EXAMINATION ON THE ENVIRONMENTAL PROBLEMS INCLUDING SOIL EROSION IN NEPAL

RISSHO UNIVERSITY DESHAR BASHU DEV

1. Introduction

The key environmental problems of Nepal are related to forests, soil, solid waste, water and air. In Nepal, largely rural population is depending on land, forest and water resources for their livelihood. In this paper, I have tried to focus on soil erosion problem in Nepal, which is crucial problem in Nepal where more than 80% of the land area is mountainous and still tectonically active. Although deforestation, overgrazing and intensive agriculture, due to population pressure, have caused accelerated erosion. It is important to understand the erosion process under normal conditions and to assess the magnitude of the problem so that effective measures can be implemented.

2. Natural Environment of Nepal

Nepal lies in southern part of Asia, with high Himalayas surrounding the top northern part connected with the border of China, all the remaining three parts are connected with India. Relatively it is a small landlocked country with the total area being 147,181 square kilometer. Almost 80 percent of the total area is covered by high hills and mountains as there are 8 mountains which are above 8000 meter from the sea level. The estimated population of Nepal is 30 million (approx.) at the end of year 2010 A.D. The increment in population is rapid and if we look at the data then in last 20 years the population has almost doubled with the average growth rate of over 2 percent per year. About 5 Million of Nepali people reside in India and over 4 million lives in different parts of the world, which makes around 21 million Nepali residing in Nepal in a density of 184 per square kilometer[1].

2-1.Altitudinal Regions of Nepal

There is a wide altitudinal variation ranging from 60.22m in the South (Kanchankalan in Jhapa district) to 8848m (Mt. Everest) in the North. Such great variation of altitude within such small are make its physiographic feature unique in the world that represents all land form features of the earth except volcanic, marine and costal islands.

Physiologically, Nepal is divided into following regions:

i. Terai with altitude up to 300 meter.
ii. Siwalik with altitudinal range 300 to 700 meter.
iii. Middle Mountain with altitudinal range 700 to 2000 meter.
iv. High Mountain with altitudinal range 2000 to 2500 meter.

[1] Central Bureau of Statistics estimated when census started in Nepal on 22 July, 2011.

v. High Himalayas with altitudinal range above 2500 meter.

Based on its physical environment, Nepal is divided into:

i. ***Lowlands:*** it includes all low lands up to 1000 meter.

ii. ***Midland:*** it includes regions from 1000 to 3000 meter.

iii. ***Highland:*** it includes regions from above 3000 meter.

On the basis of land features and slopes, Nepal is divided into:

i. Plains ii. Plateaus or Tars iii. Hills iv. Ridges

v. Valleys vi. Mountains

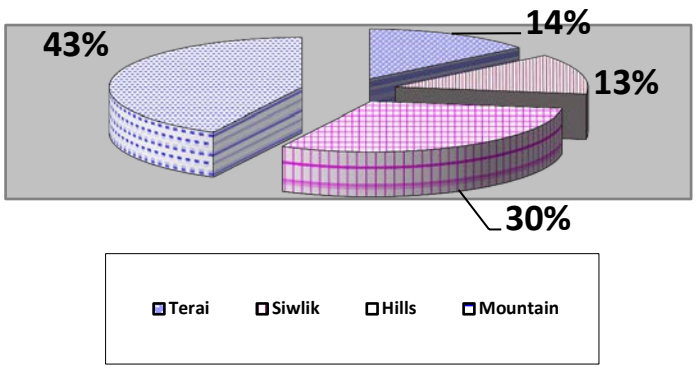
Nepal occupies only 0.1% of the earth is vast repositories of priceless biodiversity that includes; 863 bird species, 640 butterflies, 6500 flowering plants, 175 mammals, 600 indigenous plants. The country posses over 2 percent of the world's flowering plants, about 8 percent of the world's bird species and about 4 percent of the world's mammal species. In terms of species richness, Nepal is the 11th position in Asia and 25th position in the world (GoN, 2000).

2.2. Distribution of Land in Nepal

In Nepal 97 percent of surface area is covered by land. Most of the land is constituted by rock, slope land; desert area etc. 68 percent area of Nepal is covered by mountain, 15 percent by hill and 17 percent by Terai region. 20.7 percent land area of Nepal is only viable for cultivation. Out of this 52.6 percent arable land lies in Terai region, 39.1 percent in hill and 8.3 percent in mountain.

Figure 1: Land used in Nepal

Figure 2: Distribution of Land on the basis of four Ecological Regions in Nepal



Source: Environment Assessment of Nepal, 2006

2.3 Soils of Nepal

Since soil is a product of interaction among the vegetation, climate and the parent rock, different type of soils characterize different eco-climatic zones of Nepal as follows:

i. Terai Soils ii. Bhabar Soils I ii. Soils of Churiya Hills

iv. Soils of the Valleys v. Soils of Mountain Regions

3. Major Environmental Problems in Nepal

The key environmental problems of Nepal are related to forests, soil, solid waste, water and air. Largely rural population of Nepal is almost totally depending on land, forest, and water resources for their livelihood. Some environmental problems of Nepal are mentioned below:

3.1 Forest Depletion 3.2 Soil Degradation 3.3 Water Pollution

3.4 Air Pollution 3.5 Solid Waste Management

3.6 Natural Disasters in Nepal

4. Soil Erosion as Serious Problem in Nepal

Problem of soil erosion in Nepal is serious in the hills. The reckless destruction of forest trees, shrubs and all kinds of vegetation leads to the loss of large tracts of fertile land every year during monsoon. Annually 1.7 mm of fertile topsoil gets lost in Nepal. Every year about 240 million tons of soil moves through rivers from Nepal to the Bay of Bengal. It leads to desertification and decline in land productivity. The estimate of average sediment contribution from the watersheds of some major rivers originating from the high Himalayan region is Tamur 38.0, Sunkosi 21.0, Saptakosi 15.0 and Arun 7.6 tons sediments per hectare per year. The Kosi River carries a load of 9.9 million cubic meter of silt every year (Lekhak, 2010).

The erosion rate in Nepal on grazing land and croplands is 2000-5000 tonnes/ km^2/ year. The soil erosion rates in hills and mountains are 2000-5000 tonnes/ km^2/ year in agriculture fields, and 200 tonnes/ ha/ year in some highly degraded watersheds. Crop yields in these areas declined by 8-21% during 1970-1995.

4.1 Types of Soil Erosion:

Wind and water have been taken the most active agent of soil erosion. Both do the same job of removing and transporting the top soil. Thus, on the basis of these active agents, types of soil erosion can be classified as:

i. Water Erosion ii. Wind Erosion iii. Desertification

4.2 Factors and Causes of Soil Erosion:

Soil erosion is recognized as a serious environmental problem in Nepal. The country is mountainous for the most part (>80 percent) and the terrain is rugged and characterized by unstable and steep slopes, making it vulnerable to exogenous factors. Of these, the torrential monsoon rainfall that occurs within a short span of time is an important cause of soil erosion from mountain slopes. On the other hand, different forms of mass wasting, such as landslides, slumps, rock and river cutting are responsible for sedimentation in the valleys, plains and river basins, which also causes degradation of soil fertility. Development works, particularly the construction of roads and irrigation canals, has also contribution

to landslides and soil erosion increasing livestock population and over-grazing is a cause of massive soil erosion at greater rates.

4.3 Impacts of Soil Erosion on Local Environment and Human Health:

Soil erosion is one of the serious problems, especially in agro-based economy. Agriculture development and food production depend on fertility power of soil. High degree of soil erosion loosed the fertile topsoil. As a result, agriculture production and productivity will also decrease. Social, economic and environmental sectors are highly affected by soil removal or erosion. Whatever, soil erosion is a natural process. The impacts of soil erosion are many and all are closely related to environmental degradation. One of the direct impacts of soil erosion is the loss of fine topsoil. There is also depletion of organic matter and plant nutrients along with the topsoil, which ultimately affects soil fertility. It is estimated that a loss of soil at the rate of 5 tons/ha. is equivalent to the loss of 75 kg/ha. of organic matter, 3.8 kg/ha. of nitrogen, 10 kg/ha. of potassium and 5 kg/ha. of phosphorus. The specific impacts of soil erosion in Nepal are as follows:

5. Nepal’s Environmental and Natural Resources Policies

The Conservation Strategy endorsed by the Government of Nepal in 1988 includes a number of programs to internalize the environmental impact assessment (EIA) system in Nepal. The strategy underscores the need to ascertain the potential consequences of development activities on the environment and to minimize detrimental effects.

The Nepalese government formed a Land Reform Commission in 1953 and its First Five Year Plan was launched in 1956. Since then, Nepal has successfully completed 10 five-year plans and currently is into the Three-year Interim Plan. These plans have emphasized the overall development of the nation through developments in agriculture, forestry, water resources, population control, trade, transportation, industries, and other issues. The development of long term plans such as a Master Plan for the Forest Sector (MPFS) (1989-2010), the Agriculture Perspective Plan (1997-2017), the Nepal Water Plan (2002-2027), the Renewable Energy Perspective Plan of Nepal (2000-2020), the Perspective Energy Plan (1991-2017), and the Tiger Conservation Action Plan (2008-2012), clearly indicate Nepal's emphasis on environmental and natural resources for the nation's economic development. Various environmental and natural resources policies, guidelines, acts, and regulations after Nepal had begun planned development were compiled.

Natural resources policies which were begun through the centralization of management and decision making through the introduction of the Private Forests Nationalization Act of 1957 turned into decentralized management, especially in the forest sector, after the development of the National Forestry Plan of 1976 and the introduction of the Panchayat Forest Rules of 1978 and the Community Forestry Programs in 1980. In the past two decades, Nepal's policy decision making has been quite ad hoc in nature, hasty as well as haphazard. Often polices were made with limited discussion and

without understanding what the policy entailed. Despite active roles played by several international agencies the private sector and NGOs in recent years in policy formulations and implementations. Nepal's success in policy implementation is very unsatisfactory. This policy failure is primarily due to the lack of a comprehensive and systematic policy framework, especially in environmental and natural resources, and the lack of adequate engagement of the public in the policy process. A systematic policy approach enhances the involvement of ordinary citizens, the media, and other stakeholders in the policy process, establishes a momentum of national awareness, and develops commitment to resource conservation and development (NPC, 2003).

6. Land Degradation Control Measures in Nepal

Land degradation is one of the important factors to hinder agricultural production in Nepal. Government level measures to conserve and its proper planning and development have been the following:

*Establishment of the Department of Soil Conservation and Watershed Management in 1974[2].

*Another milestone attempt was the formulation of the Land and Watershed Conservation Act (1982) .

*Adoption of community forestry[3] has been considered one of the successful policy initiatives in controlling land degradation.

The UN Convention to Combat Desertification was signed by Nepal on Oct 12 1995 and since then it is obliged to combat desertification and to prepare national action plan including programs for poverty reduction, which is closely related with land degradation (Pradhan, 2008).

7. Land Related Policies of the Government of Nepal

Land is a principle resource of Nepal and constitutes about 97 percent of its total area. But the country's topography is rugged with over three quarters of the total area made up mountains and intermountain valleys. Land resource has economic, social, political, cultural and environmental meaning. Land and life are inseparable components to one another.

The Three Year Interim Plan (2007-2010 A.D.)

The following policies had been adopted in three year interim plan of Nepal relating to land resource of the country. It is notable that the next plan of Nepal has not been introduced till the date:

8. Controlling Measures of Soil Erosion

Unless loss of soil is checked, it would amount to a great loss for mankind. Thus man has made use of his ecological training in the preservation of this one of the most important resources. The chief

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[2] *Department of Soil Conservation and Watershed Management in Nepal is taken as milestone for soil conservation.*

[3] *Community forestry is taken as one of the successful programs in Nepal and exemplary in South Asia too.*

agents of soil erosion are water and wind. The actual art of soil conservation is based on certain basic principles.

Keeping in view, ideal measures and principles, ecologists and agriculturists have devised several methods of soil conservation which are given below:

8.1 Biological Methods 8.2 Mechanical Methods 8.3 Other Methods

9. Conclusion

In this paper, I have tried to focus on the soil erosion problem with different environmental issues in Nepal. Even though, being an underdeveloped country Nepal recently seems quite aware in environmental problems. There are so many good movements made by the government and private sector for keeping the country neat, clean and green. Although, practical implementation is lacking in different places including environmental issues and problems, the sincerity towards environment has been observed positive in overall sense and possible solutions are also discussed sincerely after establishment of Department of Soil Conservation and Watershed Management in 1974. In terms of energy generation and consumption, Nepal is environment friendly and has several plans to cut-off the emissions caused by the fossil fuel, and the alternative of fossil fuel, bio-fuels and bio-gas plants are focused to establish. But Nepal still have to design educational syllabus related to resources consumption, proper planning, strategy formulation, energy generation, environmental problem assessment and proper implementation of these measures.

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