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Challenges and prospects of climate change and agricultural land management practices in Ben Seshangul Gomez region Asosa zone, north west, Ethiopia

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Abstract
Ethiopia has experienced more than 10 major drought episodes since the 1970s. Evidence has shown that climate change exacerbates the situation and presents a daunting challenge to predominantly rain-fed agricultural livelihoods. The aim of this study was to analyze the extent and sources of smallholder famers' livelihood vulnerability to climate change/variability in the land practices We conducted a household survey across three distinct agro ecological communities and a formative composite index of livelihood vulnerability. Were employed to analyze trends of rainfall, temperature, and drought prevalence for the period from 1982 to 2016. The communities across watersheds showed a relative difference in the overall livelihood vulnerability. Was found to be more vulnerable, with a score had a relatively lower given similar exposure to climate variability and drought episodes, communities' livelihood vulnerability was mainly attributed to their low adaptive capacity and higher sensitivity indicators. Adaptive capacity was largely constrained by a lack of participation in community-based organizations and a lack of income diversification. This study will have practical implications for policy development in heterogeneous agro ecological.

Keywords: climate change, drought, livelihood, agricultural land

Introduction

Land is the most important limited natural resource that makes up the cardinal resource base in any agricultural production system; hence it needs to be managed effectively for the creation of wealth in many societies (Stein, *et al*, 2009) [45]. Nowadays there is an increasing substantial demands placed on land resources due to the enormous increase in the number of people living around it. It is obvious that the ability of land to support such enormous increase in the number of people living now is highly determined by the resilience of agricultural land in response to the increasing demand made up on land (FAO, 1994).

Large number of studies demonstrated that knowledge of farmers and scientists play a great role on how to manage this agricultural land productively and in sustainable manner. Decisions made on land management practices have also a significant effect on environmental quality, agricultural production and land conditions as a whole. These decisions also can be private decisions made by farm households and collective decisions made by groups of farmers and communities as a whole. For example, farm households make decisions about land use whether crop land or grazing land, the crop types to plant, the amount of labor to use, the types and amounts of inputs, investments and agronomic practices to use to conserve soil and water, improve soil fertility and reduce pest losses. On the other hand, communities also can influence land management practices through their collective decisions (Ehui, and Place, 2006).

Currently because of private and collective decisions on land management practices that fail to be in line with the response to the increasingly heavy pressure on land resources, agricultural production declines, the quality and quantity of land deteriorates. There is also increasing of competition for access to land (UNEP, 1999, cited by INTOSA, 2013). Particularly, land degradation becomes a major problem that reduce productive capacity of cropland, range land and wood land during the time of rising demand for food, fiber, fodder, fresh water, fuel, household energy and income in developing countries. The case became an alarm in Africa where land is a key asset of the rural poor society (FAO, 2009, cited by Woodfine, 2009).

According to FAO (2010) [10], worldwide 75 billion tones of soil matter are lost because of water and wind erosion every year. At the same time significant quantities of nutrients about 22kg N/ha, 2.5kgP/ha and 15kgK/ha are depleted and lost in Sub-Saharan African countries. Particularly, such type of land degradation has been recognized as a serious problem in Ethiopian highlands (Belayhun, 2010) [5]. Since the poor are dependent on the environment especially natural (Menale, *et al*, 2009). In parallel to this, it is very important to understand the challenges that resource poor farmers face to adopt agricultural land management technologies. For example, lack of proper extension services and participatory approaches that does not take in to account local social capital in implementing management technologies, technology application cost, transition in learning cost, and inability to integrate input and output market are identified as the major challenges for farmers in developing countries, including Ethiopia (Minale, *et al*, 2009).

It is obvious that agriculture plays a pivotal role in the Ethiopian economy, which is highly characterized by smallholder subsistent agriculture in which the country depends for its food supply, foreign exchange, labor force and raw material for the non-

agricultural sector. However, as Getnet (2011) stated that the agricultural sector in Ethiopia is plagued by structural problems such as; fragile soil, environmental degradation, poor farm management and population pressure. For example, in Eastern African highlands including Ethiopia the average farmland size is about one hectare or less with six persons per household for a population density of around 600/ km^2 (IFPRI, 2006). Such high population pressure reduces the availability of grazing land and quality of farmlands.

Material and Methods

The study employed mixed approach, both qualitative and quantitative methods for the purpose of collecting and analyzing data on agricultural land management practices. It also attempted to understand the major challenges related to land management practices based on the survey conducted in the study area. In particular qualitative approach was employed to describe the data extracted from informal group discussions, key informant interviews held with development agents or experts and direct observations of the study area. In addition descriptive statistics such as percentages, mean values, and frequency distributions of the quantitative approaches were employed for summarizing the raw data extracted from household survey questionnaires. The questionnaires formulated carefully to provide answers to the research questions related to the objective of the study.

Sub heading

Types of Agricultural Land Management

Management Related to Soil Care and Fertilization

Soil is a land user‟s most vital asset, but it is also a finite and often fragile resource. Soil is not only the basic resource for plant growth (supplying water, air, and nutrients); it also provides a filtering and buffering action to protect water supplies and the food chain from potential pollutants (Anne woodfine, 2009).

The Role of Development Agents in Agricultural Land Management

Extension workers have a role of transferring knowledge from research stations to farmers by using different individuals, groups and mass media methods. It is recently that Development Agents play technology development role in linking research with community needs (Chamala and Shingi, 1997**)**. Developments Agents have a role of providing training, information, knowledge and the necessary support systems for the rural agrarian society to enable them to improve their productivity and develop their capacity to conserve, protect and manage their land and natural resources in general the data for the study were obtained from both primary and secondary sources. The Primary data or first-hand information were collected from farm household respondents, Woreda agricultural experts and Kebele Development Agents (DAs) through household survey, informal discussions, and key informant interview including direct observation.

Fortnotes

In the study area, soil resources are developed from highly weathered volcanic Rocks. According to MWAO (2014) the major dominant soil resources include reddish-brown (Nitosols) which covers about 85% of the total agricultural landscape developed along the steeper slopes (Dega) agro- ecology and black basaltic soils (Vertisols) developed along gentler slopes (Weyna Dega) agro- ecology However, the quantity and quality these soil resources in the study area become decline. For example soils in the steeper upper slopes are generally less deep because of severe erosion hazard occurred on the agricultural fields (WNRCD, 2014).

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Result and Discussion

In line with the above principle, interview had been held to extract information related to strategies of agricultural land management practices and challenges that impede the practice of agricultural land management technologies in the study area. Additionally, interviews had been held with individual farmers to extract some case story information.

Field observation was made in different agricultural fields under different agricultural practices to check the types of agricultural land management practices what actually implemented in the field. In addition it used to identify what farm level problems are really existed over the

Particularly, farmers were also encouraged to express their conceptions in their own way. Overall, the researcher tried to make clear the objective of the study to all respondents to avoid confusion and to conclude with effective data administration. Finally, the researcher collected survey questionnaires with a great collaboration of enumerators particularly health extension workers and teachers who work with the local communities of the study area. the problem, and objectives of the study, research questions, research methodology, significance and the scope of the study with limitations what the researcher encountered for in the process of the study. Chapter two dealt with the review of literatures related to the objective of the topic under the study. Chapter three describes the geography of the study area. Chapter four dealt with the general characteristics of farm households and their agricultural land management practices. In addition, chapter five also dealt with the challenges and prospective grounds for agricultural land management on the study area. Whereas, the last chapter which is the final part of this thesis provides summary and conclusion of the main points of the research work, and recommendations based the research findings.

Agricultural land is a complex system that combines natural ecology and social economy, and the health of agricultural land directly influences national economic development (Jinming yan 2012). Land management relates to the activities associated with the management of land as a resource from both environmental and economic aspects towards sustainable development (UN, 1999). Agricultural land embraces a wide view of connections that encompasses biological economic, political, social and cultural aspects. Within the economic system, agricultural land is competing with other users for resources, labor, capital and management. However, the position of agriculture is also concerned with the environment for, from a systems view point, agricultural land as resource and, its quality is the result of man„ s activity on the natural environment (Meli, 1993).

Land resource is very important to the livelihood of all people those who are dependent on agriculture and as the output of

agriculture purely depends on land resource. Thus, lack of access to agricultural land increases incidence of poverty in rural areas and quality land has a direct bearing on the productivity of agriculture (Singh, 2008). According to USDA Decline. For example soils in the steeper upper slopes are generally less deep because of severe erosion hazard occurred on the agricultural fields (WNRCD, 2014).

According to Woreda communication office, currently the total land area covered with forest resource is only about 4654.05 hectare (6.0%) of the total land mass. This is mostly dominated by single species of eucalyptus trees. Woreda agricultural department of natural resource conservation (2014) also reported that the coverage of forest resource in the Woreda is not as per the land use land cover plan. It was due to high rate of deforestation had been in the past years. Because of an increasing demand for arable land, fuel wood, construction and other uses, it was also noted that still difficult to rehabilitate deforested areas. Practices. However, from natural resource utilization and management perspective increasing trend in family size of farm households‟ has also its own contribution in deteriorating the natural resources in general and agricultural land resources in particular. Because of having large average family size in farm households of the study area, the agricultural density of and far to Addis Abeba, with in KM Asosa zuria 687 km Homosha 635 km and homosha 715 km. This may not fit with that of environmental carrying capacity.

In relation to the educational status of farm household respondents‟, it is obvious that education may increase households‟ understanding on the cost and impact of land degradation. Education helps farmers to take care and manage natural resources directly tied with their agricultural business as a base of their livelihood. Farm households‟ improvement in education implies that, improving their adaptation of management technologies including fertilizers, composting, performing soil conservation measures, planting trees and fences, and it increases households‟ access to information and credit to purchase agricultural inputs that have better contribution for more effective agricultural land management practices (Ervin, 1982, cited by Getachew, 2005). In line with this argument, the educational level of farm household respondents was assessed in the study area.

Results of the analysis shows that 111 (60.3%) of the farm household respondents are illiterate, 39(21.2%) were able to read and write from their informal education, 28(15.3%) were also attended their primary education. whereas it was only about 6 (3.3%) of the total sample farm household respondents were attended their high school education (See Table 5). This implies that respondents those who are illiterate took higher proportion of the total population and can understand that they have limited adaptation on land management technologies as it underpin by the above cited literature.

Asked to explain the challenges to practice fallowing management technology. According to those respondents, small size of their farmland that is not enough to secure the increasing household members‟ annual food production was mentioned as a challenge to practice fallowing management technology in their agricultural lands. Because of this limited physical asset (land), farmers may encounter for a problem to continue crop production while resting part of their land. As a result farmers‟ in the study area were never gave rest for their plot of lands.

In addition to this, farmers in the study area were also found to be more concerned about their short-term benefits of their agricultural lands and they have some knowledge gap on the possibility of reversing the status of over cultivated land using fallowing management practices or other management options. For instance, during individual interview held with farmers, most farmers reflected the idea that when their plot of lands are depleted in its soil nutrients locally

Part of water and crop moisture supply management technology. As can be understand from the response distribution, irrigation farming was widely practiced relatively in Dabuse Kebele. However, it was noted from the discussion and interview held with farmers‟ and development agents that this due to the dominancy of large number of young age group population those who haven't their own land in the area. Thus, parts of communal grazing lands found adjacent to rivers and streams were given for the purpose of small-scale irrigation practice as a means of their livelihood.

In the agricultural sector the role of development agents is Helping farmers in the community in providing useful information related with their agricultural practices and play a supporting role in doing in collaborate with farmers during the practical implementation of appropriate agricultural land management technologies and works for the overall wellbeing of the rural poor society (John, 2000).

In line with the above principle, the student researcher assessed the supporting role of development agents‟ from farmers‟ perspective in the study area. The assessment gave emphasis on the issue related with development agents‟ cooperation and their advice, their ability and competency to select appropriate agricultural land management technologies, and related with their frequency to visit farmlands to provide technical support for farmers. Therefore, to ascertain the supporting role of development agents‟ in agricultural land management practices from farmers‟ perspective, the above mentioned expected contributions that enable (DAs) to accomplish their supporting role were provided to sample farm household respondents on five point Likert type scale with response options and assigned scores (very high =5; High =4; Medium =3; Low=2; and Very low =1). These values were added to obtain 15 and divided by 5 to obtain a mean score of 3.0 which serves as a benchmark for this five point Likert type scale.

Therefore, any response distributions with mean score values greater than or equal to 3.0 on a given variable implies that, (DAs) have full supporting role for their contribution related to their role in agricultural land management practices in the study area. Whereas, response distributions with mean score values less than the above-determined ideal mean score implies that, (DAs) have limited supporting role in relation to their contribution on the agricultural land management practices. In addition to this, to investigate in which contribution that (DAs) have more supporting role and in which of their contribution does less supporting role, the frequency values obtained for each contribution related items were weighted using the assigned score values and their contributions were also ranked according to their weighted scores.

On the other hand, development agents‟ (DAs) supporting role in their competency and their ability to select the appropriate agricultural land management technologies based on the characteristics of farmers‟ farm fields was found to be high and

showed that development agents have full supporting role in their competency as it viewed by farm households. Because the calculated mean score value of the farm households‟ responses 3.28 was greater than an ideal mean score value of 3.0. Additionally, from this survey result perspective, the farm households‟ response weighted frequency shows that development agents competency and their ability to select appropriate agricultural land management technologies was ranked first (see Table14).

Generally, from the above farm households‟ response distribution one can understand that the supporting role of development agents‟ was appreciable in their competency and ability to select appropriate agricultural land management technologies. However, their cooperation and frequency of visiting farm fields to provide advice for famers was not as such appreciable. This also indicated that development agents in the study area could not support the majority academically illiterate and technically poor farmers as per their potential. This might be the reflection of absence of incentives and trainings that needs to be given for development agents. Because, development agents may be discourage to be inspired to accomplish their tasks and to take full supporting role throughout their contribution.

Table and Figures

Table statically base for Development agents ratio

Table 1: The Distribution of Numbers of Selected Sample Farm woreda Households

Name of sample woreda	Total number of households in sample kebeles	Number of sample households	Percentage of Sampled farm House Holds (%)	Remark
Asosa zuria	544	65		544/1722X 206=65
Bambase	627	75		627/1722 X206= 75
Homosha	551	66	11.9%	551/1722X 206= 66
Total	1722	206		206

Source: Field survey, 2014

Table 2: Statically base for Development Agents ratio

Contributions related to	Frequency alternatives				n= 184	Statistics		Total weighted	frequency
the role of (DAs)	High	High	Medium	Low	V.	Mean Std. low		D	
The advice and Cooperation of (DAs) with farmers	18	36	44		39	47	2.67	1.31	
			(90)	(144)		(132)	(78)	(47)	491
Competency and ability of (DAs) to	26	69 select	40	29		20	3.28	1.20	

as constraints of agricultural land management particularly for labor-intensive management practices. However, from natural resource utilization and management perspective increasing trend in family size of farm households‟ has also its own contribution in deteriorating the natural resources in general and agricultural land resources in particular. Because of having large average family size in farm households of the study area, the Agricultural density of and far to Addis Abeba, with in KM Asosa zuria 687 km Homosha 635 km and homosha 715 km. This may not fit with that of environmental carrying capacity.

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Results of the analysis shows that 111 (60.3%) of the farm household respondents are illiterate, 39(21.2%) were able to read and write from their informal education, 28(15.3%) were also attended their primary education. whereas it was only about 6 (3.3%) of the total sample farm household respondents were

attended their high school education (See Table 5). This implies that respondents those who are illiterate took higher proportion of the total population and can understand that they have limited adaptation on land management technologies as it underpin by the above cited literature.

Table 2: Distributions of Family Size and Educational Status of Farm Household Respondents'

Variable	Category		Asosa Woredaa		Bambasi		Homosha		Total	
S			n =68		1		n =55		n =184	
			Freq	%	Freq	%	Freq	%	Freq	%
	<3		8	11.7	1	1.6	12	21.8	19	10.3
	3-4		9	13.2	7	11.5	20	36,4	38	20.7
Family										
	5-7		30	44.1	39	64.0	14	25.4	83	45.1
Size										
	8-9		18	26.4	13	21.3	9	16,3	40	21.7
	>10		3	4.6	1	1.6	0	0.0	4	2.2
	Total		68	100.0	61	100.0	55	100.0	184	100.0
	Illiterate		41	60.3	27	44.3	43	78.1	111	60.3
Education										
	Reading	and	12	17.6	21	34.4	6	11.0	39	21.2
Nal	write									
Status	Primary		10	14.7	13	21.3	5	9.0	28	15.2
	education									
	H.	school	5	7.3	0	0.0	1	1.9	6	3.3
	Education									
	Total		68	100.0	61	100.0	55	100.0	184	100.0

Source: Field Survey, 2014

Table 3: Sample survey for household kebeles at 3 worda

Name	of	Total number	of	Number	of	Percentage	of	Remark
sample woreda		households	in	sample		Sampled	farm	
		sample kebeles		households		Households (%)		
Asosa zuria		544		65				544/1722X 206=65
Bambase		627		75				627/1722 X206= 75
						11.9%		
Homosha		551		66				551/1722X 206= 66
Total		1722		206				206

Source: Field survey, 2014

Conclusion

This study attempted to assess practices, challenges and prospects of agricultural land management Asosa zone with to three woredas Bambasi Asosa and homosha woredas Thus, the analysis of the study leads to the following major findings. Regarding to the status and problems of agricultural lands in the study area, the finding of the study revealed that slop steepness and soil erosion hazard were the major problems. As a result, the agricultural land in the study area was found to be under serious degradation problem indicted by the development of rill and gully areas.

Farmers‟ application of inorganic fertilizer found to be increasing over time. However, almost all sampled farm households (about 98.9%) in the study area are not applied inorganic fertilizer, as per the recommendation of experts. On the other hand, farmers‟ use of organic sources fertilizer and their indigenous soil fertility management practices were found to be limited. However, farmers have good adoption for technologies that are more associated with their agricultural practices. For example, crop rotation and use of hybrid crops from agronomic management practices, and contour plowing and diversion ditch from soil and water conservation were the major agricultural land management practices widely adopted in the study area. The supporting role of development agents in agricultural land management practices particularly in their competency and ability to select appropriate management technologies was found to be full. However as compared with their competency, sampled farm household

respondents confirmed that development agent‟s cooperation and their frequency to visit farmlands was not appreciable.

Generally the survey results of this study indicated that the practice of more effective agricultural land management in the study area was challenged by different constraints. Among these constraints, challenge related to weak institutional capacities, challenge related to unsuitable agricultural fields, challenge related to technical gaps observed at field level, and challenge related to the local farmers‟ attitude towards the acceptance of agricultural land management technologies were the major challenges that impede the practice of more effective agricultural land management in the study area. Despite the above mentioned challenges, the availability of abundant water resources, the establishment of farmers‟ training center and the introduction of mass mobilization in soil and water conservation were identified as prospective grounds to practice more effective agricultural land management in the study area.

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