

## **Effect of Desertification on Livelihood of People in the Upper Mustang Region of Nepal**

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### **Introduction**

Nepal is predominantly a mountainous country. There are wide altitudinal variation within a short horizontal distance, as a result of which the country has extreme variations in physiography and climate. The Upper Mustang Region of Nepal is located in the trans-Himalayan area and is categorised as cold desert. The Upper Mustang contains a wild landscape of eroded cliffs and hidden caves. Geographically and culturally it looks more a part of Tibet than Nepal. The area is characterised by inaccessibility. Mules, mountain goats, and porters are the only means of transport to the region. Jomsom is the district headquarters and is located in the south of the region.

Most of the land in the area has little vegetation and can easily be eroded. Vegetation growth is very slow. The people of Upper Mustang mostly belong to *Bhotia-Gurung* and *Bista* ethnic groups and speak a Tibetan dialect. Agriculture is the main source of livelihoods. The major components covered by the agriculture practice include cereal crops, animal husbandry, and cultivation of fruit and farm trees. The system is predominantly traditional and subsistence. It takes complete one year to harvest a single crop. Fuel wood is the only source of energy.

The purpose of the study is to review the effect and impact of desertification on livelihood of the people in the upper Mustang Region of Nepal and share the challenges faced by the mountain people with the groups of intellectual community.

### **Materials and methods**

The study has used rapid appraisal methodology. For this study, both quantitative and qualitative data were collected using various tools and techniques such as non-structural small-group interviews, and observation.

### **Site selection**

In Nepal, availability of both quantitative and qualitative information is scarce. For this reason, the researchers first carried out a reconnaissance study of a few watersheds in the in the area for the study. Based on the reconnaissance study, the Ghyakhar Khola watershed was found to be the most representative watershed in the area.

### **Management of the study**

The study team consisted an irrigation engineer and an environmental specialist. The field study was assisted by a locally hired research assistant who had some knowledge about he local environment and community. Originally the field study was commenced during 1998 and this information was updated by the visit of a researcher in October 2005.

### **Data collection**

Both quantitative and qualitative data and information were collected using various tools and techniques. Agro-metrological data like temperature and rainfall were collected from nearby

meteorological stations. Socioeconomic and cultural information were recorded from Chusang Village Development Committee (VDC) office. Together information on agriculture crops, cropping patterns, productivity, livestock types and other farm grown trees were conducted with key local informants.

### **Problems and limitations**

The major problems and limitations of the study encountered were unavailability of long-term time series data, and difficulty and remote terrain for the detail field visit.

### **Results discussion and conclusion**

#### **Climate**

The climate of the area is semi-arid; so the area resembles a desert. Robinson (1977)<sup>1</sup> classified the climate of the area as the Tibetan type. The characteristics of rain shadow, 0.02 rate of annual rainfall to potential evapotranspiration, and high elevation (more than 2012 meter) indicate semi-arid type of climate in the Region (Yogarcharya, 1997). Usually, the wind velocity often exceeds 25 knots during daytime in the spring season. The velocity differs with elevation. Summers are cool and winters are excessively cold. Great temperature differences occur between sun and shade, and night and day. Usually freezing starts from the second half of November and then snowfall starts. At altitude lower than about 3,500 masl, snow does not remain more than a month. Snow in the areas above 5,500 m starts melting in April (Takaya 1977). The mean monthly rainfall varies from five millimetres (mm) in December to 92 mm in August. The average annual rainfall is about 300 mm, about 71% of which occurs in summer (June-September). Precipitation in winter is mostly in the form of snow. The average mean monthly temperature varies between 4.34 and 17.47 Celsius. The Region is facing problem of land degradation due to both climatic (e.g. low rainfall, high wind velocity, freezing of the ground for long periods, substantial flows of snow melt) and human activities (e.g. deforestation, overgrazing, poor vegetation). These factors may have played a prominent role in increasing desertification in the area. The area exhibits water deficit through the year, indicating the importance of water for agriculture and household uses.

#### **Topography**

The topography of the region is extremely variable. The geo-morphology of the area is developed by moraine deposition. The moraine terraces are characterised by pebbles, gravel, cobbles and boulders of quartzite, schist and limestone. The soil erosion is one of the main problems of the region. The main factors responsible for the high rate of erosion include high wind velocity, composition of fragile geological materials with wide range in terms of gradient and relief, sparse vegetation, freezing of the ground for long periods, and substantial flows of snowmelt. Soil erosion has adversely effected conservation and substantial development of natural resources. Basnyat (1989) notes that the community of *Caragana spp*, infact, is the only natural source that arrests progressive desertification in the region. Loss of *Caragana spp*, which is the only dominant plant type in the region leads to exposure of the soil surface and further increases wind erosion. This process reduces soil organic matter and plant nutrients, leads to deterioration in soil structure, reduces the moisture-holding capacity, and eventually leads to loss in land productivity, which is an indicator of the degree of desertification (Wagely 1997). Interviews with the villagers suggested that natural vegetation and wildlife density decreased in the watershed due to encroachment by Tibetan refugees,

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<sup>1</sup> Cited by Nelson et al. (1980)

Khampas<sup>2</sup>. Khampas, from Kham in Tibet, are the followers of the Dalai Lama and were exiled from Tibet during the Cultural Revolution in the early 1960s.

### **Farming system**

Distribution of the present cultivated land among the household is not equitable. The average landholding of cultivated land per household is 1.2 ha. Land is not a scarce resource. But it has been used in limited scale mainly being poor soil fertility and crop productivity. The principal crops grown are buckwheat (*Fagopyrum esculentus*) in the summer and naked barley (*Hordeum sp*) in the winter. Other crops include wheat (*Triticum aestivum*), maize (*Zea mays*), mustard (*Brassica sp.*), and vegetables.

Livestock are the dominant component of the farming system. They provide draught power and manure for cultivation, milk for domestic consumption, and meat for cash income. Livestock are left free to graze. During summer, they are kept at higher altitude on *lekh*<sup>3</sup> known as *kharka*<sup>4</sup>. Fruits orchards and farm grown trees are very popular in the area and occupy considerable areas of land.

Livestock are the main source of livelihoods of the people in the Upper Mustang Region. Local community keep heard of yak and goat at their *kharka*. This system requires well maintained pasture. But due to intensifying rate of desertification quality of pastureland is declined. As a result, livestock rearing system is not found profitable.

### **Off-farm activities**

The people in the region carry out various off-farm activities to earn a living. Of the various off-farm activities, trading in wool products in India, trading in medicinal herbs and musk of the Himalayan deer, transporting goods from one place to another mules are the main ones. Apart from these, some people also work in the hotels in Pokhara. Most families carry out off-farm activities during winter when freezing occurs at home. Although tourism is one of the important sources of income in the Mustang district, people in the region do not benefit from it much. The reason is that, until recently, this area was prohibited for foreign tourism.

Unlike other parts of the country, population is sparsely distributed. Although the population density with respect to the total land area of the district is quite low (about 4/km<sup>2</sup>), the population density on arable land is quite high (251/ km<sup>2</sup>). Based on the 1991 census, the population growth in the district is only one percent compared to the national average of 2.5%. The reasons for controlled population growth in the area are harsh living conditions and the practice of fraternal polyandry. Note that, in Upper Mustang fraternal polyandry used to be a common practice not too long ago. However, during our field visit, interviews with the villagers suggested that this system was breaking down.

### **Natural resources**

The important natural resources in the region are snowmelt (water), cultivated land, pasture and forest. Local communities manage these resources applying indigenous techniques.

**Water resource:** The main source of water for human use is melting snow. Other sources include winter precipitation and summer showers on a small scale, which, however, do not fulfil the villagers' needs.

**Land resource:** Land is not scarce, however, the use is in limited scale due to increased desertification. Even the small scale land has been used applying various indigenous management techniques. Among them, the important techniques applied include construction

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<sup>2</sup> Tibetan refugee, followers of the Dalai Lama from the province of *Kham* in Tibet

<sup>3</sup> High altitude area

<sup>4</sup> Alpine pasture

of levelled terraces, plantation of farm-grown trees, use of organic manure for fertilization, and provision of irrigation.

**Pasture resource:** Each village has its own pasture area on the *kharka*. Though the area under pasture is plentiful, grass for grazing is scarce. Basnyat (1989) indicates that the area under grazing land are grossly overstocked. Lack of moisture is the main reason for this. Note that livestock are one of the main sources of employment for the people living in this area. The grazing land is therefore an important natural resource. However, the increased magnitude of desertification has been limiting the use of pasture.

**Forest resource:** Forest areas are the most scarce and over-exploited resources in the area. It was observed that most forest species were uprooted for fuelwood. Basnyat (1989) notes that human impact upon this semi-arid ecosystem has been disastrous because of destruction of Juniper forest, defoliation of a vast area of forage plants, and uprooting of the remaining cushion and fallen plants for fuelwood. The harsh climatic conditions, which are extremely cold during winter and very dry in the spring, hinder sustainable development in the area. Some times heavy snowfall paralyzes most activities, compelling the inhabitants to migrate to the lower hills during winter. Many researchers (AHF 1998; Gurung 1980) suspect that the region is suffering from increasing desertification due to cold and dry climatic conditions.

### Conclusion

For the last one and a half decades, efforts are being made to arrest soil erosion in the region. Tree plantation especially has received priority for arresting erosion, because trees work as a windbreak, reduce the loss of topsoil, and help maintain overall soil fertility. Benefit of these plant species for soil and water conservation is immense.

The study shows that desertification restricts development of livestock which is the principal source of livelihoods of the local people. Further, this study shows that past and present government policies and programmes have given very little consideration to mountain specificities. Lack of mountain-specific policies and programmes has been a constraint to the development of this area. The important outcome of the present study, are given below.

Livestock are among the main sources of livelihood for the people living in this area. Therefore pastureland is one of the most important resources. Although there are plenty of areas under pasture, grass is scarce as a result of moisture stress, and this has restricted the development of livestock. The promotion of snow-harvesting techniques for pasture development is therefore essential. Similarly, the yield of agricultural crops has reached at marginal level. The opportunity of off-farm activities is getting limited. Consequently, the rate of out migration from the region is in increased trend.

Provision of alternative source of energy and adoption of appropriate agricultural practices are essential to protect the area from the process of desertification.

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