

1 Land Degradation in Nepal

2 A Review

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# Land Degradation in Nepal

## A Review

### 1. INTRODUCTION

The topic of land degradation in the Nepali context is gaining attention by the researchers in recent years. A simple article search of a topic “Land degradation in Nepal” in Google Scholar resulted in 66 articles for the past decade 2010-2019 which is only about half, 31 articles for a decade earlier in 2000-2009. For a country with limited land resources and growing population where over 240 million cubic meters of soils are estimated to be eroded only from its hills annually (USAID, 1978) and a total of 336 million tons of soil enters India through the Nepali rivers annually (Brown, 1984). The severity of soil, a national comprehensive policy on land management warrants utmost attention to the issue of land degradation.

Land degradation represents the gradual decreases in the biological productivity of land because of human activities. It occurs due to physical, biological, and chemical processes because of direct or indirect anthropogenic exploitation (Blackie & Brookfield, 1991; MOEST, 2008). Land degradation is the substantial decrease in either or both of an area’s biological productivity or uselessness to humans (Eswaran et.al., 2001; Johnson & Lewis, 2007). It is considered as a reduction to lower rank which causes the devaluation of the land in terms of crop productivity. So, land degradation could manifest itself as a social problem. The definitions of land degradation show that environmental depletion of land due to human-induced events falls under the land degradation.

According to Sauer (1956) and Pyne (1993) land degradation is an evidence of human impact on global environmental change which can be verified by looking at the historical evidence of land degradation. After the domestication of fire, the relationships among early

52 technologies and the quest for food and shelter were increased in such a way that humans  
53 started to scatter on a larger spatial scale in a short temporal scale. The innovation of tools  
54 and fire enabled prehistoric humans to control the natural world, but their impacts were  
55 minimal compared to the change brought by the agricultural revolution in later years. This led  
56 to heightened control over the geographical areas and promotion of the quantity, quality, and  
57 availability of the favored food crops. Intensive use of cultivated and uncultivated landscape  
58 transformed humanized landscape completely where forest could not grow. Due to shifting  
59 agricultural practice, the communities had to reduce the fallow cycle, either due to internal  
60 population growth or due to mobility constraints to neighboring communities. The migration  
61 of prehistoric people from one region to another region for food and shelter, fire  
62 domestication for heating and cooking; agricultural shifting from one place to another and  
63 need of additional quantity of food for growing population have magnified land degradation  
64 (Johnson & Lewis,2007).

65         There are proximate and underlying causes of land degradation (Geist & Lambin,  
66 2002). Proximate causes include biophysical factors that drive land degradation. It represents  
67 the degradation of land quality due to human-induced reasons. It involves unsuitable land use  
68 practices along with improper land management that includes traditional agricultural work in  
69 steep slopes without proper soil protection measures (Lambin et.al., 2006).

70         Underlying causes of land degradation represents unsustainable land management  
71 practices (Von Braun et.al, 2013). It has no visible impacts on the land, but it stimulates other  
72 factors to ruin the land (Mirzabaev et.al., 2016). Land degradation occurs when land  
73 management is poor or natural forces are strong enough to overcome any effort of land  
74 management by humans to control the effects of the natural events (Blakie & Brookfield,  
75 1991). Exploiting land for agricultural works on hill slope, extraction of stone, sand and  
76 gravel from the rivers and deforestation are taken as unhealthy practices (Maskey et.al, 2003).

## 78 2. LAND-DEGRADATION: THE NEPALI CONTEXT

79 Nepal is a country with fragile geology, suffers from land scarcity as defined by the  
80 Food and Agriculture Organization of the United Nations (FAO, 2011). It is facing the  
81 challenges of land degradation as both the natural and manmade activities are playing roles in  
82 land degradation (Karkee, 2004).

83 Based on agro-ecology, Nepal is divided into five ecological regions-Terai (14%),  
84 Siwalik (14%), Middle Mountain (30%), High Mountain (19%), and High Himalaya (23%).  
85 Both the hill and mountain regions occupy 70% of the country's total land and suffer from  
86 soil erosion, landslide, and washing away of the topsoil (Maskey et al., 2003). The hills and  
87 mountains are fragile and vulnerable to landslides whereas Terai is generally threatened by  
88 flooding and sedimentation (Acharya & Kafle, 2009).

89 Land degradation is not an absolute term because the process itself depends on the  
90 land use category (ICIMOD, 2000). Land degradation varies as per physiographic zones  
91 (Figure 1). Generally, rock falls, rockslides, avalanches, and glacial lake outbursts are the  
92 faces of land degradation in the mountainous region (5000m - 8848m). Mass wasting  
93 rockfall; gully erosion; surface erosion (rill and inter-rill) and riverbank cutting mostly occur  
94 in high and middle mountain regions (2100m-5000m). The Shiwalik range (1200m-2100m) is  
95 also a vulnerable zone of soil erosion. Terai (70m-1200m) is suffering from flooding, river  
96 shifting, riverbank cutting and water logging. Dry districts of Nepal- northern parts of  
97 Manang, Mustang, and Dolpa districts fall under this category (Joshi & Shrestha, 2003).  
98 Likewise, the Shiwalik hill and middle mountain areas are highly susceptible due to soil  
99 erosion (Brown, 1984). The soil coming from hill and mountain to make deposits at the  
100 riverbed in Terai is high so the riverbed in Terai is rising by 35cm to 45cm annually which is  
101 further leading to expanding river overflow at farmland (Dent, 1984). The loss of soil quality

and quantity are damaging plots of farmland which is a serious threat for land dilapidation in the hill (Sitaula et. al., 2000).

[Insert Figure 1 here]

**FIGURE 1** Physiographic zones of Nepal

The work of GLP (2005) reveals that rural ecosystems have suffered due to land use changes from soil erosion brought by topography, intense monsoonal rainfall, and hydrological processes. However, identification and quantification of external causal variables on land degradation research have often been done without giving adequate attention to the linkage of land degradation and associated factors (ICIMOD, 2000).

Data from Landslide Susceptible Index (LSI) shows that 77% of Nepal's land area have high or very high susceptibility to landslides (Figure 2-LSI, Table 1-Province level LSI). Also, based on land cover data from 2015 (Figure 3-Land cover Table 2-LSI for different LC types of Nepal) 80% or more of the land cover types have a high or very high LSI except cropland and impervious area.

[Insert Figure 2 here]

**FIGURE 2** Nepal-Landslide Susceptibility Index (Source: *Stanley & Kirschbaum, 2017*)

[Insert Table 1 here]

**TABLE 1**Percentage of land area under different categories of LSI for all seven provinces  
(Source: *Stanley & Kirschbaum, 2017*)

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[Insert Figure 3 here]

**FIGURE 3** Nepal-Land cover map (*Source: Gong, et. al., 2013*)

[Insert Table 2 here]

**TABLE 2**Percentage of land cover area under different categories of LSI for Nepal  
(*Source: Stanley & Kirschbaum, 2017 and Gong et.al., 2013*)

The situation explained above shows the importance of understanding the causes of land degradation in Nepal.

**3. CONTRIBUTING FACTORS OF LAND DEGRADATION**

There could be several factors that can trigger land degradation. Classical perspective holds farmers accountable for their lack of knowledge on the technology, skill, and perspective to keep the farmland intact (ICIMOD, 2000). The classic view identifies structural causes of land degradation related to population, ignorance, and backwardness. Similarly, a mismatch of resource distribution and inappropriate technologies are popular views of land degradation. The neo-liberal view mentions that bias in terms of property rights; institutions, price, and rapid population growth, which play roles in land degradation (Biot, 1995). A review of the available literature in Nepal shows the following causes of land degradation (Table 3)

[Insert Table 3 here]

**TABLE 3**Summary of causes of land degradation in Nepal

### **3.1 Proximate causes**

#### ***a. Sloppy topography***

Fragile geological structure of Nepal is a proximate cause of land degradation (Karkee, 2004). Cultivation in hill slopes is common in Nepali agriculture (Figure 4). For centuries, farmers have adopted a shifting cultivation in sloppy land in many parts of the world including Nepal (Maskey et.al, 2003). The washing away of soils due to slope-wash, gully and mass movement occurs on all slopes. Flash floods from overloaded streams in deep valleys washout and widen their channels. As a result, about 50 percent of the eroded material carried away into the lowland widening gullies and waterways (Gardner & Gerrard, 2003; Brown & Wolf, 1984). Human influence combined with such fragile geology plays roles for subsequent landslides, avalanches, and floods in Nepal (Figure 5). For example, turbulent rivers have damaged 400,000 hectares of productive farmland (LRMP, 1986) which shows minimal human influence on the sensitive topography can bring significant ecological hazards.

[Insert Figure 4 here]

**FIGURE4** A typical Nepali landscape fueling land degradation due to sloppy landscape, river undercutting, un-engineered road construction, and traditional farming in Lalitpur, Nepal (red arrows) and terrace farming (yellow arrows) (*Source: Authors, November 2020*).

#### ***b. Land use and land cover change***

Land use and land cover change is a prominent cause of global environment change which is active in the mountain regions as well (Koerner & Ohsawa, 2005). Study shows that mountain regions are more vulnerable for over exploitation, fragmentation, and degradation of land resources (Chaudhary et.al., 2007).

[Insert Figure 5 here]

**FIGURE 5** Lack of land cover (area around red arrows) has accelerated the land degradation in Ranajor stream in Ramechhap, Nepal (*Source: Authors, May 2020*).

Nepal has about 25% of the land suitable for agriculture while 33% of the land is able to grow forest cover (Karkee, 2004). However, human influence on the ground vegetation by cattle grazing exceeds the carrying capacity, has already been common. The shifting cultivation together with overgrazing has damaged the vegetation threatening the grassland ecosystem. The overgrazing has loosened the soil so has eased to wash away the soil that also accelerates the surface runoff (Neupane & Thapa, 2001). Land degradation drivers include reduction of vegetation covers due to drought too (Symeonakis & Drake, 2010). Furthermore, Drake & Vafeidis (2003), Symeonakis & Others (2007) agree that land use and land cover change accelerate the land degradation process. Gisbert et.al., (1994); Aidi & Grau (2004); Radel & Schmook, (2008) highlight the role of migration to be responsible for land use and land cover change.

Pre-monsoon is a season to lose the soil in Nepal when there is no vegetation (Atreya, 2002; Atreya et.al., 2006). In pre-monsoon, 60 to 80% of the total soil and nutrients are lost in Nepal due to high wind flow (Scheier & Shah, 1999). Land with plants are more protected and less affected by soil erosion. In developing countries, the loss of soil cover is



very common due to farmers' unknowingness and lack of forest management awareness (Pimentel, 2006).

### *c. Soil erodibility*

The hill and mountain areas are fragile and vulnerable to the landslide in Nepal. Land degradation is the greatest challenge in recent years and Nepal is not an exception (GON, 2015; Karkee, 2004). An estimate shows that 26 billion tons of soil is being eroded annually from crop and grazing worldwide (Brown & Wolf, 1984). In the case of Nepal, the turbulent rivers erode a total of 336 million tons of fertile soil through the main river system to India (Brown, 1981) (Figure 6).

[Insert Figure 6 here]

**FIGURE 6** Road construction in the sloppy land without proper consideration of hydrology, Bhorle, Dolakha, Nepal (*Source: Authors, July 2020*)

### *d. Fertilizer, pesticides, and disease*

Use of pesticides and chemical fertilizer is ongoing as an inappropriate agricultural activity in Nepal (Maskey et.al., 2003). This increases production in the short run but degrades soil quality in the long run (Bajracharya & Sherchan, 2009). Further, the overuse of pesticides and chemical fertilizers to produce more food for a growing population has hastened the degradation of the soil property. Although intense cultivation and excessive use of chemical fertilizer have damaged soil productivity, there is no existing control mechanism in Nepali regulations (ICIMOD, 2004).

The middle mountain region, because of intense cultivation and use of chemical fertilizers, has been found to be acidic where the pH value of soil was 3.3 and 7.5 with the mean pH value 5.8. For instance, cultivation practices such as introduction of double or triple annual crop production, uncontrolled use of chemical fertilizers (ammonium sulfate and urea) are increasing the pH values of soil (Tripathi, et.al.,1999). Tripathi et.al., (1999) also found that using less organic manure or reducing use of lime by other means raises the concentration of acid in soil. This proves that the overuse of chemical fertilizers and pesticides have been contributing to increase the soil acidity. Consequently, the productivity of the land deteriorated for most of the crops (Tripathi et.al., 1999).

#### *e. Unsustainable land management*

Fragile economy and farm policies fuel land degradation as these factors motivate people to exert the pressure on land (Karkee, 2004). The incompetence of land administration, and syndicate in urban real estate sectors are two issues that complicates the land management problem in Nepal. Although, the Government of Nepal has passed a bill but so far it is unable to address the regional and urban land issues. Government is still not able to provide digital land survey and administrative services to the people (Chand, 2019) making it very hard for transparent and accessible land management services to the public.

Regional and urban development planning and land use issues and approaches are conflicting. Land management is a special problem for spatial planning in rural and urban Nepal which has spurred challenges in land governance. In Nepal, statutory practices, land use, and land zoning do not have clear objectives which have resulted in many loopholes and failed to address irregularities in land management. Due to policy gaps at the national and provincial levels, the pressure from internal migration and investment in urban real estate has brought regional imbalance in the national economy (Chand, 2019). Locals have a low level

of acceptance of the land management plan and policies due to low level of participation in its formulation and haphazard institutional overlap. For example, the government offered parcels of land or new housing or financial aid to the beneficiaries in the Freed Bonded Laborer Rehabilitation Program in the Terai region, but the beneficiaries were not ready to accept the offer. The beneficiaries demanded housing at the market center where land is already scarce. Including this, the involvement of brokers in land parceling is leading to the over fragmentation and degradation of agricultural land (Chand, 2019).

Open space is encroached in the name of land management and spatial planning. Before the promulgation of the Constitution 2015, the Town Development Committee, an autonomous agency was active in most of the 217 municipalities in the country to manage government owned land in urban and suburban areas (Chand, 2019, Pradhan, 2015). It used to allocate the land for public infrastructure but the performance of the Town Development Committee was dismal and is often criticized for distributing the land for vested interest in such a way that there is no government and public land left over. Public is also leading to degrade the religious, trust, protected areas, grassland, community forest in the name of squatters, and natural disaster victims (Chand, 2019). The cumulative impact of fast-growing population, internal migration, unmanaged but rapid urbanization, encroachment of arable land, public land and other resources are widespread in Nepal (MOLRM, 2015).

#### ***f. Urbanization and infrastructure development***

Unmanaged and rapid urbanization has resulted in land encroachment and loss of land productivity in Nepal (GON, 2015). Construction of roads, and settlements have magnified the environmental degradation (Neupane & Thapa, 2001). Unscientific road construction in a fragile landscape is a cause of soil erosion and landslide in Nepal. Construction of non-

274 engineered roads using bulldozers has been destructive to Nepali landscapes. The use of  
275 bulldozers in road construction destroys groundwater flow path, destroys plant and  
276 vegetation, cultivated land, and the natural stability of the slope. As a result, deposition of  
277 debris over paddy fields is common (Dahal, 2019).

278

279 [Insert Figure 7 here]

280 **FIGURE 7** Soil erosion due to un-engineered road construction using Bulldozer in  
281 Bagmati Rural Municipality, Lalitpur, Nepal (*Source: Authors, May 2020*)

282 Figure7 represents a typical Nepali landscape being exploited with unscientific  
283 practice of road construction using bulldozer and excavator. The surface run-off washes out  
284 the loose soil during monsoon which also blown away by air during the dry season causing  
285 severe air pollution

286 Construction of housing complexes that change the land cover permanently is another  
287 cause of land degradation. For example, in 2012, Department of Urban Development and  
288 Building Construction under the Ministry of Urban Development purchased 4,070 square  
289 meters of land to provide housing to poor city squatters in Ichangu Narayan Housing project  
290 (currently, Nagarjun Municipality, Kathmandu) which has not been favored by the targeted  
291 beneficiaries so all 227 housing units remained vacant though another similar type of housing  
292 project in Kirtipur, Kathmandu is said to have succeeded (The Kathmandu Post, 2019;  
293 Chand, 2019).

294 Agricultural land in most of the locations of the country are turning into urban and  
295 semi urban settlements (The Kathmandu Post, 2019). For example, there were 10 urban cities  
296 in Nepal in 1952 to 1954. The number of the cities rose to 16 in 1961. Likewise, the number  
297 of urban cities has been recorded 23, 58, and 191 in 1991, 2001 and 2014 respectively. Now,

Nepali land has been facing the pressure of 263 municipalities, 6 metropolises, and 11 sub-metropolises (Dahal & Timilsina, 2017).

### ***g. Traditional agriculture in terraced land***

Poor agricultural practices play roles to lose the organic soil particles that contribute to land degradation (Symeonakis & Drake, 2004). The cultivation in high sloped ground without protective measures moves soil away. Neupane & Thapa, (2001) discuss that agricultural works in steep slopes without soil conservation measures such as terracing and adding organic manure has increased soil erosion.

Cultivation in sloppy lands with greater than 40 degree is common in Nepal (Maskey,1995). The shifting cultivation patterns have hampered the regeneration of the forest diversity (Acharya et. al., 2008). Traditional cultivation that includes shifting cultivation on sloppy ground without protective measures destroys the water resistivity of soils (Maskey,1995). Cultivating land for crops without replenishing plants and nutrients has threatened the sustainability of soil. As a result, soil loss through surface erosion from the cultivated land on hills is rampant and varies from less than 2 tons per hectare annually to as high as 105 tons per hectare (Acharya et. al., 2008).

## **3.2 Underlying causes**

### ***a. Population, and poverty***

Population and poverty are often blamed for land degradation in Nepal (ICIMOD, 2000). Nepal's Land Policy 2015 also points out that the country is losing the quality of land due to overpopulation. Cultivation in sloped land, a finite natural resource, is continuing due to the lack of enough land to grow food for the population. It is a vicious cycle of mutually reinforcing processes in which degradation has provoked poverty and poverty has further

worsened land (GON, 2015). Human influence on land to grow more food is dismantling the biophysical property of soil (Joshy et. al., 1997).

Similarly, inappropriate agricultural activities in the face of population pressure are contributing to deforestation, shifting cultivation, and the use of pesticides and chemical fertilizers in Nepal. The modification of shape and chemical composition of soil to grow additional food to feed the growing population have resulted in loss of land productivity and its usefulness to biodiversity (Maskey et.al.,2003). The loss of soil with nutrients lowers agricultural productivity that further impacts rural livelihoods (Gautam, 2000).

#### ***b. Migration and land abandonment***

Land abandonment is a result of migration which is a social phenomenon (Benayas et.al., 2007) (Figure 8). In recent years, Nepal is experiencing massive outmigration. Nepali society is also transforming to be more urbanized due to commercialization and monetization (Seddon et al. 1998). The male out migration has led to labor shortage and ‘feminization’ of the agricultural labor force (ADB, 2013). The traditional agricultural practice could not contribute to the livelihood of the subsistence farmers. On the other hand, landlessness of the people has limited the access to other natural resources. As a result, the paying capacity of people for health, education and social services remained worrisome. This has led to outmigration and those family members who have their family members out migrated, have abandoned the cropland to remain fallow (Paudel, et.al., 2014).

[Insert Figure 8 here]

**FIGURE 8** Abandoned agricultural land in Baiteshwor Rural Municipality-5, Dolakha, Nepal (*Source: Authors, October 2020*)

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349           People migrate internally to different cities when land becomes scarce (Seddon et.al.,  
350 1998; Graner & Gurung, 2003; Kollmair, et.al., 2006). The migration to foreign countries or  
351 to the Terai or urban and semi-urban areas alters the demography of hill (Seddon et al.,  
352 1998). Statistics show that 1,3491 people used to leave their origin via legal route for Gulf  
353 countries every day in 2014 for employment. The absence of the youth labor force  
354 necessitates women or elderly people to nurture the land. People's choice to move to the  
355 valley or nearby cities causes land abandonment (Gurung, personal communication, 2013).  
356 Migration created ignorance over land that further has resulted in loss of land-based  
357 ecosystem (Gisbert et.al., 1994; Aidi & Grau, 2004; Radel & Schmook, 2008). A study in  
358 Lamjung district of Nepal has identified that the shortage of agricultural labor in the village,  
359 and in the home are causes of land abandonment (KC & Race, 2019). Similarly, the Land Use  
360 Policy 2015 of Nepal recognizes that migration is a cause of land encroachment in urban and  
361 semi-urban areas.

362           The migration has further made labor wage expensive. The local people have not  
363 been able to pay the workers from the unproductive agricultural works leaving the land  
364 fallow (KC & Race, 2019).

365

### 366       *c. Deforestation*

367           Many developing countries have been facing deforestation as a major environmental  
368 problem over the past decades (Gautam et.al., 2004). Deforestation is a cause of land  
369 degradation as it stimulates the weakening factors of the water resistivity of soils (FAO,  
370 1994). The historical documents available at district and national levels show that  
371 deforestation started in Nepal in the late 18th century when the government was lured for  
372 revenue, selling forest products to India (Mahat, 1985). The conversion of forest land to

agricultural land occurred at a rapid pace in Nepal to feed the growing population (Collins & Jenkins, 1996; Maskey et al., 2003). The land degradation in Nepal is an outcome of deforestation, while deforestation is a result of both the proximate and underlying driving forces (Acharya, 2011) (Figure 9). Study shows that Forest fire which leads to deforestation, is one of the major causes of land degradation. Anthropogenic role of deforestation resulted in the loss of flora and fauna, erosion of topsoil, occurrence of landslides in the hill and flooding in the plain areas that made land poorer in quality (Karkee, 2004).

[Insert Figure 9 here]

**FIGURE 9** Deforestation for agricultural land in Lalitpur district, Nepal,

*(Source: Authors, October 2020)*

The direct forces to forest land conversion include but are not limited to over-extraction of forest products, intentional forest fire, free grazing, illegal logging and shifting cultivation. For example, collection of firewood and grass for cooking fuel and livestock is common in Nepal (Bajracharya, 1983; Axinn & Axinn, 1983). About 200 hectares of forest turns into deforested land or degrades and fragments into shrubs or bush areas daily. This reduces the plant species and soil erosion together with nutrients (Gautam, 2000).

Globally, above 9 million hectares of forest clear-cut disrupting the forest ecosystem each year. The land after deforestation is agriculturally unproductive, biologically poor, and more flammable (Uhl & Buschbacher, 1985; Uhl, 1987), which is the case in Nepal too. Despite, Nepal is counted as a country having good progress in forest coverage of 26% in 1992 to 45% in 2016 (Gill, 2019). After 1970, Nepal implemented forest conservation activities mobilizing community forest users' groups who were responsible to formulate,



implement and review their forest strategies. This program has been a successful program in forest conservation in Nepal (Kandel & Kandel, 2004).

#### ***d. Land tenure and property rights***

Land in Nepal has been under the control of elites, (e.g. *Jamindars*) marginalizing a large section of population from generations. Until the 1960s, land was held in various forms of tenure such as *raikar*, *birta* and *guthiorkipat* systems in Nepal. But in recent years, transferring the ownership of public lands to the politicians mainly with the help of power brokers, from across the political class and spectrum, using the loopholes in laws and regulations has been rampant (Republica, 2020).

The amendment to the Land Act 2001 revised the ceiling of landholding aiming to benefit marginalized people, but the attempt failed as there was no “excess” land found for reconciliation. Likewise, the policy failure is heavily criticized as “land reform in law” rather than “land to tiller.” (Sharma & Khanal, 2010). The unstable politics and government, land ownership rights, labor utilization and taxation caused fluidity in the land productivity. This argument tells us that the land reform act could not assure the right of land to marginalized people in Nepal (Regmi,1976; Regmi,1978). Subsequently, institutional arrangement and policies for land use planning seems ineffective (FAO, 2010; Sharma & Khanal, 2010). So, the Government of Nepal established the National Land Use Project in 2000 to address land use problems, but again it remained ineffective due to political fragility. As a result, people who were unsure of their future right over land, appeared reluctant to nurture the land. The carelessness of larger scale landholders has been continued in losing soil property which are necessary for crops and biodiversity (FAO, 1994).

#### ***e. Farm and non-farm employment***

KC & Race (2019) found that 22% of the households have been planning to shift to non-farm business and jobs outside agriculture sectors. Similarly, their research shows that a similar percentage of farmers are seeking overseas employment. Some farmers at the village are eager to join the army. It is likely that the occupation shifting of farmers will one day result loss of the farming knowledge, practices, and interest of youth on agriculture. Agricultural sector is ignored as an unproductive sector for job creation, low productivity and lack of career advancement. From time memorable, agriculture is taken as an occupation of uneducated people for their subsistence. Nepali youth have lack of access to finance, information, market, knowledge, and skills which make them alienated from agriculture. Due to lack of innovation and care given by educated people, current agricultural practice in Nepal is neither profitable nor environmentally sustainable (Koirala, 2018).

The Government of Nepal has an estimate that it needs to create 1.5 million jobs to meet the unemployment crisis that include 225,000 migrant workers who are likely to return from abroad and engage in agriculture due to Covid-19. However, government preparedness in terms of budget is limited to about 351 million US Dollars for fiscal year 2020/2021 which has not been encouraging (Kaini, 2020). Despite this, many youths still perceive agriculture as an ‘dead-end’ career too. Youth entrepreneurs are entering into commercial farming using advanced agricultural technology. So, examples of using labor-saving technology in crop and livestock production have been noticed (Kaini, 2018). For instance, commercial vegetable farming by a young couple in Kailali district, Nepal geared up with modern agricultural skill and knowledge. Likewise, examples of NGO, INGOs and government organizations are investing resources to attract youth into agriculture are slowly giving exciting results (Feed to Future, 2019).

#### *f. Technological change*

The population growth and market opportunity necessitate farmers to change farm-technology that alters the ways of farming (Boserup, 1965; Ruttan, 1984; Grigg, 1992). Technology is an elastic production factor having unlimited capacity in agricultural intensification (Ali, 2004). Although technology supports increased food production, it stimulates land degradation in many ways. It exerts negative impacts on land such as it loses soil particles and hampers soil organism. As a result, the application of technology in sloppy land reduces soil quality and productivity (Koeman, 1985; Winteringham, 1985; Commoner, 1988).

Technology accelerates the rate of groundwater extraction. For example, mechanized irrigation pumps extract high quantities of underground water resulting in its depletion. The water lift pump pulls up the underground water with dissolved salt that increases soil acidity, soil salinity and plays roles to decrease useful chemicals. Use of HYV rice cultivators leads to loss of aquatic species and decline rice fodder yield. Similarly, using tiller breaks the soil particles that leads to soil erosion (Ali, 2004).

#### **4. ACTS AND LAND USE POLICIES OF NEPAL**

The constitution of Nepal (2015), Land Use Act of 2019 and Land Use Policy of 2015 and lay out the key legal framework that the Government of Nepal wants to manage its land resources. The Constitution of Nepal (2015) has provisioned the policies related to agriculture and land reforms. The constitution opens the door for scientific land reform and ends dual ownership. The inactive land ownership is discouraged by provision of carrying out land pooling. The constitution aims to develop land use policies to manage, commercialize, and industrialize the land. Similarly, the constitution also focuses on the farmers' access to the land, market, and agricultural input.

Land Use Act 2019 provisions of preparing industrial corridors, special zones to pay attention to the economy, projects at different levels, protection of natural and physical heritage having national importance. It necessitates to focus on places with religious and cultural importance and the areas that are sensitive due to security, disaster, and environmental issues (GON, 2019).

#### **4.1 Problems identified by the Land Use Policy, 2015**

The Land Use Policy, 2015 of Nepal pointed out emerging problems that need to be addressed for conserving the land resources of the country. The most severe land problem to the coming generation is obviously the food insecurity which is linked directly to loss of land productivity and transformation of arable land into non-agricultural land. The policy aims to control land fragmentation that reduces the agricultural land. Nepal earthquake 2015 made realization that Nepal lacks designated land due to congested urbanization for disaster rescue operation. Similarly, exponential growth in urban population is another severe problem as it causes rapid encroachment of arable land. Ecological degradation due to environmental pollution, climate change, water related disaster (soil erosion, flood, sliding) is another problematic area that needs to be addressed by the land use policy. Also, the natural or anthropogenic exploitation of land in mountains and hills pose a threat in the riparian land.

#### **4.2 Provisions made by Land Use Policy, 2015**

Land Use Policy 2015 aims to mitigate problems associated with land use in Nepal by addressing its weakness in its implementation particularly in the context of the new political structure of federal Nepal. The Land Use Policy 2015 has offered fifteen major focus areas for the sustainable use, protection, and conservation of the country's land resources for

infrastructure development, human settlement, and food production. The fifteen focus areas can be grouped in three major fields of action (Table 4):

[Insert Table 4 here]

**TABLE 4**

Summary of the Land Use Policy 2015 of Nepal-Authors adaptation

The policy emphasizes on using Land use classification as the blueprint for zoning land for various beneficial uses and developing tools to implement the policy transparently, which ultimately help meet the goals of Nepal's Land Use Policy.

## **5. CONCLUSION AND WAY FOREWARD**

This review of understanding the broader context and causes of land degradation in Nepal shows that Nepal has already facing severe problems of land degradation. This situation if unabated would continue to grow and several anthropogenic activities are accelerating the rate of such degradation in the country.

The country needs to seriously invest its resources to stop land degradation and minimize its negative impacts. There are several successful land conservation efforts which has shown promise to help in this regard. A Sustainable Agriculture Management efforts in *Chure* region of Nepal along the southern boarder helped manage land for generations and keep ecosystem services functional (Dhakal & Acharya, 2016; WWF, 2017), A ‘Sustainable Soil Management Program’ (SSMP) which helped increase soil productivity and breaking the

vicious cycle of poverty in the neediest section of the demography in some rural areas (ICIMOD, 2020; Helvetas, 2020), and efforts by Local Initiatives for Biodiversity, Research and Development (ICIMOD 2020) are noteworthy. Lessons from such efforts can help federal and local governments to devise practical solutions to stop land degradation in the country.

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