

Factors affecting the Practice of Sustainable Land Management in East Gojjam Zone, North West Ethiopia

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Abstract

Land degradation is a serious problem in Ethiopia in general and in the study area in particular. Although efforts have been made to achieve the objective of the sustainable land management program, the success is not comparable with the efforts the country has made; as a result the community's livelihood is highly affected and many households cannot always ensure their food security. Therefore, this study was conducted in East Gojjam Zone of Ethiopia with the objective of identifying factors affecting sustainable land management practices. To achieve this objective, a household survey was conducted by collecting primary data from a randomly selected sample of 140 household heads. Descriptive statistics like mean, percentage and standard deviation along with F- tests, χ^2 - test and binary logistic regression model were employed to analyze the data. The survey results indicated that about 40 per cent of the sample respondents were maintaining the available land management measures regularly, whereas 60 per cent of them did not volunteer and hence were not interested to maintain different mass constructed land management structures. The results also revealed that educational level, awareness on land degradation, participation, labor availability, extension contact, farm size and slope of the land owned were found to be positively and significantly affecting sustainable land management practices. Finally, community empowerment, genuine community participation and appropriate sustainable land management technologies specific to each agro-ecosystem zone of the area are recommended.

Keywords: Sustainable land management, Soil and water conservation, Binary logit model, East Gojjam

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Introduction

Managing the land degradation has been the critical challenge for the economy in Sub-Saharan African countries including Ethiopia since their economy is highly dependent on subsistence rain fed agriculture. According to previous studies, Africa loses over 50 tons of soil per hectare and nearly 4 million hectares of forest land annually and these evidences indicate that the natural resources in the continent have been excessively exploited and resulted in land degradation which in turn affects their livelihoods (FAO, 2011).

The growing demand for natural resource bases leads to erosion, deforestation and other forms of land degradation, and the resultant global climate change are some of the key challenges in fragile mountain ecosystems to implement sustainable development and ensuring food security in Ethiopian highlands (Simane, 2012). Especially in the northern highlands of Ethiopia, the hills and mountains have suffered from loss of vegetation cover and fertile topsoil that only bare stones are left behind. It is evident that the thick masses of soil have been taken away by major rivers such as Blue Nile whose major tributaries originated from Ethiopian highland Mountains. Therefore, FAO has estimated an average rate of soil loss of 100 tons per hectare per year across the Ethiopian highlands (Simane, 2012).

The communities livelihood in the study area is highly dependent on agriculture, however, the development of this sector is hampered by land degradation mainly due to soil erosion and it accounts for the lion's share in reduction of agricultural production and productivity and food insecurity problem in the region. These problems are aggravated mainly due to new human settlements and intensive cultivation which are common on steep slopes and the farmers are highly dependent on traditional farming system with poor land management practices (Mitiku et al., 2006). Land management through soil conservation programs in the highlands of Ethiopia were premised on the notion that farmers did not perceive erosion and had little or no interest in combating it and hence, conservation programs relied on coercive approaches and performed poorly (Yohannes and Herweg, 2000). Failure to balance land management interventions with the current level of land degradation is still a growing challenge to smallholder farmers on the hill slopes to meet both immediate economic benefit objectives and a sustainable environment.

According to Kassie, et al. (2008), sustainable land management practices are knowledge intensive and soil and water conservation investment in the Nile basin of Ethiopia performed differently in different rainfall regions. This underscores the importance of geographical specific intervention when promoting land conservation technologies. The Ethiopian highland mountain range is the water tower of the region which is serving as the catchment of the upper Blue Nile basin to contribute more for the Ethiopian great renaissance dam. Many of the tributaries of the Blue Nile originate from these mountain ranges which include among others Gilgel Abay, Birr, Abaya, Gedeb, Chemoga, and Muga rivers. It is therefore the actual water tower of the Blue Nile that is the lifeline for the millions of people in Ethiopia, Sudan, and Egypt (Simane, 2012).

Traditional land management, including appropriate agricultural practices as well as good forestry practices have extensively protected the watersheds from accelerated erosion in the past but today's land abandonment as well as forest mismanagement has dramatically increased the frequency of intensive soil erosion events. Moreover, in the area there is high population growth which leads to expansion of cultivation of marginal lands and there is a new human settlement in a very mountainous area which depletes the main water tower of the watershed and biodiversity that leads to severe land degradation in the study area. Due to this reason the natural resource base mainly land, water and biodiversity are under intense pressure and the farming communities of the area are facing problems of food insecurity. In order to manage this problem, appropriate land management measurements particularly soil and water conservation intervention is plainly justifiable. However, despite the magnitude of the land degradation problem and the efforts made to address the issue in this area mainly in the past few decades, conservation technologies and practices are still not widely adopted and the success is not comparable with the efforts made. Thus, studies on the determinants of sustainable land management practices have significant importance. Specifically this study tries to address the following objectives:

1. To examine the level of community participation in sustainable land management activities on their farm lands and
2. To identify the major factors that affect sustainable land management practices.

Materials and Methods

Study Area

This study was conducted in East Gojjam Zone, Amhara Regional State, Ethiopia. As per the 2015 population projection using 2007 Census, East Gojjam Zone has a total of 2,496,325 (1,221,255 males and 1,275,070 females) population (Alemu et al, 2017). East Gojjam Zone has a total of four town administrations and 16 rural districts. The area includes the Choke Mountain watersheds found in the Blue Nile Highlands of Ethiopia, which extends from tropical highland of over 4000 m elevation to the hot and dry Blue Nile Gorge, including areas below 1000 m below sea level. Based on different parameters and characteristics like farming system, temperature, rainfall, soil type, adaptation potential and constraints, the area is divided into six agro-ecosystems with its respective characteristics. These include Lowlands of Abay valley (AES1), Midland plains with black soil (AES2), Midland plains with red soil (AES3), Midland plains with brown soil with sloping lands (AES4), Hilly and mountainous highland (AES5) (Simane, 2013).

Sampling Procedure and Sample Size

This study employed multi-stage sampling frame by considering agro-ecosystem zones of the study area rather than considering its geographical location. Therefore, firstly five agro-ecosystem zones (Lowland and valley fragmented, Midland plains with black soil, Midland plains with brown soil, Midland sloping lands and Hilly and mountainous highland) were purposively selected from six agro-ecosystem zones of the region for its relevance to the study; the sixth agro-ecosystem zone (Afro alpine- Choke protected area) was not considered since there is no human settlement there and it is also a protected area. Then one kebele (the smallest administrative unit in Ethiopia, equivalent to a ward) from each agro- ecosystem zone i.e. a total of five kebeles were selected randomly. A total of 140 sample household heads were selected randomly based on the size of each kebele i.e. proportional numbers of respondents were taken from each kebele.

Data Collection Methods

As a source, both primary and secondary data were used; primary data were collected through semi-structured interview schedule, focus group discussion, key informant interview

and direct field observation. These primary data were supplemented by secondary data mainly from books, journals and official reports.

Data Analysis Methods

The data were analyzed by frequency, percentage, mean, standard deviation, cross tabulation along with F-test; Chi-square test and binary logistic regression model.

The binary logistic regression distribution function for identification of factors which affect sustainable land management practices can be defined as:

$$Li = \ln \left[\frac{p_i}{1 - p_i} \right] = Z_i = \beta_0 + \beta_1 X_1 + \beta_2 X_2 + \dots + \beta_m X_m \dots \dots \dots (5)$$

β_0 Is the intercept, X is the explanatory variable, β_1 is the slope while Z_i represents dependent variable. Multicollinearity test among explanatory variables was checked by variance inflating factor and condition index for continuous variables; and contingency coefficient for categorical independent variables were employed to check their collinearity. Finally, the parameters of the model were estimated using the iterative maximum likelihood estimation procedure.

Results and Discussion

Demographic Characteristics of Respondents

As shown in Table1, the survey result indicated that among the total sample household heads, 95 per cent were male and 5 per cent of them were female. The mean age of sample household heads was 46 years with standard deviation of 9.14. The family numbers of the sample households range from 2 to 9 persons, with a mean of 5 persons and standard deviation of 1.32. About 85 per cent of the total sample households have a family size of 4 and above persons per household head. The survey results also showed that almost 95 per cent of the respondents were married.

As the education level of household heads increases, it is expected to increase the ability of farmers to obtain, process and use relevant information to apply improved agricultural technologies in general and land management practices in particular. Concerning the educational level of sample household heads, the survey results indicated that about 45

per cent of the total respondents were illiterates, while the rest 55 per cent of the respondents could read and write; and no one has attended either primary school or secondary and above.

Table 1. Demographic characteristics of the farmers

Household characteristics		Percentage	Mean	St. deviation
Age		-	46	9.14
Family size		-	5	1.32
Sex	Male	95		
	Female	5		
Marital status	Married	95		
	Unmarried	1.7		
	Divorced	0		
	Widowed	3.3		
Religion	Orthodox	100		
	Muslim	0		
	Protestant	0		
Educational status	Illiterate	45		
	Read and write	55		

Economic and Land Characteristics of the Farmers

The annual income from crop production, livestock and income generated from non-farming activities was considered to enumerate the average income of the community. The results showed that, the highest income was generated from farming income (both crop and livestock) followed by non-farming activities. This indicates that the majority of households almost entirely live on cultivation of plots and growing various crop types. Across agro-ecosystem zones there were significant differences in land size, farming income and income from off-farm activities at $P < 0.01$, 0.01 and 0.05 probability levels respectively. This shows that there exists plot size dynamism which resulted in variation in productivity and income level as a whole.

The maximum income from crop (Ethiopian Birr 49,948, for which exchange rate is US \$ 0.031 or Indian Rs. 2.23) was obtained by those households who live in agro-ecosystem II (Mid land with black soils) (Table 2). This is because teff (*Eragrostis tef*), a staple crop for humans and also a forage crop is the major crop in this agro-ecosystem which is intensively produced and outweighs other crops in price. On the other hand, farmers who gain the minimum crop income (ETB 9,479) were those who dwell in agro-ecosystem IV (mid land with sloping lands). The reason for this is attributed to the fact that this zone is probably the most degraded with infertile and non-productive red soils.

Table 2. Economic Characteristics of Farmers across Agro-eco system zones

Note: *** and ** represent levels of significance at 1% and 5% probability

Agro-eco system	Economic Parameters		
	Mean(SD) Land Size (ha)	Mean(SD) annual Farm income (ET Birr)	Mean(SD) annual Off-farm income (ETB)
AES-1	1.78 (1.03)	26,880.91 (11,409.03)	4,28.57 (223.24)
AES-2	2.07 (1.25)	49,948.39 (29,928.80)	153.85 (81.23)
AES-3	1.74 (0.68)	22,277.32 (16505.80)	1,900.50 (907.62)
AES-4	2.39 (1.67)	9,479.09 (6,884.18)	1,609.73 (121.84)
AES-5	1.15 (0.34)	14,215.00 (10,655.08)	300.00 (101.45)
Total	1.85 (1.15)	22,807.96 (20,860.82)	1,183.02 (680.10)
F-Value	5.89***	28.54***	3.58**

Farmers' Awareness on Land Degradation Problems

Farmer's awareness about the existence of land degradation problems makes them construct and maintain Soil and Water Conservation (SWC) measures to manage their land. As high as 80 per cent of the households were aware about the severity of land degradation problem while the remaining 20 per cent of the households had no awareness about the problem of land degradation and its impacts. However, different evidences indicated that farmers awareness on land degradation has significant impact for sustainable land management practices.

Level of Land Degradation across Agro-ecosystem zones

The survey results revealed that farmers who reside in lowland and fragmented valleys (AES-1), midland with sloping lands (AES-4) and hilly and mountainous highland (AES-5) were found to be faced with severe erosion problem than farmers who are from other agro-ecosystem zones (AES- 2&3 which is midland plains with black soil and midland plains with brown soil respectively). The study results also indicated that farmers in different agro-ecosystem zones have different perception levels about land degradation severity; when the farmers perceive the land degradation problem, they are more likely to use different land management (soil and water conservation) measures on their land. The Chi-square test - (73.9***) indicated that land degradation levels across agro-ecosystem zones were significantly different in which agro-ecosystem 1, 4 and 5 have experienced high land degradation problem compared with other agro-ecosystem zones in the study area (Figure 1). Based on the information gained during the focus group discussion, deforestation, over grazing, over cultivation, poor agricultural practices and poor SWC measures were some of the major causes of land degradation problem explained by the respondents, of which deforestation, over cultivation, poor agricultural and SWC practices and over grazing were central to respondent's rankings.

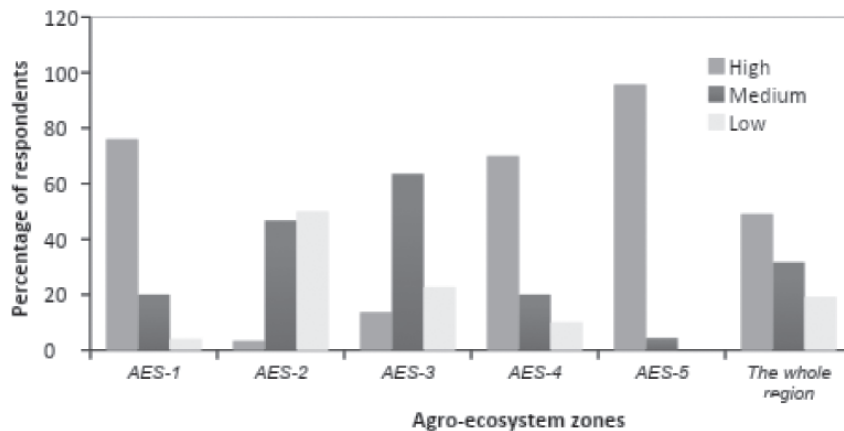


Figure 1: The level of land degradation across Agro-ecosystem zones

Community Participation in Sustainable Land Management Activities

Land management work is really worthy when it is effective and sustainable; and to be effective, it has to be carefully engineered; and to be sustainable, genuine community participation is imperative and in need indeed (Bewket, 2003). This study has understood that only 39 per cent of the households participated in sustainable land management practices particularly in soil and water conservation campaign voluntarily, whereas the rest 61 per cent of the sample respondents were forced to do the campaign work in mass by frustrating them as they were denied access to different agricultural inputs and other services. Among farm households who maintain conservation structures regularly, 88 per cent participated in sustainable land management works voluntarily. This implies that voluntary participation of communities is a vital component of sustainability of land management practices. Those farmers who participated willingly were more interested in the maintenance work of conservation structures than farmers who were forced to do so by external bodies (Bewket, 2003).

As shown in Figure 2, the participation level of respondents at planning stage of SLM programs was found to be low in the study area. The χ^2 -test showed that the participation levels of respondents at the planning stage between the two groups were also found to be significantly different.

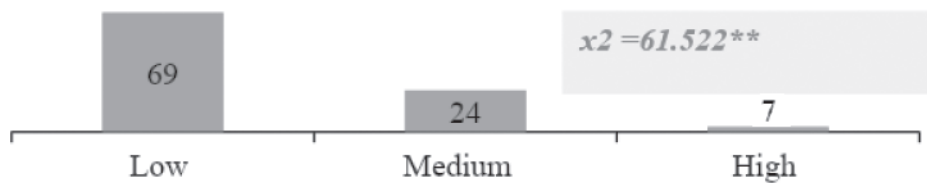


Figure 2: Community participation at planning stage of SLM practices

Current Sustainable Land Management Practices in the Study Area

Different types of sustainable land management measures were introduced to the study area with the objectives of conserving, developing and rehabilitating degraded agricultural lands and increasing food security through increased food production/ availability. Land conservation programs mainly targeted on farm lands, degraded lands and rehabilitation of gullies. The farmers are aware of different soil and water conservation measures such as soil bunds, stone bunds, fanya juu, bench terraces, contour cultivation, compost making, crop rotation, inter cropping. However, they are practicing only a few of them like crop rotation, cut of drain, intercropping, stone and soil bund, fanya juu and compost.

Benefits of Soil and Water Conservation in Crop Production and Productivity

Conservation is much more than a mere erosion control exercise but rather it has to have a wider scope of addressing agricultural production and productivity. The statistical t-test result showed that all crop type mean production in quintals were found to be significantly different at 1 per cent and 5 per cent level before and after the implementation of conservation structures in the same plots of land. The focus group discussants also reported that there is crop production and productivity increment after they practice soil and water conservation measures (Table 3).

Table 3. Crop Production per unit area before and after SWC works measured by Farmers view

Main Crop type	Cultivated land size (Hectare)	Total Production before SWC (Quintal)	Total Production after SWC (Quintal)	No.of Respondents	%	t-value
Teff	72.51	721	749.5	118	98.33	-2.865***
Mean	0.61	6.11	6.35			
S.D	0.47	4.22	4.24			
Maize	15.64	395.95	411.75	67	55.83	-2,129**
Mean	0.23	5.91	6.15			
S.D	0.12	4.34	4.38			
Wheat	24	349	365	56	46.67	-2.468**
Mean	0.43	6.23	6.52			
S.D	0.45	3.79	4.02			
Barley	8.64	128.5	138.25	28	23.33	-2.1738*
Mean	0.31	4.58	4.94			
S.D	0.19	2.05	2.15			
Sorghum,	13.33	207	222	24	20	-3.292***
Mean	0.56	8.62	9.27			
S.D	0.22	3.05	3.18			

, * significant at 5% and 1% level

Major Constraints of Current Land Conservation Practices

Regardless of a high level of perception about soil erosion problems, many farmers still have not adopted different land management technologies. Farmers were experiencing different challenges while practicing conservation technologies. During focus group discussion, the farmers pointed out that conservation structures have a problem of wasting of farmland, difficulties in turning oxen during ploughing, harbor rodents especially rats, and its labor intensiveness during construction and maintenance activities are among the frontline challenges raised by the farmers.

Logistic Regression Analysis on Factors affecting Sustainable Land Management Practices

Fourteen variables were hypothesized to affect sustainable land management practices in the study area and based on the output of the model through estimation of maximum likelihood, six variables were found to have significant impact on the SLM practices, whereas the remaining eight variables such as age, sex, family size, land ownership, off-farm income, and access/ use of credit, awareness on land degradation and distance to market were found to have insignificant impact. The results are interpreted through odds ratio and only those variables which have significant impacts on sustainable land management are discussed below.

Table 4. The Maximum Likelihood Estimates of the Model

Variable Name	Estimated Coefficient (B)	Significance level (sig.)	Odds Ratio Exp (B)
Educational status	1.014	0.045**	8.665
Farm size	-2.581	0.058*	32.323
Slope of land	2.073	0.016**	13.410
Participation on SLM	3.515	0.005***	21.9374
Labor availability	2.147	0.004***	24.172
Contact with extension agents	0.868	0.039**	6.335

***, **, * Indicate significance at 1%, 5% and 10% significance level respectively

Pearson chi-square _____ 115.06***

Hosmer and lemeshow test _____ 0.91 = significance level

-2 log likelihood _____ 49.653

R² _____ 78% - Prediction success

Based on the model output, education affects sustainable land management practices positively at 5 per cent significance level. The probability of educated farmers to use and

maintain land conservation structures were about nine times better than illiterate farmers and it can be justified that education influences technology adoption tendency of farmers by enhancing their ability to understand the practices and by improving their overall managerial ability in advance. These inferences confirm with the conclusions of the study by Getachew (2005).

Voluntary participation of the community in public campaign work of land management practices was found to be significant at 1 per cent level. By holding other variables constant, the probability of maintaining conservation structures was 22 times higher by volunteer participants than those of unwilling participant farmers. It implies that genuine participation of the community is an input for sustainable land management practices in deed and it is in line with the finding of Bewket (2003).

In this study it was found that, land size of the households has a negative correlation with sustainable land management practices at 10 per cent significance level. It implies that smaller the farm size, more likely that they manage their land better than their counterparts with larger farm size. It can be justified, as farmers are more likely to invest in managing the land when it is too small so as to reduce the risk of reduction of production due to degradation. This finding contradicts the findings of Aklilu (2006), who reported that farmers who hold large farms were found to be more likely to invest in land conservation and management technologies. Extent of slope of land was also associated with land conservation practices positively and significantly at 5 per cent significance level. The odds of farmers who cultivated sloping lands are 13 times more likely to manage their lands than those farmers who are cultivating relatively level/plain lands. This implies that farmers cultivating erosion vulnerable plots are alert to construct different conservation measures and further maintaining it to sustain their livelihood through sustainable management practices. Labor availability was found to have positive and significant association with land management practices and the finding indicated that more the labour available for the household, the more likely they are to engage in land conservation works. As the household labour is increased by one person, the probability of the household to engage in the land management work is increased with the factor of 24 as shown in the model output above. Frequency of extension agent contact was also found to have a positive relationship and it is significant at 5 per cent significance level. By keeping other variables constant, increasing

the frequency of contact by one term in a month, the probability of farmers to maintain land conservation structures will be increased by a factor of 6. Regular contact of the farmer with extension agents increased the probability of practicing land management technologies. A previous pocket study conducted in Ethiopia by Wagayehu (2003) reported that if there is close contact with the extension agents, the farmers are more likely to receive better information and technologies regarding sustainable land management.

On the other hand, age, sex, family size, land ownership, off-farm income, access/ use of credit, awareness on land degradation and distance to market were found to be less important factors in determining farmers' decision for sustainable land management practices.

Conclusion and Recommendations

Land degradation problem is a main challenge of the community and they are suffering a lot to sustain their livelihood through agricultural activities. Majority of farmers in the study area have perceived the problem of land degradation on their farm lands, however, it is not always a guarantee for adoption of sustainable land conservation and management practices. The levels of land degradation particularly soil erosion were significantly different across agro-ecosystem zones in which AES-1 and AES-5 were more vulnerable in respect of severe land degradation. Voluntary participation of the community in the process of public campaign work of land management practice through SWC was found to be low and hence local administrators forced them to do so as a mandatory work. Therefore, the practice was not participatory; particularly the planning stage of the practice lacks the active involvement of the local community at the grass root level. Sustainable land management practice is influenced by a couple of factors among which, education level, farm size, participation, labour availability and contact of extension agents were found to significantly influence farmers practices in the study area.

This study gives the direction for concerned stakeholders to design a strategy that can assure genuine local community participation at all levels of the process of land management intervention programs which is a vital instrument for sustainable management of natural resources including land and water. Further, to sustain the land management practices, current conservation technologies and practices should be delivered by considering the

specific agro-ecosystem nature of the area by avoiding the blanket supply/command for all areas because the severity and the nature of the problem is quite different across agro-ecosystem zones of the region.

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References

- Aklilu, A and Jan de, G., (2006). Determinants of adoption and continued use of stone terraces for soil and water conservation in an Ethiopian highland watershed. *Ecological Economics* in press Pp.69-83.
- Alemu et al. (2017). Spatial variations of household food insecurity in East Gojjam Zone, Amhara Region, Ethiopia: implications for agro-ecosystem-based interventions, *Agriculture and food security*.
- Bekele, S. (1998). Peasant Agriculture and Sustainable land use in Ethiopia. Economic Analysis of Constraints and Incentives for Soil Conservation. Agricultural University of Norway. Dissertation no: 1998:1.
- Bewket, W. (2003). Land Degradation and Farmers' Acceptance and Adoption of Conservation Technologies in the Digil Watershed, Northwestern Highlands Ethiopia. Social Science Research Report Series –no 29. OSSERA. Addis Ababa.
- De Graaf, Jan (1996). The Price of Soil Erosion: An economic evaluation of soil conservation and watershed development. Tropical Resource Management Papers No. 14. Wageningen Agricultural University, Department of Irrigation and Soil and Water Conservation, Wageningen, The Netherlands.
- FAO. (2011). Sustainable land management practices. Available at: www.fao.org/docrep/014/i1861e/i1861e.pdf . Accessed on September, 2017
- Getahun Degu (2004). Assessment of factors affecting adoption of wheat technology and its impacts: The case of Hula Woreda. An M.Sc.Thesis Presented to the School of Graduate Studies of Alemaya University.24pp.
- Hurni, H. (1993). Land Degradation, Famine and Resource Scenarios in Ethiopia. In: Pimental, D. (ed.), *World Soil Erosion and Conservation*. Cambridge University Press, Cambridge.

- Kessler, CA. (2006). Decisive key factors influencing farm households' soil and water conservation investments. *Applied Geography* 26:40–60.
- Kessler, CA. (2006). Moving people-towards collective action in soil and water conservation's Experiences from the Bolivian mountain valleys. PhD Dissertation, Wageningen University. 2006.
- MoFED, (2002). Ethiopia: Sustainable Development and Poverty Reduction Program. Addis Ababa, Ethiopia.
- Simane, B. (2012). Building Climate Resilience in the Blue Nile/Abay Highlands: A Role for Earth System Sciences. College of Development Studies, Addis Ababa University, Addis Ababa, Ethiopia
- Simane, B. (2013). Agro ecosystem Analysis of the Choke Mountain Watersheds, Ethiopia. College of Development Studies, Addis Ababa University, Addis Ababa, Ethiopia
- Wagayehu Bekele (2003). Theory and Empirical Application to subsistence Farming in the Ethiopian highlands. PhD dissertation, Swedish University of Agricultural Science.
- Wagayehu Bekele (2005). Stochastic dominance analysis of soil and water conservation in subsistence crop production in the Eastern Ethiopian highlands: The case of the Hunde-Lafto area. *Environmental and Resource Economics* 32: 533-550.
- Wagayehu B and Lars D (2003). Soil and Water Conservation Decision of Subsistence Farmers in the Eastern Highlands of Ethiopia: a case study of the Hunde-Lafto.
- Yeraswork A (1988). Impact and sustainability study of WFP Assisted Project ETH 2488/II Rehabilitation of Forest, Grazing and Agricultural Lands. Addis Ababa. WFP.

Abbreviations

- AEZ: Agro-ecosystem zone
- CSA: Central statistics agency
- EDHS: Ethiopian demographic and health survey
- FAO: Food and agriculture organization
- SLM: Sustainable land management
- SWC: Soil and water conservation
- WHO: World health organization