Farmers' Perceptions of Land Productivity and Degradation, and Major Practices of Land Management in Habru Woreda, North Wollo Zone, Amhara National Regional State, Ethiopia

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Abstract: This study assesses farmers' perceptions of farmland productivity and land degradation, and land management practices in Habru *woreda*, north Wollo zone, Amhara national regional state, northern Ethiopia. The study employed survey research design. Data were gathered from 215 randomly selected sample respondents, 12 key informant interviewees, and 8 focus group discussion participants from 4 purposively selected representative kebeles based on agroecology and land degradation. Descriptive analysis was employed for the quantitative data using SPSS software version 17. Accordingly, about 36% and 34% of sample respondents perceived their farmlands' productivity as very good and good, respectively. Land degradation was perceived by about 62.3% of sample respondents as severe and by 32.1% of them as moderate. Farmers used traditional and introduced management practices namely check dams, stone/soil bunds, application of manure, tree planting, contour ploughing and fallowing either per se or in combinations. Recently, Participatory Safety Net Program was implemented being derived by self-motivation and by incentives of the program as reported by 65.1% of 32.1% of sample respondents in the study area, respectively. Despite these endeavours, rainfall variability, land degradation, weeds and pests, delay in agricultural inputs, and traditional farming practices are reported as among major challenges of agricultural production. Therefore, it calls for demand driven interventions not only to avert short term challenges encountered by the farming community but also towards sustainable land management, poverty reduction, food security and livelihood development.

Keywords: Farmers' Perceptions; Habru *Woreda*; Land Degradation; Land Management Practices; Land Productivity

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1. Introduction

Land degradation is a global phenomenon that endangers the livelihoods of rural farmers indeed, of the population at large, and a country's potential to produce crops, livestock, and products from other natural resources. It remains an important global agenda in the 21st century due to its adverse impact on agronomic productivity, environment, food security, and the quality of life (Eswaran *et al.,* 2001). On a global scale, land resources are becoming increasingly scarce and the quality of land resources is usually decreasing because of land degradation and poor land management practices. Land degradation affects all three elements of the critical triangle of development goals, namely agricultural growth, poverty reduction, and sustainable resource management (Vosti and Reardon, 1997). Only few countries have land resources available for agricultural expansion, and in most cases, the cultivated land today is the same land that must be protected for the future (Barrett *et al*., 2002). Land degradation is likely to lead to further impoverishment, and conservation efforts may be critical to prevent this. Degradation plagues almost all areas of the world but more severe in arid, semi-arid and sub-humid areas and presents a global challenge that requires urgent attention (UNCCD, 2008).

The major factors of land degradation in developing countries are improper and unsustainable land management due to population pressure, small farm land, land tenure insecurity, land redistribution, limited access to credit and limited education that enforced dramatic decline in agricultural productivity that reached the level beyond the subsistence requirement of a household (IFPRI and ILRI 2007). On the other hand, degradation of soils and other natural resources proceed at a high rate in much of Africa, reflecting low rates of adoption of sustainable natural resource management strategies, especially among the poorer sub-population of smallholder producers (Barrett *et al*., 2002).

Sub-Saharan Africa (SSA) is particularly vulnerable to threats of natural resource degradation and poverty. This is due to various factors including a high population growth rate and increasing population pressure, reliance on agriculture that is vulnerable to environmental change, fragile natural resources and ecosystems, high rates of erosion and land degradation, and low yields and high post-harvest yield losses. In SSA concerted efforts to deal with land degradation through sustainable land management (SLM) must address issues related to water scarcity, soil infertility, organic matter and biodiversity. Sustainable land management seeks to increase production through both traditional and innovative systems, and to improve resilience to the various environmental threats (Liniger *et al*., 2011). Through centuries of farming practices, the farmers and pastoralists in Ethiopia were managing their land resources pertaining to the needs of prevalent populations. With an increasing population and growing demands, more land was put under cultivation. Subsequently forest areas were cleared, encroaching agriculture into steep slopes and areas that were not suitable for agricultural activities. Land degradation and particularly soil erosion by water not only reduced the productivity of the land but also aggravated the effects of drought, such as famine and migration. Obvious signs of degradation in the highlands of Ethiopia are wide gullies swallowing fertile lands and rock-out crops

making farming a risky business. But also less visible sheet erosion processes result in a tremendous loss of fertile topsoil, particularly on cropland (Mitiku *et al.,* 2006).

The Ethiopian highlands are known for their inherent fertility and sufficient rainfall. They are also among those with highest agricultural potential in Africa, and yet they are threatened by accelerating land degradation (Shiferaw and Holden, 1998). According to Assefa (2009), land degradation is a major problem in the highlands of Ethiopian, as roughly estimated, nearly 1.0 to 1.9 billion tons of soil is lost each year due to unsustainable and poor land management practices. The problem is serious in the northern highlands of Ethiopia, particularly in Amhara region, Habru *woreda* where land degradation is severe. Farming has expanded to marginal lands, communal grazing land and the natural forests on the verge of total disappearance due to inappropriate land management practices. The concerned government agencies and NGOs have been making efforts to reverse the situation; however, the perception held by the farmers about land degradation and land management practices at local level have not been studied systematically in the study area.

In Ethiopia, significant soil and water conservation (SWC) activities were implemented during the 1970 and 1980s by mobilizing farmers through their peasant associations, mainly in food for work programs (Bewket, 2007). This approach was criticized for its top down approach, lack of participation of local community and consideration of local scenario based implementation instead of black-sheet recommendations. In many parts of the country, the recumbent government has also been undertaking SWC through integrated and participatory watershed development approaches to improve rural livelihoods with sustainable natural resource management. One of the goals, in the government's Plan for Accelerated and Sustainable Development to End Poverty (PASDEP) of 2006-2011, was to enhance food security through improved natural resources management (MoFED, 2006). But land management practices are complex issues requiring further investigations as they are influenced by different factors operating at different scales (Gashaw, 2006; Pender *et al.,* 2006). In a nutshell, this paper reports on perception of land degradation and practices of land management by smallholding farmers in the study area.

2. Research Methods

2.1. Description of the Study Area

Astronomically, Habru *woreda* is located between 11°24'00"N-11°45'00"N, Latitude and 39°30'00"E-39°57'00"E, Longitude. Habru *woreda* is located in North Wollo administrative zone, Amhara regional state, Ethiopia. Mersa town is the center of the Woreda, which is 490km northeast of Addis Ababa and 30km south of Woldiya, capital of north Wollo zone of the region. Habru *woreda* is bordered on the south by Mille river, on the west by Gubalafto *woreda*, on the north by the Alawuha river, and on the east by the Afar region. The topography was characterized by plain lands (40%), plateaus (35%), escarpment (22%), and other landscapes (3%).

2.2. Research Design and Procedure

To achieve the objective of this study, a descriptive survey research design was employed. The data obtained from primary and secondary sources were analysed through qualitative and quantitative techniques. A multi-stage sampling procedure was employed to select the sample '*kebeles'* and determine the sample size. There are 34 kebeles in *Habru woreda and* multistage random sampling was employed to select four of them. In the first stage, 34 '*kebeles'* of the study area are classified into two agro-ecological zones: temperate highland (*Dega*) and sub-tropical mid-highland (*Woina Dega*). In the next stage, two '*kebeles'* from the highland agro-ecology, and two from mid-highland agro-ecology were purposively selected on severity of land degradation. Out of 1925 household heads, 215 household heads (106 from the highland, and 109 from the mid-highland agro-ecologies) were selected for survey through random sampling technique. In addition to this, 12 key informants were selected, namely development agents, agricultural experts, model farmers, community leaders and local government representatives and key informants interview (KIIs) was employed. The data was triangulated with 8 respondents of participants of focus group discussions (FGDs). The data were analysed through statistical techniques such as frequency and percentage.

3. Results and Discussions

3.1. Farmers' Perception of Farmland Productivity

Table 1. Distribution of respondents on farmers' perception of farmland productivity

Productivity level	Frequency	%
Very good	77	35.82
Good	73	33.95
Moderate	26	12.09
Poor	39	18.14
Total	215	100

Source: Field survey, 2014

Land productivity is essential to raise agricultural production on a given plot of land. Farmers' perception is associated with land productivity and crop production. According to the survey results, 69.8% of sample respondents perceived their farmlands as good and very good in the study area (Table 1). Despite this fact, most stated the challenges that they faced in the due time including rainfall variability, land degradation, weeds and pests, delay in agricultural inputs, among others. The qualitative results also revealed that insufficient and inappropriate timing and supply of chemical fertilizers have effect on the decline of land productivity. During the KIIs, model farmers underlined there were serious delays on fertilizers. Moreover, farmers use repeated ploughing of farmlands as a traditional practice. They also make use of traditional farming practices that is labeled as highly erosive cropping practices by Constable (1984). According to him, such kinds of practices are

responsible for about 80% of the erosion in the highlands and these practices are namely the growing of crops on steep slopes without applying soil conservation practices; the growing of food crops that requires fine seedbeds (e.g. Teff) that remain loose and erodible for a long period during the rainy season; planting practices that leave the soil bare at times of erosive rain, and the use of crop residues and animal dung for fodder and fuel wood. Tefera (2010) underlined that such traditional farming system knocks down sustainability of production and productivity by changing soil structure and exposing farmlands for aggravated soil erosion and degradation.

3.2. Farmers' Perception of Land Degradation

Farmers' knowledge and perception of land degradation are reflected in the use of certain land management practices. Farmers who have already perceived the problem of land degradation are more likely to invest on land management practices to minimize the problem (Gashaw, 2006). According to survey results (Table 2), about 62.3% of the respondents have perceived the problem of land degradation as severe, and this has also been reflected during the KIIs and FGDs that severity of land degradation have denude some parts of their farmlands. Whereas, about 32.1% perceived moderate status of land degradation on their farmlands. Regarding the perception of major causes of land degradation, 22.8% and 20.9% of sample respondents have perceived deforestation and overgrazing as major causes, respectively (Table 2).

Table 2. Farmers' perception of levels and causes of land degradation

Farmers' perceptions of status of farmland degradation	Frequency	%
Low	12	5.6
Moderate	69	32.1
Sever	134	62.3
Total	215	100.0
Farmers' perceptions of causes of farmland degradation		
Deforestation	49	22.8
Over grazing	45	20.9
Over cultivation	37	17.2
Poor farming practices	28	13.0
Excess rainfall	17	7.9
Cultivation of steep slopes	26	12.1
Poor government policies	13	6.1
Total	215	100.0

Source: Field survey, 2014

3.3. Major Types of Land Management Practices

The classification of land management practices into traditional and introduced may be controversial. Among the reasons, spatial and temporal variation in the functionality and effectiveness of a particular land management practices; socio-cultural and technological differences; and lack of universality as a traditional management system at a given locality may not be so in other localities (Dejenie, 2011). Despite this fact, most of these practices are relatively well adopted either in a form of traditional practices since long period of time or in a form of introduced from other communities in Habru *woreda*, like in other parts of the region. These major practices implemented in the study area are presented in the following sections.

3.3.1. Traditional land management practices

The traditional land management practices are those that are being implemented since long periods of time and some of which are identified by local nomenclature. According to Habru *woreda* Agriculture and Rural Development Office, there are about 11 types of traditional land management practices that have been identified and registered by Ministry of Agriculture (Table 3).

Table 3. Locally identified major traditional land management practices in Habru *woreda*

English version	Local version
Stone bunds	*Yedingay Kab*
Drainage ditches	*Boyi (tress boyi, December boyi, and fesses boyi)*
Drainage ditches	*Mele*
Mulching by crop residues	*Sircho*
Weeding by oxen	*Shilshallo*
Furrows	*Dirdaro*
Livestock trampling/compacting	*Tiktako*
Fencing/traditional boundary	*Dib/dinber/*weber/*mashem*
Agro-forestry practices	*"shiferaw" zaf /morryinga/*

Source: Field survey, 2014

3.3.2. Introduced land management practices

Primarily, conservation practices are introduced with the objective of conserving, developing, and rehabilitating degraded agricultural lands as well as increasing food security through increased food crop production (Dejenie, 2011). In the study area, the list of major land management practices reported by sample respondents include check dams, stone/soil bunds, application of manure, tree planting, contour ploughing and fallowing either *per se* and/or in combinations. As revealed in Table 4, about 21.9%, 18.1% and 14.9% of sample respondents practised check dams, stone/soil bunds, and manure applications *per se*, respectively. Likewise, combinations of the aforementioned methods are reported by about 27.9% of sample respondents. The

major introduced land management practices in the study area are presented in Table 4 below.

Table 4. Major introduced land management practices by sample respondents

Introduced land management practices	Frequency	%
Fallowing	6	2.79
Contour farming	9	4.19
Manure application	32	14.88
Soil (stone) bunds	39	18.14
Check dam	47	21.86
Tree planting	22	10.23
Others*	60	27.91
Total	215	100.00

*Combination of all practices

Source: Field survey, 2014

Fallowing: According to the survey results, about 2.8% of the respondents practised fallowing as farmland management practice. It is practiced by relatively resource-rich farmers who own relatively plenty farmland. However, according to KII results its application is becoming lesser because farmers need the land to grow crops every year for their increasing population as they have shortage of land.

Contour farming: Contour farming is a common traditional practice of tilling the land along the contours of the slope to reduce the runoff on a steep sloping land. It is used separately or in combination with other conservation structures such as plantation trees and cut-off drains (Damena, 2012). The findings of this study have indicated that about 4% of sample respondents applied the structures in combination with other structural conservation practices.

Crop residues: Leaving crop residues on the field after harvest is another traditional practice used by the farmers in the study area. During field observations, there were only small amounts of crop residues visible in farm plots. Even though farmers' perceived the importance of crop residue for improvement of soil fertility and also for soil and water conservation, |most of the farm households in the area, especially women, were collecting crop residues from the field for animal feed and fuel wood. According to KII results, some of the residues from cereals (wheat, barley and *teff*) and legumes (haricot beans and pea beans) were stored in the home compound and sold to feed livestock during the dry season.

Soil (stone) bund: Soil (stone) bund is an embankment or ridge built across a slope along the contour. Soil bunds are made of soil or mud (Fig. 1). In the study area, about 18% of the respondents constructed soil (stone) bunds (Table 4), particularly around the mountainous area; farmers were constructing bunds by the cash they earned from Participatory Safety Net Program (PSNP). Through FGDs, it was identified that farmers mostly used soil/stone bunds to maintain rain water. Unless they are well designed and when overtopped at one location, they will cause gullies.

Such structures are better suited for semi-arid and arid parts of the country than in the high rainfall areas. In line with this, farmers are willing to conserve their soil and water, but they demand more appropriate technologies, and that poorly designed practices can be the major cause of erosion in areas treated with SWC (Ayele, 2010).

Figure 1. Fields with stone/soil bunds and terraces are common in Merto area
Source: Photograph taken during field survey, 2014

Tree planting: Trees and other non–crop plants such as sisal, euphorbia and recently introduced the so-called "*shiferaw*" tree (also called *Morryinga*) is planted along the contour sometimes together with other conservation practices. One tenth of the sample respondents are in favour of it (Table 4). According to the FGDs, it is applied to reduce runoff and conserve the soil and water. Indigenous and newly introduced trees and shrubs are planted upon overused and eroded lands to enable land rehabilitation. In certain areas, the community use area enclosure so that both human and livestock interventions are restricted to enable land rehabilitation. Key informants' interview results indicated that these plants are drought resistant, not edible and therefore not destroyed by animals in the area. Another advantage is that farmers use these on along their farmland to demark their farm and/or homestead boundaries.

Check dams: Check dams are built in the gully systems to harvest water and sediment and thereby control gully erosion (Fig. 2). Survey results have showed that about 22% of the respondents participated in the construction of check dams. In the field observation, it was observed that rill and gullies were very common and the community used stone, soil, and cement to construct the check dams.

According to KIIs, check dams are also used to collecting water that is usually used for small scale irrigation as well as planting permanent trees in the side of the check dams. Check dam is the most effective practice of adoption of SWC measures that help to plug the gully and rills and to increase soil wetness.

Figure 2: Check dam constructed in Goshwuha area to harvest water and sediments
Source: Photograph taken during field survey, 2014

Drainage ditches: Drainage ditches are the most widely used conservation practices in the study area. They are micro-channels constructed on cultivated farms to drain off excess water and control soil erosion. Construction is part of the normal ploughing activity in these low cost measures. However, unlike the plough furrows, the ditches are made relatively wider and deeper in dimension and usually run diagonally across the field. Local farmers in study area call these drainage ditches as *boyi* and there are different types of *boyis namely tress boyis, December boyi and fessess boyi* (Table 3).

Cut off drains: This structure is a graded channel constructed mainly in moist area to intercept and divert the surface runoff from higher slopes and protect downstream cultivated land or village (Assefa, 2009). It is one of the physical structures constructed by digging the soil deep to divert the runoff before reaching the farmland. According to FGDs, cut off drains are constructed during dry season in order to avoid impediment of land preparation during main cropping season. On the contrary, cut-off drains in dry area are used to divert runoff and additional water into cultivated fields to increase soil moisture. The farmers constructed such structures not only to prevent loss of seeds, fertilizer and soil due to excessive runoff coming from uplands but also to dispose excess water from the farmlands. Despite this fact, most of the farmers perceive that these structures accelerate soil erosion through time.

***Fanyajuu*:** It is constructed during dry season to reduce and/or stop erosion and increase water holding capacity of the soil so that soil productivity improved and crop yield enhanced. *Fanyajuu* is usually applied in cultivation land with slopes with gradient ranging from 3% to 16%. It can also be constructed in uniform terrains with deep soils. Most farmers are in favour of this structure and it is also substantiated by other authors too. According to Desta *et al.* (2005), the main benefit of *fanyajuu* is its capacity to become bench terrace within few years than soil bunds, yet it has overtopping and breakages. The construction of *fanyajuu* takes less space than soil bunds and accelerates bench development; thus, space can be greatly reduced with *fanyajuu* terraces (WFP, 2005).

Recently, increasing demands for food crop production, associated shortage of farmlands, and the likes forced farmers to cease long-stayed traditional ways of land

management practices such as fallowing, manuring, terracing, and leaving crop residues on the fields (Damtew, 2006).

3.4. Drivers of Participation in Land Management Practices

The contemporary status of land management practices in the study area is of two major parts: land management programs with and without government or NGO subsidies in the form of Food for Work (FFW). In the first case, land management practices on crop lands are thoroughly implemented by the farmers' themselves without any financial or material support from either the government or NGOs. Land management practices in this case are indigenous, inherited and they have been transferred from generation to generation and their costs of investment are completely covered by farm households.

For the second case, land management activities outside cultivable plots such as gully stabilization, check dam construction, and hillside terraces are supported by FFW programs subsidized by the government and/or NGOs. These are undertaken over community lands and sample respondents were asked to identify driving factors for their participation in land management practices in the study area. Accordingly, about 65.1% of them participated by self-motivation while 32.1% by incentives in the form of FFW using PSNP (Table 5). The interview results have showed that public work components of PSNP in the study area mostly focus on protecting communal lands such as hillside terracing and participating in construction of roads, school and health centres. Hence, there might be time scarcity to construct soil bund on farm plots. From this data, it is possible to infer that the majority of them have participated on land management practices through self-motivation. As per the results obtained from the FGDs, most respondents have stated that participation in PSNP have encouraged cooperation among sample households. Yet, landless respondents have been dissatisfied and (have) complained as they have not been beneficiaries of the program.

Table 5. Drivers of participation in land management practices by respondents

Participation in land management practices	Frequency	%
By incentive	69	32
Enforced by local leaders	6	3
By self-motivation	140	65
Total	215	100

Source: Field survey, 2014

4. Conclusions and Recommendations

Land degradation is a global phenomenon that endangers the livelihoods of rural farmers. The challenges are very severe in the developing countries where the livelihoods of the community are dependent on land and land resources. To understand perception of land degradation and practices of land management methods in Habru *woreda*, north Wollo zone of Amhara national regional state, three

'kebeles' were purposively selected and a total of 235 respondents and participants were sources of data. The data were gathered using questionnaire, KIIs and FGDs and were analysed through statistical techniques such as frequency and percentage.

According to the major findings of the study, about 69.8% of sample respondents have perceived their farmlands as good and very good in the study area. Despite this fact, most have stated the challenges due to insufficient and inappropriate timing and supply of chemical fertilizers. About 62.3% and 32.1% of them have perceived land degradation on their farmlands to be 'severe' and 'moderate', respectively. Farmers manage their farmlands both in traditional and introduced methods including check dams, stone/soil bunds, application of manure, tree planting, contour ploughing and fallowing either *per se* and/or in combinations. Their participation in public land management practices are derived by self-motivation and by incentives as reported by 65.1% and 32.1%, respectively.

In a nutshell, proper land management should be devised to avert the severe land degradation prevalent in the study area. Likewise, contextualized interventions by concerned stakeholders should be devised not only to avert the shortfalls behind access to agricultural inputs, PSNP and FFW projects, and resources but also to improve the status of land management practices implemented by smallholding farmers both at their farmlands and community lands.

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