs nearly in all Ethiopian regions, south to Cape Province, and also in Nigeria, Cameroon, and S.W. Arabia. The roots of this plant are used for stomach and tooth problems.

2.4 Methods of Data Collection

In order to collect information on the three species related to pollination processes, the following activities were conducted. Data collectors were grouped into three by assigning one individual to each species. Three plants from each species and the same area were included in the data collection. The data collected from the present study include critical obser-

vation of pollinators while visiting the floral parts of each species, taking a photo of each pollinator/visitor on the floral part, and at the same time recording the time and naming the general name of pollinators (for example, bees, flies, birds, *etc*). During observation, flower visitors were sampled for a total 8-9 h period (from 7 a.m. to 6 p.m., with extra observation hours on major visitation periods by the researcher) for each tree species, with five flowers/individuals selected based on the exposure to pollinators. This observation activity was conducted by walking along planting lines and choosing any flowering individual for about 30 minutes of observation. The observation time was a day time and separated into four classes. These are 7 to 9 a.m., 10 to 12 a.m., 1 to 3 p.m., and 4 to 6 p.m. to identify the visitation frequency of pollinators. The observations in each time interval were recorded, and photos of the pollinator/visitor/robber on the flower were taken. This data collection was conducted for about five flowering periods from November to December 2021.

2.5 Identification and Data Analysis

From pollination observation, the observed insects pollinating/visiting flowers of the selected species were identified by entomologists into their functional

groups, such as bees, beetles, flies, moths, butterflies, and birds. Data collected from the field for three flowering plants in five weeks about the insect visitation, pollinators' diversity, number of visits to each species, and pollinators' preferred time in a day were analyzed using qualitative and quantitative analysis. In order to make this study complete, it requires further taxonomic research to identify the insects and determine insect diversity. Moreover, it is important to further extend studies toward pollen and nectar analysis to identify which insects, in deed, pollinate which specific plant species during interactions.

3 Results

3.1 Insect-flower pollination in three species

Though identification to the taxa level is not conducted, the total insect pollination observed during the flowering season of the three plant species was categorized into six functional groups, such as bees family, Apidae (Hymenoptera), beetles (Coleoptera), flies (Diptera), moths and butterflies (Lepidoptera), and birds. Wasps were rarely observed in the flowers of the selected three species. Types of bees encountered in the flower-visiting process of the three plant species were carpenter bees (*Xylocopa spp.*), honey bees (*Apis mellifera*), and solitary bees in Apidae.

Generally, bees were the most flower-visiting insect group for the three species. For example, the *Veronica leopoldii* flower was visited 24610 times, the *Hypericum revolutum* flower 25170 times, and the *Rosa abyssinica* flower 26240 times in the study period. The insect visitation rate by bees for the three species was 6-10 times/minute. Bees, particularly honey bees, visited more flowers per time at any time of the day for *Rosa abyssinica* and *Hypericum revolutum*. Beetles were the second most visited insects on the flowers of the three species, followed by flies, moths, butterflies, and birds (Figure 5). According to the present study, plants attracted a range of insects, with the honey bee as the most abundant visitor accounting 88% of the total visits for the three plant species. Of the six functional groups, five except birds were in abundance on all three plants in varying proportions.

During data collection, it was observed that more frequent flower visitation (*Rosa abyssinica* of beetles next to bees, particularly, happened in the morning session of the day. From the present study, the average visitation rate of beetles in the three species was 0.5-3/ minute. Moreover, flies visit the flower of all species at a rate of 2-2.6/minute followed by butterflies (1/minute), and moths (0.76/minute birds (0.6/minute).

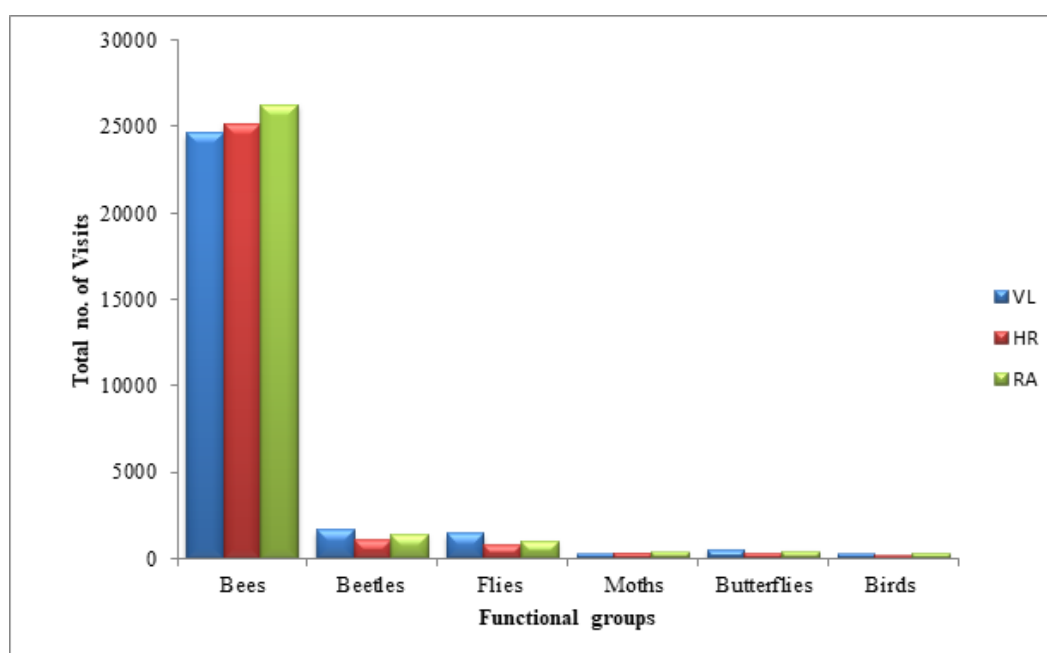


Figure 5. Visitation frequency by six functional groups

Generally, it was described that the flowers most visited by beetles have the following characteristics: bowl-shaped with sexual organs exposed, white to dull white or green, strongly fruity, open during the day, moderate nectar producers, may be large solitary flowers, and may be clusters of small flowers.

Among the functional groups, butterflies were least actively engaged in visiting flowers of the three species. More frequency of butterflies' visitation was observed in *Vernonia leopoldii* in the late morning and early afternoon session compared to the other two species in the garden.

3.2 Insect visitation to flowers in each observation time

As can be seen from figure 6, the visitation rate for bees is much higher than the other insects in four consecutive periods of a day. The flower visitation

rate decreases from morning to late afternoon in each time interval, particularly for bees. However, the flower visitation rate by beetles was high in the late afternoon from 4 to 6 p.m. On top of this, total visits by birds were very low compared to other functional groups. In plant-pollinator interaction, the type of flower, shape, color, odor, nectar, and flower structure vary by the type of pollinators that visit them. It was observed during data collection that insects visited multiple flowers on the same plants, and sometimes insects visited multiple neighboring plants. In all three species, insect flower visitation in the morning session was comparatively higher. The rate of insect flower visitation for the three species indicated a decrease from the first week to the fifth week of floral blooming. In *Vernonia leopoldii*, there was a high number of floral visits by all the insect functional groups in the first and second week of the flowering period.

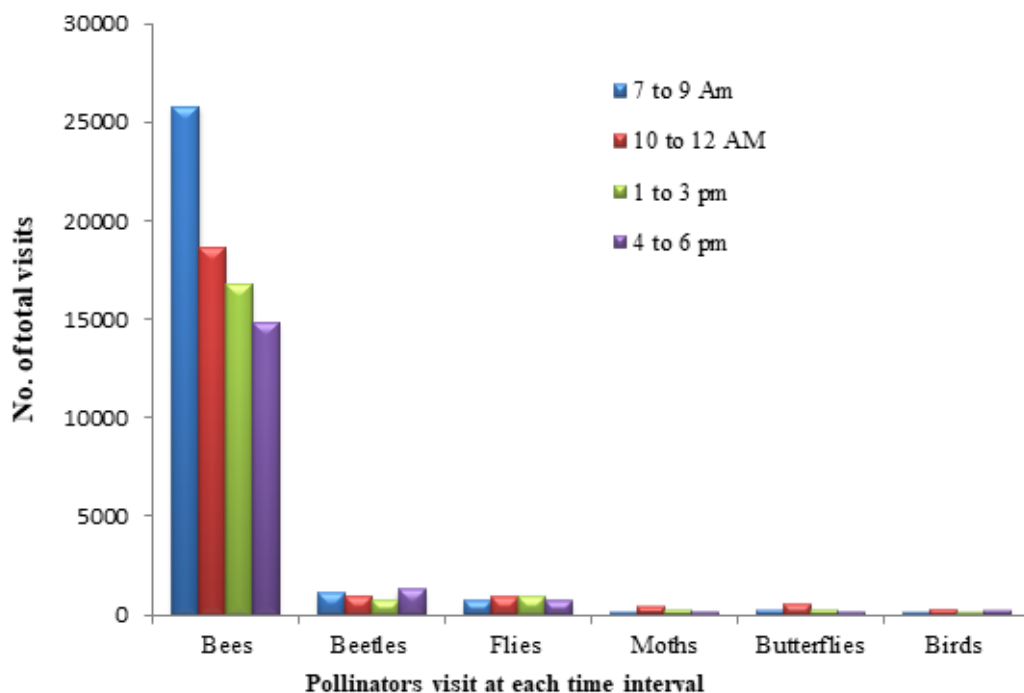


Figure 6. Pollinators visit at each time interval

3.3 Total insect-flower Visitation in the three species

It was observed from figure 7 that the total insect visitation to the floral parts of *Rosa abyssinica* (29722) is higher than the other two species, *Hypericum revolutum* and *Vernonia leopoldii*. Of all the six functional

groups, only flower visitation by bees accounted for 88% of *Rosa abyssinica*, 90% of *Hypericum revolutum*, and 85.6% of *Vernonia leopoldii*. This result shows that most of the insect-flower visitation for the three species is taken role by bees. The remaining two species have a limited role either in pollination,

robbing, visiting, or stealing in the three species. The morning session of visitation hours (7 to 9 AM and 10 to 12 AM) were preferred by visiting insects for *Rosa Abyssinica*. The total visitation by bees is more active in the early morning and then eventually

less active in the late afternoon for the three species. Later on after flowering season, it needs further studies a number of seeds have been set as indicated as was confirmed by researcher observation.

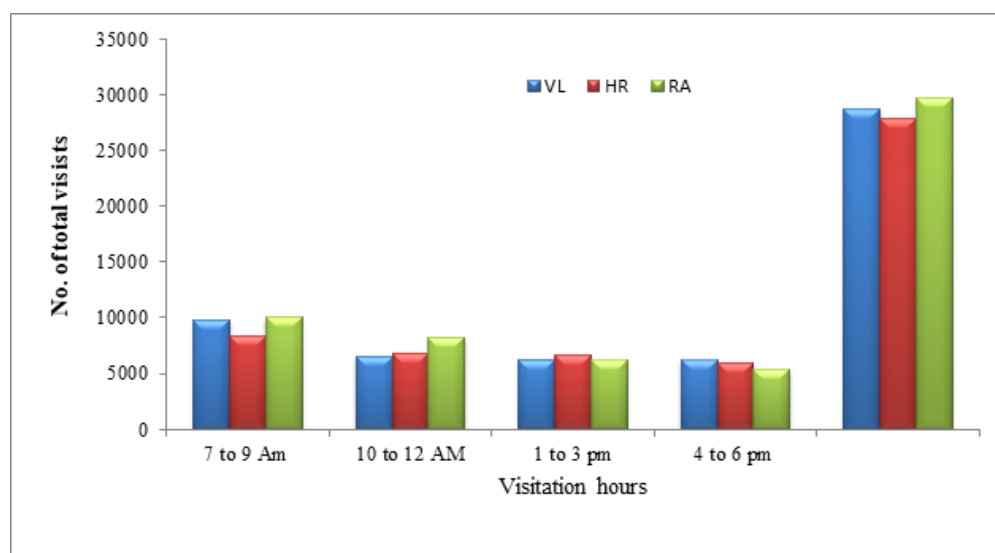


Figure 7. Total insect-visits in three species

4 Discussions

In this five-week observational study, six functional groups of insects either, visiting or pollinating flowers of *Rosa abyssinica*, *Vernonia leopoldi*, and *Hypericum revolutum* were identified. These plant species have brightly colored flowers (white, purple, and bright yellow) with nectars and pollen in them. Of the six functional groups, bees were the most common visitor/pollinators in the three species, which may be attributed to the flower structure, flower colour, odour, and availability of nectars. Insects are assumed to be responsible for 80-85% of all pollination, of which 75-80% was attributed to honeybees (Johannsmeier & Mostert, 2001)

Moreover, the development of the modern flower caused the evolution of some pollinating insects like moths and butterflies (Lepidoptera). Almost all species of Lepidoptera possess a tongue/proboscis adapted for sucking (<https://www.britannica.com/science/pollination/Butterflies-and-moths>).

According to an updated comprehensive overview of Lepidoptera in Ethiopia, Tujuba *et al* (2019) recorded and presented a total of 2,438 taxa in 48

families, of which 664 are endemic. For pollination, the biggest groups of insects are solitary bees, bumblebees, and honeybees because of their sufficient body hair and their behavior patterns even if this study did not identify this level of classification (Free, 1993; Du Toit, 1988), however, bees took the first place in the pollination. A high frequency of bees' visitation was recorded in three study species, indicating the high possibility for bees to be a major pollinating group for the three flowering plants in the Gullele Botanic Garden.

Of the total pollinators of major crops in Ethiopia, honeybees contribute 80% of the pollination service (Getachew Worku, 2018). Families of bees and butterflies are the most important pollinators in Ethiopia, and their diet (particularly for bees) is exclusively composed of pollen and nectar collected from flowers. For example, *Apis mellifera* and *Trigona spinipes* were the most generalist visitors, being the only insects that visited all olive tree species in the study reported by Kevan and Baker (1983). Bees are by no means the only insect pollinators worthy of mentioning. Butterflies (Lepidoptera), Flies (order Diptera), beetles (order Coleoptera), moths (order

Lepidoptera), and wasps (order Hymenoptera) are important pollinators as well, and some have developed specialized relationships with their preferred host plants. Moreover, these pollinators are essential in promoting the seed set of many flower and fruit crops, as well as the quality of seed /fruit, early flowering, oil content, pyrethrin content, rubber content, and the amount of lavender oil (Free, 1993).

Bees visited many flowers per minute for the three species compared to other insect groups. Bees, as the quickest visitors/pollinator visit, flowers in all three species over four to five times faster than beetles, flies, butterflies, and moths in this study. However, it was reported that families of bees and butterflies are well-known pollinators, once their diet (especially for bees) is more or less exclusively composed of pollen and nectar collected from flowers (Goulson, 2003). Even if butterflies are active during the day and visit a variety of wildflowers, they are less efficient than bees in transferring pollen from one to another flower because butterflies have highly perched long thin legs, which do not pick up much pollen on their bodies and lack specialized structures for collecting it. Butterflies probe for nectar, their flight fuel, and typically favor the flat, clustered flowers that provide a landing pad and abundant rewards. In addition, butterflies have good vision but a weak sense of smell. Unlike bees, butterflies can see red (Lewis, 1995).

The insect visitation in five weeks to the floral parts of *Rosa abyssinica* is higher than the other two species, which may be attributed to the floral structure, odour, and color. The floral structure of this species is very suitable for insects such as pollinators, visitors, robbers, and thieves. This species has floral parts that are open, fragrant, white-pale yellow, the sepals long, narrow, and hairy, soon fall and have five petals about 2 cm long, tip rounded to square, with many stamens (Fichtl & Adi, 1994).

The present study agrees with the finding of the previous work, which showed that hymenopterans were quicker than lepidopterans or dipterans in their visitation rates on lavender, in a study that described interspecific patterns of plant-pollinator interactions (Herrera, 1989; Garbuzov & Ratnieks, 2014). Moreover, bees in urban environments are keystone species for pollination purposes. Pollination services by bees

help propagate both wild and ornamental plants that, in turn, support birds and other urban wildlife by providing fruit and seeds, as well as harboring insect prey (Biesmeijer *et al.*, 2006; Ollerton *et al.*, 2011). Bees directly benefit people by pollinating crops grown in residential and community gardens (Matteson & Langellotto, 2009) but they also present opportunities to interact with nature and engage in conservation (Colding *et al.*, 2006).

Among other factors, flower shape, temperature, light, and season were the most important variables influencing insect visitation rates. In this study, the visitation frequency by bees and butterflies was higher in the early morning than afternoon and eventually became low in the late afternoon for the three species. This variation could be because of reduced secretion of sugar with increased sugar concentration due to the higher evaporation. Another reason could be the higher rate of nectar production in the morning than afternoon and lowest around the midday. This finding was supported by a similar study reported in Herrera (1990). Moreover, studies indicate that pollinator efficiency depends on visitation frequency and the total number of visits from a given functional group (Couvillon, 2015; Herrera, 1990; Garbuzov & Ratnieks, 2014). The present observational study demonstrates the density of insect functional groups and visitation rate varies across the visitation hours for the three species in the Gullele Botanic Garden, which would impact the process of pollination and production of seed set.

From an ecological point of view, studies showed the decline of pollinators, which affects ecosystem stability and loss of biodiversity and, in turn, the plants they pollinate (Biesmeijer *et al.*, 2006; Taki & Kevan, 2007). This decline in pollinator populations is due to human practices that contributed to the loss of wild and flower-rich habitats. By changing some of our practices, such as how we manage flowering plants in our gardens and farms, we can help conserve these vital pollinator species. Unless the bee population and other pollinators in the botanic garden are not maintained, there will be a decrease in flowering plants and other plant biodiversity, including the species considered in this study. As a consequence, a decrease in the population size of bees and other pollinators will usually result in inad-

equate pollination of the three species, which in turn affects the reproductive capability of the sampled species and other flowering plants (Meixner *et al.*, 2010; Winfree *et al.*, 2009).

5 Conclusion and Recommendations

It is concluded from the present study that bees were the most frequent pollinators/visitors for the three selected flowering plants. The most active period for pollinators in a day was the early morning session compared to other periods for the three flowering plants. Of the five flowering weeks, the high frequency of visiting or pollinating by insects was recorded in the first flowering week, where all flowers were at the stage of blooming with plenty of nectar and pollen. The number of functional groups identified was fewer than in other similar studies, indicating that insect conservation should be integrated into the Gullele Botanic Garden. Bee-attractive native plants should be promoted in the Garden, particularly by establishing a pollinator garden as an additional theme for the sustainable conservation of other essential plant species, as well as its pollinators. Adding plants through tree planting and increasing plant diversity in the garden could enhance pollinators and their abundance. Finally, studies related to pollinator diversity, the taxonomy of pollinators, pollinators, and floral structures of animal-pollinated plants in the garden should be conducted as the second phase after this baseline study on three selected species.

Acknowledgments

I would like to thank research staff and gardeners of Gullele Botanic Garden for supporting me in data collection.

Conflict of Interest

The author declares that there is no conflict of interest.

References

Baldock, CRK. (2020). Opportunities and threats for pollinator conservation in global towns and cities. *Current Opinion in Insect Science*, 38: 63-71.

Biesmeijer, J.C., Roberts, SPM, Reemer M, Ohlemuller R, Edwards M, & Peeters, T. (2006). Parallel declines in pollinators and insect-pollinated plants in Britain and the Netherlands. *Science*, 313: 351–354.

Colding, J., Lundberg, J. & Folke, C. (2006). Incorporating green-area user groups in urban ecosystem management. *Ambio*, 35: 237–244.

Couvillon, MJ., Walter, CM., Blows, EM., Czaczkes, TJ., Karin, L., Alton, KL. & Ratnieks, FLW. (2015). Busy Bees: Variation in Insect Flower-Visiting Rates across Multiple Plant Species. *Psyche: A Journal of Entomology*, Volume 2015 |Article ID 134630 <https://doi.org/10.1155/2015/134630>.

Du Toit, AP. (1988). Pollination ecology of commercial sunflower (*Helianthus annuus* L.) in South Africa with special reference to the honeybee (*Apis mellifera* L.). MSc Thesis, University of Pretoria, South Africa.

FAO (2018). Rapid Assessment of Pollinators' Status: A Contribution to the International Initiative for the Conservation and Sustainable use of Pollinators. Publishing Management Service Information Division, Rome, Italy.

Fichtl, R. and Adi, A. (1994). Honey bee flora of Ethiopia. Weikersheim (Germany), Margraf Verlag, 519p.

Free, JB. (1993). Insect Pollination of Crops (2nd ed.). San Diego, CA: Academic Press.

Garbuzov, M. & Ratnieks, FLW. (2014). Quantifying variation among garden plants in attractiveness to bees and other flower-visiting insects. *Functional Ecology*, 28 (2):364–374.

Getachew Worku (2018). Economic value of pollination service of agricultural crops in Ethiopia: Biological Pollinators. *Journal of Apiculture Science*, 62(2): 265-273.

Goulson, D. (2003). Conserving wild bees for crop pollination. *Food Agriculture and Environment* 1: 142–144.

Herrera, CM. (1989). Pollinator abundance, morphology, and flower visitation rate: analysis of

- the quantity component in a plant-pollinator system. *Oecologia*, 80(2):241-248.
- Herrera, CM. (1990). Daily patterns of pollinator activity, differential pollinating effectiveness, and floral resource availability, in a summer flowering Mediterranean shrub. *Oikos* 58: 277-288.
- Janecek, S., Riegert, J., Sedlacek, O., Bartos, M., Horak, D., Reif, J., Padysakova, E., Fainova, D., Antczak, M., Pesata, M., Mikes, V., Patacova, E., Altman, J., Kantorova, J., Hrazsky, Z., Brom, J. & Dolezal, J. (2012). Food selection by avian floral visitors: an important aspect of plant-flower visitor interactions in West Africa. *Biological Journal of Linnean Society*, 107:355–367.
- Johannsmeier, MF. & Mostert, JN. (2001). Crop pollination. In: Johansmeier, MF (ed), Beekeeping in South Africa. Plant Protection Research Institute handbook.
- Lewis, A. (1995). Butterfly Gardens; Luring Nature's Loveliest pollinators to your Yard. Brooklyn Botanic Garden Hand Book 143. ISBN0945352883.
- Matteson, KC. & Langelotto, GA. (2009). Bumble bee abundance in New York City community gardens: Implications for urban agriculture. *Cities Environ.* 2(1): article 5, 12 pp. <http://escholarship.bc.edu/cate/vol2/iss1/5>.
- Meixner, MD., Costa, C., Hatjina, F., Bouga, M., Ivanova, E. & Büchler, R. (2010). Conserving diversity and vitality for honey bee breeding. *Journal of Apicultural Research*, 49(1): 85-92.
- Michener, CD. (2000). The Bees of the World. – Baltimore and London (The John Hopkins University Press), 913p.
- Nicolson, WS. & Geraldine, WA. (2017). Plant-pollinator interactions and Threats to pollination: Perspectives from the flower to the landscape. *Functional Ecology*, 31: 22-25.
- Nabhan, G. & Buchmann, S. (1997). Services provided by pollinators. In: *Nature's Services. Societal dependence on natural ecosystems*. Island Press, Washington.
- Ollerton, J., Winfree, R. & Tarrant, S. (2011). How many flowering plants are pollinated by animals? *Oikos*, 120: 321-326.
- Taki, H. & Kevan, PG. (2007). Does habitat loss affect the communities of plants and insects equally in plant-pollinator interactions? Preliminary findings. *Biodiversity Conservation*. www.doi.org/10.1007/s10531-007-9168-4.
- Tujuba, TF., Sciarretta, A., Hausmann, A. & Abate, GA. (2019). Lepidopteran biodiversity of Ethiopia: current knowledge and future perspectives. *ZooKeys* 882: 87–125 <https://doi.org/10.3897/zookeys.882.36634>.
- Winfree, R., Aguilar, R., Diego, P., Vázquez, DP., LeBuhn, G., Marcelo, A. & Aizen, MA. (2009). A meta-analysis of bees' responses to anthropogenic disturbance. *Ecology*, 90(8): 2068-2076.
- Yamaji, F. & Ohsawa, TA. (2016). Field Experiments of Pollination Ecology: The Case of *Lycoris sanguinea* var. *sanguinea*. *Journal of visualized Experiments* (117): www.doi.org/10.3791/54728.

Re-visiting community based participatory watershed management: Challenges, opportunities and its linkage with smallholder farmers' ecosystem service awareness in Southern Ethiopia

Haile Ketema^{*1}, Tariku Negasa¹, Mulugeta Sisay¹, and Mesfin Nigussie²

¹ Dilla University, College of Agriculture and Natural Resource, Department of Natural Resource Management:
e-mails: haileketema2005@yahoo.com, tare4x@gmail.com, and mamuler@gmail.com, P.O.Box: 419.

² Dilla University, College of Agriculture and Natural Resource, Department of Agricultural Economics:
e-mail: m_da2005@yahoo.com, P.O.Box: 419

^{*}Corresponding author: email haileketema2005@yahoo.com

Received: 03rd August 2023

Accepted: 26th August 2023

©2023 Dilla University. All Rights Reserved

DOI: 10.20372/ejed.v05i1.03

Abstract

Ethiopia is endowed with abundant natural resources and valuable biodiversity. However, natural resource degradation and biodiversity losses in response to unwise management have been challenging and creating critical economic and social problems in Ethiopia. Previous efforts to curb the problems have not been successful as expected. Most often, physical works have received major emphasis, while the human components are mostly overlooked. To assess and re-visiting the challenges and opportunities of community-based participatory watershed management (CBPWM) and its linkage with smallholder farmers' ecosystem service awareness, five districts (Wonago, Abaya, Dilla Zuriya, Yirgachefee, and Kochere) were selected. A cross-sectional survey design with two sampling stages was used. Likert with three scales (agree, neutral, disagree) was used. A purposive sampling technique was used to select kebeles from the five districts. A stratified sampling technique was also used (based on agro-ecological zone: Humid, Semi-humid & Semi-arid) to assess the linkage of smallholder farmer's ecosystem service (ES) awareness with CBPWM. Three hundred (300) farmer respondents were selected using simple random sampling techniques from the selected AEZs, Districts, and Kebeles. The result shows that farmer's perception of change in environmental conditions has improved over the decades since the start of CBPWM. Their understanding of the environmental condition has also improved the benefits earned from CBPWM like increasing household income, social ties and security, women empowerment, and skill development. The result also shows that farmers had limited access to CBPWM plan preparation, training, evaluation, and monitoring activities in their local area. Moreover, there is a limitation of adequate resource allocation (in terms of materials, labor, and finance) and application of appropriate and site-specific technologies at each kebele level where active CBPWM works exist. Though there are challenges, almost all respondent farmers had a good awareness of ecosystem services (ES), whose livelihood depends on. Almost in all agro-ecological zones, ES has shown declining trends in the study area. To restore declining ES in the study area, different agro-ecological zone-based measurements have been applied. The result implies that CBPWM work needs serious attention from all stakeholders to achieve its envisaged mission of building a climate-resilient green economy in Ethiopia. Moreover, conservation and participation-based land management is a means to obtain ecosystem goods and services sustainably.

Keywords/Phrases: Challenges, Opportunity, Ecosystem service, Awareness, Participatory, Southern Ethiopia

1 Introduction

Since antiquity, agriculture has been the mainstay of most people in Ethiopia (German *et al.*, 2007). Even though different governmental regimes have come up with different policy perspectives to improve the agricultural sector, more than 80% of the population entirely depends on it (Gebrehaweria *et al.*, 2016; German *et al.*, 2007). For more than two and half decades, “agricultural development led industrialization” (Mellor and Dorosh, 2010) that has been implemented, emphasizes improving the people’s livelihood (Gebrehaweria *et al.*, 2016; Wolancho, 2015) and strengthening the natural resource bases using restoration and conservation techniques. Indeed, this policy has played a significant role in economic transformation and the reduction of poverty in the country (Mellor and Dorosh, 2010). The sector (agriculture) contributes approximately 42% to the gross domestic product (GDP) of the country. Despite its huge contribution, it is highly constrained by spatial and temporal climate variability and watershed degradation, which has negative implications on the livelihood of the people (German *et al.*, 2007; Habtamu, 2011). Sustainable livelihood and boosted food production in an agricultural-based developing country like Ethiopia require the availability of sufficient water and fertile land (Habtamu, 2011; Wolancho, 2015). Recurrent drought in the past has resulted in crop failure in lowlands, while high rainfall intensity in highlands results in low water infiltration and high run-off, causing severe soil erosion and land degradation (German *et al.*, 2007; Habtamu, 2011; Wolancho, 2015; Gebrehaweria *et al.*, 2016). Watershed degradation in the form of soil erosion, low water infiltration (high run-off), and reduction in soil fertility is a critical challenge to agricultural productivity and economic growth. Currently, soil fertility and freshwater degradation take the lead among degrading watershed resources and pose a significant socio-economic, ecological, and environmental threat, especially for developing countries, including Ethiopia, where a traditional agricultural-based economy is the dominant (Habtamu, 2011; Vogl *et al.*, 2017). This state of affair has spurred the Ethiopian government to launch an extensive watershed management program in the country (German *et al.*, 2007; Habtamu, 2011; Wolancho, 2015).

Watershed management in Ethiopia, which began

in the early 1970s (Wolancho, 2015) in different parts of the country, to some extent has improved the multiple environmental and social benefits provided by watersheds (Bewket, 2003; Wolancho, 2015). However, most of the benefits were tailored towards minimizing soil erosion rather than enhancing agricultural production at individual and national levels. Between 1970 and the 1990s, high priority was given to engineering measures with minimum emphasis on the compatibility of the watershed works with the day-to-day activities of the farmers (Gebrehaweria *et al.*, 2016; Miheretu and Yimer, 2017a). Moreover, the watershed management approach was government-led (with some concerted efforts with NGOs), top-down, and incentive-based, where beneficiaries had less stake in watershed decision-making (Miheretu and Yimer, 2017a). Despite the concerted efforts of government and NGOs, the adoption rate for improved technology by the farmers remains less at the time. For this lower adoption rate, demographic, socioeconomic, institutional, and biophysical are the main contributing factors or challenges affecting watershed management.

Post-1991 is a period the regime has given due emphasis to poverty reduction and natural resource management using a watershed approach. Cognizant stakeholders have tried to review the concerted efforts made so far and lessons learned and come up with concrete solutions for watershed problems (Gebrehaweria *et al.*, 2016; Miheretu and Yimer, 2017a). Among the solutions, community-based participatory watershed management is the major means to achieve natural resource management and livelihood improvement objectives within the prevailing agro-ecological and socio-economic environment (Azene and Kimaru, 2006; German *et al.*, 2007). This new approach has given prior attention to bottom-up information flow, and farmers principally play their role in planning, implementing, monitoring, and evaluating watershed works. However, with its limitation, the approach requires active involvement and contribution of local people (Wolancho, 2015), and this improves the productivity of natural resources in an ecologically and institutionally sustainable way where the community has a strong stake in decision-making (Gebrehaweria *et al.*, 2016). In general, community-based participatory watershed management creates an opportunity for reclaiming

degraded land, increasing agricultural production, water resource development, improving soil fertility, improving market access, off-farm activities, and diversifying income sources, where the benefits are realized at household and community level (Perkins, 2011; Wolancho, 2015; Gebrehaweria *et al.*, 2016; Miheretu and Yimer, 2017a). However, some scholars (for instance, Perkins 2011) argue that “participation” in community-based participatory watershed management sometimes hides, perpetuates, and exacerbates social and political inequalities, especially existing along gender.

Currently, community based participatory watershed management is widely applied in all parts of the country pertaining to the policy known as “*climate resilient green economy*”*. For the accomplishment of this stretched policy, watershed management has been considered as a milestone following the sectoral and watershed approach (Economy, 2011). The government understands the essence of this approach as evidence from successfully implemented pilot projects appears to be promising, though there are many things to be amended during at planning, implementation, monitoring and evaluation phases of watershed works in the country. Considerable efforts have been invested to replicate the successful history of woredas and kebeles† community-based participatory watershed management to areas with less experience and ineffective in implementing the approach (Bewket, 2003; Habtamu, 2011; Wolancho, 2015; Gebrehaweria *et al.*, 2016). As a major component of the efforts made to replicate success history of watershed management to other areas, in the last seven years a nationwide 30 day free labor public watershed work has been launched and, with its some shortcomings, encouraging results have been obtained throughout the country. However, the achievements made so far are not as envisaged or expected in terms of social, economical and environmental issues. Moreover, different complaints are coming out from the participants that watershed works are neither fully voluntary based as it was

explained by the government body nor participatory/bottom up in actual prevailing situation. Furthermore, the success in one watershed may not be a solution for other watersheds, or the application of similar packages for all watersheds with minimum attention to local differences did not bring the sought positive changes. Site-specific watershed works have been given less attention. Despite different encouraging results that have been obtained within these seven years of watershed public work campaign, as a matter of chance, little effort has been exerted to identify existing challenges that retard watershed works behind and the use of these challenges as an opportunity to make sure the sustainable existence of ecosystem services derived from the watershed. Therefore, this study aimed to assess the challenges, opportunities, achievements, and ES improvements since the start of community-based participatory watershed management in the Southeastern Rift Valley escarpment of Ethiopia.

2 Materials and Methods

2.1 Description of the Study Area

The research was conducted in five districts (Wonago, Abaya, Dilla Zuriya, Yirga Cheffee, and Kochere) of Southeastern escarpments of the Ethiopian rift valley. Hydrologically, the area is located under the Gidabo watershed. The upper-lying area of the watershed is the source of many perennial rivers that usually feed Abaya-Chamo Lake. The altitude of the area ranges from 1400-1800m asl. Geographically, it extends between 6°15'N to 6°26'N latitude and 38°10'E to 38°12'E longitude.

The area is characterized by a bimodal rainfall distribution with a maximum between March and July and relatively between minimum August and October (Ketema and Yimer, 2014). The mean annual rainfall and temperature of the study area ranges from 1200mm to 1800mm and from 15.10°C – 22.5°C, respectively.

* **Climate Resilient Green Economy (CRGE):** It is a strategy that contains Ethiopia's vision to achieve a middle income country status by 2025 while developing a green economy through providing key targets for reducing emissions and increasing climate resilience in 8 key sectors.

† **Kebele:** It is the smallest administrative unit of Ethiopia, similar to a ward, a neighborhood or a localized and delimited group of people.

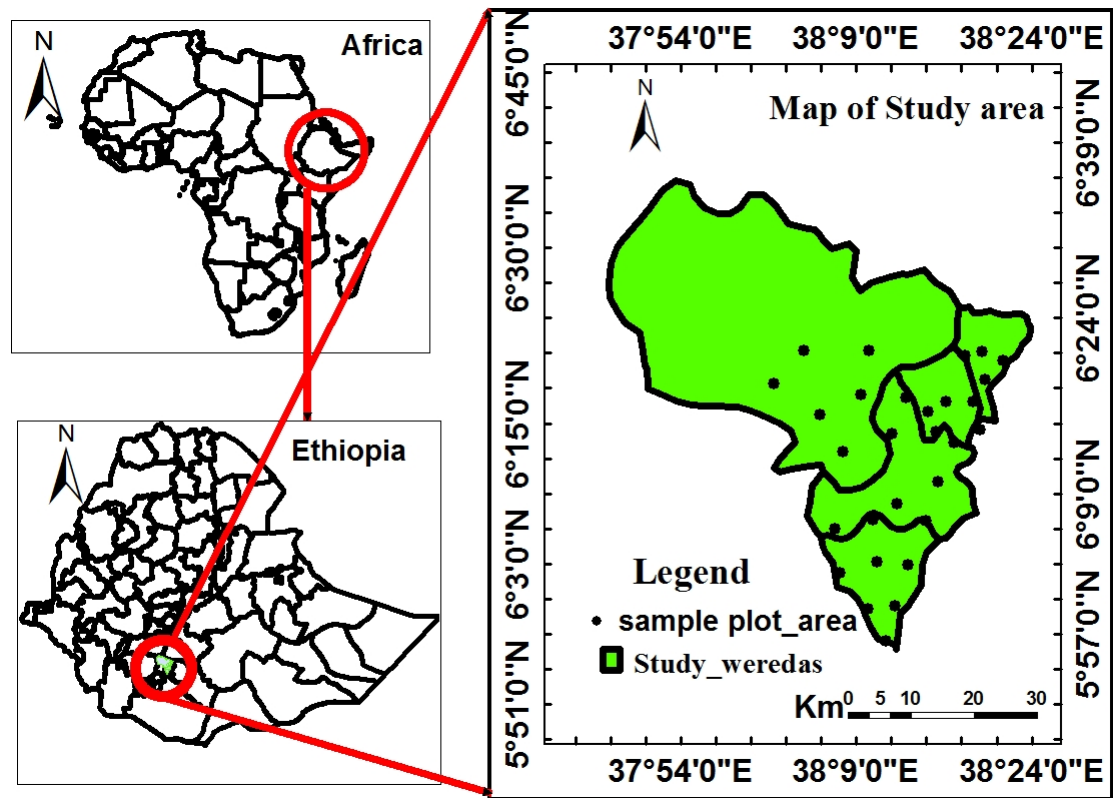


Figure 1. Map of the Study Area

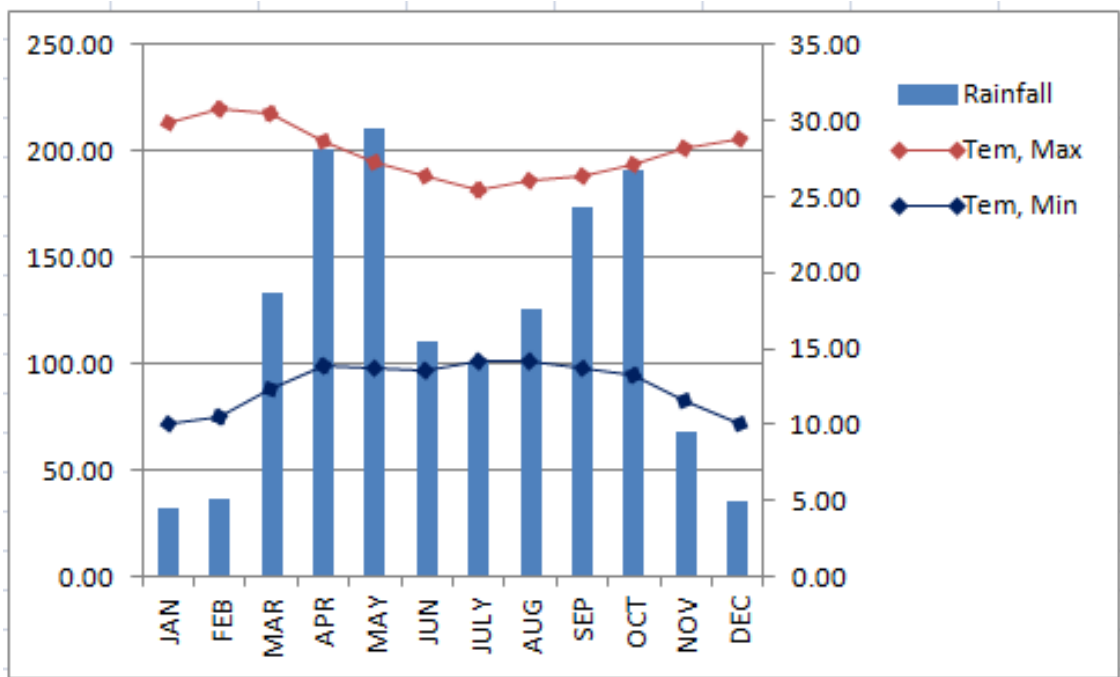


Figure 2. Mean monthly Rainfall (mm) and Temperature ($^{\circ}$ C). (Source: National Meteorological Services Agency (NMSA) of Ethiopia, 2009 E.C)

The land use system of the area is not only purely crop farming, but also it is a combination of crops, shade trees, and fruit trees with a generic name known as agroforestry system (Kanshie, 2002; Temesgen *et al.*, 2018). This type of land use is commonly seen in the semi-humid part or the coffee belt of the study area. The local farmers, especially those found in the humid and semi-arid agro-ecological zone (AEZ), produce cereals using traditional farm equipment known as “*Maresha*” (Ketema and Yimer,

2014). The plowing system is simple and shallow tilling up to a soil depth of 15 cm on average. This traditional tillage implement is commonly drafted by oxen (Gebregziabher *et al.*, 2006). The local farmers had an experience of repeatedly tilling (2-3 times per season) their land with any two consecutive tillage operations carried out perpendicular to each other. As a result, the soil is pulverized, resulting in weak soil structure and compact formation (Ketema and Yimer, 2014).

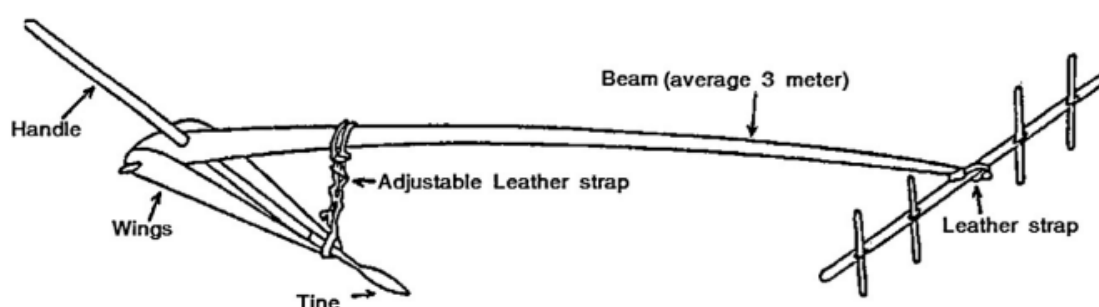


Figure 3. Traditional plowing equipment by oxen)

On the other hand, since land tilling using “*Maresha*” is not suitable and appropriate in the agroforestry system, the local farmers commonly use “*hand hoe*” (Figure 4). Hand hoe is traditional farming equipment commonly used in the semi-humid AEZ with the concepts of minimum tillage practices.

In the semi-humid AEZs, the agroforestry system is well known for its being traditional and a way of life for the local people. Perennial trees (such as *Milletia ferruginea*, *Ficus vasta*, and *Erythrina abyssinica*) and annual crops exist intermingled mostly in mutual co-existence. The local farmers leave weedy herbaceous on top of the soil with the objectives of mulching and addition of organic matter into the soil system. Therefore, nutrient cycling and soil protection from erosive forces and inducing rainwater to

percolate into the soil is an advantage derived from the system. In the semi-arid AEZs, livestock production and cultivation of crops (through agricultural investment) are some of the mainstays of the farmers for their livelihood.

The dominant soil of the study region is chromic luvisol (Kanshie, 2002) around Wonago, Dilla Zuriya, Abaya, and Yirga cheffee districts. However, Nitisols are common in the highland parts of Wonago, Dilla Zuriya, Yirga cheffee, and in the whole parts of Kochere districts. However, Chromic Luvisol is common and has good agricultural potential in the study area. It is characterized by Argillic B horizon due to the accumulation of clay in the sub-surface (Ketema and Yimer, 2014; Negasa *et al.*, 2017). Clay is the dominant textural fraction in the study area.



Figure 4. Traditional hand hoe tool used in agroforestry system. (Source: authors' field photo, 2017)

2.2 Research Design, Data Collection and Analysis

The data was collected using a cross-sectional design with two stages. These are: (1) after identification of kebeles from selected districts using purposive sampling techniques, on-site in-depth interview and discussion were carried out to understand farmers' awareness about existing challenges and opportunities of CBPWM[‡] in the area. From five districts, we selected 300 individual farmers using simple random sampling techniques. The interview lasted 1:00 -1:30 hours per interviewee and was focused on the bonds that existed between the farmers' household and CBPWM for the last seven

years. Farmer's household characteristic was also given due emphasis during the interview. The data was collected with three Likert scale (agree, neutral, disagree). (2) Ecosystem service awareness and changes, its trends and potential restoration measures that have been perceived and sensed by farmers since the start of community-based participatory watershed management (CBPWM) were assessed using group interview techniques. From the five districts (Wonago, Abaya, Dilla Zuriya, Yirga Cheffee, and Kochere), 300 individuals were selected based on agro-ecological zones (humid, semi-humid, and semi-arid AEZs) using stratified sampling techniques.

[‡] CBPWM, community based participatory watershed management

Table 1. Definition of key terms

CBPWM	Description
Challenges	Insufficiency in terms of technologies, institutions, resources (material, finance & labor) and plan preparation for effective community based participatory watershed management (CBPWM).
Opportunities	Conducive environments (both internal and external) or facilities for implementation of CBPWM.
ES awareness and changes	Farmer's awareness and changes that is observed since CBPWM has been implemented.

Descriptive statistics was used for data analysis. The scores given to Likert scale were taken as measure on a continuous scale. SPSS version 20.0 for windows was used for analysis.

3 Result and Discussion

3.1 Respondent characteristics and their environmental perceptions

Farmers who participated in community-based participatory watershed management (CBPWM) have an average age between 40 and 50 years (50%) with greater than 20 years of farming experience. The field survey result indicates that out of 300 sample household respondents, the majority (60%) were males, and the remaining (40%) were females with the marital status of married (88%), Unmarried (7%),

and Divorce (5%) in the area. Women-headed households were highly burdened with CBPWM work since they were responsible for watershed work in the campaign and the household activities. Moreover, the majority of the respondents had an educational level of 1-6 (61%) grade with an average family and farm size of 4.72 people to a household and 0.3 ha (60.33), respectively. Almost all respondents rely on mixed farming and off-farm activities for their livelihoods. In addition, the land tenure system of the respondents was categorized as direct ownership (83.67%) and tenancy (16.33%).

Table 2. Respondent characteristics

Characteristics	Category/number (proportion)
Sex	Male (60), Female (40)
Age	25-30 (5), 31-40 (34), 40-50 (50), >50 (11)
Marital Status	Married (88), Unmarried (7), Divorce (5)
Educational Level	1-6 (61), 7-8 (26.33), Illiterate (12.67)
Years of Experience	5-10 years (14.33), 11-15 years (20.33), 16-20 years (30.33), >20 years (35)
Average Family Size	4.72 people to a household
Average Farm Size	<0.25 ha (25.33), 0.25-1 ha (60.33), >1 ha (14.33)
Current Livelihood activity	Mixed farming (cereal farm, coffee, cattle) and off-farm (daily based work)
Land Ownership type	Direct ownership (83.67), Tenancy (16.33)

Over the last decades, community watershed management works through mobilizing farmers have been improved over time (Miheretu and Yimer, 2017b; Moreda, 2018). The improvement was due to watershed degradation problems that occurred on the farmers' farms and communal land in the previous time. Watershed degradation usually manifests in different ways, including soil erosion, the decline

in soil fertility, loss of vegetation cover, decline in water resources, and desertification (Andersson *et al.*, 2011; Moreda, 2018). Therefore, halting and reversing watershed degradation has dual benefits for the farmers. First, it improves their land productivity, and second; by making substantial investments in their land, farmers would avoid confiscation of land use rights and strengthen the security of their tenure.

Since the watershed resources are central to farmers' livelihood, its problems provide better insights to observe and understand the local dynamics under which they struggle to meet their livelihood needs. In this respect, the survey results under Table Three portray farmers' perception of changes observed in environmental conditions since CBPWM has been implemented in the area. For instance; the results indicate a generally high perception among farmers that quantity and quality of surface water (34.33%), quality of soil (33.33%), forest resource and its coverage (43.33%), and livestock feeds (50%) of their land has worsened in the last seven years. But a considerable proportion of farmers have also perceived improvements in surface water (26.67%), soil quality (32.67%), and forest resource (33.33%) in

their local area. However, the perception of farmers indicated worsened resources, which contradicted government reports. As it has been stated by the government, the objective of CBPWM is to reverse and mitigate the exploitive land use history, focusing on reducing further land degradation and rehabilitating land resources (Azene and Kimaru, 2006; Wolancho, 2015). However, the reality that has been seen on the ground and what is perceived by the farmers diverges from the government's efforts. Moreover, the rainfall variability (46.67%) and micro-climate (42%) also became worsened in the area over the last seven years. Generally, the overall environmental condition of the area has been worsened (35.67%) as perceived by the local farmers during the last seven years.

Table 3. Farmer's perception (%) on change in environmental conditions in the last seven years after CBPWM has been implemented (N = 300)

Environmental Condition	Improved a lot	Improved	No change	Worsened	Worsened a lot
Quantity and quality of surface water	14.00	26.67	13.33	34.33	11.67
Quality of soil resource	11.67	32.67	16.67	33.33	5.67
Forest resource and its coverage	6.67	33.33	11.67	43.33	5.00
Livestock feeds	-	18.33	23.33	50.00	8.33
Rainfall variability	-	5.00	33.33	46.67	15.00
Micro-climate of the area	-	35.00	5.00	42.00	18.00
Overall environmental condition of the area	10.67	30.00	18.00	35.67	5.67

CBPWM = Community based participatory watershed management.
(Source: Author's own survey, 2018).

Even if the environmental condition of the area was worsened, farmers did not deny the overall benefits they gained from CBPWM works in the area. Due to participation in the CBPWM works, farmers have believed that their household income (agree, 44.33%), their social tie (67.67%), and their social security (43%) have improved over time over the last seven years. Household income has increased due to the payment of the productive safety net program (PSNP). PSNP users are expected to provide 3-5 days per week for six months to the CBPWM work schemes. Based on the information obtained from the Zonal agricultural office and field observation, the scale of CBPWM through public work is remarkable. However, the problem is farmers' participation in public work schemes would not have been the same if the PSNP had not been available. Dur-

ing group discussions, farmers explained that free labor was not acceptable since all who were involved in the PSNP were poor. However, non-participant farmers in PSNP were discouraged from participating in CBPWM works. Farmers who were not in the PSNP explained that it was a great disadvantage not to be included in the PSNP in terms of access to different training, credit services, and other opportunities. Based on the abovementioned facts, 34 % (Table 4) of the farmers' households showed disagreement with the assertion that CBPWM works have increased the voluntary participation of farmers.

On the other hand, farmers believed that CBPWM works improved their social ties (agreed, 67.67%) in the community. During public work, farmers come

together from different areas to participate in the CBPWM work. This provided opportunities for farmers to exchange ideas and improve their intimacy. It enhanced team spirit within the community and solved conflicts with adjacent farmers (Teshome *et al.*, 2016). CBPWM works through a mass mobilization approach increased the number of participants.

Moreover, women empowerment (79.67%) and land management (LM) skills and experience sharing among farmers (65%) improved over time. Women have opportunities to participate actively in the CBPWM works. Off-course, there is a division of labour among the community. For instance, during CBPWM works, women were involved in soil bund compaction and paving the waterways, and men were engaged in digging ditches and the construction of stone terraces, waterways, cut-off drains, and other heavy works. Their active participation improved their decision-making power in making the design and layout of CBPWM work. In addition to LM skill and experience sharing among farmers, the availability of hand tools for CBPWM works was mentioned as an important benefit gained, especially for those poor farmers. Farmers learn from development agents and fellow farmers about theoretical knowledge and practical skills for implementing CBPWM works. Moreover, hand tools were supplied by government and non-government organizations for the construction of SWC measures. Despite

these positive aspects, farmers pointed out in group discussions that there was a critical shortage of hand tools at the community level.

On the other hand, conflicts over communal resources among farmers increased (63%) even after the implementation of CBPWM works in the area. The sources of the conflict were not from sole resource limitation but also arose from ethnicity (For instance, conflicts between Gedeo and Guji). According to the zonal agricultural office report, FGD, and field observation, conflicts over grazing land increased over time in the area that needs government attention to halt.

In addition, participation in the CBPWM work improved the social security of the farmers, especially those who were the beneficiaries of PSNP. The benefits gained from public work, either in kind or cash, were used for savings, school, health, and payment for *idir* and *iqub* (informal institutions made by a group of farmers). Concerning the above facts and observations made by the farmers, the government has political inclination or motives towards CBPWM works by giving more attention to area coverage of work rather than quality work. Concerning this, farmers pointed out that CBPWM work served the government in political objectives by ensuring state control over the rural population. Therefore, during the interview, 49.67% of the farmers agreed that the government has a high political inclination or motives towards CBPWM works.

Table 4. Farmer's perceptions on the benefits of CBPWM (N = 300)

Benefits of CBPWM	Agree	Neutral	Disagree
Increase in household income	44.33	26.67	29.00
Increase in social tie	67.67	13.33	19.00
High political inclination	49.67	10.33	40.00
Increase in voluntary participation of farmers	32.67	33.33	34.00
Increase in social security	43.00	37.00	20.00
Reduce conflict on communal resources	25.67	11.33	63.00
Increase in women empowerment	54.67	18.67	26.67
Rehabilitation of degraded land	79.67	10.67	9.67
Development and sharing of land management skill, experience and working tools among farmers	65.00	16.33	18.67

(Source: Author's own survey, 2018).

3.2 Challenges of Community based participatory watershed management (CBPWM)

Practically, all-natural resource management programs are implemented at the watershed level these days because it is repeatedly observed that watersheds are integrated socio-environmental units whose parts are interdependent. For the normal functioning of components, the works of each part of the watershed should be led by an appropriate watershed plan since the well-being of the whole watershed is dependent on the viability of its components. However, in the past seven years, practically, various challenges, constraints, and controversies negatively affected the quality of CBPWM works and its replicability to other areas.

According to the FGD and interviews, which were held with farmers, the accrued challenges of CBPWM works in the last seven years were categorized into four groups (Table 5, 6 & 7).

1. Challenges in terms of CBPWM plan preparation and community participation

Attempts to address watershed problems without consideration of appropriate plans often fail. Appropriate plan preparation and effective participation of the local farmers should also be recognized. According to the interview, over the last seven years, around 69% (Table 5) of the respondents perceived that access to CBPWM plan preparation was not participatory as claimed by the government.

Table 5. Community based participatory watershed management challenges in terms of watershed plan preparation in the village (N=300)

No.	Items	Respondent's Response					
		Agree		Neutral		Disagree	
		No.	%	No.	%	No.	%
1	There is access to participate on kebele level CBPWM plan preparation each year.	69	23	24	8	207	69
2	CBPWM plan preparation is on the basis of bottom-up approach in the village.	54	18	74	24.67	172	57.33
3	There is access for training in the kebele for CBPWM plan preparation	94	31.33	74	24.67	132	44
4	CBPWM plan preparation is not our task based on our previous experience	163	54.33	54	18	83	27.67
5	We have access for monitoring and evaluation of CBPWM plan and works	59	19.67	64	21.33	177	59

The fact on the ground is contrary to the assertion that CBPWM plan preparation was made through the active participation of the local farmers. This practice not only deprives the natural rights of the farmers to participate but also discourages them from investing in their land and encourages them not to strongly feel CBPWM as their work (feel low sense of ownership). On the other hand, as mentioned by the interviewees, access to training (disagree, 44%) and monitoring and evaluation of CBPWM works (disagree, 59%) were not available in an adequate manner in the previous time.

Farmers also mentioned that CBPWM plan preparation was not based on a bottom-up approach. Community-based participatory watershed management plans commonly come from woreda[§] and zonal-level government offices. During FGD, farmers mentioned that there was a quota system to participate in training and plan preparation. They mentioned that they did not remember exactly when they were invited for CBPWM work plan preparation from their kebeles, rather they blessed the plan prepared by Woreda and Zonal level. They explained that there was passive participation of farmers in CBPWM work plan preparation in the study area.

[§] Woreda is roughly equivalent to a district and is the next higher administrative division to kebele in the country.

2. Challenges in terms of CBPWM resource allocation

Farmers in the sample also identified the main challenges of CBPWM works (Table 6) about resource allocation. Lack of efficient time usage and labour utilization are the main challenges of CBPWM works in the study area. Before starting the CBPWM work, they reached a consensus with farmers that indicated the starting and leaving time from work. However, as it was observed in the fields during CBPWM works using mass mobilization, some farmers arrived late and left early. In addition, some farmers just came to the field only to fulfill the compulsory free labour requirement. This trend indicated that there was no efficient use of time & human working forces during the implementation of CBPWM works in the study area.

Farmers also mentioned that the CBPWM works lacked fair and adequate sharing mechanisms of watershed goods among farmers based on their free

labor contribution each year. For instance, after implementing SWC measures and making closure area, some benefits emerged, such as grass, fuel wood, and others. Therefore, farmers claimed that the allocation of such resources should be based on labour contribution during the campaign of CBPWM work. On the other hand, the contributions of free labour should also be based on the size of holdings. For instance, at the current work norm of CBPWM, farmers with small holdings invested the same amount of time and labour as farmers with larger holdings. Even landless and youth whose means of subsistence were non-farm activities also invested their time and labour for CBPWM works such as SWC activities in their kebele. However, the notion of CBPWM through mass mobilization did not include a mechanism for benefit sharing because it works on the principle that the benefit will be accrued and diffused and cannot be quantified for each farmer separately (Azene and Kimaru, 2006; Teshome *et al.*, 2016; Singh, 2017; Moreda, 2018).

Table 6. Community based participatory watershed management challenges in terms of resource allocation in the village (N=300)

No.	Items	Respondent's Response					
		Agree		Neutral		Disagree	
		No.	%	No.	%	No.	%
1	We have taken practical training on how to prepare plan, layout and implement SWC measures in the watershed	124	41.33	24	8	152	50.67
2	There is voluntary participation of farmers in CBPWM at village level	94	31.33	74	24.67	132	44
3	Good experience of sharing watershed goods and services adequately in the village	175	58.33	26	8.67	99	33
4	There is appropriate or sufficient support (financial) from government or NGOs for CBPWM work in the village	14	4.67	94	31.33	192	64
5	Adequate working materials for implementing SWC are available in the village	52	17.33	24	8	224	74.67
6	Efficient use of time & human working forces for implementing CBPWM works	49	16.33	79	26.33	172	57.33

In addition, farmers also mentioned that the shortage of working materials during the CBPWM campaign was another critical challenge since some poor farmers did not have tools for soil-related work. Around 74.67% of the farmers complained about the availability of the working tools. As it was explained by local farmers and observed during the field, some

hand tools were supplied by agricultural offices and NGOs for individuals to minimize the shortage of hand tools for making SWC structures. On the other hand, some farmers complained about the fairness of the distribution of the hand tools since some were using their tools for the CBPWM works. In connection with the shortage of working materials and

others (such as seeking incentives and prioritizing their work), voluntary participation (disagree, 44%) of farmers in CBPWM work has been under question. However, due to different bylaws (formal and informal), a large number of farmers always participate in the CBPWM works. The existence of bylaws and enforcement might have contributed to a large number of farmers participating in community works (Teshome *et al.*, 2016; Miheretu and Yimer, 2017a; Moreda, 2018).

3. Challenges in terms of using appropriate and site specific technology

During FGD and interviews, farmers mentioned that the culture of technology usage and its adaptation to CBPWM work was being improved each year. They showed that there was increased adaptation (50.67%) of technologies, such as the application of different soil and water conservation measures improved over the last seven years in the study area. Due to land degradation problems seen, either on their farmland or communal lands, the willingness (61.33%) of farmers to implement SWC measures in the CBPWM campaign improved over time. Concerning using physical SWC measures in CBPWM work, the habits of integrating biological measures with physical measures were also improved over time in the study area. It was also mentioned that farmers were more reluctant to use SWC measures on their farm plots for two reasons. First, farmers think that SWC measures that were implemented occupied space that was productive for crop production. Second, workability became difficult within the implemented SWC measures since there were lengthy SWC measures that hampered the movements of oxen during farm ploughing. Concerning the abovementioned facts, the local farmers search areas that are not suitable for crop production for implementing SWC measures. In addition, they think that the implementation of SWC on cropland can disintegrate the farm. During FGD in Wonago district, a group of farmers said that:

“Even if there are soil erosion problems on our land, most of us do not have deep interest to implement SWC measures on our crop land due to space and workability issues; instead we always search areas other than crop land (commonly on communal land) for implementing SWC technologies”.

In principle, depending on the slope, rainfall, and workable soil depth of the area, each SWC measure has specific standards. Appropriate sites must be selected for suitable technologies in the watershed, especially on cultivated land. Wolancho (2015) stated that SWC structures built on cultivated land should be suitable for farming activities, including easy travel across farmland. On the other hand, research findings suggest that structures built below these standards are less effective in controlling soil erosion and ensuring environmental sustainability.

The local farmers (60.67%) argued that little attention was given to selecting appropriate technologies (such as SWC and tree seedlings) for appropriate sites in the research area. Sometimes, SWC measures constructed in the wrong sites become dangerous as they aggravate erosion by collecting the surface runoff and enhancing collective high-volume flow. They plant tree seedlings without giving due attention to the appropriateness of the site (for example, eucalyptus tree), which is also another fact that needs attention. Farmers only consider the benefits earned within a short period. However, due to many influences, such as a decline in crop production due to erosion, the rate of technology adaptation (agree, 50.67%) of farmers improved over time in the study area. In this perspective, even if they have a concern with SWC measures (the issues of space and workability), they showed a strong willingness (agree, 61.33%) to implement different technologies such as SWC on their farm plot to reduce the burden of crop failure due to soil erosion.

Moreover, due to increased awareness and its impact on the water resource, communal land management using SWC measures is also commonly applied in the area. However, as was witnessed by the local farmers (during FGD) in all districts, SWC measures constructed in the farm could not stay a long time (disagree, 54.67%) due to different reasons. Firstly, there is a lack of continuous evaluation and monitoring of SWC measures from the planning to the implementation phase. Even if there is some practice of evaluation and monitoring by the office experts, participation of the local farmers has been very low and, hence, this has made the farmers feel as if the work does not belong to them (less self-belongingness). Secondly, the culture of voluntarily

maintaining SWC structures by the farmers is poor. Farmers tend to wait for public campaign work and development agents to take care of the maintenance (Wolanchu, 2015). Some farmers ignore the SWC measures after they are damaged by rain and livestock, and others remove the measures during tillage processes. The main reason for this is a lack of awareness and household labour shortage, but the existing situation hampers the long-term defensive function of the SWC structure and challenges the crop productivity of the area.

During FGD in Wonago district, farmers raised that some farmers deliberately destroy SWC structures with the notion to take some incentives (in the form of money or kinds like wheat or cooking oil) while maintaining the structures. Therefore, due to some incentives, especially in the PSNP package, the local farmers showed strong will (agree, 78.67%) to maintain SWC measures each year. The increased willingness is not only for conserving the environment but also for earning money (a major driving force) from maintaining the SWC structures. Thirdly, the appropriateness of the SWC technology for the particular site determines the longevity of the structure in the place. Researchers (for instance, Wolanchu, 2015; Miheretu and Yimer, 2017a; Moreda, 2018) explained that the appropriateness of the technologies (such as SWC) for a particular site relates to how these technologies are combined or compatible with the farming system and used. Some of the influencing factors for using appropriate SWC technology for a particular site are affordability, experience, and availability based on the degree of awareness.

In soil and water conservation principles, the physical structures must be integrated with biological measures such as grasses and trees along the contour line in the watershed. In the study area, all in all, farmers have a strong motivation for planting tree seedlings on their farm plots. According to the interview and FGD held in all districts, the higher motivation for planting tree seedlings was due to three important things. First, it is for environmental conservation, such as regulating soil erosion and land rehabilitation. Second, it is for satisfying alarm-

ingly increasing household demand for fuel wood, charcoal, and animal feeds. Third, it is for satisfying the government office workers, politicians, and other NGOs for the sake of getting incentives in the form of money or kind for communal use either at the district or kebele level. The culture of planting seedlings in all study districts was improved over time. According to the respondents, around 56.67% of the interviewees replied that planting trees on their farmland has increased over time. However, tree selection and planting at appropriate sites is still a problem in the study area.

Though culture of planting trees by farmers has increased, vegetation coverage at the national level has decreased over time. A similar situation has also been seen in this research area, where a large number of tree seedlings have been planted each year, but a few have survived. This is connected with the survival rate of the planted tree seedlings that could be affected by many factors such as population growth, animal grazing, high dependency on biomass energy, agricultural expansion, poor governance, policy, and land tenure system of the area. The ambition of the government to build a climate-resilient green economy has played an influential role in mobilizing farmers for watershed works and planting trees on degraded lands. However, even if the culture of planting trees has been improved over time (agree, 53%), still seedling survival is under question in the study area.

As a rule of thumb, the technologies implemented in the watershed as community-based participatory watershed management works must pass through continuous monitoring and evaluation procedures. However, in the study area, as local farmers subjectively responded (disagree, 73%), there was no monitoring and evaluation of technologies implemented in the watershed so far. Due to a lack of continuous follow-up, different watershed works have been malfunctioning in a short period. Field observation carried out by the agricultural office experts in the watershed is rare and does not allow the active participation of the local farmers in monitoring and evaluation of watershed works.

Table 7. Community based participatory watershed management challenges in terms of technology usage in the village (N=300)

No.	Items	Respondent's Response					
		Agree		Neutral		Disagree	
		No.	%	No.	%	No.	%
1	There is appropriate site selection for appropriate SWC measures and tree seedling	94	31.33	24	8	182	60.67
2	High adaptation of technologies by farmers in the village	152	50.67	74	24.67	74	24.67
3	Farmers have strong willing for implementing SWC measures on their farm plot as well as in the communal land.	184	61.33	39	13	77	25.67
4	Any SWC measures constructed by farmers stay for long time in the watershed	56	18.67	80	26.67	164	54.67
5	Farmers have strong will for maintaining SWC measures each year.	236	78.67	17	5.67	47	15.67
6	Farmers have strong motivation for planting tree seedlings on time on her/his farm land and in the common land.	170	56.67	0	0	130	43.33
7	Farmer's habit of planting and caring seedlings has been improved through time.	159	53	39	13	102	34
8	There is continuous monitoring and evaluation of technologies or CBPWM works by farmers	48	16	33	11	219	73

3.3 Opportunities of community based participatory watershed management (CBPWM)

After the CBPWM program was initiated, the output gained by the local farmers from the watershed continued to improve over time and increased their economic and environmental benefits. Many opportunities allowed the implementation of CBPWM works in the study area (Table 8). In the past few years, recurrent drought and population pressure (1000 persons per sq. km) have reduced crop productivity in the watershed. As a result, farmers have shown motivation (55%) to reduce the impact of poverty through managing watersheds. Therefore, the presence of motivated farmers became a milestone for implementing CBPWM works in the country and the study area. Similarly, land degradation in the study area was considered an opportunity (agree, 64.33%) and attracted the attention of the farmers and the local governments. They also indicated that a decline in crop productivity due to land degradation was another case that attracted attention to watershed works.

A high population in the area has created a huge burden on the job opportunity. As a result, inhabitants of the area, especially the youth searching for off-farm jobs outside their area and daily laborers

were engaged in watershed work. However, after implementing CBPWM works, some watersheds have been rehabilitated to a position that produces different goods and services for the people. The local people have used the rehabilitated watershed as an opportunity for job creation, such as fattening, bee-keeping, and small-scale irrigation.

In Ethiopia, the culture of working together is very strong. Many platforms enable farmers to work together, such as *Debo*, *Jigi*, *Edir*, and *Equb*. Moreover, a public campaign in the form of CBPWM carried out each year for watershed works (agree, 71%) in the study area is one platform that manifests the habits of working together. CBPWM work is believed to improve the existing culture of the farmers working together. During the campaign of CBPWM, they close and experience each other, and this creates a good opportunity for skill and knowledge sharing. One farmer from the Wonago area explained that:

Working together enables individual farmers to share skills and knowledge on the types of work under question. Sharing skills enables them not only in the work they engage in but also in sharing some social life. The volume of work is also far greater than individual efforts.

On the other hand, working together does not always have a positive impact. Sometimes, the groups can be easily influenced by members and politicians, and the output may be strange, which is out of expectation. The presence of indigenous knowledge (IK) in

the study area has been considered an opportunity for implementing CBPWM works. More than 50% of the respondents explained that our existing indigenous knowledge is a milestone for today's modern technologies, such as improved SWC practices.

Table 8. Opportunities of Community based participatory watershed management in the village (N=300)

No.	Items	Respondent's Response					
		Agree		Neutral		Disagree	
		No.	%	No.	%	No.	%
1	Presence of Motivated farmers	165	55.00	30	10.00	105	35.00
2	High rate of land Degradation	193	64.33	63	21	44	14.67
3	Presence of Experienced institution	70	23.33	55	18.33	175	58.33
4	Reduced crop land productivity	185	61.67	52	17.33	63	21.00
5	High demand for off-farm job	179	59.67	25	8.33	96	32.00
6	Increased national attention	169	56.33	61	20.33	70	23.33
7	Habits of working together	213	71.00	35	11.67	52	17.33
8	Availability of community indigenous knowledge	160	53.33	65	21.67	75	25.00



Figure 5. Wooden check dams made by the local farmers (Wonago area). Source: Haile, 2017

Researchers portrayed that the majority of the people in the rural area are rich in local knowledge, which they are conserving their environment. In the study area, farmers are well acquainted with traditional agroforestry system management and soil and water conservation measures. Increased attention has been given to indigenous tree species and Enset since they are highly attached to the cultural practices and food

system of the area. The transfer of indigenous knowledge from elders to the juvenile generation ensures the sustainability of the system and its contribution to the modern means of conserving the environment. Therefore, it is recommended to seek ways to understand local wisdom and techniques related to environmental management and integrate this with the modern concepts of natural resource conservation.

3.4 CBPWM and ES awareness

As illustrated in table 9, respondents commonly reported an awareness of provisioning, regulating, supporting, and cultural ecosystem services. The majority of the respondents identified the ES based on the AEZs of the area. Thus, higher crop production (except coffee production) ES were observed by respondents in humid areas. Cereal crops (such as wheat and barley) and Enset (*Ensete ventricosum*) were commonly grown in the highland (humid) part of the study area.

In the semi-humid area, where coffee is predominantly grown, around 91.67% of the respondents were observed as provisioning ES services. However, as observed by the respondents, the semi-arid part of the study area has shown less provisioning services for crop production compared with humid and semi-humid areas. According to the respondents, higher raw material (51.67%) provisioning services were observed in the humid area relative to semi-humid and arid AEZs.

Table 9. Percentage of respondents who identified ecosystem service at their local area

Ecosystem Service	Humid (%)	Semi-humid (%)	Semi-arid (%)
Provisioning Services			
Crop production			
Cereals	71.67	10.00	18.33
Coffee	8.33	91.67	0.00
Enset	80.00	16.67	3.33
Raw material	51.67	23.00	25.33
Livestock feeds	26.67	31.67	41.67
Livestock production	28.33	11.67	60.00
Fuel wood	27.33	30.00	42.67
Fresh water	38.33	55.00	6.67
Natural/plant-derived medicines	34.33	36.67	29.00
Regulating & Supporting Services			
Soil Erosion regulation	19.00	70.00	11.00
Water regulation	21.67	69.00	9.33
Micro-climate regulation	26.67	55.00	18.33
Nutrient cycling	24.33	60.00	15.67
Soil formation	25.00	65.00	10.00
Pollination	18.33	61.00	20.67
Habitat/refugee	33.67	21.67	44.67
Cultural Services			
Recreation service	16.33	64.33	19.33
Spiritual value	30.67	32.33	37.00
Cultural practice	31.67	33.00	35.33
Sense of place	21.00	47.33	31.67
Cultural Heritage	27.00	51.00	22.00
Education and Knowledge of system	26.67	46.00	27.33

Farmers who reside in semi-arid areas have observed higher provisioning services of livestock feed

(41.67%), livestock production (60.0%), and fuel wood (42.67%) relative to humid and semi-humid ar-

eas. However, freshwater (55.0%) and Natural/plant-derived medicines (36.67%) provisioning services in semi-humid areas were higher than in humid and semi-arid areas. Respondent's awareness of regulating and supporting services (Table 9) from ecosystems was low in humid and semi-arid relative to semi-humid areas.

Since agroforestry is the dominant land use type in the semi-humid area, higher amounts of soil erosion regulation, water regulation, micro-climate regulation, nutrient cycling, soil formation, and pollination were observed by the respondents. However, a remarkable number of respondents believed that there were higher services of habitat/refugee (44.67%) in semi-arid parts of the study area. In humid and semi-arid areas, these regulating and supporting ecosystem services were low for two main reasons. These were: (1) there is a continuous expansion of cultivated land at the expense of grazing and forest land uses for a mono-cropping system. (2) Excessive forest cutting for charcoal and timber making.

Respondents in the survey appeared to show and appreciate a spectrum of cultural services derived from ecosystems in different agro-ecological zones. Among these, 64.33%, 47.33%, 51.00%, and 46.00% of respondents appreciated and valued recreation services, sense of place, cultural heritage, education, and knowledge of the system in semi-humid areas. In this area, the higher appreciation of these ecosystem values is due to the presence of an agroforestry system. The area is evergreen and attractive for living. Moreover, the landscape has been in the process of being registered as a World Cultural Heritage on UNESCO for its traditionally managed use of local knowledge. In addition, this culturally managed landscape is becoming the source of education and knowledge systems for many young researchers from different Universities in and outside Ethiopia. A few respondents identified cultural services in humid areas relative to semi-humid and semi-arid areas. On the other hand, a similar awareness level was observed by the farmers (Table 9) residing in humid, semi-humid, and semi-arid areas on spiritual services and cultural practices of ecosystem services. However, relatively a small number of farmers have identified spiritual values (37.00%) and cultural practices (35.33%) in semi-arid areas. In the semi-arid

areas, the ethnic Guji Oromo commonly resides, and this ethnic group has a strong attachment to spiritual and cultural exercises near water bodies and under the trees. Of course, the cultural practice under the tree is also common in the semi-humid area, locally called "*songoo*".

3.5 ES change, its trends and potential restoration measures

Respondents reported a declining supply of provisioning services such as raw material, livestock feeds, livestock production, fuel wood, fresh water, and natural/plant-derived medicines in all AEZs of the study area in the last five to ten years. On the contrary, cereal crop production has increased at the expense of other land use types, such as forest in humid, agroforestry in semi-humid and woodland in semi-arid areas due to high demands for food. However, farmers witnessed that coffee production has been expanding towards humid areas, while it is decreasing in both semi-humid and semi-arid areas.

Enset production has shown no change in humid areas, while it has decreased in semi-humid and semi-arid areas due to pest and disease problems. Farmers also indicated a decline in regulating and supporting ecosystem services in humid and semi-arid areas over the last five to ten years. Soil erosion regulation has declined each time due to the expansion of cultivated land and deforestation. Concerning soil erosion, water regulation, nutrient cycling, and soil formation service have been similarly decreased in the area. Despite these declines, actions taken to maintain ecological functions were limited. Moreover, the trend correlated even with the ineffectiveness of some conservation measures built in the area. In semi-humid areas, as reported by the respondents, change was not observed as it was seen in the humid and semi-arid areas. This is due to a traditionally managed agroforestry system in the areas.

Respondents also reported that cultural services of the ecosystem have declined in the area over the last five to ten years. Of course, even if the ecological functions available in the area are sufficient to deliver the service due to different factors such as modernization and religious effects, the exercises carried out by the people have decreased over time in the area. However, according to the respondent's obser-

vation in the semi-humid area, cultural services have shown no change over the last five to ten years. This is hopefully due to the effects of the agroforestry system in the area. On the other hand, the potential

of the area for education and knowledge services has been increasing over time to understand how the culturally managed agroforestry system contributes to the conservation of natural resources of the area.

Table 10. Trends of ES in the study area

Ecosystem Service	Humid	Semi-humid	Semi-arid
Provisioning Services			
Crop production			
Cereals	↑	↑	↑
Coffee	↑	↑	↓
Enset	↔	↓	↓
Raw material	↑	↓	↓
Livestock feeds	↓	↓	↓
Livestock production	↓	↓	↓
Fuel wood	↓	↓	↓
Fresh water	↓	↔	↓
Natural/plant-derived medicines	↓	↓	↓
Regulating & Supporting Services			
Soil Erosion regulation	↓	↔	↓
Water regulation	↓	↔	↓
Micro-climate regulation	↓	↔	↓
Nutrient cycling	↓	↔	↓
Soil formation	↓	↔	↓
Pollination	↓	↔	↓
Habitat/refugee	↓	↔	↓
Cultural Services			
Recreation service	↓	↓	↓
Spiritual value	↓	↓	↓
Cultural practice	↓	↓	↓
Sense of place	↓	↑	↓
Cultural Heritage	↓	↔	↓
Education and Knowledge of system	↑	↑	↑

Note: ↑ = Increase, ↓ = Decrease and ↔ = No change

3.6 Measure to restore changes and maintain ES

Ecosystem service changes that have occurred in the study area are due to different sources. Some changes are emanated because of changes in livelihood, while others are due to nature. However, to whom the changes are concerned or emanated, the actions taken to curb and maintain ecological functions appeared to be very limited in the study area.

Concerning the specific measures, enacting bylaws and enforcement to regulate access and users is common in areas where communal lands exist to control the behavior of the local farmers in resource consumption. Local bylaws are essential for restoring and maintaining ES by controlling the behavior of the local people. In the study area, almost more than 75% of the local farmers in all AEZs are aware of the importance of bylaws for the sustainability

of ecosystem services. A large number of farmers (N=118) in the humid AEZ have been applying sustainable land management (SLM) compared with semi-humid (N=123) and semi-arid (N=59). In Humid AEZ, farmers are experiencing land degradation, so to curb this problem; they have been applying SLM projects with the help of government offices and NGOs. In the semi-humid area, where agroforestry is dominant, many farmers (N= 161) have used integrated soil fertility management on their farmland to boost crop production. In semi-arid AEZ, since crop cultivation is highly limited to adequate rainfall, applying integrated soil fertility management is almost uncommon for local farmers. On the other hand, technologies like water harvest-

ing, planting multipurpose trees (fast and ecologically friendly), and planting early maturing trees and crops with the capacity to tolerate drought were used by the local farmers in all AEZs with some degree of implementation variations. Farmers in semi-arid AEZ (N=200) were aware of their environment and planted drought-tolerant crops. For soil and water conservation measures, only 39.67% of farmers in humid, 11.67% in semi-humid and 48.67% in semi-arid EAZs practiced to regulate water and promote crop productivity in the area. In semi-humid AEZ, since the area is covered by a traditionally managed agroforestry system, it is uncommon to apply physical SWC measures in a biologically managed environment.

Table 11. Local measures for restoring and maintaining ecosystem service (N=300)

No	Measures	Humid	Semi-humid	Semi-arid
1	Enact bylaw to regulate use or access	90	95	115
2	Water harvesting	88	103	109
3	Use of sustainable land management	118	123	59
4	Integrated soil fertility management	116	161	23
5	Planting fast growing and ecologically friendly trees	110	97	93
6	Planting of early maturing crops and trees	100	100	100
7	Drought tolerate crop variable	45	55	200
8	Applying soil and water conservation	119	35	146

4 Conclusion and Recommendations

The concepts and application of watershed management have been improved through time and have become the main solution for countries challenged by climate change impacts. It is an essential measure for rehabilitating or recovering deteriorated environments, especially in developing countries. For good practical application of watershed management, training, and awareness creation are vital for community mobilization. Based on this, farmers in all study areas were given training and made aware of their problems, such as land degradation, soil erosion, deforestation, soil fertility, etc.

In most surveyed districts, improper land use has affected soil productivity on individually owned lands; communally owned lands were severely degraded and demanded intensive land investment to restore it. Community-based participatory watershed man-

agement (CBPWM) aims to rehabilitate degraded land use types where watershed goods and services are not satisfying the demands of society. To alleviate the mentioned problems, the government has mobilized the community each year through a community campaign to implement different watershed management measures, such as site-specific soil conservation structures. The survey result revealed that farmers changed their perception towards change in environmental conditions since the start of CBPWM. Moreover, their attitude toward the benefits of CBPWM changed significantly over time. This research has identified the main challenges that have limited the successful accomplishment of CBPWM in the study districts. In all districts, there were problems with plan preparation and community participation through understanding the potential capacity of the kebele and woreda. Moreover, there were also challenges in terms of allocation and se-

lecting appropriate and adequate resources for the CBPWM campaign. In addition, the research also identified limitations/challenges in terms of using appropriate and site-specific technologies, such as soil and water conservation measures in all sample districts. In most districts, soil and water conservation (SWC) structure selection, design, construction, and spacing were considered the major problems. Some major errors in SWC measures were the poor stone foundation, bunds with narrow berms, shallow channel depth, and long bund lengths for land users and their animals, such as oxen movement across the farmland. In addition, the effort to repair the broken/sediment-filled structures was poor in all districts and needs attention, which influences the long-term fate of these structures.

On the other hand, the efforts made to support the physical measures with biological measures with tree seedlings and fodder grasses on bunds and degraded lands can be considered excellent land management lessons that have motivated the farmers to participate voluntarily in such labor-intensive tasks each year. On the contrary to the above, the research has also revealed that the CBPWM campaign provided some concrete opportunities to the local farmers, such as motivation of farmers, gaining experience and lessons, increased national attention, and creation of job opportunities for the local farmers (off-farm jobs). The existing culture of farmers working together and their indigenous knowledge have played a tremendous role in making the CBPWM campaign effective, though some problems (such as training, plan preparation, resource allocation, and technology usage) persistently exist.

CBPWM has a positive contribution to the understanding of ecosystem service for the farmers. Based on this, the research has revealed that farmers found in different agro-ecological zone had different awareness levels. Farmers residing in humid areas have a higher awareness of ES, such as crop production (cereals and Enset production) and minimum awareness about coffee production. On the other hand, farmers in the semi-humid areas had more experience in coffee production than cereal crop production. Similarly, farmers in semi-arid areas had higher ecosystem service awareness of livestock production than coffee production. Farmers have witnessed

that after watershed management was implemented, watershed goods and services were improved in the area. However, with some inappropriate management, such as cutting trees and lack of continuous maintenance and modernization), there were changes in the ecosystem services production (provisioning, regulating, supporting, and cultural services) and usage in the study area. Even if CBPWM has been carried out each year, ES (provisioning services such as crop production, raw material, livestock feeds, livestock production, fuel wood, fresh water, and natural/plant-derived medicines) has shown a declining trend over the last seven years in the study area. Similarly, the declining trends of provisioning ecosystem services have also influenced the regulating, supporting, and cultural services of ecosystems in the study area. Restoration of ecosystem services using different methods is different at different agro-ecological zones. Restoration measures such as water harvesting, planting fast-growing trees, early maturing, and drought-tolerant crops are more relevant to semi-arid agro-ecological zones. Similarly, applying SWC measures and using sustainable land management techniques were more relevant for humid agro-ecological zones.

Finally, the voluntary participation of farmers is mandatory for the sustainable management of watersheds and the continuous production of ecosystem services in the study area. Watershed plan preparation should be based on understanding the potential of the area, scheduling appropriate training for farmers, and allocating adequate resources (money, human, and technological) for effective watershed plan implementation requires continuously blending and relying on local farmers' knowledge and scientific measures. This enhances the collaboration between local communities and the scientists. This, in turn, enhances the efficiency of land use management activities and reduces disconnects between the local community and the researchers.

Acknowledgments

We are grateful for the willingness of local farmers who allowed us to carry out interviews and focus group discussions (FGD) in their local area. We also extend our thanks for assistance from the Ministry of Agriculture and Rural Development Office at the Woreda level and Development Agents at the Kebele

level for data collection. Finally, the authors are indebted to Dilla University for the financial support of the study.

Conflict of Interest

The authors declares that there is no conflict of interest.

References

- Kurt, L., 2003. Environmental Assessment Management Framework for the Pastoral Community Development Project. Environmental Resources Management, 1001 Connecticut Ave, NW, Suite 1115, Washington, DC 20036.
- Gebreselassie, S., Juhar, N., Almagaw, A., & Engidawork, A. (2016). Economic Linkage between Pastoralists and Farmers in Ethiopia: Case Study Evidence from Districts in Afar/Amhara and Oromia. 2-35.
- Gebregziabher, S., Mouazen, A.M., Hendrik, V.B., Ramon, H., Nyssen, J., Verplancke, H., Behailu, M., Deckers, J., De Baerdemaeker, J., 2006. Animal drawn tillage, the Ethiopian ard plough, Maresha: a review. *Soil Till. Res.* 89, 129–143.
- Wendemeneh, D., 2010. Characterization and Classification of the Soils of Upper Sala Watershed in Dilla Zuria District of Gedeo Zone, Southern Ethiopia. (M.Sc. thesis) Haramaya University, Natural Resource Management and Environmental Sciences, Ethiopia, pp. 88.
- Marcela, Q., 2009. Effect of Conservation Tillage in Soil Carbon Sequestration and Net Revenues of Potato-Based Rotations in the Colombian Andes. (M.Sc. thesis) University of Florida, USA, pp. 18–30.
- Kippie, T., 2002. Five Thousand Years of Sustainability. A case study on Gedeo Land Use (Southern Ethiopia) (Ph.D thesis) Treemail Publishers, Heelsum, The Netherlands, pp. 295.
- Lakew Desta, Carucci, V., Asrat Wendem-Ageñehu and Yitayew Abebe (eds), 2005. Community Based Participatory Watershed Development: A Guideline. Ministry of Agriculture and Rural Development, Addis Ababa, Ethiopia.
- Gebreghaweria G., 2012. Watershed management in Ethiopia. *Agricultural Water Management Learning and Discussion Brief. AGWATER SOLUTIONS Improved Livelihoods for smallholder farmers*. Available on: awm-solutions.iwmi.org. Accessed on: 25/09/2017, Time: 10:30 am.
- Nigussie, H. A., 2003. Sediment deposition in reservoirs in Tigray (Northern Ethiopia): Modeling rates, sources and target areas for intervention. <http://www.kuleuven.be/geography/frg/staff/41853/index.php>. Accessed on 26/01/2015.
- Woldeamlak, B., 2003. Towards integrated watershed management in highland Ethiopia: the Chemoga watershed case study, PhD dissertation, Wageningen University.
- Kefyalew, A., 2004. Integrated Flood Management WMO and Global Water Partnership, Associated Programme on Flood Management. Editor, technical unit, Ethiopia.
- Mafongoya, P. and Kuntashula, E. 2005. Participatory evaluation of Tephrosia species and Provenances for soil fertility improvement and other uses using farmers' criteria in Eastern Zambia. *Experimental Agriculture*, 41:69-80.
- Franzel, S., Hitimana, L. Akyeampong, E. 1995. Farmers Participation in on-station tree species selection for agroforestry: a case study from Burundi. *Experimental Agriculture*, 31:27-38.
- German, L., Hussein Mansoo, Getachew Alemu, Waga Mazengia, Amede, T. and Stroud, A., 2007. Participatory integrated watershed management: Evolution of concepts and methods in an ecoregional program of the eastern African highlands. *Agricultural Systems*, 94 (2007) 189–204.
- Power, A. G., 2010. Ecosystem services and agriculture: tradeoffs and synergies, Review, Phil. Trans. R. Soc. B (2010) 365, 2959–2971.
- Mendelsohn, R. & Olmstead, S. 2009. The economic valuation of environmental amenities and disamenities: methods and applications. *Annu. Rev. Environ. Resour.* 34, 325–347. (www.doi.org/10.1146/annurev-environ-011509-135201).
- Ranganathan J, Raudsepp-Hearne C, Lucas N, Irwin F, Zurek M, Bennett K, Ash N, West P., 2008.

- Ecosystem services: a guide for decision makers. World Resources Institute, Washington, D.C
- Ralph Winkler, R., 2006. Valuation of ecosystem goods and services Part 1: An integrated dynamic approach, *Ecological Economics* 59: 82 – 93.
- Skourtos, M., Kontogianni, A., Harrison, A., 2010. Reviewing the dynamics of economic values and preferences for ecosystem goods and services, *Biodivers Conserv*, 19:2855–2872.
- Nico Eisenhauer, Pedro M. Antunesc, Alison E. Bennettd, Klaus Birkhofere, Andrew Bissett, Matthew A. Bowker, Tancredi Caruso, Baodong Chen, j, David C. Coleman k, Wietse de Boerl, m, Peter de Ruiter, Thomas H. DeLuca, Francesco Fratip, Bryan S. Griffithsq, Miranda M. Hartr, Stephan Hättenschwilers, Jari Haimit, Michael Heethoffu, Nobuhiro Kanekov, Laura C. Kellyw, Hans Petter Leinaasx, Zoë Lindoy, Catriona Macdonaldz, Matthias C. Rillig A, B, Liliane Ruess C, Stefan Scheu D, Olaf Schmidt E, Timothy R. Seastedt F, Nico M. van Straalen G, Alexei V. Tiunov H, Martin Zimmer I, J, Jeff R. Powellz, 2017. Opinion paper Priorities for research in soil ecology, *Pedobiologia - Journal of Soil Ecology* 63 (2017) 1–7.
- Kabindra Adhikari, K. and Hartemink, A., 2016. Linking soils to ecosystem services - A global review, *Geoderma*. 262:101-111.
- Geneletti, D., 2006. Ecological evaluation of land: some considerations on approaches and shortcomings. *Int. J. Sus. Dev. Plann.* Vol. 1, No. 4: 419–428.
- De Groot RS, Wilson MA, Boumans RMJ, 2002. A typology for the classification, description and valuation of ecosystem functions, goods and services. *Ecological Economics*. 41:393–408.
- Lal, R., 2003. Soil erosion and the global carbon budget. *Environment International*. 29: 437–450.
- Gyssels G, Poesen J, Bochet E, Li Y (2005) Impact of plant roots on the resistance of soils to erosion by water. *Progress in Physical Geography*. 29(2):189–217.
- Tesfaye Habtamu, 2011. Assessment of sustainable watershed management approach case study
- Lenche Dima, Tsegur Eyesus and Dijil Watershed. MSc thesis, Faculty of the Graduate School of Cornell University.
- Waga Mazengia, Deribe Gamiyo, Tilahun Amede, Matta Daka & Jermias Mowo, 2007. Challenges of Collective Action in Soil and Water Conservation: The Case of Gununo Watershed, Southern Ethiopia. *African Crop Science Conference Proceedings* Vol. 8: 1541-1545.
- Mark R. Wade, M. R., Geoff M. Gurr, G.M., and Steve D. Wratten, S.D., 2007. Ecological restoration of farmland: progress and prospects. *Phil. Trans. R. Soc. B*: 363, 831–847 www.doi.org/10.1098/rstb.2007.2186.
- Romanekas, K., Romanekien, R., Štarauskis, E., Pilipavius, V., Sakalauskas, A., 2009. The effect of conservation primary and zero tillage on soil bulk density, water content, sugar beet growth and weed infestation. *Agron. Res.* 7, 73–86.
- Mosaddeghi, M.R., Hajabbasi, M.A., Hemmat, A., Afyuni, M., 2000. Soil compactibility as affected by soil moisture content and farmyard manure in central Iran. *Soil Till. Res.* 55, 87–97.
- Marcela, Q., 2009. Effect of Conservation Tillage in Soil Carbon Sequestration and Net Revenues of Potato-Based Rotations in the Colombian Andes. (M.Sc. thesis) University of Florida, USA, pp. 18–30.
- Haile, K. and Fantaw, Y., 2014. Soil property variation under agroforestry based conservation tillage and maize based conventional tillage in Southern Ethiopia. *Soil & Tillage Research*. 141: 25-31.
- Tariku Negasa, Haile Ketema, Abiyot Legesse, Mulgeta Sisay and Habtamu Temesgen, 2017. Variation in soil properties under different land use types managed by smallholder farmers along the toposequence in southern Ethiopia. *Geoderma*. 290: 40–50.
- Alan J. Duncana, *, Fantu Bacheweb, Kindu Mekonnen, Diego Valbuenaa, c, Gedion Rachierd, Dagnachew Lulee, Mesfin Bahtaf, Olaf Erensting, 2016. Crop residue allocation to livestock feed, soil improvement and other uses along a productivity gradient in Eastern Africa. *Agriculture, Ecosystems and Environment*. 228:101–110.

- Mathukia, R.K., Sagarka, B.K. and Panara, D.M., 2016. Fodder production through agroforestry: a boon for profitable dairy farming. *Innovare Journal of Agri. Sci*, Vol 4, Issue 2, 13-19.
- Mengistu Alemayehu, Tilahun Amede, Böhme, D, Peters, K. J., 2013. Collective management on communal grazing lands: Its impact on vegetation attributes and soil erosion in the upper Blue Nile basin, northwestern Ethiopia.
- Ferreira Araujo, Ademir Sérgio; Leite Carvalho; Luiz Fernando; de Freitas Iwata; Bruna; de Andrade Lira Jr, Mario; Xavier Ribeiro, Gustavo & do Vale Barreto Figueiredo, Márcia (2011). Microbiological process in agroforestry systems, A review. *Agron. Sustain. Dev.* (2012), 32, 215-226. Springer.
- Zake, Joshua; Pietsch, Stephan A.; Friedel, Jürgen K. & Zechmeister-Boltenstern, Sophie (2015). Can agroforestry improve soil fertility and carbon storage in smallholder banana farming systems? *Journal of Plant nutrition and Soil Science* (2015), 178, 237-249.
- Bagyaraj, D.J.; Thilagar, G.; Ravisha, C.; Kushalappa, C.G.; Krishnamurthy, K.N & Vaast. P (2015). Below ground microbial diversity as influenced by coffee agroforestry systems in the Western Ghats, India. *Agriculture, Ecosystems and Environment* (2015), 202, 198-202. Elsevier.
- Ambaye, D.W., 2015. Land Rights and Expropriation in Ethiopia, Doctoral Thesis in Land Law, Springer Theses, www.doi.org/10.1007/978-3-319-14639-3_2.
- Melesse Temesgen, 2007. Conservation Tillage Systems and Water Productivity Implications for Smallholder Farmers in Semi-arid Ethiopia. (Ph.D. thesis) Delft University of Technology, The Netherlands, pp. 132.
- Andersson, E., Brogaard, S. & Olsson, L. 2011. The political ecology of land degradation. *Annual review of environment and resources*, 36, 295-319.
- Azene, B.-T. & Kimaru, G. 2006. Participatory watershed management: Lessons from RELMA's work with farmers in eastern Africa. *RELMA, ICRAF, Nairobi*.
- Bewket, W. 2003. *Towards integrated watershed management in highland Ethiopia: the Chemoga watershed case study*, PhD dissertation, Wageningen University.
- Economy, C. R. G. 2011. Ethiopia's Climate Resilient Green Economy: Green Economy Strategy. *Addis Ababa: FDRE*.
- Gebreawerria, G., Dereje, A. A., Girmay, G., Gior-dano, M. & Langan, S. 2016. An assessment of integrated watershed management in Ethiopia. *IWMI Working Paper*.
- German, L., Mansoor, H., Alemu, G., Mazengia, W., Amede, T. & Stroud, A. 2007. Participatory integrated watershed management: Evolution of concepts and methods in an ecoregional program of the eastern African highlands. *Agr. Syst.*, 94, 189-204.
- Habtamu, T. 2011. Assessment of sustainable watershed management approach case study lenche dima, tsegur eyesus and dijjil watershed. MSc Thesis, Cornell University, USA.
- Kanshie, T. 2002. *Five thousand years of sustainability? A case study on Gedeo land use (Southern Ethiopia)*. Wageningen Agricultural University. Ph. D. Dissertation. Wageningen.
- Ketema, H. & Yimer, F. 2014. Soil property variation under agroforestry based conservation tillage and maize based conventional tillage in Southern Ethiopia. *Soil Till. Res.*, 141, 25-31.
- Mellor, J. W. & Dorosh, P. 2010. Agriculture and the Economic Transformation of Ethiopia *ESSP2 Working Paper 010*
- Miheretu, B. A. & Yimer, A. A. 2017a. Determinants of farmers' adoption of land management practices in Gelana sub-watershed of Northern highlands of Ethiopia. *Ecological Processes*, 6, 19.
- Miheretu, B. A. & Yimer, A. A. 2017b. Determinants of farmers' adoption of land management practices in Gelana subwatershed of Northern highlands of Ethiopia. *Ecological Processes* 6.
- Moreda, T. 2018. Contesting conventional wisdom on the links between land tenure security and land

- degradation: Evidence from Ethiopia. *Land Use Policy*, 77, 75-83.
- Negasa, T., Ketema, H., Legesse, A., Sisay, M. & Temesgen, H. 2017. Variation in soil properties under different land use types managed by small-holder farmers along the toposequence in southern Ethiopia. *Geoderma*, 290, 40-50.
- Perkins, P. E. E. 2011. Public participation in watershed management: International practices for inclusiveness. *Physics and Chemistry of the Earth, Parts A/B/C*, 36, 204-212.
- Singh, C. 2017. Is Participatory Watershed Development Building Local Adaptive Capacity? Findings from a Case Study in Rajasthan, India. *Environmental Development*.
- Temesgen, H., WU, W., Eshetu, Y., Belewu, B. & Mengistie, K. 2018. Variation in Ecosystem Service Values in an Agroforestry Dominated Landscape in Ethiopia: Implications for Land Use and Conservation Policy. *Sustainability*, 10, 1126.
- Teshome, A., de Graaff, J. & Kessler, A. 2016. Investments in land management in the north-western highlands of Ethiopia: The role of social capital. *Land Use Policy*, 57, 215-228.
- Vogl, A. L., Goldstein, J. H., Daily, G. C., Vira, B., Bremer, L., McDonald, R. I., Shemie, D., Tellman, B. & Cassin, J. 2017. Mainstreaming investments in watershed services to enhance water security: Barriers and opportunities. *Environmental Science & Policy*, 75, 19-27.
- Wolanchu, K. W. 2015. Evaluating watershed management activities of campaign work in Southern nations, nationalities and peoples' regional state of Ethiopia. *Environmental Systems Research*, 4, 6.
- Perkins, P. E. E. 2011. Public participation in watershed management: International practices for inclusiveness. *Physics and Chemistry of the Earth, Parts A/B/C*, 36, 204-212.
- Andersson, E., Brogaard, S., Olsson, L., 2011. The political ecology of land degradation. *Ann. Rev. Environ. Resour.* 36, 295–319.

Effects of Community Based Watershed Management on Rural Livelihoods: The Case of Lume Woreda, East Shewa Zone, Oromia, Ethiopia

Getinet Mideksa Aredo¹, Hurgesa Hundera Hirpha^{*2}, Tesfaye Genamo Genebo²,
and Teshome Beyene Leta²

¹ Agricultural Transformation Institute (ATI), Oromia, Addis Ababa, Ethiopia, P.O.Box. 708.

² Arsi University, College of Social Sciences and Humanities, Department of Geography and Environmental Studies,
Arsi, Bekoji campus, P.O.Box. 9, Ethiopia.

^{*}Corresponding author, Email: hurgesa@gmail.com

Received: 08th August 2023

Accepted: 19th September 2023

©2023 Dilla University. All Rights Reserved

DOI: 10.20372/ejed.v05i1.04

Abstract

In Ethiopia, natural resource degradation is worsening and posing significant risks, especially to the livelihoods of rural communities. Community-based watershed management is fundamental for managing natural resource degradation and minimizing its associated risks on the livelihoods of rural communities. The main objective of this study was to examine the effects of community-based micro watershed management on rural livelihoods. The study used descriptive survey research design to achieve the intended objectives and employed quantitative and qualitative data. The total sample size of 251 respondents was taken using a systematic random sampling technique from a study population of 2595 households inhabited in four selected Kebeles. A questionnaire, interviews, field observation, and document analysis were used to collect the data. Besides, statistical methods such as percentage of frequencies, mean, standard deviation, bar graphs, paired sample t-test, and chi-square test were used in data analysis. Results show that there was a statistically significant difference in crop productivity before and after interventions of community-based watershed management practices ($p=0.05$). The findings also demonstrated that the livelihoods of the rural community were improved in terms of food availability, income, annual saving capability, and household affordability for medical care. Qualitative data results also proved that the trend of community-based micro watershed management adoption, different activities were consistently practiced by the community and demonstrated an improvement in area coverage for conservation structures. Consequently, the household heads gained knowledge and experience via the process, enabling them to have a favorable perspective on watershed management measures and their impacts. Contrarily, the result added that some challenges were observed in reducing the improvement of livelihoods, such as lack of management and maintenance of previously conserved micro watersheds, less protection of conserved watersheds from animal and human interference, inadequate follow-up, and low integration between sectors. It can be concluded that intervention in watershed management significantly improved the rural community's livelihoods. It is recommended that improvement in the practice of community-based watershed management is necessary. Therefore, the agriculture and natural resource management office of the woreda should mobilize and coordinate the community and other relevant resources. These actions are also vital for addressing the challenges observed in the watershed management activities.

Keywords/Phrases: Community based, Lume Woreda, Rural Livelihoods, Watershed

1 Introduction

Natural resources are the basis for the sustenance of the poorest people in many developing countries. The world's poorest people who live in rural areas depend on natural resources for their livelihoods (World Bank, 2018). The general economy and standard of living in developing nations like Ethiopia depend on the productivity of their land (Gezahegn *et al.*, 2018). However, the most productive topsoil layer is degraded by erosion and poor conservation practices, causing a reduction in agricultural production, which results in significant risks to rural communities.

According to Wang *et al.* (2016), the watershed management approach has emerged to deal with the complex challenges of natural resource management and alleviate associated problems. The development of watershed planning in Ethiopia started in the 1980s for implementing natural resources conservation and development programs. Since then, the majority of non-governmental groups and the government have centered their efforts on the watershed logic for rural development (Lakew *et al.*, 2005). Eyasu (2002) and Bekele (2003) reported that the approach at the time was top-down in implementation and mainly focused on engineering measures for reducing soil erosion.

However, the large watersheds' selection for implementation, which was difficult to manage, and the top-down planning approach, where a range of interventions remained limited, made the program less effective (MOAE, 2005). The approaches neglected post-rehabilitation management aspects and disregarded local knowledge, socioeconomic conditions, and available resources. Realizing these limitations, the government launched Community-Based Micro Watershed Management (CBMWM) in the early 2000s to accomplish integrated natural resource management and livelihood enhancement goals (MOAE, 2005). Following such interventions, the best practices from the programs for the Tigray and Oromia regions were partially studied and documented.

Literature sources indicate that one of the main causes of unstable livelihoods is the destruction of natural resources, which is exacerbated by rising population and climate change (WARD0, 2013). These

factors mainly affect the rural communities whose livelihoods mainly depend on utilizing natural resources. The livelihood of rural communities depends primarily on agricultural production for food and to meet the economic demands of their families. Based on this, in recent years, intensive efforts have been made by the government of Ethiopia to implement CBMWM practices to improve the livelihoods of rural communities through conservation activities. However, the extent to which these resources are conserved, protected, and managed determines the levels of livelihood improvement of the rural community and, thereby, sustaining the program. The efficiency of conservation measures varies from place to place, as discussed in different literature. For instance, multiple positive effects like reduction in soil erosion and improvement in soil fertility, soil moisture, and crop yield were recorded due to the intervention of CBMWM in Gemechis *Woreda* of Oromia region (Dejene and Etefa, 2018). A study in central zones of southern Ethiopia indicated that integrated watershed management is a method of continuous restoration, growth, and efficient use of available natural resources in a watershed and a multidisciplinary approach to offset soil depletion (Mekonen and Fekadu 2015).

The research findings of Abebe (2015) showed that natural resource conservation has contributed to improving rural livelihoods in the Tigray region. The same study added that some of the contributions were alternative income generation through honey production and growing vegetables and crop production improvements. However, the benefits were not adequate due to free grazing and conflicts over communal lands. On the other hand, research conducted by Demesew *et al.* (2020) showed that the efficiency of conservation measures in the watershed over periods was assessed as being ineffective in the humid highlands of Ethiopia, while the implemented measures were effective in preventing soil erosion in the semiarid highlands of Tigray region.

Recently, other studies conducted in different parts of the country showed that Watershed Development achievements (WSD) were not effective. Likewise, the study in southwestern Ethiopia addressed that lack of effective community engagement, poor technology implementation, insufficient policy, lack of

stakeholder participation, and lack of ownership strongly contribute to the failure of CBMWM practices (Meshesha & Birhanu 2015). In south-east zones of Ethiopia, it was reported that all the stone bunds in watershed management were lost due to lack of maintenance and overgrazing (Tiki *et al.*, 2016). Similarly, studies carried out by Gebremariam & Desalegn (2018) on farmers' perception of integrated watershed management at the Maego watershed in North Ethiopia and research by Meseret and Gashaw (2021) on trends of community-based interventions on sustainable watershed development in the Gumara watershed in the north Ethiopian highlands showed ineffective projects.

Hence, the community withdrew from conservation efforts, even on their farmlands, due to the deterioration of the quality and standards of installed measures by the campaign. From this point of view, it is difficult to expect the benefit of WSD activities in the long term (Meseret & Gashaw, 2021). These studies

have shown that the level of livelihood improvement brought as a result of CBMWM differs from place to place; pointing out the need for many studies to be done in divergent research areas because each watershed has a unique set of issues. On the other hand, the effects of CBMWM have not been well evaluated and documented in the study area, though it has been widely implemented for years. Indeed, the rural community livelihood in the study area is still low despite the implementation of CBMWM. Hence, the objective of the study was to evaluate the effects of CBMWM practices on the livelihoods of rural communities and trends in implementing management practices in Lume Woreda in the East Shoa zone of Oromia regional state in Ethiopia.

2 Materials and Methods

2.1 Description of the Study Area

The study was conducted in Lume 'Woreda', East Shoa Zone of Oromia Regional state, Ethiopia.

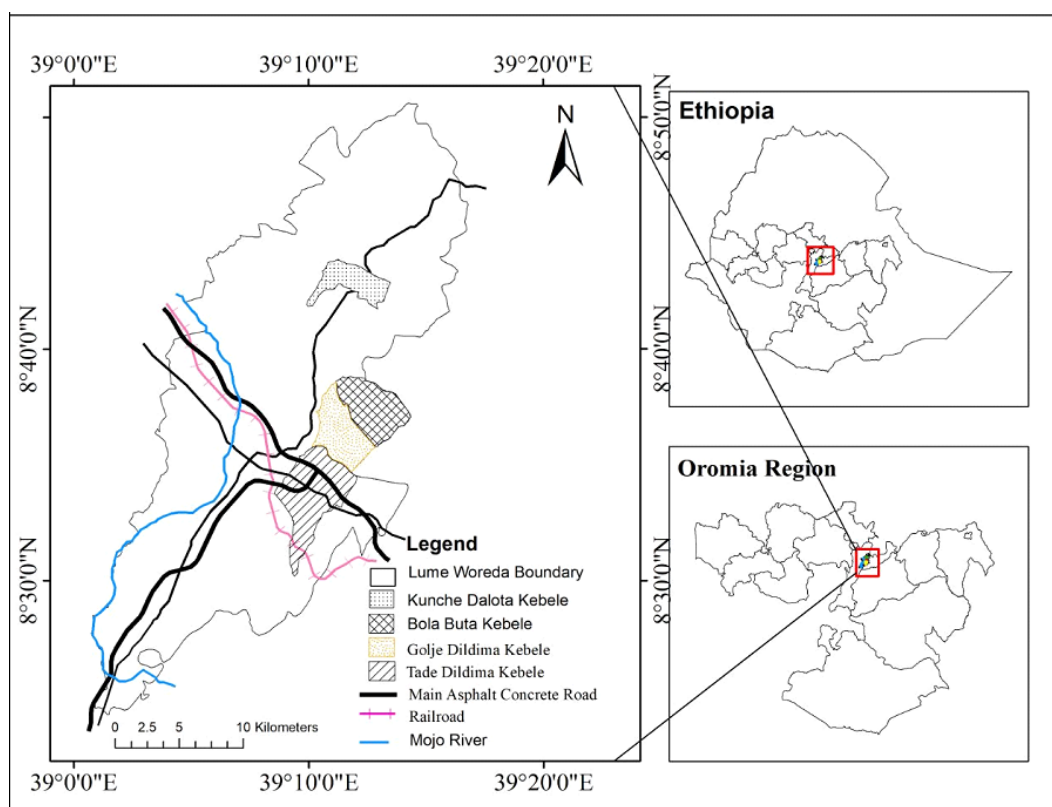


Figure 1. Location Map of Lume Woreda and survey area. (Source: developed using CSA (2007) and ArcGIS 10.8 version software)

Astronomically, the *Woreda* lies between 8°22'30"N to 8°50'42"N and 39°01'30"E to 39°15'35"E with altitude ranges from 1500 to 2300 m.a.s.l. Lume *woreda* is located in the Great East African Rift Valley system, at about 75 kilometers Southeast of Addis Ababa. The *woreda* is bounded on the South by the Koka Reservoir, on the West by Adea *woreda*, on the South-west by Liben Chukala *woreda*, on the North-west by Gimbichu *woreda*, on the North by the Amhara Regional state, and on the East by Adama and Boset *woredas*. The *woreda* spans 65,130 hectare.

Lume *woreda* receives an average annual rainfall of 500 to 1200 mm. The distribution of rainfall is weakly bimodal and starts with small rains from March/April to May, and the main rainy season extends from June to September (Lume Woreda Agriculture and Natural Resource, 2013). The average annual temperature is 18-280 °C. The *woreda* agro-climatic zone comprises 30% highland, 45% mid-highland, and 25% moist lowland. Considering the population and housing census carried out in 2007, the total population of the *Woreda* is increasing yearly by about 2.9%, and the projected population number of the *Woreda* by 2020 was 176,545 (CSA, 2020). The *woreda* has 35 rural *kebeles* and has 5 urban *kebeles*, covering around 675.15 km², and having a population density of 261.5 individuals per km².

2.2 Data Sources and Types

The study adopted a descriptive survey research design with both quantitative and qualitative approaches. The study population was 2595 rural households found in four selected *kebeles*, represented by household heads who are decision-makers concerning farming and conservation activities.

The researchers used primary and secondary data sources. Hence, primary data was collected from a survey of sample households, interviews with officials, development agents (DA), and representatives of *Kebele* watershed committees, and observation in the field. Secondary data was generated by reviewing unpublished documents, such as reports from the Woreda Agricultural Office, Market & Trade Development Office, and Health Office, which were relevant to addressing the research question.

2.3 Sample Size Determination and Sampling Technique

For sample size determination, Yamane formula at a 94% confidence level was used. The sample size was determined as follows:

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

Where “*n*” is the sample size, “*N*” is the population size (household heads) of four *Kebeles*, and “*e*” is margin of error. When substituting the above equation:

$$n = \frac{2595}{1+2595(0.06)^2} = 250.9$$

Therefore, a total sample size of two hundred fifty-one (251) respondents was selected. In line with this, the allocated sample size to each *Kebele* was calculated through proportional allocation methods (Cochran, 2002) as follows. Where *n_i* = the required sample size from each selected *Kebele*; *N_i* = total number of households in each selected *Kebele*; *N* = total number of households, in all selected *Kebele*; and *n* = total sample size from the study population. Additionally, the researchers selected 4 experts from the Woreda agriculture office who work on natural resources 4 *Kebele* watershed committee representatives (one from each sample *Kebele*) 2 elders, and 4 DAs for KII (Key informant interview).

The study involved different sampling techniques. Out of 35 *Kebeles* in the Woreda, four *Kebeles* were selected purposively because CBMWM practices have been implemented and well managed in these selected *Kebeles* than in other *Kebeles* in the Woreda, their accessibility for transportation, and they are relatively nearby to conduct the study.

To select individual households for the survey, a systematic sampling technique was used where only the first unit of the sample was chosen at random, and the remaining units were chosen at predetermined intervals from the sampling frame (Thomas, 2020). Accordingly, lists of households from selected *Kebeles* were collected. The first household was selected randomly from households in the list. Then, using the formula, every 10th household was selected. This was done to spread the samples more evenly over the entire household.

2.4 Data Collection Methods

The questionnaire was prepared mainly to address the specific objectives of the research. It was divided into five sections: personal and socioeconomic characteristics; the effects of community-based micro watershed management on the livelihood of rural communities; trends in the implementation of CBMWM practices; perceptions of the community on their livelihood improvement due to CBMWM, and challenges that hinder the success of community-based micro watershed management. The questionnaire had closed and open-ended items to collect quantitative and qualitative data. Before distributing the questionnaire to the respondents, it was piloted on 12 households to check for alignment and clarify confusion. The interviews were conducted in local languages.

The respondents were given a brief explanation of the purpose of the study and its merit so that they were able to respond accordingly to the target. The enumeration was done by research assistants, and all the assistants were closely supervised throughout the data collection process. Finally, out of 251 households, 247 (98%) filled out and returned the questionnaire. According to Macfarlan (2014), key informant interviews refer to interviewing people who have informed perspectives on an aspect of the issue being evaluated. The key informant interview was carried out sequentially after completing the questionnaire.

Data can be gathered through observation by keeping an eye on people or events. A participatory observation technique that enables us to communicate with stakeholders about what is observed was undertaken to answer research questions. In order to triangulate the quantitative data, field observation was employed to track the actual practical application of CBMWM on the ground and its effects on rural populations' livelihoods. Photographs of some conservation structures and income-generating activities were taken and discussed. Procedurally, the survey data instrument was tested by pilot study to check its validity in the study.

Secondary data were also collected from government offices' reports and other documents related to the study. Accordingly, basic data such as the topogra-

phy feature, land use system, demography and socioeconomic conditions, average crop productivity, the status of implementation of watershed management practices, and its trend were collected from the Woreda Agriculture office. The climatic data on temperature and rainfall distribution was gathered from the Ethiopian metrological agency of Adama branch. Similarly, the Woreda Health and Trade Offices provided community-based health insurance data and the average price of the main crops, respectively, which were used in the analysis of research results.

2.5 Data Analysis

To analyze quantitative data, descriptive statistics such as mean, standard deviation, and percentage were employed. The data analyzed by descriptive statistics were demographic characteristics, the trends of implementation of CBMWM, and challenges that hinder the success of CBMWM toward livelihood improvement.

Furthermore, inferential statistical techniques such as paired sample t-tests and chi-square tests were also employed as a set of tools in this study. Paired sample t-test was used to compare the mean score on some continuous variables from two data sets (Kennedy, 2016). In this study, a paired sample t-test was used to analyze the changes in scores for livelihood improvement tested before watershed management intervention and after intervention. This was assessed by surveying the total annual income of respondents before and after the intervention. Also, a chi-square test was used for categorical variables to explore relationships between improvements due to CBMWM and farmers' perceptions. Qualitative data obtained from open-ended questionnaires, interviews, and observations were analyzed and described through concepts and opinions qualitatively using narratives.

2.6 Research Ethical Consideration

This study was conducted under universal research ethical standards. Ethical and legal standards of research were maintained. A letter of permission was obtained from the Lume Woreda Administration to conduct the study in the selected *kebeles*. Oral communications were made with the research participants before the onset of data collection. How-

ever, the researchers refrained from overstating the purposes and implications of the study for agitating the participants. In the questionnaire survey, respondents were given the freedom to respond to the questions with their willingness. During qualitative data collection, ethical elements such as respect for humanity, confidentiality of personal ideas, respect for privacy, and freedom of attitude expression were maintained.

3 Results and Discussions

3.1 Demographic and Socioeconomic Characteristics of the Respondents

Results in table 1 revealed that among the respondents, 93% were males and 7% were females, implying that watershed management is more labor intensive and the participation of females is higher in indoor activities.

Table 1. Demographic & socioeconomic characteristics of the respondents (N=247)

Variables	Category	N	%
Sex	Male	230	93
	Female	17	7
	Total	247	100
Education level	Unable to read and write	49	20
	Able to read and write	127	51
	Grade 1-4	36	15
	Grade 5-8	24	10
	Grade 9-12	11	4
	Total	247	100
Marital Status	Single	15	6
	Married	218	88
	Widowed	3	1
	Divorced	11	5
	Total	247	100
Household livelihood activities	Agriculture	229	93
	Agriculture & Trade	18	7
	Total	247	100
Land ownership	Owned	186	75
	Rented	61	25

Source: Own computation from the household survey, May 2022

In addition, CSA (2012) states that the proportion of women-headed households in Ethiopian rural areas is less than one-sixth due to socially connected factors. This figure shows variations from place to place owing to many factors like awareness, employment, social norms, and duties in the family system. The marital status results showed that most of the respondents (88%) were married, which is an important element for practicing watershed management as it is additional input during watershed practice. It was also noted that 93% of the respondents' livelihood activities were agriculture and 7% were agriculture

and trade activities in combination, indicating that if the watershed environment is protected, it will initiate their livelihoods gradually. Moreover, the results revealed that 75% of the respondents owned farmland, and 25% plowed rented land. Private farmland ownership probably initiates the participation of farmers in watershed management activities. Almost 80% of the respondents were able to read and write. This ability helps the community understand the awareness of implementing watershed management practices and enhances the utilization of improved agricultural technologies. This finding goes

with research findings, which stated that education improves a person's capacity to recognize and react to novel situations and their skill set, which includes the effective use of agricultural inputs (Mondala *et al.*, 2012).

3.2 Trend of Community Based Micro Watershed Management Practices

This study considered trends in the application of WSD activities and community involvement in the activities. The long-term viability of the watershed development program is crucial for improving the livelihood of smallholder farmers (Meseret & Gashaw, 2021). Regarding the trends of farmers' participation in CBMWM, most of the respondents

(83%) agreed that there is a constant trend of improvement, whereas 14% were neutral and 2% disagreed. Furthermore, 7% of sample households rated their interest in watershed management practices as good, 71% as medium, and 21% as poor. The sample survey results revealed that the trend of watershed management practice shows improvement in area coverage, for which 89% of the respondents agreed, while 10% were neutral, and 1% disagreed. This result implies that the participation of households in the CBMWM revealed improvement in realizing the work targets for the long-term protection of the resource base. This participation enhances their awareness of watershed management and its associated benefits.

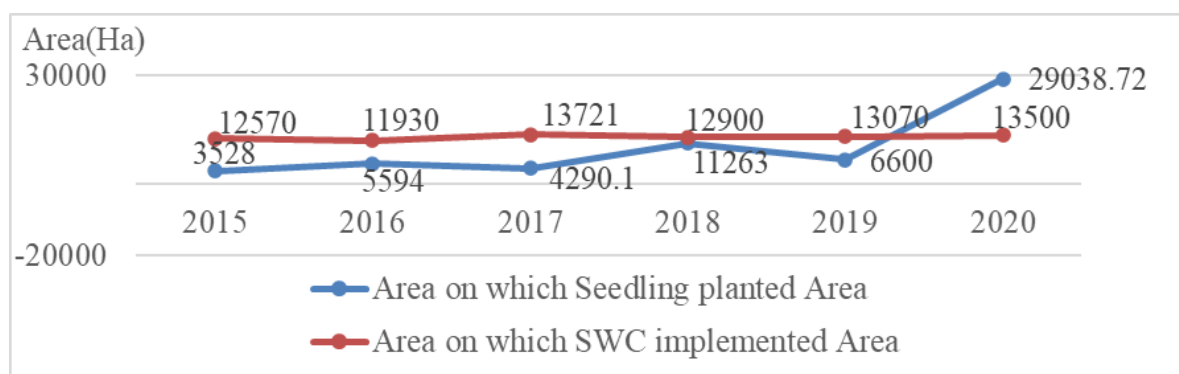


Figure 2. Trends in the area covered by conservation and the number of seedlings planted. (Source: Lume Woreda Agriculture and Natural Resource Office)

Moreover, the data in figure 2 illustrates the trends of achievement for different years in area coverage, which nearly supports the research findings explained above. According to key informants and experts interviewed, the reason for the increase in plantation achievements from 2019 onwards was the country's green legacy agenda and the resultant movements.

3.3 Effect of CBMWM to the livelihood of rural community

3.3.1 Effect of CBMWM to crop productivity and production

Results of the Paired sample t-test in table 2 reveal that the average productivity of 'Teff' before and after the intervention is 13.31 and 16.99 quintals, with a standard deviation of 3.76 and 4.03, respectively. Additionally, the mean difference between the Teff production before and after the intervention is

3.68 quintals. Similarly, the average productivity of Wheat before and after the intervention is 19.41 and 25.02 quintals. Also, the mean difference between the Wheat production before and after the intervention is 5.61 quintals. Moreover, the average productivity of Beans before and after the intervention is 14.51 and 17.68 quintals. Again, the mean difference in Beans production before and after the intervention was 3.17 quintals. In addition, the average productivity of Maize before and after the intervention was 21.05 and 28.89 quintals. The mean difference in Maize production before and after the intervention was 7.84 quintals. Finally, the results revealed that there is a statistically significant difference in crop productivity before and after the interventions, as the p-values of all pairs (0.000). These results have significant implications for rural households whose survival depends primarily on agricultural production, both for food and to meet the economic demands of their families.

Table 2. Main crop production in quintal before and after CBMWM intervention (N=247)

Variable	Mean	Mean difference	T-Value	P-Value
<i>Teff</i> production before intervention	13.31 (± 3.760)	3.68	21.84	0.000
<i>Teff</i> production after intervention	16.99 (± 4.029)			
Wheat production before intervention	19.41 (± 5.610)	5.61	17.19	0.000
Wheat production after intervention	25.02 (± 6.536)			
Bean production before intervention	14.51 (± 4.981)	3.17	16.89	0.000
Bean production after intervention	17.68 (± 5.553)			
Maize production before intervention	21.05 (± 6.374)			
Maize production after intervention	28.89 (± 5.826)			

Source: Own computation from the household survey, May 2022

As indicated in table 2 above, there is a statistically significant difference between before and after interventions of the main crops, *Teff*, Wheat, Bean, and Maize productivity in the study area since the p-values of all pairs (0.000) were less than 0.05, which were supported by the views of the local communities. Thus, according to the interviews, the increase in crop production was attributed to the introduction of watershed management activities like physical and biological structures, which contributed to the improvement of soil moisture availability reduction in soil erosion, and the enhancement in the utilization of improved agricultural technologies and practices adopted by farmers who were assisted by the training given in watershed management programs which have similar sense with the findings of Haregeweyn *et al.* (2008). Haregeweyn and her co-researchers state that watershed management practice at the micro level is essential for improving the performances of the ecosystem, like reducing sedimentation problems in different reservoirs and improving the water table of the surrounding areas, thereby enhancing the quality of springs and streams. Furthermore, it increases the capacity of the land to support and produce sufficient yield of cereal crops. It was observed that utilization of these components with conservation activities improves productivity per unit area of land. The findings of this study are in line with Tamirat *et al.* (2018), who described that most of the conservation practices introduced through CBMWM campaigns were able to reduce soil erosion and increase crop yields.

3.3.2 The effect of soil and water conservation in improving productivity

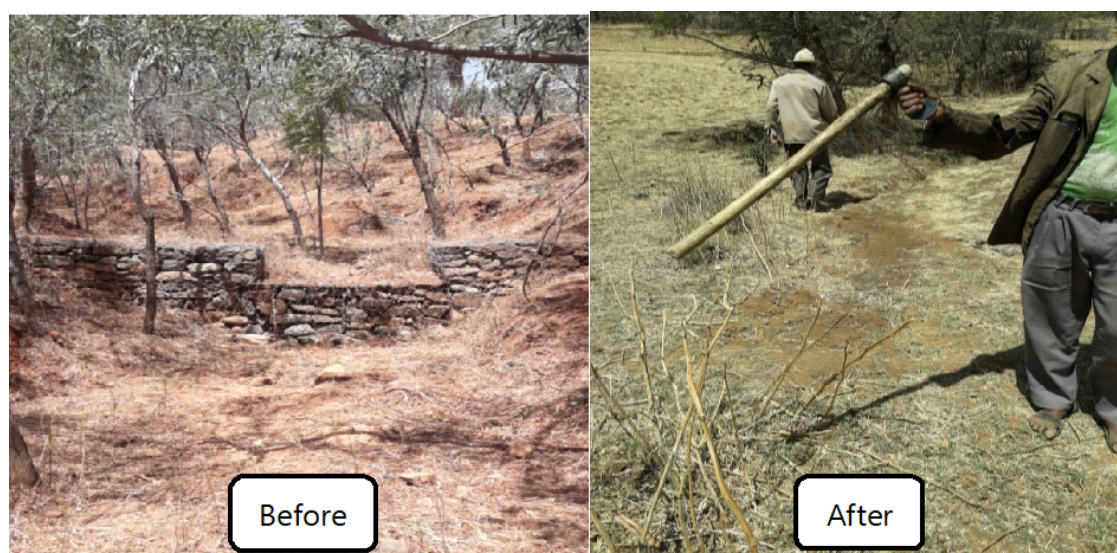
The results of respondents presented in Table 3 showed that 85% agreed, 14% strongly agreed, and 1% of the sample household heads responded neutral with the reduction of soil erosion after watershed management practices. Furthermore, the results revealed that most respondents (84%) agreed, 7% strongly agreed, and 9% were neutral on the improvement in vegetation coverage after watershed management. The response of sample households (96%) showed that there was an improvement in the change of gully-affected areas to productive land after watershed management intervention.

The protection of soil from being washed away by erosion due to different watershed management activities like gully treatments and planting of trees play a substantial role in improving the productivity of crops. During field observation (Figure 3), it was realized that management practices changed degraded and gully areas into lands that can produce forage crops, grasses, and trees serving different purposes in the study area. Because of the implementation of moisture-saving structures on the hill or upper site, there was an improvement in soil moisture. Especially at downstream sites, as the farmers expressed, there is an increase in the height of their crops in the field, and ultimately, agricultural productivity and environmental conditions of the study area are improved sustainably.

Table 3. CBMWM's role in addressing soil erosion & gully problems (N=247)

Variables	Category	N	%
Soil erosion decreased	Strongly agree	35	14
	Agree	209	85
	Neutral	3	1
	Total	247	100
	Improved	238	96
Change of gully area to productive land intervention	No Improvement	9	4
	Total	247	100
	Strongly agree	17	7
Vegetation coverage improved after watershed management	Agree	207	84
	Neutral	23	9
	Total	247	100

Source: Own computation from the household survey, May 2022

**Figure 3.** Conservation structure in Bola Buta Kebele. (Photo taken by the first author May 2022)

This was consistent with the study conducted by Abiyot *et al.* (2018), which explains how CBMWM improves biodiversity, raises soil fertility, lowers soil loss, and helps mitigate climate change. Figure 3 shows constructed check dams and plantations of soil-conserving trees used to reduce soil erosion and protect the washing away of soil from the farmland. Due to this, the washed-away soil from the upper stream is retained and deposited in between structures along the way, forming stable land.

3.3.3 The role of CBMWM program in the utilization of Agricultural technology

Figure 4 shows that 85% and 7% of respondents agreed and strongly agreed, respectively, on the improvement in the utilization of agricultural technologies after watershed management, while 7% were neutral and 1% disagreed. This result implies that most of the respondents observed improvement concerning the use of agricultural technologies following the watershed development activities, which in turn results in crop improvements.

As indicated by Arslan *et al.* (2020), the term "technology" is used in this context to refer to improved germplasm, fertilizer, and improved agronomic practices because watershed has those components to improve rural livelihood through resource conservation and management measures like moisture conservation, crop rotation, and intercropping.

According to the key informants' interview, it was stated that watershed management activities enhanced the proper utilization of improved agricul-

tural technologies like improved crop varieties and improved farming practices such as row planting, crop rotation, and intercropping by farmers, which helped them improve productivity. The study conducted by Mondala *et al.* (2012) indicated that the average productivity of all crops per hectare was also found to be higher in the rehabilitated watershed than in the control villages, which is a clear illustration of the land treatment and productivity enhancement operations carried out as the watershed development program's component.

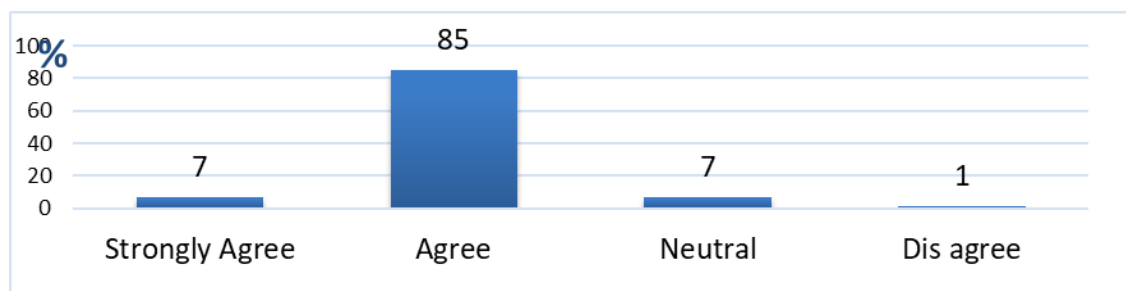


Figure 4. Improvement in the utilization of agricultural technology after watershed management. (Source: Own computation from the household survey, May 2022)

3.3.4 The effect of CBMWM on the economy of rural communities

As part of agriculture, crop production was the most essential source to boost household income in the study area, as described by informants. The main crops in the study area were *Teff*, wheat, beans, and maize.

As seen in Table 4, there was a difference in the average income of 107,700 Birr, 91,900 Birr, 73,000 Birr,

and 38,716 Birr/hectare from the main crops of *Teff*, wheat, bean, and maize, respectively, after watershed management intervention. Due to the intervention of different watershed management practices, the productivity of most crops was increased, which in turn increased the household's income. This result is supported by research findings of Gebrehaweria *et al.* (2016), who reported that there was a positive impact of watershed management on the production and productivity of crop livestock, farm incomes, socioeconomic conditions, and livelihoods.

Table 4. Average crop productivity and income levels before and after CBMWM

SN.	Crop type	Before intervention (2011)			After intervention (2020)			Difference in total income (Birr)
		Quintal per ha	Price per quintal (Birr)	Total income (Birr)	Prod. Per quintal per ha	Price per quintal (Birr)	Total income (Birr)	
1	<i>Teff</i>	24	800	19,200	30	4230	126,900	107,700
2	Wheat	41	520	21,320	51	2220	113,220	91,900
3	Bean	17.5	600	10,500	25	3340	83,500	73,000
4	Maize	34	400	13,600	41	1276	52,316	38,716

Source: Own computation from Woreda Agriculture & Trade Office, May 2022

This result implies that the majority of the household's cost of living is covered by the income generated through selling their crops. However, at this point, it should be noted that the increase in income is not only due to an increase in production but also due to the price inflation of crops.

3.3.5 The effect of CBMWM in food and feed availability and productivity of livestock

Paired sample t-test results showed that the average length of months the household's harvest covered for consumption before and after the intervention was 10.88 and 12.11, with a standard deviation of 2.11 and 1.35, respectively. The mean difference in the time length of the households' harvest covers their consumption before and after the intervention is 1.23 months. This result is due to different rea-

sons. Firstly, because of CBMWM intervention, the productivity of the crops improved, as discussed in the previous section. Secondly, since there is an improvement in household income, they cover the expenses needed for the household, and they enable to save the crops for sale. When compared to farm inputs and non-food items, the cost of accessing food items at home is higher in rural expenditure, especially during off-seasons (Girma *et al.*, 2013). The aggregate of these helps the household to elongate the average length of time the household's harvest covers for consumption and hence improve food availability and socioeconomic condition after the intervention. This is consistent with a report from the Global Theme on Agriculture, which claimed that watershed management increased crop yields and provided the community with more food and fodder (Pathak *et al.*, 2007).

Table 5. Effect of CBMWM in food & feed availability and productivity of livestock

Variable	Mean	Std. Deviation	Std. Error Mean	Mean difference	t-Value	P-Value
Length of month a harvest cover before intervention	10.88	2.112	0.135	1.236	9.670	0001
Length of month a harvest cover after intervention	12.11	1.347	0.086			
Source of animal feed before intervention	1.84	1.259	0.081	0.889	10.253	0.001
Source of animal feed after intervention	2.72	0.676	0.043			

Source: Own computation from the household survey, May 2022

3.3.6 CBMWM's effect on the creation of income sources, livelihood and saving capability

Saving is one of the key factors in any nation's household's welfare and economic growth. Research conducted by Dejene (2003) indicated that rural households in Ethiopia mostly make their savings from the money they receive from selling agricultural goods. The amount of savings depends on one's level of education, family size, average annual income, typical annual expenses, ownership of livestock, and availability of credit service (Genemo & Bekele, 2021). The paired sample t-test showed that the average annual saving capability of households before and after the CBMWM intervention was 5994 birr and 11083 birr, with a standard deviation of 8993 and 13621, respectively. The mean difference between the average annual saving capability of households before and after the intervention was 5089 birr. The

average saving after the intervention is 11083 birr, comparable to a research finding which reported that sample households practiced saving with an average amount of 11365.3 birr (Girma *et al.*, 2013). This result has meaning for rural households, which allows them to cover expenses at hard times, like purchases of agricultural inputs and even food during the off-season, as discussed by informants. Similarly, the average source of additional income from products other than crops before and after the intervention is 1.85 and 2.92, with a standard deviation of 1.18 and 1.53, respectively. The mean difference between the source of additional income other than crops before and after the intervention was 1.07. Finally, the annual saving capability of a household and the average source of additional income revealed that there is a statistically significant difference between before and after intervention at $p=0.001$.

The key informants also explained that the annual saving capability of households improved after watershed management intervention due to the improvement in the income of farmers. In addition, saving culture was developed via awareness created by the training given in the program. Moreover, the introduction of CBMWM in the study area helped the household heads to have a source of additional income, such as the sale of wood, forage, seed, grass, daily labor, and trade, in addition to other agricultural products. Research conducted by Gebremariam

& Desalegn (2018) reported that following watershed management, income from rain-fed crops, livestock, poultry, and off-farm sources of income, including food-for-work programs, increased.

In addition, during field observations (Figure 5), it has been observed that farmers were engaged in additional income-generating activities like beekeeping around their homesteads. However, they were very limited in the number and type of activities they were engaged in when compared to the available potential.



Figure 5. Income generation from beekeeping activity in Tede Dildima Kebele. (photo captured by first author, May 2022)

It was observed that activities such as homestead vegetable production, poultry production, dairy activity, fattening, and beekeeping are possible alternative potentials that households can engage in to improve the socioeconomic condition of their households by integrating with watershed management.

3.3.7 The Effect of CBMWM on Social Aspects

Regarding the experience developed in natural resource management after the intervention, the analysis results revealed that 89% of the respondents developed experience, whereas 11% did not. In addition, the results of respondents show that 24%, 11%, and 4% of the job opportunities created were in the daily laborer, forest management, and trade

categories, respectively. However, the contribution of CBMWM intervention in creating additional jobs was below 50% as sample households responded. Some of the reasons raised by informants were lack of access to electricity, road, and lack of experience.

3.3.8 CBMWM's effect on strengthening social and human capital

As discussed by informants, there were household heads organized into their micro-watershed names and managed enclosed areas for rehabilitation purposes. They also established cooperatives in the name of their micro-watershed and solved common problems like the construction of roads and

service delivery like goods, savings, and credit services, which indicate the development of their social capital. Such achievements are examples of the Chaltu cooperative of the Gerersa watershed in Tede Dildima and Ade Mamo watershed in Bola Buta. Furthermore, farmers were given training like family planning and benefited from it while working together on conservation practices. Thus, watershed management facilitates the community to come together, share their experiences, and develop knowledge that helps them alleviate their common problems, hence improving their livelihood. These are parallel with research findings stating that social associations have been established and strengthened through the watershed management practice (Joseph & Fikirte, 2013).

3.3.9 Effect of CBMWM on the health and education sector

The results reveal that most respondents (94%) were members and users of health insurance. The findings also indicated that the majority of respondents (90%) agreed, 9% neutral, and 1% disagreed with the improvement in affordability of household healthcare costs following the intervention. Improvements in affordability of households for health costs after intervention since watershed management plays a significant role in improving income and productivity of crops, as discussed in earlier topics. Due to this, many household heads cover necessary payments and become members and users of health insurance. The membership enabled household members to get treatment in their nearby health centers without any other extra costs. The research findings of Jackson & Mulyunyi (2015) reported that adopting watershed management measures had increased household incomes for 85% of the households included in the study. The additional revenue was used to meet other family requirements, including paying for medical care, clothing, and home development. Further, the results revealed that 94% of the respondents agreed that watershed management helps the education sector by providing trees for the construction of schools and their fences and for cooling the climate of the school environment. According to key informant reports, due to the CBMWM program, different seedlings planted around most schools have become trees that are used for various purposes.

3.4 Community Perception towards their livelihoods as a result of CBMWM

Farmers who are concerned about soil deterioration and expect to benefit from conservation are more likely to choose appropriate conservation techniques and strategies into practice (Gizaw, 2010). Contrarily, it's likely that farmers may not want to use any conservation technique if they fail to recognize the problem of soil degradation, which could result in the loss of any potential benefits. They believed that building actual soil and water conservation structures requires a lot of labor, reduces arable area, and is challenging to plow. Therefore, one crucial element revealed in this study is how farmers perceive themselves.

3.4.1 Farmers' perspectives on use of trees from enclosure areas and the program's long-term viability

Watershed management facilitates frameworks that ensure not only the conservation of land resources but also the use of them in a manner that will not cause ecological imbalance. Regarding the perception of the community on their livelihood improvement due to CBMWM, most of the respondents (83%) believed that there is a perception that households can use trees in enclosed areas of a watershed for firewood and other purposes in the study area. As discussed with key informants, they reported that aged and fallen trees in the enclosed areas of the watershed are used for firewood and even for sale, which serves as additional income for farmers. This finding has implications for developing a sense of ownership over the watershed that they manage.

3.4.2 Farmers' perceptions of the effects of CBMWM on livelihoods

The results revealed that 59% of the respondents agreed, 30% strongly agreed, and 11% disagreed regarding the household's willingness to participate in watershed management. Similarly, 64%, 27%, and 9% of the respondents agreed, disagreed, and strongly agreed that there is improvement in agricultural production, income, and the environment due to watershed management. A chi-square test for independence (with Cramer's V) indicated a significant association between community perception of livelihood improvement due to CBMWM and knowledge

development on implementation of CBMWM as p is less than 0.05, Cramer's $V=0.158$; knowledge development on the effect of CBMWM on livelihood as p is less than 0.05, Cramer's $V=0.203$; and household willingness to participate in CBMWM as p is less than 0.05, Cramer's $V=0.171$.

3.5 Challenges that Hinder the Effects of CBMWM

The results revealed that the majority of respondents (81%) believed that the challenges that minimize the role of watershed management in livelihood improvement are lack of management, maintenance, and protection. Regarding access to necessary inputs for conservation activities, 67%, 25%, and 8% of the respondents agreed that they were accessing inputs, not accessing inputs, and poorly accessing inputs, respectively. Given the treated communal and enclosed area protection from animal and human destruction, the response of sample household heads showed that 60% were protected, 28% were not protected, and 12% were not protected as required. The result also shows that 58% of respondents agreed that they accessed integration between sectors in helping the farmers to have additional income-generating activities, and 42% did not. This finding implies that there was no adequate integration between the sectors in assisting the farmers to have more additional income-generating activities, even though there was an improvement after intervention.

4 Conclusion

Though the practices of micro-watershed management by the communities and their outcomes were not adequate, some improvements were observed in the study site. Some of these outcomes were improvements in crop-livestock productivity, food availability, diversification of livelihood activities, agronomic practices, and diversification in agricultural inputs. Likewise, rehabilitation of degraded lands, reduction in soil erosion, and improvement of vegetation cover were also among the major achievements recorded at the site, mainly as a result of watershed management practices carried out over the last three decades. It was also noted that the surrounding communities can get construction materials from the managed watershed.

Another positive effect of community-based micro-watershed management activities is that it allowed the local communities to work together, which enabled them to share information and discuss common agendas like saving and credit services from nearby institutions. As inferred from the results of the study, community-based micro-watershed management is carried out every year and shows improvement in area coverage, though it is not sufficient. Thus, individual farmers have experience in carrying out conservation activities and have positive perceptions of watershed management practices and their effects. Thus, the conclusion is that the introduction of CBMWM has improved livelihood elements like the natural, financial, social, and human capital of rural communities. However, some challenges reduce the benefits obtained from watershed management practices, such as low participation of females, lack of maintenance of previously conserved watersheds, free grazing, and expectation of immediate outcomes by the farmers.

Acknowledgments

The authors wish to express their sincere gratitude to all institutions and individuals for their full cooperation in providing the necessary data and information in the whole research process. The authors are also grateful to the anonymous reviewers and editors for their management of the review and publication process of the manuscript.

Conflict of Interest

The authors fully declare that they have no competing interests in publishing the manuscript.

References

- Abebe Gidey. (2015). *The Contribution of Soil and Water Conservation Practices towards Sustainable Rural Livelihoods in Tigray Region, Northern Ethiopia*.
- Abiyot Legesse, Misikir Bogale, & Dereje Likisa. (2018). Impacts of Community Based Watershed Management on Land Use/Cover Change at Elemo Micro-Watershed, Southern Ethiopia. *American Journal of Environmental Protection*, 6(3), 59–67. <https://doi.org/10.12691/env-6-3-2>

- Bealu Tukela. (2018). Determinants of Savings Behavior among Rural Households in Case of Boricha Woreda, Sidama Zone, Southern Ethiopia. *International Journal of Recent Scientific Research*, 9(11), 29748–29752. <http://dx.doi.org/10.24327/ijrsr.2018.0911.2921>
- Bekele Melaku. (2003). *Forest property rights, the role of the state, and institutional exigency*.
- Cochran. (2002). coheran2002407_03_Cochran_Sampling_Techniques_3rd-ed.pdf.
- CSA (2007). Population and Housing Census of 2007, Addis Ababa, Ethiopia
- CSA, (2012). Ethiopian agricultural sample survey 2011/2012. Volume IV, report on land utilization, Statistical Bulletin 532. Addis Ababa: Ethiopia, Central Statistical Agency.
- CSA (2020). Population Size by Sex, Area and Density by Region, Zone and Wereda, Addis Ababaa, Ethiopia
- Dejene Aredo. (2003). Determinants of Rural Household Savings in Ethiopia. In *SSRN Electronic Journal*.
- Dejene Aredo. (2003). Determinants of Rural Household Savings in Ethiopia. In *SSRN Electronic Journal*.
- Dejene Teressa, & Etefa Guteta. (2018). The Effects of Community Based Watershed Management on Livelihood Resources for Climate Change Adaptation the Case in Gemechis District, Oromiya. *International Journal of Environmental Sciences & Natural Resources*, 15(2). <https://doi.org/10.19080/ijesnr.2018.15.555906>
- Demesew Alemaw Mhired, Dessalegn Dagneu, Christian D. Guzman, & Tilashwork Alemie. (2020). *Demesew, (2020) A nine-year study on the benefits and risks of soil and water conservation practices in the humid highlands of Ethiopia. The Debre Mawi watershed. Request PDF*.
- Eyasu Elias. (2002). *Farmers' perceptions of soil fertility change and management*.
- Gebreaweria Gebregziabher, Dereje Assefa, Girmay Gebresamuel, Meredith Giordano, & Simon Langan. (2016). *An assessment of integrated watershed management in Ethiopia*. International Water Management Institute (IWMI), Colombo. (IWMI Working Paper 170).
- Genemo Fitala, & Bekele, M. (2021). Choice and Determinants of Saving in Rural Households of Bale Zone: The Case of Agarfa District, Oromia, South East Ethiopia. *OALib*, 08(02), 1–20. <https://doi.org/10.4236/oalib.1107167>.
- Gebremariam Yaebiyo, & Desalegn Emuru. (2018). Gebremariam Yaebiyo deFarmers' Perception on Integrated Watershed Management and Household Annual Income Evaluation at Maego Watershed, North Ethiopia. *Asian Journal of Advances in Agricultural Research*.
- Gezahegn Weldu, Derribew Anteneh, Solomon Tekalign, & Ramireddy, A. (2018). Spatial modeling of soil erosion risk and its implication for conservation planning: The case of the gobeles watershed, east hararghe zone, ethiopia. *Land*, 7(1). <https://doi.org/10.3390/LAND7010025>.
- Girma Teshome, Bezabi, Emanu, & HajJema. (2013). Determinants of Rural Household Savings in Ethiopia: The Case. *Journal of Economics and Sustainable Development*.1700.
- Gizaw Desta. (2010). Conceptualizing rill erosion as a tool for planning and evaluating soil conservation in Angereb watershed. *Ethiopia-Methodological Development: Research*. https://boris.unibe.ch/69286/1/Final_ESAPP_Paper_Q505.pdf
- Haregeweyn N, Poesen J, Nyssen J, Govers G, Verstraeten G, Vente J, Deckers J, Moeyersons J, Haile M (2008) Sediment yield variability in Northern Ethiopia a quantitative analysis of its controlling factors. *Catena*, 75(1):65–76
- Islam, T., & Ryan, J. (2016). Livelihood an overview, Mitigation in the Private Sector (Issue .). <https://doi.org/10.1007/s40899-021-00572-2>
- Jackson, L., & Mulyunyi, D. P. (2015). Impact of Integrated Watershed Management Practices on Sustainable Rural Livelihoods of the People of Rwanda: a Case Study of Mwange Watershed in Gicumbi District. *International Journal of Science and Research (IJSR)*, 6(11), 598–604. <https://doi.org/10.21275/ART20177657>.

- Joseph, K., & Fikirte Regassa. (2013). Livelihood Impacts of Environmental Conservation Programmes in the Amhara Region of Ethiopia. *Journal of Sustainable Development*, 6(10). <https://doi.org/10.5539/jsd.v6n10p87>.
- Kennedy, L. (2016). *T-Tests in R To test means of one or two groups*. 1–4.
- Lume Woreda Agriculture and Natural Resource (2013). *Woreda report on agricultural performance unpublished*
- Macfarlan, A. (2014). *Key Informant Interviews Better Evaluation*. http://betterevaluation.org/evaluation-options/key_informant_interviews.
- Mekonen G, Fekadu A (2015) Experiences and challenges of integrated watershed management in central zones of southern Ethiopia. *Int Journal of Current Research*, 7(10):20973–20979
- Meseret Addisie, & Gashaw Molla. (2021). Trends of community-based interventions on sustainable watershed development in the Ethiopian highlands, the Gumara watershed. *Sustainable Water Resources Management*, 7(6), 1–14. <https://doi.org/10.1007/s40899-021-00572-2>
- Meshesha YB, Birhanu BS (2015) Assessment of the effectiveness of watershed management intervention in Chena Woreda, Kaffa Zone, South-western Ethiopia. *Journal of Water Resour Prot*, 7(15):1257
- MOAE. (2005). Watershed development in india an approach evolving through experience Community-Based Participatory Watershed Development: A Guideline. *Federal Democratic Republic of Ethiopia Ministry of Agriculture and Rural Development, Addis Ababa, Ethiopia (Issue January)*.
- Mondala, B., Singh, A., & Jha, G. K. (2012). Impact of Watershed Development Programmes on Farm-specific Technical Efficiency: A Study in Bundelkhand Region of Madhya Pradesh. *Agricultural Economics Research Review*, 25(2), 299–308.
- Sekaran, U. (2003). *Sample Size for a Given Population Size*. 2003.
- Tamirat Sinore, Endalkachew Kissi, & Abebayehu AtichoA. (2018). *Sinore et al*,(2018).
- Tiki L, Kewessa G, Wudneh A (2016) Effectiveness of watershed management interventions in Goba district, southeastern Ethiopia. *Int Journal of Agric Sci*, 6(9):1133–1140
- Thomas, L. (2020). *Systematic Sampling. A Step-by-Step Guide with Examples*.
- Wang, G., Mang, S., Cai, H., Liu, S., Zhang, Z., Wang, L., & Innes, J. L. (2016). Integrated watershed management: evolution, development and emerging trends. *Journal of Forestry Research*, 27(5), 967–994. <https://doi.org/10.1007/s11676-016-0293-3>
- World Bank. (2018). *India: Systematic country diagnostic realizing the promise of prosperity*. In World Bank Publication.
- Yamane, T. (1967). *Statistics, An Introductory Analysis*, 2nd ed.

Gondoro as a Social Capital: Analysis of an Indigenous Conflict Resolution and Peacebuilding Practice of the Guji and Gedeo Peoples

Ashebir Tadesse*¹ and Tadesse Jaleta²

¹ Department of Oromo language and Literature, Dilla University, Ethiopia.

² Department of Oromo Language, Literature and Folklore, Addis Ababa University, Ethiopia.

*Corresponding author, Email: ashebirtadesse@yahoo.com

Received: 04th May 2023

Accepted: 10th September 2023

©2023 Dilla University. All Rights Reserved

DOI: 10.20372/ejed.v05i1.05

Abstract

The people ruled by the Gada system have a tradition of stopping conflict and establishing peace. The Guji and Gede'o people have a tradition of conflict resolution and peacemaking called Gondoro. This research paper aims to show that the Gondoro traditional method of conflict resolution is the social capital of the Guji and Gedeo people. To achieve this purpose, the qualitative descriptive research approach was applied. Through this approach, the Gondoro tradition was described in terms of how it was performed and the traditional practices and their contextual meanings it embodied. A purposive sampling technique was used to select key informants who were cultural group leaders from Guji and Gede'o. In-depth interviews, focus group discussions, and document analysis (archival analysis) were employed for data collection. The data were analyzed by dividing them into different topics to adequately answer the research questions. Based on the analysis of the qualitative data, Gondoro is performed to cleanse 'fratricide' that could happen between the Guji and Gedeo people or within the Guji or Gedeo people. It is done to cleanse the grief resulting from the 'fratricide' and restore peace among the communities. The article discusses that the Guji and Gede'o people have 'fraternal' relationship that has been reinforced through their shared legendary narratives and cultural practices. Accordingly, the article argues that the Gondoro tradition is the social capital of the Guji and Gede'o people. The article concludes that indigenous knowledge, such as the Gondoro tradition, can serve as a good experience for Ethiopian ethnic groups sharing the border to solve their security problems through their common tradition.

Keywords/Phrases: Conflict, Gedeo, Gondoro, Guji, Peace, Social Capital

1 Introduction

1.1 Background

Studies show indigenous social practices embodying pools of social knowledge and resources that are deeply rooted in social relationships reinforce fraternity, solidarity, and peaceful co-existence within communities and among communities (Phillips & Pittman, 2009). According to social capital theorists such as Bourdieu (1986), Coleman (1988), and Putnam (1993), the accumulation of indigenous social knowledge is the values of a society that strengthen social relationships, ensure common prosperity, sus-

tain common ethics, and guarantee the coexistence of the members of the community. Brock-Utne (2001:9) notes, "The immediate objective of such conflict resolution is to mend the broken or damaged relationship, rectify wrongs, and restore justice". Evidence shows that societies have been adapting and using conflict resolution methods for centuries.

This article presents Gondoro as a social capital that serves as an indigenous mechanism to sustain harmonious social relationships between the Guji and Gedeo peoples. Gondoro is defined as an institutionally designed mechanism of conflict resolution by

Guji and Gedeo communities and neighboring ethnic groups (Solomon, 2009). Researchers such as Asebe (2007), Asnake (2004), and Solomon (2009) stated that conflicts that happened between Guji and Gedeo ethnic groups during 1995, 1998, and 2017/18 were resolved through Gondoro practices. It is customary to resolve conflicts between Guji and Gedeo through Gondoro practice. According to Asebe (2007), Asnake (2004), and Solomon (2009), Gondoro sustains social cohesion and peaceful coexistence between the Guji and Gedeo peoples. Researchers such as Asnake (2004), Asebe (2007), and Solomon (2009) show that in Ethiopia, customary practices have played an important role in stopping conflicts between individuals as well as among different ethnic groups to establish peace. For example, Asebe (2007) stated that the tradition of conflict resolution and peacemaking are deeply rooted in the cultures of different ethnic groups and play significant roles in maintaining social relations. Asnake (2004) emphasizes the same idea that society gives great importance to tradition as it contains the morals and cultural beliefs of the society. The traditions of conflict resolution and peacebuilding have played an important role in resolving conflicts between ethnic groups and establishing peace, as they are carried out by the customs and ethics of the society. Solomon (2009), Asebe (2007), and Gumi (2016) stated that the Gondoro practice has been exercised among the Guji and Gedeo peoples since ancient times.

This article opts to build on the existing studies by focusing on analyzing Gondoro as the social capital of the Guji and Gedeo peoples. It attempts to explain how Gondoro is performed as a shared and inter-ethnic practice, the actors and their roles, the place where it is performed, the practices and their context, the ethics, the values, and the beliefs that constitute Gondoro Performance.

1.2 Concept of Social Capital

In this article, the social capital theory has been used as a theoretical basis to analyze and describe the data. This theory observes indigenous knowledge of conflict resolution and peace-building as social capital.

Informed by the social capital theory, Fred-Mensah (2005), cited in Osei-hwedie & Rankopo (2012), de-

scribe traditional conflict resolution mechanisms as social capital. Similarly, Phillips & Pittman (2009) present social capital as a set of resources intrinsic to social relations and include trust, norms, community responsibility, reciprocal obligations, civic sense, and networks that can improve the efficiency of society by facilitating collective action for achieving mutually beneficial ends. It is often correlated with confidence in social institutions, civic engagement, and overall community well-being and happiness. According to Field (2008), the central thesis of the theory of social capital can be summed up as that relationship matters. People connect through a series of networks, and they tend to share common values with other members of these networks. The members in a group provide safety and status credit for each other. It is these social ties that guarantee the existence and effective functioning of societies (Fred-Mensah, 2005).

Based on the social capital theory, Volker (2007) argues that social capital constitutes tiered of traditions reflected through shared performances in a certain place and time. From this perspective, the tradition of conflict resolution and peacemaking means that the community where it lives has the means of stopping conflict and making peace through tradition without the intervention of government structures or without the formal courts. Barfield (2004) argues that the tradition of conflict resolution and peacemaking is based on communities with similar cultures and values or communities that share traditions. It means that society evaluates whether practices in society are customary or unc customary based on its traditions. When immoral acts are committed, society imposes social sanctions on the perpetrator. To lift these social sanctions and return to society, the perpetrator flees to traditional community leaders.

In summary, social capital entails the accumulation of social knowledge that enables to live together in life, play roles for community members, maintain peace, maintain social relations, and perform common actions that bring common benefits, shared traditions, ethics, and morals. Since the issue of conflict resolution and peacemaking is not an individual but a group or community issue, having a tradition of conflict resolution and peacemaking to maintain social relations, unity, and community is

closely related to the concept of social knowledge accumulation. Therefore, in this study, it was necessary to analyze the implementation of conflict resolution and peacebuilding practices performed in Gondoro through the lens of the social capital theory.

The process of ending conflict and building peace is conducted by community actors who have a social role in the shared social capital. In support of this idea, Volker (2007) states that “the process to settle the conflict through indigenous means is led by traditional kings, chiefs, priests, sheiks’ healers, big men, elders (being a social elder, not a biological category)”. It means that ending the conflict is processed through the traditional forces in the community. Depending on the culture of the community, these traditional performers vary in different communities. Similarly, in Guji and Gedeo community, the actors and their roles in the performance of Gondoro are explained in depth in the discussion section.

1.3 Cultural and Social Background of the Guji and Gedeo People

The Guji Oromo are one of the Oromo groups living in southern Ethiopia, mainly in the districts called West and East Guji zones. Asmerom (1973) stated that Guji and Borana are the oldest lands and sources of Oromo culture in Oromo evidence and folklore. Asebe (2007), states that Guji, unlike other Oromo branches, is composed of three independent but not separate ethnic groups that help each other during warfare. They are Uruga, Mati, and Hoku. Hinnant (1977) argues that the spiritual world and the daily life of the Guji Oromo people derive from the Gada system. According to Asebe (2007), in Guji, community peace is maintained, and conflicts are resolved through community traditions rather than modern legal bodies.

At the local level, there is a community leader called Hayyuu Gosaa in every branch of Guji. The three moieties - Uruga, Mati, and Hoku - have their community leader, called Abba Gada, elected every eight years by Gumi Gada at the Gada Assembly. Each moiety has balbala (literally clan) led by Hayyuu Gosa, who were former Gada members who have transferred power and are now elected as advisors to the Abba Gada. The hayyuu gosaa, or community leaders are also responsible for mediating conflicts

in the community. The Guji people believe that God sent Qaalluu to the people ruled by Gada (Asebe, 2007). Gada has laws of peace and morality. They believe that when a person violates these laws and ethics, that person or group will be destroyed (Hinnant, 1977).

The Gedeo are one of the ethnic groups in Southern Ethiopia (Asebe, 2007; Solomon, 2009). Gedeo community is known for its renowned Agroforestry and delicious Yirga Caffee coffee. The Gede’o people have a traditional administration of the Gada System, which they also call the Balle system. The Gedeo has seven subclans, each of which has a cultural community leader called Hayecha. The Guji and Gedeo ethnic groups have their cultural community leaders called Hayyuu gosaa in Guji and Hayecha in Gedeo are similarly elected from all moieties at the Gada assembly. In Guji, the hayyuu and in Gedeo, the hayecha guide the community at the local level according to the Gada system. In their mythology, Guji and Gedeo are said to be brothers (Asebe, 2007; Solomon, 2009).

In general, the Guji Oromo and the Gede’o have brotherly relations and share culture and traditions. Both have traditional governance systems, have a common Qaalluu and share Gondoro traditions. (Asebe, 2007; Solomon, 2009).

2 Methodological Approach

This study is based on a qualitative approach with descriptive research design. Straus and Corbin (1998) state that the “qualitative method is a typical research approach which enables to come up with data that cannot be easily produced by statistical procedures or other means of quantification”. Creswell (2012; 274) stated the purpose of the qualitative descriptive method is to find a detailed explanation of the object of the research.

The researcher used qualitative descriptive research methods to gather evidence on the explanation of Gondoro as a social capital. The qualitative descriptive research was used to gather information about life experiences, human behavior, emotions and desires, social activities, and cultural events related to the topic under study (Straus & Corbin, 1998). In other words, this research followed a qualitative

descriptive research approach as it focused on analyzing the performance of Gondoro practice as a conflict resolution and peacebuilding device among the Guji Oromo and Gedeo. Data were collected from the key informants selected from the Guji and the Gedeo communities using a purposive sampling technique. Methods of data collection include key informants' interviews, focus group discussions, and document analysis (Sandelowski, 2012). Using the purposive sampling strategy, the researcher selected and collected information from those who have an understanding and role in the Gondoro's performance.

2.1 Sources of Data

Data were collected from primary sources who are community leaders playing a role in the implementation of Gondoro traditions. In addition, the researcher used video and photographic evidence of Gondoro performance as a secondary source of evidence. The primary sources of evidence are the Guji Oromo community leaders called hayyuu gosaa and Gedeo hayecha, appointed at the Gada assembly. Additionally, previous studies on the same topic have been used as secondary sources.

2.2 Sampling Technique

In this study, the researcher has applied the purposive sampling technique. Because the sources of information in this research were from community members who played a role in implementing the Gondoro tradition among the Oromo and Gedeo people, the purposive identification technique was used. Patton (2015) suggests that with purposive identification techniques, the researcher selects the entity that he or she thinks has sufficient evidence.

Therefore, the purposive identification strategy was used to select the most informed members of the community group for qualitative research. Accordingly, the researcher selected the community leaders called hayyuu gosaa in Guji and hayecha in Gedeo, who play a role in implementing the Gondoro tradition by purposeful identification strategy. Based on the purposive sampling techniques, seven community leaders from Guji and four community leaders from Gedeo were selected and participated in interviews and focus group discussions. The researcher asked the community leaders open-ended interview

questions, noted their answers, and recorded their voices.

2.3 Methods of Data Collection

In-depth Interview: Creswell (2011) explained that qualitative in-depth interviews are used by the researcher to ask open-ended questions to more than one informant and record their answers. The researcher used in-depth interviews to ask community leaders from Guji and Gedeo open-ended questions to gather in-depth descriptions of how Gondoro traditions are performed to resolve inter-ethnic conflicts and restore peaceful relationships. The in-depth interview allowed the researcher to understand and write about the feelings of the community leaders on the subject being investigated. In this study, the researcher asked open-ended questions to the informants who played a role in the performance of Gondoro practice and recorded their answers, and analyzed their answers under sub-topics of this paper.

Focus Group Discussion: Focus group discussions (FGDs) are a form of group interview that capitalizes on communication between research participants to generate data (Kitzinger, 1995). FGDs explicitly use group interaction as part of the method. This means that instead of the researcher asking each person to respond to a question, in turn, people are encouraged to talk to one another: asking questions, exchanging narratives, and commenting on each other's experiences and points of view (Kitzinger, 1995). The researcher organized the focus group discussions of the community leaders from Guji and Gedeo to respond to the research questions by supporting each other. In FGDs, when the junior community leader responds to the topic, the senior community leaders build on and enrich discussions, which results in collaborative knowledge-making. The researcher brought together the community leaders through group discussion to help and remind each other to answer the questions on the issue of Gondoro traditional performance between Guji and Gedeo people.

Analysis of Recorded Documents: Secondary data from archived videos that were recorded previously were collected and analyzed. Therefore, as a second source of evidence, the researcher collected data from Gondoro performed records between the Guji Oromo people and the Gedeo people in 2017/18.

Therefore, in this study some audio-visual videos and photos were analyzed and described in line with the research questions.

2.4 Methods of Data Analysis

The data collected for the research should be analyzed to achieve the research objectives and answer the research questions. Accordingly, the researcher translated the data collected from the interviews and group discussions, as well as photographic and audio records of the 2017/18 Gondoro performance between Guji and Gedeo were analyzed under different sub-topics. In this study, mainly content analysis and thematic methods of data analysis were employed. The researcher used content analysis to interpret the recorded images and communication made during interviews and focus group discussions. The thematic method of data analysis also was employed to group the data obtained by interview and focus group discussion into themes to give sense to the content.

3 Results and Discussions

3.1 Interethnic Relationship between the Guji and Gedeo Peoples as Opportunity to Restore Peace

The key informants from Guji and Gedeo explained that the Guji and Gedeo peoples share an ancestor, which they ascertain through their common legendary narrative. Informants who participated in the focus group discussions and interviews confirmed that Guji and Gedeo are brothers. According to Abba Girja from the Guji community and Hayecha Jabo Kura from Gedeo, Guji, and Gede' on are the sons of Jiille. According to them, Jiille had three children. Daraso, Gujo, and Boro. Daraso is the father of Gedeo. Gujo is the father of Guji. Boro is the father of Borana. The Guji and Gedeo peoples share languages and predominantly use Afan Oromo and Gedeuffa languages. The Guji and Gedeo also have similar Gada grades with slight differences in the naming of the grades.

The Guji people are traditionally governed by the Gada system. Similarly, the Gedeo ethnic is governed by the Gada system, which they also call the Balle system. Both ethnicities have a common spiri-

tual father, Qallu, at the supreme level. There is an Abba Gada at the highest level in the structures of both communities. Next to the Abba Gada, there is the community leader at all moiety levels called Hayyuu Gosaa in Guji and Hayecha in the Gedeo. These community leaders are assigned and renamed at the Gada assembly among the existing ethnic moieties, as stated by the key informants (Abba Girja, Abba Hessa, Hayecha Hayilu Bayyane, and Jaboo Kura). In the context of Gedeo, the community leaders are selected from all the seven Gedeo ethnic groups at the Songo assembly and perform the covenant ceremony to become the community's leader (information from key informants Hayecha Hayilu Beyene, Hayecha Alamayo, Hayecha Jabo Kura).

Culturally, Guji and Gedeo share cultural practices, of which Gondoro is the key one. According to participants of the FGDs and in-depth interviews, Guji and Gedeo do not kill each other (fratricide is not acceptable and is considered a huge violation of norms) because they consider each brother. If a brother kills accidentally, performing Gondoro is the culture. According to informants from both communities, Guji does not kill Guji, and in the same way, Gedeo does not kill Gedeo or Guji. It is not customary for the Guji and Gedeo to fight and displace each other. Doing something uncultured separates one from the community. Gondoro is performed to cleanse the person who has committed the crime.

When the Gondoro is performed, the community returns to its former peaceful coexistence as a group. The researcher learned from interviews and group discussions that Gondoro is performed to cleanse the person who killed his brother and bring him back to a peaceful social life. Gondoro is the tradition of cleansing a person or group tainted by murder and returning them to society. Once the Gondoro is done, the fighting stops; peace will descend. It means that society returns to its former peaceful coexistence. This is happening in societies with shared culture and tradition (Barfield, 2004). Generally, as it was stated in the literature review, having shared culture and tradition helped the Guji and Gedeo peoples to stop conflict and establish peace.

3.2 Gondoro as an Interethnic Social Capital Between the Guji and the Gedeo

The relationship between the Guji and the Gedeo peoples has been based on profound values of brotherhood and considering each other ancestral kins. An informant from the Guji, namely Abba Girja, confirmed this reality, “In our culture, a brother does not kill and harm his brother. The Guji and the Gedeo people are brothers. They do not kill and harm each other. In case this happens between us, we cleanse it by performing Gondoro. These statements show that the Guji and the Gedeo believe that Gondoro is a common cultural value by which they remove an evil spirit that has caused homicide between brothers. They perform the Gondoro practice as a means to correct the disorder and avoid the evil spirit that is not acceptable in their cultures.

According to the information obtained from key informants in both ethnic groups, Gondoro serves as social capital to resolve conflicts and restore peace between Guji and Gedeo. In both cultures, Gondoro practice has been an indigenous performance of peace-building since ancient times and serves as a common asset through which they sustain their brotherhood and harmonious relationships. Therefore, it can be said that Gondoro is the social capital between Guji and Gedeo because Gondoro is related to what other cultural researchers described as social capital (Bourdieu, 1986; Coleman, 1988; Fred-Mensah, 2005; Field, 2008; Phillips & Pittman, 2009; Osei-hwedie and Rankopo, 2012).

3.3 Procedures in the Interethnic Gondoro Performance

Meetings of the Guji and Gedeo Abba Gada

The data obtained from the interview and focus group discussion from both Guji and Gedeo show that the Gondoro procedures for homicide and inter-ethnic conflict resolution differ in their performance and level of involvement. In case of homicide within the Guji or Gedeo communities, the Abba Gada is not involved in the process. But in the case of inter-ethnic conflict – conflict between the Gedeo and Guji peoples- the Abba Gada is the main actor in stopping conflict and establishing peace. For this matter, the Guji-Gedeo inter-ethnic conflict resolution process begins with the meeting of the Abba Gadas of the

two ethnic groups. Abba Gadas of the two ethnic groups meet and decide to reconcile.

An informant from the Gedeo (Hayecha Hayilu Beyene) asserted, “According to our culture, the two brothers do not clash with each other”. Abba Gada is the leader of the society and has the responsibility to secure peace in the society when an inter-ethnic conflict happens. The Guji Abba Gada and the Gedeo Abba Gada meet, and discuss why brothers have killed each other?” According to informants from both groups, the Abba Gadas negotiate for the end of conflict and restoration of peace. Therefore, the two Abba Gadas call the community leaders from all moieties, called hayyuu gosaa in Guji and Hayecha in Gedeo to come together and investigate the cause of conflict.

Hayyuu gosaa of the Guji and hayecha of the Gedeo meet at “Edera” in Gadab District. Informants from the Gedeo (Hayecha Jaboo Kuraa) explained that Gadab was named because, in the past, a terrible fire came burning all the lines and went out when it reached Gadab. So then, the place is cool. Gadab is the seat of the Qallu. Qallu is the spiritual father of the Guji and Gedeo people. In Gadab, the place called Edera is a sacred land where community leaders from both ethnic groups meet to investigate the cause of conflict. The community leaders together examine and identify the violations and abused truth, the falsehood, and the wrongdoings. They identify the root cause of the conflict. After sitting down together and learning the truth, they resolve the uncultured act. Generally, in inter-ethnic conflict resolution, its procedure starts with the meeting of the Abba Gadas of the two ethnic groups to decide to reconcile.

Cleansing and Prayers

The groups’ leaders facilitate reconciliation by focusing on what God loves and what is human. They perform the ‘Falachu’ cleansing ritual to facilitate reconciliation. The hayyu gosa call a non-Guji and Gedeo person from the Wata community to slaughter cleansing sheep. Community leaders are representatives of all communities who contribute money and buy sheep. The Wata slaughters the sheep. It is believed that Wata slaughters the ‘falo’ cleansing sheep brought by Guji and purifies Gedeo and also

slaughters the one brought by Gedeo and purifies Guji.

According to informants from the Guji and the Gedeo, sheep are sacred. An informant from the Guji (Abba Galcha) says, "When a sheep suddenly enters a man's house, they anoint butter on its forehead and take it out." An informant from the Gedeo (Hayecha Hayilu) asserts, "The blood of a slaughtered sheep purifies all uncultured acts". Guji and Gedeo are brothers. Brothers do not kill each other, fight each other, or displace each other. When they kill each other, they say, "It cuts the blood." They believe that the blood cut means that the seeds of both

groups will be cut off and disappear. They believe that bad blood is passed to generations. There is a belief that they will not succeed. The reason is that Guji and Gedeo are societies ruled by the creator of God 'Waaqaa/ Magano'. They believe that God will destroy us if actions are committed by society without culture. Therefore, the conflict between the brothers is unculture and they slaughter a sheep to cleanse the evil (according to informants Abba Girja and Jabo Kura).

The picture presented below (Figure 1) show when a Wata man slaughter 'falo' the cleansing Sheep.



Figure 1. Community Leaders on performing Cleansing and Prayer

Community leaders of both ethnic groups come together, and perform cleansing 'Falachu' and prayers to the supernatural power. They slaughter an animal, but they do not eat its meat there. The first one they slaughtered together was to make the way and hold the appointment of Gondoro, to be cleansed by the blood of the lamb, according to informants from the two ethnic groups.

Participants in the FGDs asserted that the Guji and Gedeo people do not kill each other as they are broth-

ers. However, occasionally, when conflict occurs, they resolve it by performing the Gondor practice to correct what is not customary. They believe that if it is left uncorrected or left unrestored, it will be destroyed and will cause serious harm to both ethnicities. Therefore, it is customary to clean up this terrible accident with sheep blood, which is at the core of the Gondoro performance. The practices in Gondoro's performance symbolize the cultural meaning given by the community. This was also stated by Paul Adewale and Olutola (2016) and Kelemework

(2013). According to the Guji and Gedeo communities, when a brother kills a brother, the purification ritual is a must. There is also a cleansing ritual when the Guji Oromo people and the Gedeo people fight and kill or displace each other. Communities' leaders from Guji and Gedeo who participated in interviews and focus group discussions similarly stated that the wrongdoings, including killing each other will lead to passing the bad blood to generation. According to informants in interviews and group discussions, a purified sheep was slaughtered and washed with sheep blood to cleanse and prevent transmission of bad blood to the community.

Reconciliation

In resolving the conflict between the Guji and the Gedeo people, reconciliation takes place before the Gondoro performance. During their Gada period, the Abba Gada of the two ethnic groups had a traditional responsibility to ensure reconciliation. During their administration, conflict between brotherly peoples was not their culture, so they reconciled. So, they put together the community leaders. Guji sends the community leaders from all moieties of Guji named Kotoma and Darimu. Gedeo sends community leaders named Hayecha from the seven Gedeo groups. The Guji and Gedeo community leaders, named hayyuu gosaa in Guji and hayecha in Gedeo meet at the place called "Edera", which is found in the Gadab district, to discuss the problems and uncusomary practices. They investigate the causes of security problems together. This process is called 'Dubbii Qoruu' to mean investigation. The investigating tool that community leaders use is the community's rules and regulations declared at the Gada Assembly.

Informants from Guji (Abba Girja, Abba Galcha, Abba Aanole) stated that parents, the hayyuu gosaa (community leader), and the Yuba teach the com-

munity at different age grades about the rules and regulations of the Guji community. In the same way, the informants from Gedeo (hayecha Hayilu Beyene, Jabo Kura, and hayecha Alemayehu) explained Seeraa (rule of do and don't) in their society.

Issues of right and wrong in their community are declared at the Gada Assembly. According to Guji and Gedeo social structure there are ethnic group leaders at lower level. These cultural group leaders are elected to the Gada assembly. They also are considered as Aba Gada consultants. According to informants, these traditional group leaders have no other interest at all but to examine everything in the light of social justice, ethics, and laws addressed at the Gada assembly. They believe that the conflict between the brotherly ethnicities is an uncusomary act and therefore it is bad without reconciliation. Therefore, the community leaders of both ethnic groups examine everything together.

Informants such as Abba Anole, Hayilu Beyene, and Jabo Kura pointed out that the discussion of the communities' leaders from the Guji and the Gedeo ethnic groups center on expressions such as the following:

Why did we fight? What happened to us outside of our culture? Why did the brothers fight with each other? According to our culture, according to the rule of the Gada system, a brother does not fight with his brother. Brother shall not kill his brother. If there is a sudden fight with each other, Gondoro should be done in our culture to stop the war and bring peace..

Besides, the community leaders come together on the reconciliation day and slaughter an animal, usually a bull. The community leaders from the Guji invite those community leaders from the Gedeo.



Figure 2. Guji and Gedeo Community Leaders Slaughtering a Bull

They split the skin and gave it to each other. They eat the meat together, leaving the skin there.

3.4 Social Practices on the Day of Reconciliation

Eating liver together

They share and eat the liver of the slaughtered animal, and this practice symbolizes that they have cleansed the sin that happened between them and restored their brotherhood. This practice is key in the Gondoro performance as it signals the genuine avoidance of conflict and restoration of peace between the two communities or the groups in conflict. As participants in the in-depth interviews and FGDs revealed on the Day of reconciliation, Gedeo community leaders slaughtered one bull. The community leaders from the Guji also slaughter one bull. The Guji offers the Gedeo, and the Gedeo offers the Guji to eat the meat of the slaughtered bull. Then, they eat the liver together. It is to reveal that they are brothers and confirm that they have restored their peaceful relationship.

Skin Splitting Tradition

According to the informants, Guji splits the skin of the slaughtered bull and gives it to Gedeo. Gedeo

splits the skin of the slaughtered bull and gives it to Guji. Leaving the skin there means leaving an evil spirit in a place of reconciliation. They leave the skin there to show that they have removed the conflict through Gondoro practice.

Confirmation of Peace and Blessings

To ensure that everything is done according to the laws and ethics of the community, the community leaders ask each other, “Are traditional things done for this Gondoro?” Until the date of Gondoro, anyone who murdered someone individually is purified and presented to Gondoro through the community’s leaders of the two ethnic groups. All groups slaughter a bull to each other on reconciliation.

Members of both nations look forward to the day of Gondoro, cleansed and refreshed. In the Gondoro ritual, the Abba Gada Gedeo, and the Gedeo drink yogurt together from the same Qori, which is a cultural material that serves to store yogurt and milk. They taste the honey from a traditional item called ‘Qori’ together and sprinkle it on each other. They also sprinkle it on the participants of the ceremony. They blessed the people they led to taste like honey to each other.



Figure 3. The Guji and Gedeo Abba Gadas Sprinkling Honey-bear and giving blessings

At the end of the Gondoro ritual, the Abba Gadas of two ethnicities sprinkle the honey bear on each other and the participants. During the Gondoro ritual, the Qallu, the spiritual father of the Guji and Gedeo people, is available to bless the participants and all the people at the ritual place. It is believed by the community that the presence of Qallu is necessary to have lasting peace.

Drinking yogurt and Booka (honey) from one Pot

At a traditional Gondoro ritual, Guji Abba Gada and Gedeo Abba Gada drink together from a pot of yogurt and honey. Drinking yogurt together means giving up hatred for each other. It refers to the cooling of hatred. It signifies the descent of peace between the Guji and Gedeo communities. It shows the cooling of hatred between the two communities. It indicates that the two societies have moved from

the spirit of hatred to the spirit of reconciliation. It ensures that they return to their previous love and brotherhood (data from cultural group leaders during interviews and FGD).

Similarly, during the Gondoro performance in Guji and Gedeo, Guji and Gede'o Abba Gadas together taste the honey from the jar or 'Qori' and sprinkle it to each other and the participants. They also spray the community sitting on the Gondoro performance. According to the informants who participated in the group discussions and interviews, honey shows love and taste for each other. They do it to show that they taste to each other like honey. They do it to prove their forgiveness and reconciliation. The Abba Gadas (Gada leaders) bless their people and taste each other like honey.

3.5 Actors in Gondoro Performance

Qallu (spiritual father)

In the Gada system, the Qallu is the spiritual father. Qallu is regarded as the representative of God on earth among the Guji and Gedeo communities. In traditional administration, Abba Gada is blessed by the Qallu. Informants stated that the Qallu is recognized by the Guji and Gedeo peoples as the supreme structure in the system. No Abba Gada or his advisors will be legitimate unless they get the recognition and blessing of the Qallu leader (Hinnant: 1977: 198). On the day of the Gondoro ritual, the Qallu is present. It is believed that the reconciliation will be genuine and complete by the presence of the Qallu at the performance of the Gondoro performance. The presence of Qallu at Gondoro's performance will prevent everyone from seeking revenge after reconciliation because Qallu is the spirit father of both the Guji and Gedeo ethnic groups. This is because it is feared that Qallu will curse anyone who takes revenge and breaks reconciliation.

Abba Gada

The Abba Gada is the traditional ruler. The Abba Gada of Guji and Gedeo meet and decide to reconcile. They bring out the community leaders called hayyuu Gosaa together. According to informants from Guji, the Guji Abba Gada issues the communities' leaders called Darimu and Kotoma from the Guji moieties. According to Gedeo, there are com-

munity leaders called hayecha from "shone baxe" and "Sesa Baxe" of Gedeo Moieties.

The Abba Gadas of both ethnicities hold their members and ask each other about the conflict conditions. The authority belongs to the Abba Gada, but the speaker is a community leader called Hayyuu gosaa. The Abba Gada let the community leaders investigate the root cause of the conflict. They investigate the causes of the conflict between the two ethnics and agree to reconcile. On the date of the Gondoro ritual, the Abba Gada of both ethnics open the meeting by saying reconciles 'Araara' (informant abba Hessa, Abba Girja, Hayecha Alemayehu, Hayecha Jabo Kura).

The Community leaders (Hayyuu Gosaa)

The Guji community is a structural community structured by the Gada system. Guji has three major branches: Uraga, Mati, and Hoko (Asebe, 2007; Tadesse, 2004). These three major branches have different sub-branches called gosee in the lower level. All sub-branches have their community leader called Hayyuu gosaa. According to the informants (abba Girja, abba Galcha, and abba Anole), it is not customary for community leaders from the same sub-branch to examine the issues of the two parties alone. The issue or issue of reconciliation is examined inclusively by the community leaders of Darimu and Kotoma. This is to ensure the participation of all moieties through the representation of their leaders.

In the same way, the Gedeo people have seven groups, and all seven groups have their cultural community leader called hayecha. The Gedeo people have the Shone Baxe and Sesa Baxe moieties. It means seven Gedeo cultural leaders who represented their moiety in the Gondoro reconciliation. The hayyuu gosaa means community leaders are a delegation selected by the Abba Gada from all moieties at the new Gada assembly, and their role is confirmed at the assembly.

The cultural community leaders are well-educated in the laws and ethics of the community and the community values their knowledge. They play the role of peacemaking in the community. At the assembly, they are given the name of the assembly. The Abba Gada presents the community leaders at the assembly

and approves them. The Cultural community leaders are the messengers of the Abba Gada. Generally, the Darimu and Kotoma of Guji communities' leaders and Hayechas of Gedeo cultural communities' leaders have an enforcement role in cleansing. They also have the role of restoring justice and investigating what was happening out of their culture. They reconcile on behalf of their moiety, and they convey their reconciliation to the people. They perform traditional events on reconciliation. They slaughter ox and eat liver together to show their brotherhoods.

Wata

Wata is non-Guji and Gedeo community. According to data obtained during interviews and FGD, the Guji and Gede'o community leaders explained that the Wata community lives in the Guji and Gedeo people but does not belong to the Guji and Gedeo groups. The Wata is not present in the social structure of Guji and Gede'o but plays a role in the performance of Gondoro. Wata has the role of slaughtering the cleansing sheep. He washes the murderer with the blood of a lamb. Wata shaves the murderer's hair. The wata cleanses the murderer and prepares for the Gondoro ritual. Before Gondoro rituals, all curses should be cleansed and ready for new life. A wata takes the meat of a lamb slaughtered for the cleansing called falo, and takes the weapons or clothes worn by the perpetrator of the murder. The role of the wata is to cleanse the murderer by washing the murderer with the blood of a lamb. In the Gondoro ritual process, calling wata to slaughter a sheep to cleanse the sinner with blood is considered as cleansing of sins by the community. In the Gondoro performance process, this step is the initial step for reconciliation.

Gondoro as a Symbol of lasting Peace

According to interviews and discussions with a group of Guji and Gede'o cultural leaders, there is no fighting again after Gondoro. According to the community's view, when conflict returns after Gondoro, it is said that "the bad blood will pass to society present and future." It is believed that when blood is passed, it is not pleasant; it is crushed, it is wounded, and the generation is lost. Therefore, Gondoro is not done for the deceased but for the existing community to prevent evil blood from being passed

on from generation to generation. It is done to make a good future. It is also a cleansing as a society.

After the Gondoro is done, the displaced people return to their homes. Neighbors build houses with neighbors. Guji builds Gedeo's house, and Gedeo builds Guji's house. They embrace each other. They give a daughter to each other to be linked by marriage. There is no fear or hatred at all. Performing a Gondoro is a strategy of renewal by cleansing whatever has been done without custom. It is a cleansing strategy. This strategy has been developed by the community in the past. It is part of the community's social capital. It means that both the individual and the community are cleansed by the performance in Gondoro to get rid of the problems they were in. The Guji and Gedeo communities claim to be brothers in their testimony. According to the traditions of both communities, brothers do not kill or displace each other; it is uncultured. Whether the homicide or displacement, it is customary to investigate the problem and bring it back to peace. This means that it is part of the social capital of both communities.

4 Conclusion

Gondoro is practiced as a common tradition of peace-building and avoiding hostility. Barfield (2004) expresses such tradition as glue that sustains the solidarity and peaceful coexistence between different communities. The Gondoro serves as a social capital between the Guji and the Gede'o peoples, who consider each other brothers. According to Ajanaw (2018), such tradition plays an important role in conflict resolution and peace because it contains values and expectations shared by the two communities. Such shared tradition plays an important role in resolving conflicts and establishing peace.

Goondoro has been functioning as a social capital of sustaining peace and brotherhood, and this implies the power of indigenous knowledge and practices in building peace and sustaining stability at the grassroots. Accordingly, Gondoro is the social capital of the Guji Oromo and the Gedeo people. In support of this view, Fred-Mensah (2005) posited that the tradition of conflict cessation and peacebuilding is part of the societal knowledge repository. According to informants who participated in the focus group discussions and interviews, the bodies playing a role

in Gondoro implementation have cultural responsibilities. The community respects them very much. The community believes and implements what they say. According to the evidence provided by the informants in the group discussions and interviews, the community accepts what these bodies say. They believe that anyone who does not do what they say will perish. The community also perceives as immoral any person or group who refuses to respect these cultural enforcers. Society will isolate anyone who violates social morality.

In general, the findings of this study show that Gondoro's performance is implemented as a social capital through which the Guji and Gedeo peoples resolve conflicts, restore peace, and sustain their brotherly relationship. The Gondoro performance is part of the accumulation of social capital of the Guji and Gedeo peoples and is in line with the social capital of African tradition. They believe that Gondoro cleanses and renews what has been done that is not customary. The practice of Gondoro between Guji and Gedeo can be taken as an example of the effectiveness of using shared traditions of conflict resolution and peacebuilding to resolve conflicts between border regions in Ethiopia. In addition, the new generation needs to understand the social capital we have in our culture and learn to solve security problems through cultural processes.

Acknowledgments

First of all, we thank God for helping us to do the research in good health. We are grateful to Dilla University Research and disseminations Office for covering the cost of this study. We thank the community leaders of the Guji and Gedeo participated in the research interviews and FGD answering our questions in the discussion. We are especially grateful to Yuba Aba Girja and Hayecha Hailu Beyene from the community leaders for sharing their cultural knowledge with us. We thank Mr. Tsegaye Tadese from Gedeo Zone Culture and Tourism Bureau for providing us with additional research evidences from the archive. We are grateful to the editors for their valuable comments from beginning to end that helped improve our manuscripts. We would like to thank Mr. Bedane Tune and Mr. Belay Bire for introducing and connecting us with the community leaders by moving with us as we collected data. Finally, we

declare that it is the responsibility of the authors for the errors seen in this article.

Conflict of Interest

The authors declares that there is no conflict of interest.

References

- Ajanaw Alemie. (2018). Roles of Indigenous Conflict Resolution Mechanisms for Maintaining Social Solidarity and Strengthening Communities in Alefa District, North West of Ethiopia: Gondar University. *Journal of Indigenous Social Development*, Vol.7, Issue 2, pp, 1-21.
- Asebe Regassa. (2007). Ethnicity and Inter-ethnic Relations: The Ethiopian Experiment and the Case of the Guji and Gedeo' (M. Phil Thesis), Faculty of Social Sciences, University of Tromsø, Tromsø.
- Asnake Kefale. (2004). 'Federalism: Some Trends of Ethnic Conflicts and their Management in Ethiopia.' Ina. G. Nhema, editor. *The Quest for Peace in Africa: Transformations, Democracy and Public Policy*. Utrecht: International Books.
- Bello, P. and Olutola, A. (2016). *Indigenous Conflict Resolution Mechanisms in Africa: Lessons Drawn for Nigeria*: Tshwane University of Technology.
- Bourdieu, P. (1986). The forms of capital. In John G. Richardson (ed): *Handbook of Theory and Research for the Sociology of Education*. New York; Greenwood Press.
- Brock-Utne, B. (2001). *Indigenous conflict resolution in Africa*. A draft presented to the week end seminar on indigenous solutions to conflicts, Institute for Educational Research, University of Oslo, Norway.
- Creswell, J. W. (2003). *Research design: quantitative, qualitative and mixed approaches* (2nd ed.). London: Sage publications.
- Field, J. (2008). *Social capital* (2nd ed). London: Routledge.

- Fred-Mensah, Benk. (2005). "Nugormesese: An indigenous basis of social capital in a West African Community". 1K Notes, No. 86, November. World Bank.
- Hinnant, J. C. (1972). Guji of Ethiopia. New Haven: Human Relations Area Files, Inc.
- Hinnant, J.C. (1977). The Gadaa System of the Guji of Southern Ethiopia: University of Chicago Press
- Kelemework Terefe. (2013). Conflict and alternative dispute resolution among the Afar pastoralists of Ethiopia. *African Journal of History and Culture*, 3(3), 38-47.
- Kwaku Osei-Hwedie and Morena J. Rankopo. (2012). Indigenous Conflict Resolution in Africa: the case of Ghana and Botswana. IPSHU English Research Report Series, 29, 33-51. University of Botswana.
- Patton, M.Q. (1915). How to Use Qualitative Methods in Evaluation. Newberry Park, CA: Sage Publications.
- Phillips, R., & Pittman, R.H. (2009). An introduction to community development. New York: Routledge.
- Putnam, R, D (1993). Bowling alone: America's declining socila capital. *Journal of Demokiracy*, Vol. 6, 1, 64-78.
- Sandelowski, M. (2012). Writing usable Qualitative Health Research Findings. *Qualitative Health Research*, 22, 1404-1413.
- Solomon Hailu. (2009). A History of the Gedeo, 1941-2000' (MA Thesis), Department of History and Heritage Management: School of Graduate Studies: Addis Ababa University.
- Strauss and Corbin, J.M. (1998). Basics of Qualitative Research: Techniques and Procedures for Developing Grounded theory: Sage Publication, Inc.
- Tadesse Jaleta. (2004). A contextual study of Guji-Oromoproverbs: Function in Focus. (MA Thesis), Department of Foreign language and Literature, School of Graduates, Addis Ababa University.
- Volker, B. (2007). Potential and Limits of Traditional Approaches in Peacebuilding. Australian Centre for Peace and Conflict Studies.