Land degradation has been a part of livelihoods in most of rural household of the developing countries. Its critical constraints have been observed in agricultural production and in living standards in most of rural livelihoods that leaves these households vulnerable to severe hardship. This paper aimed to understand the community's responses on the impacts of land degradation and anticipated management strategies in the Upper Songwe basin. It used a survey method in which, household survey, key informant interviews, institutional interviews and field observation were used in data collection. The results revealed the decline in physical and social capital and limited opportunities in farming communities due to land degradation. Soil erosion and landslides reduced area for cultivation, changed the water colour and increased the silts and reduced fish catch in the river and Lake Nyasa. Expansion of cultivations, engaging in the processing of natural resources products have been ways of surviving in the area. Farmers also frequently migrate on a temporary basis to locations that have favorable farming conditions. To improve livelihood and sustain natural resource there is a need to institutionalize adaptation strategies that provide an environment for rural community to understand land resource management and adaptation strategies.

Key words: Land degradation, Rural livelihood, environmental management, climate variability and upper Songwe

INTRODUCTION

Land resources play a central role in the lives of farming community in rural areas. Land is a fundamental resource on which human populations dependent for food, fuel and fodder (Paul and Kimble, 2008; Swift, 2008; Gessesse et al., 2016). Under wise management, land resources such as soil, water and vegetation have a variety of essential life support roles. It supports their livelihoods and is important in helping them to manage vulnerability to shocks and disasters (WHO, 2007; Gwambene, 2011). It is palpable that the sustainability of mankind depends on the wise use of such precious land/environmental capital as ascribed in Gessesse et al. (2016) and Keesstra et al. (2016). However, the quality of the environment and natural resources on which rural livelihoods depend is declining (Rahman, 2013). Land degradation has posed greater influence on resource management practices, agricultural production and natural resources. They reported to increase probability of abnormal events, which threatened human and ecosystems. The animal fodder, plant species diversity, organisms and the ecosystem have been affected. Furthermore, it was revealed that natural resource bases that provide safety net functions during stress periods have been reduced (see also in Gwambene, 2011). Broad environmental indicators have shown a continuing decline in the earth's physical condition and fallenin living standards. It is apparent that farmers have lost comparative
part of topsoil to erosion and most of the rural areas in sub-Saharan Africa suffered moderate to extreme soil degradation (Born and Kästli, 2008; Pulido and Bocco, 2014). Agricultural activities, deforestation and overgrazing being among the main causes of the present degradation that increased vulnerability of rural household to the environmental changes. These have negative effects on their livelihoods and health, and are making them more vulnerable to risks and shocks, so they are less able to move out of poverty (Liwenga, 2003; URT, 2007). Land degradation and Climate change and Variability do not just result in lower productivity but also increased vulnerability to rural livelihood and natural resources in the area. There is increasing evidence that the lack of means to cope with low production in itself is a cause of persistent variability in living standards and poverty. According to OECD, (2001) Poverty encompasses different dimensions of deprivation that relate to human capabilities, including consumption and food security, health, rights education, voice, security and dignity.

Land use shifts and their sustainability are an important part of climate and it is through the response of the plant-soil system that it will have its main impact on humankind (Swift, 2008). Furthermore, it is in the tropics that the demands of developing human populations are most tightly linked to climate- and mil-determined limits. The link between environment and poverty reduction is becoming strong. Since the Rio Earth Summit in 1992, the importance of a sound environment to sustainable livelihoods has been widely acknowledged, particularly for the rural poor in Africa, Asia, and Latin America (FAO, 2005; World Resource Institute, 2005). Income derived from the environment is a major constituent of the livelihoods of the rural poor, and this direct dependence on nature (Liwenga, 2003; Pew, 2006; Gwambene, 2011). An effort to reduce poverty would be feasible in the context of livelihood and environmental sustainability. A livelihood is sustainable when it can cope with and recover from stresses and shocks, maintain or enhance its capability and assets, while not degrading the natural resource base. The recognition of the critical necessity for improved management of the soils and water resources could make a significant practical contribution to agricultural development.

Farmer’s communities in rural areas are more vulnerable to environmental disasters and changing climate (Ramesh and Madhavi, 2009; Gwambene, 2011). They suffer more losses, injuries and deaths from natural since they are more likely to live in unsafe housing and in areas prone to disasters such as floods, landslides and drought. The impacts of land degradation and global climate change that could include declining water supplies (Low, 2005; Tumbo, 2007; Rahman, 2013), poor harvests and increased spread of disease will further affect livelihoods (Liwenga, 2003). Such effects are more severe in areas susceptible to disease and have little savings, food and other assets (to sell and consume) to help them cope in the event of fluctuating climates and extreme weather (Gwambene, 2011; Keesstra et al., 2016).

The effects of population growth in the basin are a rising challenge because agricultural farming and settlement that inevitably put enormous pressure on the remaining natural resources, especially the forests with regard to demand for construction poles and fuel wood. This, coupled with the adverse impacts of climate change and variability experienced through the changes in seasonal rotation and pattern of rainfall that increased vulnerability to rural livelihood (FAO, 2005; Measey, 2010; Torikul et al., 2015). The problem of soil erosion due to runoff (rain water) is severe increased in the upper basin area. High poverty levels incapacitate people’s ability to invest in socioeconomic development and it increases land resource degradation (Gwambene, 2012). Such factors threatened crop production that forces farmers to depend on low-input and low-risk technologies making them less able to thrive back after disasters. It is also observed that, a huge number of people are forced to displace from their primary occupation (Measey, 2010; Torikul et al., 2015). To address such challenges and improve land management in the area this paper assessed the land degradation and rural livelihood in the Upper Songwe basin in Ileje District. The main objective was to understand the community’s responses on the impacts of land degradation and future management/adaptation strategies. The study explored perceptions of rural community on land degradation and how they respond to land resource loss and degradation.

MATERIALS AND METHODS

Study area

This study was conducted in Ileje district within the Upper Songwe trans-boundary river basin. The basin is located in the south-western part of the United Republic of Tanzania and the northern part of the Republic of Malawi. Songwe River forms part of the Tanzania - Malawi border, flowing from north-west to south-east into the Lake Nyasas’ northern end. The basin has a total area of 4,214.3 square kilometers of which 54.6% are located within Tanzania and 45.4% in Malawi (Chiuta and Johnson, 2010). The Songwe basin comprises of six districts that include: Mbeya, Mbozi, Ileje, and Kyela in Tanzania, and Karonga and Chitipa districts in Malawi (Born and Kästli, 2008). The Basin is divided into three major sub-basins, namely the upper, middle and lower basins. Figure 1 below shows the location of the Songwe basin and indicates the study area.

The altitude of the upper basin lies between 2,000 and 2,400 meters above sea level in the Rungwe Mountains and on about 1,300 meters above sea level in the Chitipa highlands (Born and Kästli, 2008; Lemann, 2010). In the south-western and north-eastern parts of the area the
Potential corollaries of land degradation on rural livelihoods in upper Songwe transboundary river catchment, Tanzania

estimated annual rainfall ranges from 1,000 to 1,400mm per year. The geology of the area consists of rocks (gneiss) and quaternary alluvium deposits in depressions (Lemann, 2010). The area is covered with red and alluvial soils which have little fertility. Miombo woodland is the main vegetation in the area and is interspaced with settlements and agricultural land. The upper Songwe basin was selected for study due to its potential characteristics on agricultural production and land degradation. The area for a long time experienced land degradation, identified to be among the critical environmental degradation hotspot sites and it has been acknowledged for its contribution to sedimentation and pollution of Songwe River (Born and Kästli, 2008).

The middle basin covers the parts of Ileje and Chitipa districts. Its altitude ranges from 1,100 and 1,300 meters above sea level with the annual rainfall ranging between 1,000 and 2,500mm per year in the western and lower parts of this part of the basin. The area consists of the gneiss rocks and quaternary alluvium deposits in depressions with miombo woodland and cultivation (Born and Kästli, 2008). The lower basin covers the small part of the basin and it cover the part of Kyela and Karonga districts with altitude ranging from 400 to 1,100 meters above sea level. The annual rainfall varies within the catchments it is about 1,500mm and 3,000mm per year (Chiuta and Johnson, 2010). The geology consists of gneiss and quaternary alluvium with fertile soils near Lake Nyasa/ Malawi. The area is heavily cultivated with more tree crops and wetland cultivation. The common vegetation in the area includes miombo woodland and little forests (SRTCMP, 2004).

**METHODOLOGY**

The survey method was used for primary data collection that included key informant interviews, household questionnaire and field observation. Interviews with the key people that include knowledgeable aged people, local government officials at the village, ward and district levels were conducted. The interviews centered on land management, land tenure, climate, perceptions of land degradation and gender roles in production. In addition the field observations that involve visiting farmlands, infrastructure and other land resources located within valleys and uplands were conducted. Both qualitative and quantitative information was collected and used in understanding land degradation and its implication on rural livelihoods. The assessment of the resources and activities were rural communities are making and living. The combination of both qualitative and quantitative methods facilitated to scrutinizing the social dynamics of livelihoods and the interactions between the actors and the natural environment.
.resource base. A livelihood comprises the capabilities, assets (both material and social resources), and the activities required for a means of living. The data collected from different sources and methods were edited, coded, tabulated, compiled, processed and analyzed using different techniques. Quantitative data were compiled and analyzed by using Statistical Package for Social Sciences (SPSS) version 16 and Microsoft Excel software. The qualitative data were analyzed using content and trend analysis, factor analysis, as well as cluster analysis. The qualitative data from key informant interviews, household interviews and observations were examined and presented in summary form and the results were displayed in the form of description, tables, charts and figures.

RESULTS AND DISCUSSION

Livelihood activities and land degradation

Farming is the major activity and it is basically done for subsistence and partly commercial purposes, mainly to cater for basic household needs. Traditionally, smallholder farmers engaged in farming and livestock keeping, collecting natural resources for home use and developing the farm and its infrastructure. The population as in most rural areas, use small plots of land, ranging from 0.2 to 3 acres and rely on their own food production. This makes them particularly vulnerable to shocks like drought, flood, crop pests and land degradation. Off-farm employment, education, and networking within the family and community are less undertaken in the area. Small-scale fishing is done in Songwe Transboundary River largely for consumption, but during the wet season the catch is high and therefore some of the fish are sold in the local markets. All these livelihood activities are related to natural resources and are easily affected by environmental degradation, especially, on uplands and along river banks. Land productivity and agricultural production had declined and faces many challenges in the study area.

The study revealed that before 1980, arable land were easily accessed and soils were fertile; a large part of the land was covered with natural vegetation that helped to conserve land resources. It was further reported that in those good days there were an adequate water, productive land and food were secured in the area. Yields from farms were very high and food security was guaranteed, hunger and famine were rarely heard. But with the increase of population, now the land resources have been degraded as a result of deforestation and soil erosion, which reduced water retention, increased flooding during rains, reduced water flow and soil fertility. The river banks are cultivated because they provide fertile flat land with sufficient moisture, but this again supports further erosion. Table 1 shows the reported environmental problem, causes and suggested measures.

The results indicate that land degradation is among the main environmental problem in the study area. Basing on Key informant and household interviews soil erosion, deforestation and climate variability was the main cause of land degradation. Soil erosion was extensive and in some places were severe, leading to a big sediment load and brown colour in the river, which is finally washed into Lake Nyassa, where it is deposited. The cause of such erosion was reported to be due to deforestation, cultivation on steep slopes, river banks and in some areas overstocking especially along cattle routes. Such results also discussed in other studies (Gwambene, 2012; Easdale, 2016; Gessesse et al., 2016; Pulido and Bocco, 2014). Deforestation and removal of vegetation in the area were mainly due to opening new settlements, fields, fuel and other uses. Also predominant of mono-cropping cultivation of seasonal crops such as maize and finger millet is less effective in terms of soil and water conservation resulting in further soil degradation. Such factors, coupled with a high rate of population increase and the coincident pressure on the land that affects both food security and environmental management. Figure 2 shows the factor that accelerates land degradation in the study area.

The results indicate that climate change and decline in land fertility that require addition, nutrient trough application of fertilizer are among the main course of land degradation. Based on key informant interviews, low capacity to apply fertilizers due to soil exhaustion is among the factors that affect agricultural crop production and increased land degradation in the study area. In the upland for example, due to infertile land farmers have to shift to another productive and marginal land. Such shift requires more land that in turn affects farming practice and land management. Such results are consistent with the findings of Gwambene, (2012), Teshome et al. (2016) and Gessesse et al. (2016). Access to productive land among the smallholder farmers is among the challenge of sustaining agricultural crop production in the area. Such situation becoming more pronounced and it exists in many parts of the world, whereas productive land is not available for agricultural production, thus, people who want or need to farm and make a living have little opportunities to access and improve production (Darnhofer et al., 2012; FAO, 2012). The analysis indicated that most respondents are aware with the cause of land degradation as indicated in Figure 2. The perceived environmental problem in the study area increased household vulnerability and environmental risks. The main resources at risk include land for agriculture, water sources, forest, settlements and livestock.
### Table 1. Environmental problem, causes and suggested solution in Songwe basin

<table>
<thead>
<tr>
<th>Environmental Problem</th>
<th>Cause</th>
<th>Solution</th>
</tr>
</thead>
<tbody>
<tr>
<td>Deforestation</td>
<td>Demand for energy such as firewood/charcoal, construction of new settlements, expansion of agricultural land, bush burning for pasture, hunting small animals, honey harvesting and slash and burn for growing finger millet. The main driver for such changes are climate change and increased demand of natural resource that due to population increase.</td>
<td>In reducing deforestation the suggested measures include afforestation and better management of existing vegetation, discourage encroachment in conserved areas. Such measures must take into account provision of alternative sources of energy and planting of fast and eco-friendly growing trees. Other measures include provision of education on agricultural production and environmental management, increase land productivity and agriculture production through improvement of agricultural implements, soil fertility, agroforestry, organic farming and water management practices. Such measures will need to put in place enforcement of laws and by law.</td>
</tr>
<tr>
<td>Soil erosion</td>
<td>Among the mentioned causes of soil erosion are removal of vegetation (due to demand for fuel-wood, poles, slash &amp; burn), overgrazing, Poor farming practices (cultivation along steep slopes, near water sources and river banks and poor ridge alignment)</td>
<td>The suggested measures to reduce soil erosion include afforestation, environmental management education, De-stocking, improvement of agricultural practices and improvement of extension services.</td>
</tr>
<tr>
<td>Sedimentation</td>
<td>Erosion mainly from anthropogenic activities in the highland areas</td>
<td>Afforestation, sound agricultural practices in upstream and education on environmental management.</td>
</tr>
<tr>
<td>Pollution</td>
<td>Agro-chemicals, soil erosion, bush fires, mining and Pollution from poor sanitation</td>
<td>Promote and support organic farming, provision of environmental education and promotion of good sanitary practices.</td>
</tr>
<tr>
<td>Water Borne Diseases</td>
<td>The main cause is water pollution and poor water treatments</td>
<td>Promote and support good sanitary practices and environmental education</td>
</tr>
<tr>
<td>Reduction in water/</td>
<td>The main causes include sedimentation, deforestation and poor agricultural practices</td>
<td>Afforestation, conservation of water sources, sound agricultural practices upstream and improvement of water uses.</td>
</tr>
<tr>
<td>rivers flows</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Floods</td>
<td>Catchment degradation, Deforestation and climate variability</td>
<td>Catchment rehabilitation, afforestation, proper land uses, improve agricultural practices and the construction of dams along rivers where possible.</td>
</tr>
<tr>
<td>Declining biodiversity</td>
<td>Deforestation, bush burning, expansion of settlements and agriculture and illegal hunting</td>
<td>Control of illegal hunting practices, enforcement of regulations and bylaws, afforestation, apply good agricultural practices and the provision of environmental management education.</td>
</tr>
</tbody>
</table>

**Perceived implication of land degradation**

*Implication of the land degradation on human and biophysical resources*

The study results revealed that the livelihood and biophysical environment are heavily affected by land degradation that compounded with changing climate. One of the major potential effects of environmental degradation on human societies is through its impact on agriculture, in particular in those areas of the world where the population is heavily dependent on local food production (see also in Swift, 2008). Decline in agricultural production increased environmental problems include soil degradation, overuse of land resources, decline in water availability, poor infrastructure, loss of soil fertility, climate change and variability and health problems. Figure 3 indicates the main Land degradation that affects a significant portion of arable lands, decreased the wealth and economic development of the rural communities and the national economy. Through analysis of key informant and household questionnaire it was apparent that the land resource base becomes less productive, food security is compromised and competition for dwindling resources increases. The most pronounced implication of land degradation include loss of fertility, soil degradation, deforestation/loss of vegetation, decline in water, increase of diseases and pollution. Such factors increased vulnerability of rural livelihood and posed a great traumata on land resource management. Such a result is consistent with other studies done in other areas (Krishan et al., 2009; Gwambene, 2012; Assefa and Hans-Rudolf, 2016; Keesstra et al., 2016).
Based on the key informant interview land degradation lowered yields on major food crops, accelerated loss of land in marginal areas, intensify floods and increased duration and intensity of droughts. Most of these phenomena have long been part of the ecology, but as observed through key informant the effects have become more acute in the area. The respondents provided concrete, verifiable examples of impacts that pose direct challenges to human security and vary significantly from historical norms and ecological perspectives. These include decreased land productivity affecting crop production, human health, economic activity, and environment. Others are increased frequency and severity of soil erosion in recent years, the occurrence of severe drought and unprecedented floods and landslides that observed in the upland and along river banks.

**Implication of land degradation on gender perspective**

Women, in particular, were concerned about environmental changes. They found that they were now having to walk longer distances and to more isolated places to collect resources such as wood, water, grass and wild fruits. This was increasing their work burden and exposing them to more risks. Based on key informant interviews it was revealed that women stay with their
children during the hardship period, while men migrated to another area for casual Labors that increases the burden and vulnerability over women. Likewise the youths were reported to be the most desperate because they are poor and have few opportunities for improving their livelihood. They deliberately go out to find employment and use the marginal land for cultivation that is the only alternative remaining for them. Others locate a very small piece of land by their parents, which has become infertile. It was envisaged that most of the youth have a fewer livelihood alternative, to sustain their livelihood most of them engaged in casual labour and others non-farm activities such as pit- timber sewing on other people’s land.

Many women are vulnerable due to their reduced access to sources of information, as well as their lack of decision-making power in resources management and preparedness programs. The analysis indicates that women and youth have limited access to and involvement in decision making over the land resources and services on which their well-being and livelihoods depend. The unequal impact on women is evident and affects everyday life and opportunities, since in many low-income countries, women already work more hours each day than men. Additionally, in Africa rural areas, women are more involved in agriculture than men. For example, it was estimated that 80 percent of smallholder farmers are women and they produce about 60-80 percent of food grown in the developing world (FAO, 2005; Born and Kästli, 2008).

Such factors, increased vulnerability to the youth and women, it also contributed to poor land resource management among the farming community. This was due to the fact that youth and women are more involved in farming and utilization of natural resources at the household level. To sustain land management in the area there is a need of empowering of women and youth through provision of land management education and involvement in decision over the utilization of land resources.

Consideration and integration of gender issues are important in land resource management and improvement of livelihood of smallholder farmers and resource management strategies to upset land degradation. Gender mainstreaming would need to focus on a holistic approach to ensure sustainability of land resources and provide equal inclusion of men and women in all aspects of resources management. The focused of such gender inclusion in land management would depend on the skills, knowledge and commitment of staff involved in implementation and management. Therefore, there is a need for promoting the involvement of both women and men in consultation and decision making from the community level to the highest management levels.

Implication of Land degradation on Natural Resources management

In the basin land degradation and water sources degradation coupled with negative impacts of climate change and variability changed the hydrological regime of the river. Most of forest reserves are under inadequate management because of inadequate financial and human resources. The study revealed that the basin is adversely affected by anthropogenic activities, such as the application of bush fires associated with charcoal burning, inappropriate agricultural practices, brick burning and fuel wood collection. These practices reported to result in reduced protective vegetation cover and biodiversity. Basing on household survey some of deforestation practices resulted from extraction of fuel wood, charcoal and logging as a poverty alleviation strategy for the local communities.

Factor such as change in rainfall pattern, intensity and its distribution as well as expansion of settlements and deforestation in the upper reaches of the river basin affects natural resources base and livelihood. It was revealed that most of unsustainable agricultural practices are the result of inadequate extension services, in affordability of purchasing inputs, use of low technology, unreliable market and lack of credit facilities. It has also been noted that most of the people in the catchment area also suffer from unsupportive macro-economic policies which have led to the removal of agricultural input subsidies and unregulated market forces. Figure 4 indicates some of reported environmental problems in the study area.

Land degradation, increased attention for many people to think and worry about its implication. The results indicate that most respondents are aware of land degradation and they have been affected by it in one way or the other. Land degradation in terms of loss of soil fertility and soil degradation reported to be among the main environmental problem in the area that have impacted the livelihood of the farming community in the study area. Based on household survey and key informant interview climate change also compounded the impacts on crop production, animal keeping and natural resources utilization and management. Moreover, deforestation in the upper catchment and flooding has been identified as a frequent phenomenon leading to losses of crops, livestock, property and, sometimes, human life in the lower part of the catchment. There is also inadequate communication network in the catchment thus limiting access to markets, reduces competitive pricing and limiting supply of inputs and other necessities. Environmental degradation weakens community resilience and increased community vulnerable to environmental changes. The results have shown a continuing decline in the production, deterioration of environmental condition and at the same time that living standards have fallen. Such environmental degradation, along with emerging agronomic constraints reduced arable land and increased food shortage as also stipulated by Assefa and Hans-Rudolf, (2016). Agricultural activities need to increase productivity on existing cropland due to less arable land available for agriculture due to land
degradation that affects outputs. But declines in the productivity increased the need for appropriate, cost-effective or feasible agricultural inputs such as fertilizers. However the ability of farmers to increase their production through the use of agricultural inputs is still questionable. These situations increase rural households vulnerable to food insecurity and environmental deterioration.

**Responses and Land management strategies**

The household builds livelihood strategies by combining a range of activities that are used to reduce vulnerability and cope with the deteriorating situation. Such strategies include the development and use of appropriate soil and water resources management practices to mitigate and reduce the impacts of land degradation. Basing on the situation and biophysical environment, measures to mitigate the effects, diverge from one place to another; depending on specific effects, experiencing and adaptive capacity. Figure 5 shows the commonly used coping and adaptation strategies used in the area.

The results indicate the measures taken by farming community that ranges from copying, adaptation to mitigation measures. The most commonly used coping and adaptation measures include buying food, involving in casual labour, selling animals, depending on drought tolerant crops such as cassava and bananas and reliefs. Such strategies help them to survive during the hardship.
time. It is apparent that people who live in the environmentally degraded areas overtime struggle on a daily basis to survive and are unable to cope with any additional stress factors. Limited livelihood alternatives, competition over scarce resources and lack of access to healthcare and other services can compromise a community’s ability to respond to a hazard event. The coping and adaptation strategies used in the area indicate lack of alternative livelihood activities in the area that increase their vulnerability to any environmental changes. Land degradation and climate variability severely affected local communities and wider economic systems that required community based resource management to promote more resilient communities.

Measures that prevent soil loss and soil degradation is among the recommended strategies to reduce land degradation and improve livelihood at the household. It is all within the concept of managing water and land related resources to improve the social welfare of the residents and at the same time sustain the ecosystem. Integrated Water Resources Management (IWRM) can invariably reduce the impacts of land degradation, particularly in areas where the problem of land degradation is lampoon and more pronounced. The IWRM process seeks to institute a coordinated development and management of water, land and related resources for, among other things, an improved welfare of the community, without impacting negatively on the sustainability of the ecosystem (Measey, 2010). It is important to understand the opportunities and constraints to sustainable livelihoods and applies soil and water conservation measures at all levels.

CONCLUSIONS AND RECOMMENDATIONS

The future of smallholder farmers in the developing countries largely determined by how land managed and actions taken to mitigate or adapt to impacts of land degradation. The environmental degradation identified as a main constraint in agricultural production and key threat to human societies. The situation has its background on bad farming methods that have been employed over the years compounded by climate change and variability. Rural livelihood in developing countries faces serious environmental issues that could undermine the development processes, if left unaddressed, and specifically affect rural community who are faced by a combination of hardships. One of the potential mitigation strategy is to promote management practices that would improve soils, forest and water resources. This would involve putting in place strategies that contribute to the reviving soil fertility and management of land resources. The focus should be on improving local community production system and land productivity, which may include the use of organic farming, good agronomic practices and climate smart farming methods as a way to reviving soil fertility and retaining moisture. There is also a need for improving and maintaining soil fertility, and achieve more sustainable, healthy and productive farming systems, even on our fragile soils in a highly variable and changing climate. This must involve training farmers on soil conservation and environmental restoration in order to restore their neglected fields. Such strategies have to consider sustainability of soil management, water source conservation, agriculture and forest management with regards to ecological viability, cultural acceptability as well as economically prolific. Promotion of the use and development of renewable energy, adoption of energy efficiency and conservation through tax incentives, public campaigns and economic incentives recommended as important strategies in reducing degradation. The focus should be on improving the technology and transfer of information to the farmer. This study also recommended the need for strengthening the research on the development of climate smart agricultural practices and improvement of extension services.

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