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Status of Natural Vegetation and Ecosystem Structure between Seti -Mardi Confluence to Siding, Kaski, Nepal

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Abstract

The structure and ecosystem of vegetation play an important role in the environment because vegetation is the main part of environment. The biodiversity as well as ecosystems of the forest are the main measures of the structure of vegetation. The suitable procedures are taken here to assess the vegetation structure between Set – Mardi confluence to Siding, Kaski, Nepal. in the southern part of the mount Annapurna lies Mardi Himal as the neighbouring snow covered mountain of the Mardi river basin. Human modifications on vegetation structure is negligible in the densely forested areas though in some villages near the river banks deforestation is also found. Attempt has been made here to indicate the horizontal and vertical vegetation structure of this area. on the basis of the fiend observation and plant identification, the structure and ecosystems are identified. Such identification zones are demarcated with the help of altitudinal variation. In the uninhabited areas, the structure of vegetation is dense as compared to the habited river banks and a few villages. Various habitat types of vegetation are taken for used for the assessment of the structure and ecosystem. Vegetation plays a significant role to deliver good and services for the sustenance of ecosystems as well as for the sustainable habitat together the human beings. Vegetation measurement is basically done here on the basis of the transect method according to the altitudinal variation. Altitudinal vegetation zones are assessed here for the vegetation structure and ecosystem.

Key words: plant species, vegetation zones, ecosystem, altitude, functions, approaches

Introduction

The ecosystem is a life sustaining system of environment. All the biotic elements like living organisms, animals, plants, etc. are included in it. ‘Ecosystem is a complex in which habitat, plants and animals are considered as one interesting unit, the materials and energy of one passing in and out of the others’ (Woodbury 1954). According to Drury (1998), the ecological imperative argued that succession led to maximum productivity, diversity, efficiency, cycling and stability. Disturbance of the climax was followed by recovery. Tansley (1923) emphasized that ‘vegetation is constantly undergoing changes’. Plants can be called the engineers of ecosystem because they give spaces to live for the living beings. Horizontally, the similar types of vegetation are flourished whereas different types of vegetation flourish vertically. For the zonation of vegetation, vertical distribution is important. Transects along the gradients are taken in order to find out the functional role of vegetation structure and its zonation. The same transect from the Seti – Mardi confluence to Siding has been taken to find out different vegetation zones and the ecosystem of this area plotless distance and point to plant distance have been used to decide the plant variation according to the height and aspects. Point-centered transect and wandering transect were used to collect vegetation in about two km distance. But the samples of vegetation were taken as its variety changed. Wandering transect was used in such a situation. Plant density, its varieties as trees, shrub, herbs, etc. were found out.

There is variation of the plant growth on earth. Plants make their own communities in any area due to the different environmental conditions. The nature of vegetation is also not the same everywhere. In Nepal the altitudinal variation has affected the distribution of plant species effectively. Kihara (1955) gave the zone of *Shorea robusta* plants under the zone of *Castanopsis* forest between 500 – 2100m and the zone of mixed evergreen forest from 500 – 2200m. He observed other zones as evergreen oak forest, alpine forest, etc. In 1962, swan divided vegetation of Nepal into seven zones as lower monsoon forest, middle monsoon forest, upper monsoon forest, deciduous forest, rhododendron forest, wet alpine forest and dry alpine forest but Bhatt (1977) divided the vegetation of Nepal into four zones as tropical, subtropical, temperate, sub-alpine and alpine vegetation zone.

On the other hand, the forest of Nepal has been divided by Stainton (1972) mentioned 15 forest zones in the central midland Nepal. The more than latitudes, altitude has been taken for the zonation of vegetation in the mountainous region of the country. The ministry of forest department of medicinal plants in 1973 in flora of Nagarjun there has been found four zone of vegetation as *Schima wallichii* forest, dry oak forest, mixed broad leaved forest and alpine forest. Pears (1977) has written about vegetation and ecology in this way: 'The study of vegetation provide a logical starting point for an understanding of the complexities in ecological relationship'. Therefore, 'the structure of vegetation can be defined as the vertical arrangement of plants, stratification and horizontal distribution of plant layer'. The structure of plant communities proposed by Dansereau (1951) is more important than others. He found out 3000 plant species. Among them, 1000 species were of large woody vines.

The structure of plant depends on the amount of moisture, wind velocity, organic materials, nutrients, etc. Cantlen (1953) indicated vegetation differences on the north and south slopes of Cushetunk mountain in New Jersey. He found that the south slope had higher air and soil temperature and a larger vapour pressure deficit and the northern being a measure of water availability and evaporation.

Zones of vegetation

The application of the transect method in the observation of vegetation types and zones between the Seti-Mardi confluence to Siding, the altitudinal variation in a short distance was found between about 914m. to 3200m. vegetation types and zones were also markedly found between these altitudes. From the observation of more than 300 plant species, sub-tropical, temperate and even sub-alpine type of vegetation was observed. On such basis the following five vegetation zone were identified in the study area. For example,

i) *Schima wallichii – Castanopsis indica* zone
ii) *Pterocarpus satalinus Schima wallichii* zone
iii) *Quercus lamellosa* zone
iv) *Rhododendron arboreum* zone and
v) *Rhododendron barbatum – Carex* species zone.

***i) Schima wallichii – Castanopsis indica* zone**

The vegetation zone of Schima wallichii – Castanopsis indica begins from an altitude of 914m near the Seti – Mardi confluence and extends nearly up to Khuibang up to the altitude of 1260m. *Schima wallichii* and *Castanopsis indica* which are locally known as *Chilaune* and *Katus* are the dominant plant species of this vegetation zone. Moreover, there are many plant species available there. For example, *Adiantum edgeworthii, Berberis asiatica, Eurya acuminate, Rubus ellipticus, R. paniculatus, Osbeckia chinensis, salmalia malabarica, Artemisia vulgaris, Lyonia ovalifolia, Maesia chisia, Castanopsis tribuloides,* etc. The lower portion of this zone has the abundant forest of *Schima wallichii* with the mixture of *Castanopsis*. As the altitude increases, the density of these plants also decreases. The sout*hern slope of the mountain has*

the dense forest of Schima wallichii as well as Castanopsis indica, because these two types of plants are found side by side. The distribution of *Alnus nepalensis* is also there.
The other plant species of bushy types found in this zone are mainly *Berberis asiatica, Bauhina purpurea, Desmodim latifolia, Rubus rugosus, R. ellipticus, Osbeckia stellate, O. chinensis, Woodfordia fruticosa, Artemisia vulgaris. Lyonia ovalifolia, Maesia chisia, adhatoda vasica*, etc. many ferns are also present in this zone, for example, *Gleichenia gigantean, Pteris geminate, P. tripartila, Drynaria propinqua, etc.* This vegetation zone is within the watershed area of the Mardi and its tributaries like Idi Khola, Pater Khola, Pau Khola, etc. The neighbouring areas are deforested in this zone.

ii) Pterocarpus satalinus Schima wallichii zone

The appearance of *Pterocarpus santalinus* plant species gives notice of the beginning of the second zone of vegetation. The average altitude of 1260m from Khuibang to the altitude of 1590m at Siding, there is the distribution of *Pterocarpus santalinus* and *Schima walichii* vegetation zone. As the altitude increases, the density of *Pterocarpus* species also increases with the decreasing number of *Schima wallichii*. Comparatively, deforestation is less in this zone than in the first zone. The villagers have also controlled the forest from being deforested. The Mardi and its tributaries are responsible for the erosion of the mountainous region of this zone. The other important plant species found in this zone are Alnus *nepalensis, Castanipsis indica, C. tribuloides, Ficus clavata, Litsea oblonga, Berberis asiatica, Eurya acuminate, Rubus ellipticus, R. paniculatos, Osbeckia chinensis, Artemisia vulgaris, Lyonia ovalifolia, Maesa chisia,* etc.
The distribution of shrubs is also important in this area. The major shrub species of this vegetation zone are *Berberis asiatica, Citrus media, Mimosa rubicaulis, Bauhina purpurea, Rubus ellipticus, R. raniculatus, Hydrangea aspera, Osbeckia stalata, O. chinensis, Woodfordia fruticosa, Luculia gratissima, Mussenda roburghii*, etc.

***iii) Quercus lamellosa* zone**

The vegetation zone of *Querus lamellosa* begins from the the altitude of about 1590m and extends up to about 2000m. *Quercus lamellosa* is extensively available in this zone. The Quercus species or the oak forests are the significant plants on the southern flanks of the Annapurna Himalayan zone of Nepal. in the study area, it is flourished abundantly. This is an important forest, because it is useful in increasing soil fertility and maintaining biodiversity of this region. This plant is used for timber as well the local fuel. 'Through the history the oak has been a symbol of permanence, strength and courage' (Keator and Bazel 1998). Actually Quercus species are the evergreen forests of this area. Among more than 35 species reported from the Himalayan region (Negi and Naithani 1995), eight species are found in Nepal (DRP 1997), for example, *Quercus lamellose, Q. floribunda, Q. glauca, Q. mepilifolioides, Q. lanata, Q. leuchotrichophra, Q. oxyodon and Q. semecarpifolia*. Ecologically there are important plants to maintain the ecosystem of this area because they are important to promote the recharge of mountain springs (Valdia 1998).
Some important plant species of this zone *Quercus lamellose* species are *Pterocarpus santalinus, Rhododendron arboreum, Michelia chmpaca, M. kisopa, Maesa chisia, Litsea oblonga, Albizzia mollis, Daphne bholua, boehemeria macrophylla, Ficus nemoralis, Alnus nepalensis, Arundinaria maling, A. subereta*, etc.

***iv) Rhododendron arboreum* zone**

Along the transect of the study area, the dominance of Rhododendron arboreum forest together with other species were studied between the altitude from Rosi Khola (2000m) to Bhurung

(3000m). Around 50 per cent plants are of this type in this zone. Rhododendron is the largest genus in Ericaceae family with over 1000 species including many bushy species and a number of trees that grow to heights of up to 30 meters (Scott 2010). According to Suzuki and Noshiro (2001), Nepalese rhododendron species have diffuse-porous wood with distinct growth rings and evenly distributed small vessels and hetero-cellular rays. The maximum age of rhododendron species is about 120 years (Elliptt and Vose 2012). The first known rhododendrons in Europe were those that grew in the Alps at an altitude between1200m and 2400m (Scott 2010).

The zone of Rhododendron arboreum is famous for these plant species, for example, Michelia *kisopa, Berberis chitria, Mahonia nepaulensis, Rhus, wallichii, R. succedanea, Prunus napaulesnis, Rosa brunonii, Viburnam erubescens, Rhododendron barbatum, Daphne bholua, Quercus spilata, Q. lamellose, Carex* sp., *Aonitum palmatum, A. spicatum, Michelia champaca, Osbeckia chinensis,* etc. Important shrubs of this region are *Arundinaria intermedia, A. maling, Calanthe masuea, Sarcococca coriaceae, boehmeria macrohphylla, Girandnia palmate, etc.* together with the herbs like *Hydrocotyle nepalensis* and *Arisaema speciosum.*

***v) Rhododendron barbatum – Carex* species zone.**

Rhododendron species are widely distributed in the Himalayan region between 1500m – 5500m. The flowers of this plant are edible. Sometimes the dried flowers are also used are eaten after frying with ghee to check dysentery (Bhattacharjee 1998). The flower of this species growing in Simla hills and other neighbouring areas of the western Himalayas are considered to be more efficacious (Biswas & Chopra 1982. The fresh and dried corolla which are sour to taste are also taken to remove fish-bones that get stuck in the gullet (Pradhan & Lachungpa 1990).

After *Rhododendron barbatum* plant species, another dominating plant is the *Carex* species like a long grass. In the peak winter, the *Carex* speces becomes dry and in summer it reappears. The other important plant species of this zone are *Aconitum palmatum, A. spicatum, Mesonopsis paniculata, Ligularia amplexicaulis, Rumex nepalensis, Paris polyphylla, Lilium nepalensis, Arundinella nepalensis,* etc.

Importance of Vegetation on Ecosystem

As the mountainous forest, the five vegetation zones of the study area have capacities of for the arrangement of ecosystem of this region. In the general classification of vegetation functions in the landscape, two basic groups of functions – ecological and social (or socio-economic) functions were distinguished (Elias 1983). Ecological functions were considered in systems of ecological relationships; they are important for the existence of natural ecosystems. Social functions of vegetation were considered in the system of human society relationships. They are products of the human society's needs and make use of the properties and effects of vegetation (Elias 2010). Ecological functions of vegetation (Elias 1983) determine the capacity of the ecosystem to provide and to contribute to goods and services that satisfy human/human society needs (de Groot 1995). If the ecological function is actually used, it becomes a social or socio-economic function (Elias 1983).

Deductive as well as inductive approaches can be applied for the study of ecosystems. In the deductive approach, top-down systems are applied, whereas in the inductive approach bottom-up systems are applied, i.e. the field studies are important in it. The evaluation of vegetation is based on plant species diversity analyzed quantitatively by vegetation relives (number of small plots of vegetation) and on ecological characteristics and socio-economic values of plant species (Jurko 1990). The forest resources are important for the ecological functions, because they provide ecosystem services for other living organisms.

The key component of the ecosystem is vegetation. So, its contribution is necessary for many biogeochemical cycles of water, carbon, nitrogen and so on. Vegetation is also important for the conversion of solar energy into biomass to develop the food chains. The energy balance is also dependent on vegetation. It also maintains the climate. The release of oxygen, soil development, wildlife habitat and their food chains, vegetation is very important. The socio-economic benefits related to the byproducts of vegetation are its concerns as well.

Conclusions

There are human-dominated ecosystems and wild ecosystems in the world. The ecosystem of the study area has both types of ecosystem. The lower part, basically from the Seti – Mardi confluence to Siding village, human domination is more. But in the uninhabited forest, wild ecosystem is still in dominance. Agro-ecosystem is found in the cultivated areas of the villages which are on the river banks and its periphery along the study transect. Thus, wherever people have lived, human domination is found. Their domination is in the forest as well, because they go to the forest to collect firewood, timber and grass for their use. Some mining of stone is also found. In such places, rural techno-ecosystems are found. For example, rural transportation of roadways, trails, etc. because of infrastructural development. In the study area, the diversification of land altitude has brought changes in climate, soil, moisture and plant variation in the same latitude and longitude too. On the basis of the central Himalayan phytogeographical elements, the discussion of the vegetation zones and ecosystem has been done. The five main vegetation zone like *Schima wallichii – Castanopsis indica*, *Pterocarpus satalinus Schima wallichii, Pterocarpus satalinus Schima wallichii*, *Quercus lamellose*, *Rhododendron arboreum* and *Rhododendron barbatum – Carex* species zones are demarcated with the help of central Himalayan floral distribution. The slope aspects and altitudes have allowed for the growth of different types of plants in their communities. Most of the plant species of the southern slope in lower altitude are woody and hard in character due to the high temperature and abundant rainfall. Like Veillon (1965) reported the species composition variation from one zone to another with the altitude, the Seti-Mardi confluence to Siding areas have such variation, which assisted to divide it into five vegetation zones.

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