Federal democratic republic of ethiopia environmental sciences essay

AEAdult EquivalentANRSAmhara National Regional StateFAOFood and Agricultural OrganizationFDREFederal Democratic Republic of EthiopiaGDPGross Domestic ProducthaHectareHARCHoleta Agricultural Research CenterIAASTDInternational Assessment of Agricultural Knowledge, Science and Technology for DevelopmentKCalKilo CalorieLPMLinear Probability ModelmasImeter above sea levelMoFEDMinistry of Finance and Economic DevelopmentPAPeasant AssociationPIPerception IndexSADAOCSustainable Food Security in Central West AfricaSLMSustainable Land ManagementTLUTropical Livestock UnitUSAIDUnited States Aid for International DevelopmentWHAZWag Himera Administrative ZoneWHOWorld Health Organizations

INTRODUCTION

Background of the study

Over the last decades, many developing countries have experienced notable progress in their economic growth and managed to improve the welfare status of their population considerably. Nevertheless, food security has not been attained in most developing countries and food insecurity continues to be a deep seated problem. Ethiopia has been known for its wide spread poverty and devastating famines which occurred in the mid-1970s and 1980s. According to Sisay (2003), the country faced problem of food insecurity supported with the evidence of lowest kilo calorie intake in Africa of about 1845 kilocalories per person per day. This figure is less than the world minimum standard for survival of 2100 kilocalories and much less than the standard for an adequate diet of 2400 kilocalories. In actual fact, the per capita food output of the country has been declining for nearly 30 years and

the ability to feed growing population at about 3% per annum, is deteriorating from bad to worse (Astatke, 2002). According to MoFED (2006) in the worst cropping year, up to fifteen million people in drought-prone areas of the country could face food shortages, which are either chronic or transitory in nature. A combination of factors has resulted in serious and growing problem of food security. However, the dependency of livelihoods of majority of the people on agriculture results in fast and vast land degradation. Land degradation mainly in the form of soil and nutrient depletion from the top horizon of soil has become one of the most important environmental problems. Together with fast growing population, erratic rainfall and poverty, land degradation poses a serious threat for food security status of the nation in general and that of household in particular. Among the various forms of land degradation, soil erosion is the most serious problem, which results in soil nutrient depletion and loss of productive capacity of land. Soil erosion is an environmental problem, which poses an ominous threat to the food security status of population and future development prospects of the country (Wagayehu, 2003). Water, wind and livestock are the main agents of soil erosion at the study area. The potential of the land or its productivity has deteriorated from time to time due to run off, topographic variations, slope of the soil, intensive farming and farming on steep slopes and deforestation. Loss of soil nutrient and its productive capacity leads to low productivity potential of land, which in turn brings loss in crop yields and results in a vicious cycle of poverty and food insecurity (Alemneh et al., 1997). In Ethiopia, in response to extensive degradation of the resource base, new land conservation technologies were introduced in some degraded and food deficit areas, mainly through food-for-work in the

early 1980s (Shiferaw and Holden, 1998). Despite these efforts, the natural resource base is deteriorating from time to time. It will be difficult to protect the natural resource base, unless perception of farmers to land degradation hazards changed towards the natural resource management. Farmers' perception level of land degradation is quite different. They have different perception levels for the environmental benefits of their farmlands they are willing to get. In the same manner, farmers have different tackling actions based on their perception levels. The existence of extensive land degradation is a cause for low land productivity resulting in declining crop yield and this in turn affects food security condition of people (Tweeten, 1993). In the study area, land degradation and low agricultural productivity are severe problems. Similar to other parts of the country, the region is exposed to various types of physical, chemical and biological forms of land degradation. As a result of these, the region is most affected by recurrent drought and food security problems. Many people live in conditions of chronic hunger with a low average energy supply. Low levels of per capita food production aggravated food insecurity problem. Thus, the declining of per capita food production together with land degradation, has threatened the food security status of the people at the study area. Hence, there is a pressing and urgent need to assist farmers to be able to achieve food security through rapid increase in food productivity and production on economically and environmentally sustainable basis.

Statement of the Problem

Land degradation is a global threat to human population and has been described widely and gained public attention significantly since the earth

summit in Rio de Janeiro, 1992 and the formulation of Agenda 21. Available evidence shows that the issue of land degradation is a serious problem in East Africa, and elsewhere in Africa. Land degradation in the form of soil erosion is one of the most serious environmental problems in the highlands of Ethiopia. The prevalence of traditional agricultural land use and the absence of appropriate resource management often result in the degradation of natural soil fertility. This has important implications for soil productivity, household food security, and poverty in those areas of the country (Teklewold and Kohlin, 2011). As the scale of human activities expands, the capacity of ecosystems to regenerate the natural resource base becomes an increasingly binding constraint to further growth and development (Kostas, 2001). Due to this and other reasons now a day's poverty, inequality and food insecurity are the most crucial and persistent problems facing humanity. Making their living on marginal land and moisture stressed condition, and heavily degraded and less productive land, farmers in the study area are facing continuous food shortage. Various attempts have been made both at national and regional levels to alleviate problems of land degradation and declining agricultural productivity which have direct causal effect on food insecurity. However, problems have been more serious and critical than ever before and threat for many people at the study area. It will be difficult to protect the natural resource base, unless perception of farmers on land degradation hazards changed towards natural resource management. In addition, problem of food security takes particular forms in its extent, causes and consequences at lower levels of analysis. Macro levels analysis of the problem concealed important differences at micro level, which would result in blanket recommendations to widely varying problems.

So far, no empirical Studies conducted at the study area in analyzing the linkage between farmers' perceptions to land degradation problems and food security. Moreover, the complex and interrelated socioeconomic and bio-physical factors that determine food security at household level (micro level) in the study area and their coping strategies during crisis situation are not studied in detail. Therefore, this study is designed to examine the association between smallholder farmers’ perception on land degradation and household food security status together with other socioeconomic and bio-physical determinants of food security and their coping strategies. Moreover, it will be very crucial to device appropriate interventions that help to mitigate land degradation, guide policy decisions, device appropriate interventions and integrated efforts to combat food insecurity.

Objectives of the Study

The general objectives of this study will be to explore the link between smallholder farmers’ perception on land degradation, food security and household copping strategies to identify policy options for enhancing food security status in the study area. The specific objectives of the study will be: To examine farmers’ perception of land degradation and its effect on households food security. To identify the major determinants of food security in the study area. To assess households choice of coping strategies towards food insecurity.

Research Questions

The study will attempt to answer the following research questions: Do the demographic, socioeconomic and institutional determinants affect household food security status? Do farmers practice coping strategies when they face

food availability problem? Do farmers' perceptions of land degradation have an effect on household's food security? How can policies and institutional support be oriented to ensure sustainable land management

Hypotheses

The following hypotheses will be tested in the studyHypothesis 1: Demographic (family size, Age of household, education level, dependence ratio), socioeconomic (Off-farm income, Non-farm income, Total livestock holdings, size of cultivable land, soil conservation measures) and institutional factors (Credit services, distance from market services) do not affect food security status of households. Hypothesis 2: Food insecure households are not practicing coping strategies when they faced food availability problem. Hypothesis 3: Perception of smallholder farmers on land degradation will not have any effect on household's food security status.

LITERATURE REVIEW

The concept of Land degradation

Land degradation can be defined as a process that lowers the current and future capacity of the land to support human life (Demeke, 1998). Land degradation and soil degradation are often used interchangeably. However, land degradation has a broader concept and refers to the degradation of soil, water, climate, and fauna and flora (Alemnehet al. 1997 cited in Behailu, 2009). Land/soil degradation can either be as a result of natural hazards or due to unsuitable land use and inappropriate land management practices. Natural hazards include land topography and climatic factors such as steep slopes, frequent floods and tornadoes, blowing of high velocity wind, rains of

high intensity, strong leaching in humid regions and drought conditions in dry regions. Deforestation of fragile land, over cutting of vegetation, shifting cultivation, overgrazing, unbalanced fertilizer use and non-adoption of soil conservation management practices, over-pumping of ground water (in excess of capacity for recharge) are some of the factors which comes under human intervention resulting in soil erosion (Dominic, 2000). Ethiopia is one of the sub Saharan African countries where soil degradation has reached a severe stage. Land degradation mainly due to soil erosion and nutrient depletion, has become the most important environmental problems in the country. Coupled with poverty, fast growing population and policy failures, land degradation poses a serious threat to national and household food security (Shiferaw and Holden, 1999). According to Gebreegziabher, et al. (2006), in Ethiopia where deforestation is a major problem, many peasants have switched from fuel wood to dung for cooking and heating purposes, there by damaging the agricultural productivity of crop land. An Ethiopian Highland Reclamation Study conducted two decades ago revealed a frightening trend in environmental degradation where by "...27 million ha. or almost 50% of the highland area was significantly eroded, 14 million ha seriously eroded and over 2 million ha beyond reclamation. Erosion rates were estimated at 130 tons/ha/yr for cropland and 35 tons/ha/yr average for all land in the highlands.... Forests in general have shrunk from covering 65% of the country and 90% of the highlands to 2. 2% and 5. 6% respectively" With the country’s population now almost double what it was then, things have, obviously, gotten much worse since (Aynalem , Undated).

Causes of Land Degradation

Land degradation is the result of complex interactions between physical, environmental, biological, socio-economical, and political issue of local, country wide or global nature. But, the major causes of land degradation are happened by the mismanagement of land by the respective local people. There are four major causes of land degradation: deforestation, overgrazing, agricultural activities, and over exploitation (McClelland, 1997). The well-known proximate causes of land degradation include deforestation, overgrazing, limited soil and water conservation measures, limited application of nutrients/organic matter, burning of dung and crop residues and declining use of fallow (FAO, 1995; Wagayehu, 2003; Pender, 2004;). In Africa, the contribution of different management factors towards land degradation is estimated to be 49%, 24%, 14%, 13% and 2% for overgrazing, mismanaged agricultural activities, deforestation, overexploitation and industrial activities (Vanlauwe et al., 2002; cited in Tilahun, 2002) respectively. Agricultural mismanagement of soil and water resources include non-adoption of soil and water conservation practices, improper crop rotation, use of marginal land, insufficient and/or excessive use of fertilizers, mismanagement of irrigation schemes and over pumping of ground water (FAO, 2001). Lack of early awareness about soil erosion and soil fertility decline by farmers is another possible cause of land degradation (Tilahun, 2002). These all are direct causes of land degradation primarily caused by human intervention exposing natural resources to depletion and loss. Human interventions expose the soil to erosion and induce depletion of natural capital asset of society (Wagayehu, 2003). In the sub-Saharan Africa, the major agents of land degradation are water erosion, wind erosion and

chemical degradation that affected soil loss by 47, 36 and 12 % respectively (Tilahun, 2002). Population increase, land shortage, insecure land tenure, poverty and economic pressure are indirect causes of land degradation (FAO, 2001). Population growth has long been considered a prime cause of environmental degradation (Atakilite, 2003). It forces farmers to cultivate marginal land (FAO, 1995). With current trend of population growth there is a poor prospect for ecological sustainability and economic viability of the current agricultural practice unless an effort is made to integrated development in family planning, environmental rehabilitation, and agriculture supported with enabling policy (Yohannes, 1999). Many hypotheses have been developed considering population as a cause of land degradation. Following the dire predictions of Thomas Malthus, population pressure is a cause to poor soil fertility leading to decreasing crop yield (Million, 1996). As a result of reduced size of landholding owing to high population density, intensive cultivation, steep slopes, over grazing, and intensive rainfall have resulted in much of the top soil being washed away (Ibid). In many parts of the country, man has accelerated soil erosion by reducing and removing the vegetation cover and by employing poor cultivation practices (e. g. up slope and down slope plough) (Thomas, 1991). Through intensive mismanaged cultivation, man has destroyed the original crumb structure and depleted the nutrient make up of soils. Some researchers found out that population pressure are not always a cause to soil degradation. High population density in places like Holland, one of the three most densely populated countries in the world, does not have problem of soil loss (Atakalitie, 2003). Significant numbers of studies from Africa have also presented the optimistic view that the population increase leads to

intensification of production, tree planting and conservation activities, for example the Kenyan Machakos district (Yohannes, 1999; Atakilite, 2003). Though there are controversial arguments concerning population growth, different studies (FAO, 2001; Pender et al., 2004) have shown that in sub-Saharan African countries including Ethiopia support the pessimistic hypothesis of Malthusian classical thought of population growth i. e. ''more people high erosion'' has shown a cause to land degradation. A study made in north western Ethiopian highlands by Gete (2000) concluded the absence of sound land use tenure policies (frequent changes in the tenure systems and frequent distribution of land), population pressure, weak economic development strategies, unstable institutional frame works, and weak link between research and extension have all been found to be root causes of soil degradation and are major policy constraints discourage the farmer from making any sort of investments in the land to use it in a suitable way (ibid). A study made by Dione (2002), on land tenure systems in Africa reported that, farmland held under exclusive and secure land rights (e. g. titled land) is more productive than farmland under other forms of rights (e. g. communal lands). He reported that, when families believe that the land tenure system is unfavorable to them, they are reluctant to invest in good agricultural practices, such as soil and water conservation and management (Dione, 2002). In similar fashion, in Ethiopia with the lack of land ownership, farmers have the tendency to make the land less attractive to others (FAO, 2001). The current land policy of Ethiopia, i. e., the right to use and transfer to their children is expected to affect long term investments including construction of conservation bunds, planting trees, short term fallowing and the like (Tilahun, 2002). In addition to insecure tenure, communal grazing

land and wooded areas for the extraction of fire wood give rise to land degradation.

Consequences of land degradation

Land degradation has a negative connotation that implies the loss of value within the environmental-economic system (Gretton and Salma, 1997). The lost value is related to the productivity of land for agriculture, the environment as host of naturally occurring species of flora and fauna or to the environment as a place for other human activities such as mining, secondary industries, human habitation and waste assimilation (ibid). Land degradation effects on agricultural productivity are manifested through their impacts on both, the average and variance of yield, as well as the total factor productivity of agricultural production (FAO, 2001). It affects agricultural productivity, leads to clearance of forests and native grass lands as existing land loses productivity, places demands on other natural resources to repair the land (lime for neutralizing acidity, water for flushing irrigation salinity) and leads to off-site pollution and loss of productivity and amenity values (Gretton and Salma, 1997). These impacts are translated into economic costs in the form of loss of income (or consumption), increased income risk and increase costs of production. Soil degradation has resulted in decreased food production, droughts, ecological imbalance and consequent degradation of the quality of life (FAO, 1995). As commonly known degraded soils rarely respond to mineral fertilizers, have very poor water-holding capacity, and totally have low productive capacity that manifests itself through decreased food production. In addition to its natural capital asset depleting effect, soil erosion also induces immediate onsite effects, those that happen at the site

where erosion occurs, and off-site effects which have positive or negative effects as the soil leaves the boundary or the field due to erosion and enters another field or watershed (Wagayehu, 2003).

Smallholder farmers' perception of land degradation

Although an understanding of the physical erosion phenomena is important for the formulation of erosion control strategies, it is also vital to understand social relations influencing management choices. Unsustainable farming practice is linked to a lack of choice due to poverty rather than linked to neglect. In some cases farmers are aware that some of their actions are actually damaging the land, but the immediate benefits of these actions seem more important than long-term degradation. A study made on farmers' perception of resource problems and adoption of conservation practices in Rwanda by Ndiaye and Sofranko (1994) reported that the majority of the farmers in study area perceived that reduced soil fertility and erosion problems in their farm fields, and loss of top soil, reduction in fertilization, or a decrease in length of fallow are determinant factors that are accountable for lower fertility of soil. A study on soil degradation and farmers' perception of soil fertility in Ghana by SADAOC (2002) reported that farmers do not appreciate the real fertility status of their farmlands and give low priority to soil and water conservation measures. According to the finding of the study, Ghanaian farmers act when they perceive that a problem really exists and threats their livelihoods either in their farm income or food security conditions. These types of conservation measures do not reverse land degradation, since exhaustible and non-exhaustible resources are once depleted.

Household Food Security

Definition and Concepts of food security

The most widely used definition of food security is the one forwarded by World Food Summit in 1996 and broadly set as ‘ Food security exists when all people at all times, have physical and economic access to sufficient, safe and nutritious food to meet their dietary needs and food preferences for an active and healthy life’ (FAO, 1996). This definition integrates stability, access to food, availability of nutritionally adequate food and the biological utilization of food. To sum up, it is known that food security concepts and definitions have developed over the past thirty years. Hence, the current concept emphasizes the role of multiple factors that affect the household’s or individual’s ability to acquire enough food all the times. Maxwell and Smith (1992) highlighted four core concepts of food security: sufficiency, access, security and time. ‘ Sufficiency’ and ‘ access’ determine the food security situation of a given country or household (Debebe, 1995). Sufficiency of food is defined as the calories required for an active, healthy life. Sufficiency or enough food indicates intake of enough calories, including proteins and micro proteins for an active healthy life (Maxwell and Smith, 1992).‘ Access’ marks the households and individuals are able to acquire sufficient food (Debebe, 1995). Access to food answers the question of whether individuals and households (and nations) are able to acquire sufficient food through any means i. e. by entitlement to produce, purchase or exchange of food with cash income and/or receipts of in-kind transfers of food or as a gift (whether from other private citizens, national or foreign governments, or international institutions) (Maxwell and Smith, 1992; Smith

et al., 2000). Food access is concerned with the demand for food, which is a function of several variables: the price of the food item in question, the price of complementary and substitute items, income, demographic variables and tastes or preferences (FAO, 1996). It highlights the ability of individuals to acquire sufficient food (effective demand) and purchasing power of consumers. Food availability highlights supply of food (from production, stocks, and imports) at national level and production and inventory at the farm level (Tweeten, 1993). It is the supply of food, which depends, on relative input and output prices as well as on the technological production possibilities (FAO, 1996). Food security defined as access to enough food is built on the idea of the balance between vulnerability, risk and insurance (Maxwell and Smith, 1992). Security access to enough food is associated with idea of vulnerability to entitlement failure, focusing more on the existence of risk which vary from natural to manmade factors (Maxwell and Smith, 1992; Debebe, 1995). Risks to food entitlement originate from many sources and include variability in crop production and food supply, market and price variability, risks in employment and wages, and in health and morbidity (Maxwell and Smith, 1992). Failure in crop production is highly correlated to decline of land productivity caused by soil degradation of which this study gives due emphasis. Time deals with where food insecurity has chronic, transitory, or cyclical dimensions to sufficient food supply or access to enough food at all times. Chronic food insecurity is that the household runs continually high risk of inability to meet the food needs of household members (Maxwell and Smith, 1992). It affects households and its members chronically with lack of sufficient access to food either by produce or purchase. It involves a continuously inadequate diet caused by the persistent

inability to acquire food (FAO, 1996). In contrast, transitory food insecurity occurs when a household faces a temporary decline in the security of its entitlement and the risk of failure to meet food needs for short duration (Maxwell and Smith, 1992). It is a temporary lack of adequate food access for a household, arising from adverse changes in food prices, food production or household income (FAO, 1996). The major sources of transitory food insecurity are year-to-year variations in food prices, foreign exchange earnings, household income and failure in domestic food production (Maxwell, 1996). It focuses on intra-and inter-annual variations or fluctuations in household food access. Temporary and cyclical or seasonal food insecurity also argued to be under these categories (Maxwell and Smith, 1992). Temporary food insecurity occurs for a limited time because of unforeseen and unpredictable circumstances while cyclical or seasonal food insecurity occurs when there is a regular pattern in the periodicity of inadequate access to food, may be due to logistical difficulties or prohibitive costs in storing food or borrowing (Ibid). There are three critical dimensions of food security: the level of aggregation (household, national, and global or international), the time frame (short, medium and long term) and the necessary and sufficient conditions (availability, access and utilization) (McCalla, 1999). The food security problem must be solved at a household level. This level is a level of identification of whether people are eating or not. At national level, nations have the responsibility of providing food for their people and at global level the global community can contribute to food security at household and national levels (McCalla, 1999). At the second dimension at short term, food security addresses the issue of how households get access to food through any means and at medium term the

primary focuses of food security must be at national level (Ibid). The nation develops different set of policies; institutions which allow fast income growth that ensure sustainable food security. The third dimension of food security deals with three necessary questions: (1) is the food available? (2) Do people have access to that food? And (3) Even if people have access to the food, do they utilize it correctly and eat diets necessary to be nutritionally secure (McCalla, 1999)?

Determinants of household food security

A study done in Dire Dawa[1]using the binary logit model, family size, annual household income, amount of credit received, irrigation use, age and educational status of the household head, cultivated land size, total livestock and oxen owned, were important determinants that influences households food insecurity (Abebaw, 2003). Abebaw concluded that a farmer with more cultivated land size has less risk of food insecurity. The author did not consider land degradation as important physical variable that affects negatively or positively food security status. A study conducted by Mulugeta (2002) using multivariate logistic regression model showed that, family size, number of oxen owned, use of fertilizer, food expenditure pattern, number of livestock owned, cultivated area, off-farm income and income per adult equivalent have significant impact on determining the state of food security. Among the biophysical characteristics soil fertility problem is one that affects crop production. It has negative impact on crop production performance and causes for deterioration of food security status of the household. In spite of this he reported that, using chi- square tests there is no significant difference between food secure and food insecure households with respect to soil

fertility problem. A study made by Tesfaye (2003) reported that family size, land size, herd size, agro ecology, use of fertilizer, use of irrigation, food aid and income from crop produce determine household food security. Farmer in the area generates their income from sale of crop, livestock and their products and off-farm means. However, the author focused only on income from crop sale. In addition to this, land size was taken as one of important variables that affect food security, but its degradation and loss of soil nutrient was not considered as determinants of food security.

Linkage of land degradation and food security

Land degradation, poverty and food insecurity are pervasive and interconnected problems in Ethiopia (Holden and Shiferaw, 2004). The prolonged result of deforestation and other forms of land degradation resulted in stochastic rainfall causing severe droughts at irregular intervals and these droughts threaten the lives and livelihoods of millions of people. Drought caused by stochastic rainfall brings incapability of farmers to acquire food and hence causes extreme food crises. Deterioration in natural resource, disruption in food systems and distortion in policies and social ties are some of the risk conditions that contribute to the worsening of food entitlement (Debebe, 1995). The links between land degradation and livelihood indicate that as land degradation, poverty and food insecurity are closely interconnected problems, measures or strategies to reverse land degradation help in improving food security status of a nation. Increase in food production is critical for achieving food security for growing population in many developing countries. However, degradation and declining productivity of soils, due to primarily inappropriate management practices,

poses a serious threat to agriculture in many areas (Slaymaker, 2002). The author pointed out that land productivity being a key determinant of food security; mitigation of degradation process and restoration of soil productivity through various measures has to be a priority concern to achieve both food security and wider poverty reduction objectives.

Coping strategies

What do households do during food crisis or risks? Households are not passive victims of food insecurity or drought. But based on their capacity, every household undertakes different activities to cope with crisis and to minimize it. For analytical purposes, the various actions can be grouped under three stages: risk minimization, risk absorption, and risk-taking. The first stage involves insuring against risk in an environment of limited credit and insurance markets. It involves measures of savings, investments, accumulation, and diversification (Webb and von Braun, 1994: 57). The next stage of coping involves a drawdown of investments, calling in loans, and searching for new credit. As capital for investment dwindles, consumption of food and non-food items become restricted, stores of food are drawn down, and the number and variety of potential income sources available become crucial to survival. The last stage of coping, which may become inevitable if famine persists and food aid does not arrive, involves the collapse of normal systems of survival and the adoption of abnormal ones.

METHODOLOGY

Description of the study area

Location

Sekota is located between 120 23’ and 130 16’ north longitudes and 380 44’ and 390 210 east latitudes. It extends for about 98 km in the north south direction and 67 km in the east west direction. The district is located in the eastern part of WHAZ of the ANRS. WHAZ, which is one of the administrative zones in ANRS, represents the Agew ethnic group. Sekota shares borders with Tigray National Regional State in the north and east, North Wello Zone in the south. Sekota town, the capital of the zone, is 720 km north of Addis Ababa and 540 km northeast of the regional state capital, Bahir Dar.

Natural Resource Endowments

The people in Sekota district are suffering from continuous food, fuel wood, water, and grazing land shortage. The topography of the district is characterized by rugged and a chain of mountain terrains most of which is covered by patchy grasses during the small rainy season. For the remaining season, the terrain has been covered by bare rock. The forest and bush cover of the area is concentrated in specific areas most of which are communally owned or are the property of the church. For all households, firewood is the most important source of energy (87%) for cooking followed by dung (64 %). The depletion of firewood has currently led to the extraction of former vegetation cover. The area has virtually been stripped of vegetation and shortage of grazing and fuel wood scarcity is ever increasing. In spite of the effort of extension program to popularize tree planting and encourage establishment and proper management of farm wood lots it has

registered little success (SERA, 2001). The study undertaken by SERA (2001) indicated that shortage of grazing is the widest spread as reported by 75 % of the households in the study. All grazing areas belong to the PAs and all households are using it as communal grazing grounds. These unregulated communal grazing plots have a character of open access property regime, which resulted in over exploitation, and degradation of the pasture. As far as the infrastructure of the area is concerned, road network and public transportation system is extremely under developed. The electric power and telecommunication network is very poor. In the whole district, the scarcity of potable water is a common phenomenon including the capital town. Crop production in the area is not a promising enterprise due to shortage of farmland, depletion of soil fertility, and moisture stress (Adefress et al, 2000). The total livestock population in general and that of small ruminant in particular is high in the study area. However, the area is classified as one of the food insecure district in the country.

Land use and farming system

The district has a total area of 305771 ha. From this area, only 14. 2 % is used for crop production. About 36. 4 % of the Sekota district is non-usable at present. Area covered by bush constitutes 37. 8% of the district while only 0. 01 % of the area is under forest cover. Area allotted for grazing and road construction has 3. 2% and 6. 5 % share from the total area, respectively (WADO, Unpublished). The share of crops to livestock in the farming system varies based on the agro-climatic zone. The mid altitude areas are dominated crop cultivation. In the lowlands livestock rearing is an important enterprise as to crop production.

Conceptual Framework

Food securityFood utilizationFood accessFood availabilityNutrition-Child-AdultConsumption-Food- Non foodIncome-Farm-Non farmProduction-Farm-Non farmResource-NaturalPhysical and human

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Sustainable Land Management (SLM)Generic indicator categories (Determinants)

Income

-Total income, Crop income, livestock income, wage income, Self-employment income, and market road access

Production

-Total area cultivated, Irrigated area, area in fallow, Access to and use of inputs, crop diversity, Non-farm income, Food production, cash crop production, cottage industry production

Resources

-Soil quality, water availability, Forest resources.-Livestock ownership, Infrastructure access, land ownership access-Gender of household head, Dependency ratio, Education level, Household size, Age of household headReduced Land degradation

People Ideas & Perception

-Perceived benefits from SWC-Opinion about the characteristics of the technology like design...-Perception about soil erosion-Response to soil erosion-indigenous knowledgeFigure. The Schematic Presentation of the

Conceptual FrameworkSource: Adapted and modified from Luid, 2002. The schematic conceptualization of the linkage between variables is presented as follows. In research and development concerning the use of natural resources, two opposing, in certain instances even competing, points of view have to be differentiated. These actors can be grouped broadly into local land users and external actors with their perspective of the problem as well as possible solutions (securing a livelihood versus promoting a certain conservation technology). From external perspective, the vision is that through sustainable land management, including investments in soil and water conservation, the livelihood of the concerned land users can be improved. The internal perspective, on the other hand, is focused on needs and opportunities, and centers around securing the livelihood. Sustainable resource use can only be achieved by bringing the two perspectives and the two courses of action together. The conceptual framework for this study will be drawn from perspectives on the linkage between land degradation and sustainable land management theories with food security status." Firstly, decline in soil fertility as a result of land degradation decreases farm productivity and income. As crop/livestock production is the major source of household income in the highlands, decline in soil fertility, through nutrient depletion and poor soil and water holding capacity affects the on-farm income significantly. Secondly decline in soil fertility affects productivity of labor; a degraded land requires much more labor that competes with off-farm income of the household. Thirdly, land degradation reduces the underground and above ground biodiversity of the system, which in turn, affects the biochemical process of the rhizosphere and the vegetation cover of the land." Farmers` perception about the problem of land degradation and

the determinants of household food security status are in the center of the frame. In this study the effects of farmer perception about land degradation and other demographic, socio-economics, institutional and production will be assessed as an independent variable that determine the three components of availability, access and absorption (utilization) together or the household food security status. The household food security is affected by shocks, forcing the households to adopt various coping strategies.

Sample and Sampling technique

A two-stage sampling technique will be employed to draw sample household heads. In the first stage, out of the total thirty three PA’s in the district six PA’s will be selected in simple random sampling procedure. However, inaccessible PA’s will be first excluded in the course of PA’s selection. At second stage from the six PA’s, a total of 140 sample household heads will be selected from the respective lists of farmers using probability proportional to size sampling technique . The sample size for this study is determined by the formula. Where the total sample size, the proportion of the population who are food secured and food insecure (in this case it is equal to 0. 5 since we do not know the proportion) the accepted level of error term. By applying this formula the total sample size is given by n= 384. But due to time and financial constraint only 140 will be considered. This will also complement the sample size with the recommended ten times the number of variables in a given model. (Edriss, 2007).

Data sources and methods of collection

Type and sources of data

To achieve the objectives of this study both quantitative and qualitative data will be collected from primary and secondary sources. Primary data will be collected from 140 sample households selected from six PA's of the district and it will include information on: household demographic characteristics (education, age, family size, sex, marital status), household assets, household income and expenditure, livestock holdings, land characteristics (land size, number of plots, land use, slope and soil fertility), institutional factors (credit, training, accessibility of farm inputs and extension services), land management (soil erosion severity, soil conservation practices, perception of land degradation) and household food security indicators and vulnerability. Secondary data about population, age structure, land use pattern, farming systems, infrastructure situation, etc. will be collected from published and unpublished sources.

Methods of collection

In view of the complexity of the problems of food shortage and land degradation, the nature of information needed on various aspects of this study, a single method of data collection is impossible to satisfy the data needs. Therefore, combination of formal and informal method of data collection techniques will be employed to generate adequate and reliable data. The primary data collection will be done through a structured questionnaire. The questionnaire will be first pre-tested and modified before the executions of the survey. The primary data will be supplemented by secondary data. Moreover, focus group discussion will be made with

community leaders, experts and farmers. Furthermore, some observations will be done through transect walk in some randomly selected PA's focused on general farming system, land management style of communal, grazing and farmland.

Method of data analysis

Theoretical Model

To provide an analytical basis for the examination of the determinants of food security and their impacts on the population, it is necessary to develop a relevant theoretical framework. From the definition and existing literature on household food security, three main concepts can be identified: food availability, access and utilization, as stated above in the conceptual framework, which are further dependant on several factors. Keeping these in mind, a theoretical framework is proposed that will serve as an organizing tool for considering the kinds of impacts that need to be considered in the analysis. Generally land holdings in developing countries are small (IAASTD, 2008) e. g. in Ethiopian's case more than 85 % of farmers have farms of less than 2 ha. These small land holders and those who rent in land people living in rural areas are most likely to become food insecure. Rural households can be categorized into three sub categories i. e. small famers, farmers renting in lands up to 2 hectares and landless rural households. Based on consumer behavior and production theories, the proposed model will explains the behavior of these households in terms of food security. Farming households (land owners and those renting in) generally combine the features of both producers and consumers. In order to provide insights into the decision making processes of households, different production models have been

proposed by economists (see for example Strauss, 1983; Gundersen and Gruber, 2001; Felekeet al., 2003; Shaikh, 2007). For any production cycle (short run—i. e. up to 1 year), these households are assumed to maximize a utility function expressed in equations (2LW) and (2LL) depending on household categories; LWLWLLLLWhere: = Land owner and rent in= Land less= consumed food commodities produced by the household= consumed food commodities purchased from the market and= consumed non-food commodities (durables, non-durables, services, health issues, etc.) purchased from the market. For the sake of a simple exposition, only food and non-food commodities are considered and assumed that markets exist for both these commodities. The household makes decisions regarding its consumption (CFP, CFM and CNFM) and its production (QFP, QNFM). A household's utility is maximized subject to production, income and time constraints for respective categories as:

Production Constraint:

000LWWhere:= Quantities of food commodities produced by households= Quantities of non-food commodities purchased from the market= Total available labor0= Technology (Fixed in the short-run)0 = Quantity of land of a household (Fixed in the short-run)0 = Capital stock (Fixed in the short-run)In the short run, a household holds fixed amount of land, capital stock and technology so these variables are considered constant for land owners but for rent in land farmers is not constant as they can rent in land at any time.

Consumption Constraint:

LWLLWhere:= Prices of food commodities sold by the household= Marketed surplus of food commodities= Prices of food commodities purchased from market= Quantities of food commodities purchased from market= Prices of non-food commodities purchased from market= Quantities of non-food commodities purchased from market= Wage rateF = On-farm labor, N = Off-farm labor and = Total off-farm income

Time Constraint:

It is assumed that small farmers and landless rural households cannot afford leisure time as to get maximum utility from their time; consequently, their total available time is divided into on-farm labor and off-farm labor. FNFN)Where;= Total time available to the household to allocate between farm and off farm: assuming zero leisure, in this case, numericallyThe consumption and time constraints on household behavior can be combined into a single identity by incorporating (4) into (3LW and 3LL), as; LWLL

Income Constraints:

By rearranging the above identity we will get the following income constraints; LWLLIn income constraints (7LW and 7LL), the left hand sides show the households' consumption expenditures. For land owners and rent in farmers (7LW) food (own production and purchased from market) and non-food commodities (clothing, health, schooling and farm inputs) purchased from the market; for tenants land rent is added in expenditures. For landless households the expenditures comprise of only food and non-food (clothing, health and schooling) commodities. The right hand sides of these equations

show the incomes of these household categories. Equations (7LW) include total production i. e. food (PFP x QFP), the value of household's time (wt) and non-farm income (N). While in case of landless households income equals total wages. When there is an imperfect market, which is the case in most of the developing countries (Verpoorten, 2001), production and consumption decisions are independent. Under such conditions the equilibrium is not only characterized by the first order conditions but also by equality between consumption and production. The farming household (small farmer and/or rent in farmers) decides for the consumption of food commodities (CFP) keeping in mind its decision to produce the quantities of food commodities (QFP). As a consumer, the household maximizes its utility by equating the marginal rate of substitution between food and non-food commodities to the marginal product of labor. The household offers its excessive production (than its consumption) for sale in the market. Similarly the amount of household supplied labor falls short of the demand; hence, it hires additional labor. While in free times it offers labor to other farmers and businesses as it is assumed that no leisure time for these households due to their very small scale. In the light of the above discussion the production and consumption equations can be derived separately in terms of prices, wage rate, technology, land, and capital (see for example Strauss, 1983 and Felekeet al., 2003). For the production side the input demand QD and output supply QS can be derived as; 000LWandLWOnce the optimum level of inputs and labor is selected, the value of income when profits have been maximized can be obtained by substituting consumption and production equations (8LW and 9Lw) into income constraint equation (7) as: YLW = wL+ QS (PFP, LN) + N..... (10LW)YLL =

wL…… (10LL)Similarly, for the consumption side the consumption demand in terms of prices, wage rate and income can be written as; LWLWLLLLFor the food security the utility maximization function can be written as; LWLWLWLWLLLLLLLLWhere:= food security utility maximization function= food security status that can be measured in per capita calorie intake. Equations (12LW, 12LL) reflect a simplified scenario of the economic behavior of the rural households for food security in terms of consumption i. e. CLW, CLL (.) related to the food production or availability, consumption (utilization) and income i. e. YLW, YLL (.) related to the food accessibility in terms of resources to obtain the food. For more simplistic expression, these equations can be expressed as one equation for a combined household food security function as; iiWhere: = function for combined household categories

Empirical Model

After determining the food security equation for rural households (11*), the next step will be to calculate the household food security status. To determine whether a household is food secure or not calorie intake can be calculated from the consumed food commodities. A household is food secure if the difference of its calorie consumption and recommended daily calorie consumption is greater than or equal to 0. iWhere, i= Food security status of ith household (food secure = 1, food insecure = 0)= Calorie consumption from self produced and market purchased food commodities= Recommended calorie consumptionAssuming a linear function, the household food security status can be written in terms of households' production and consumption demands and expenditures in terms of

household income as: Where Zi is the vector of all socio-economic, demographic and institutional factors that affect the food security status of the ith household and εi is the error term. Since the dependent variable FSi is in a binary form i. e. 0 = food insecure or 1 = food secure. The logistic regression will be applied to this problem because it directly estimates the probability of an event occurring for more than one independent variable, that is, for k independent variables (Hailu, and Nigatu, 2007). The model can be treated as a qualitative response model. (Displayed detail in the model specification section).

Computing perception index

Farmers' perception of land degradation will be computed using weighted perception index. farmers will be provided with a list of possible effects (e. g. decrease in farm output, loss of soil nutrients) and they will be asked to indicate the extent to which they perceived these variables on a 5-point Likert-type scale (5 = to a great extent, 4 = to some extent, 3 = to a little extent, 2 = to a very little extent and 1 = to no extent). The values on the Likert type scale will be added to obtain 15, and divided by 5 to obtain a mean score of 3. 0. Then farmers' perception index on land degradation is computed as the sum of perception level perceived by sample households for each factor to the number of variables that describes land degradation problems. Any mean score, equal or higher than 3. 0 was perceived as a possible effect of land degradation on agricultural production, while mean score less than 3. 0 was not perceived as an effect. Soil erosion, soil fertility, soil conservation activities and institutional support that increase production and productivity mainly by minimizing land degradation will be considered to

compute the perception index of land degradation. Then, after computing the index its effect on food security will be analyzed as an independent variable in the logit model. Farmers' perception index is given as: Where, Y: indicates perception index for farmer Y; j j= 1, 2… 4 variables used to indicate perception and: is number of indicative variables.

Measuring food security

Food security at the household level is best measured by direct survey of income, expenditure, and consumption and comparing it with the minimum subsistence requirement (Von Braun et al, 1992). The Ethiopian government has designated 2, 100 Kcal (225 kg) cereals per annum as a minimum acceptable weighted average nutritional requirement per person per day (FDRE 2001, MoFED 2006). Hence for this study 2100 kcal per adult equivalent (AE) per day will be employed as a cutoff between food-secured and food-insecure households. For the purpose of this study, household's food or calorie acquisition per AE per day is used to identify the two groups. Accordingly, data on available food for consumption were obtained through recall by the household, and then which will be converted to kilocalorie. Thus, those households who have energy per AE beyond the minimum subsistence requirement (2100kcal) are deemed to be food secured, otherwise food-insecure.

Measuring determinants of food security

In this study, descriptive (such as mean, standard deviation, maximum, minimum, sum and percentages), frequencies and cross tabulation will be computed. The statistical significance of the variables will be tested for both dummy and continuous variables using chi-square (), P-value and t-tests

whenever needed. For the analysis of data STATA 11 statistical package will be employed.

Model specification

Models, which include dependent variable in a binary form i. e. 0 = food insecure or 1 = food secure are called dichotomous. Such models approximate the mathematical relationships between explanatory variables and the dependent variable that is always assigned qualitative response variables. The four most commonly used approaches to estimate dummy dependent variable regression models are (1) the linear probability model (LPM), (2) the logit, (3) the probit and (4) the tobit model. They are applicable in a wide variety of fields (Gujarati, 1995). The probability model, which expresses the dichotomous dependent variable (Yi) as a linear function of the explanatory variables (Xi), is called linear probability model (LPM). LPM has some econometric problems like non-normality of the disturbances (Ui), heteroscedastic variances of the disturbances, non-fulfillment of 0 Variable specification and working hypotheses Different variables will be expected to affect household food security status in the study area. The major variables that will be expected to have influence on the household to be food secure or not are explained below. The dependent variable of the model (HFST): the household food security status is a discrete variable representing the status of household food security. It is represented in the models by two possible alternative ways: 1 for food secure and 0 for food insecure household. The independent variables of the model: the independent variables that will be expected to have association with food security status are selected based on available literature. The hypotheses of

the study with respect to each one of the regressors is presented below: Family size (FAMESIZE): this variable is continuous in the model, refers to the size of household members converted in adult equivalent. The existence of large number of family members with limited resources could affect the food security status of the household. This is due to increasing demand for food with limited food supply. Therefore, family size and food security status will be negatively related. This also in agreement to some research evidences, that family size has negative and significant impact on food security status of households (Mulugeta, 2002, Abebaw, 2003). Age of the household head (AGEH): this variable is continuous in the model; rural households mostly devote their time or base their livelihoods on agriculture. The older the household head, the more experience he has in farming and weather forecasting. Moreover, older persons are more risk averters, and mostly they intensify and diversify their production activities. It will be hypothesized that age of the household head and food security are positively related. Sex of household head (SEXH): this variable is represented in the model by dummy variable (i. e. 0 if the household head is female and 1 otherwise). The sex of household will be considered to affect food security differently. Male-headed households have more access to agricultural technologies, more labor power and farmland as compared to female-headed households. Therefore, male headed households are hypothesized to be more food secured and female households are less likely to be food secure. Level of education (EDULEVEL): Education is a dummy variable taking value 1 if the household head is literate, 0 otherwise. Education equips individuals with the necessary knowledge of how to make living. Literate individuals are very ambitious to get information and use it. As agriculture is a dynamic occupation, the

conservation practices and agricultural production technologies are always coming up with better knowledge. So if the household head is literate he will be very prone to accept extension services and any other income generating activities. Therefore, education may have a positive impact on food security. Abebaw (2003) also documented positive and significant effect of education on food security status of farmers. Dependency ratio (DERO): It refers to the number of inactive labor force (less than 14 and above 64 years old) to the active labor force (Between 15 and 65 years old) with in a household. A household with more inactive productive labor force compare to the active age shows a high dependency ratio and the vice versa holds true. A household with high dependency ratio is more likely to be food insecure and vice versa. Therefore, in this study dependency ratio will be hypothesized to be negatively related to food security status of households in the study area. Size of cultivated land (LANDCULT): As the cultivated land size increases, provided other associated production factors remain normal, the likelihood that the holder gets more output is high. This variable represents the total cultivated land size of a household in hectare. It will be hypothesized that farmers who have larger cultivated land are more likely to be food secure than those with smaller area. supported by the findings of Mulugeta Tefera (2002); Abebaw (2003)Livestock holding (TLU): livestock holding refers to the total number of livestock holding of the farmer measured in tropical livestock units (TLU). Livestock production constitutes a very important component of agricultural economy. Therefore, it will be expected that a higher possession of livestock increase the probability to be food secure. Supported by empirical studies tested the finding that livestock holdings have positive and significant impacts on food security status (Mulugeta, 2002). Soil

conservation measures (SWCMS): This variable is represented as dummy in the model, i. e., 1 if the household head practices improved, traditional or both type of conservation methods and0 if the household didn't apply or practice any soil conservation measures. Practicing any soil conservation techniques will mitigate land degradation problem through maintaining soil fertility, which increase crop production, ceteris paribus. Thus, a household who practices any type of soil conservation measures will be hypothesized to have positive impact on food security. Supported by a research conducted on soil and water conservation in the Eastern Ethiopia highlands at Hunde-Lafto area by Wagayehu (2003) concluded that investing in soil and water conservation (SWC) measures have positive impacts in terms of mitigating land degradation and improve farm household’s food production and income. Credit service (CREDTAMT): Credit is an important source of investment. Those households who acquired the credit they wanted had better possibilities to invest. They could purchase agricultural inputs and livestock. Hence it is hypothesized that credit and food security are positively correlated. Perception index of land degradation (PILD): This variable is a continuous variable that measures farmer's perception of land degradation problems by perception level of soil erosion, reduced soil fertility, importance of soil conservation measures and institutional support in mitigating land degradation. Positive attitude towards soil conservation measures indicates the level of farmers’ perception towards land degradation problems. Therefore, it is hypothesized that farmers who perceive land degradation problems are more likely to be food secure. Supported by a study made in Tanzania on land degradation by Alemneh et al. (1997Distance from market center (DISMARKT): proximity to market centers create access to additional

income by providing off-farm/non-farm employment opportunities, easy access to inputs and transportation. It is, therefore, expected that households nearer to market center have better chance to improve household food security status than who do not have a proximity to market centers. Off-farm/non-farm income (NONFI): this represents the total amount of off-farm and non-farm income (in Birr) the farmer or any of the household members earned with in the year. It is expected that the availability of off-farm/non-farm income is positively associated with household food security status. In agreement with Mulugeta (2002) has shown that off farm non-farm income increased household food security

EXPECTED OUTCOME

The expected outputs of this study are as follows; A Master of Science in Agricultural & Applied Economics Thesis will be developedA working paper for food security studies and development of policy recommendation and a journal article will be produced.

WORK PLAN

ACTIVITYJune –Nov 2012Dec2012Jan2013Feb2013Mar2013Apr2013May2013Proposal WritingProposal PresentationData CollectionData Cleaning, Entry And AnalysisFinal Report WritingPresentation and Submission

BUDGET

ITEM

unit

quantity

unit cost (Mk)

total cost (Mk)

Data Collection

1. 1 Accommodation and FoodDays1012, 000. 00120, 000. 001. 2 Transport and Fuel to fieldDays1022, 500. 00225, 000. 001. 3 Hiring of 3 EnumeratorsDays106, 000. 00240, 000. 001. 4 Stationery + questionnaire printing20, 000. 00

Data Analysis

60, 000. 00

3. 0Thesis Preparation and Production

70, 000. 00

TOTAL MK

749, 000. 00

TOTAL (U$)

4681. 25