Chapter 6

DISCUSSION

Food security has come to depend on a small handful of widely cultivated species. Over 50 per cent of the world's daily requirement of proteins and calories comes from three crops—wheat, maize and rice (Jaenicke and Höschle-Zeledon 2006); 12 species contribute 80 per cent of total dietary intake. By contrast, wild foods provide a greater dietary diversity to those who rely on them.

Ethnobotanical surveys of wild plants indicate that more than 7000 species have been used for human food at some stage in human history (Grivetti and Ogle 2000; MEA 2003). Some indigenous communities use over 200 species (Kuhnlein et al. 2009); in India, 600 plant species are known to have food value (Rathore 2009); DeFoliart (1992) records 1000 species of edible insects used worldwide. Some 1069 species of wild fungi consumed worldwide are important sources of protein and income (Boa 2004).

The aboriginals and tribals in our country have been using wild plants in their daily life for food, fibre, medicine, oil, housing, art and craft, agricultural implement etc. since time immemorial. Many of the uses of plant products made by the people have remained endemic to certain regions or tribes in the country. Their knowledge of the uses of plants is often kept secret and could not be systematically documented and utilized properly.

The Himalayan region is inhabited by a large number of ethnic communities, many of them with distinct tradition, culture and life style. Most of the local communities at higher altitudes (>2000 m) are subsistence farmers or agropastoralists with a long history of settlement and land use practices ranging from few to several centuries (Atkinson 1982). The hostile climatic conditions and steeper mountains have restricted human settlements to the flatter valley bottoms. As a result, quite a few interior pockets of Himalaya are relatively less influenced by man and support rich natural vegetation. The natural vegetation, usually above 2000 m in the western and north-western Himalaya abounds in numerous economically important species.
At lower altitudes the forests meet the food, fuelwood, fodder and timber demand of the local people while steeper and frequently burnt grassy slopes are left for the fodder grasses. Other temperate grassy slopes and alpine meadows are used as summer grazing grounds by local people as well as several migratory pastoral communities (Phillimore 1981, 1984, 1989, Tucker 1986, Rawat and Uniyal 1993). The alpine and subalpine regions are also well known for the large number of rare and valuable medicinal herbs, which are consumed locally or sold in the local markets. Demand for several medicinal plants in national and international markets has increased rapidly in the recent decades (De Coursey 1997, Tandon 1997, Sharma 1998); this has resulted in the selective removal of highly valuable species from many sectors of the Himalaya. Thus, traditional practices of livestock grazing, harvest of commercially important species and demand for fuelwood and fodder are the major anthropogenic activities throughout the north western Himalaya.

The benefits of wild resources to inaccessible rural villages in Himalaya cannot be ignored. The positive relationship between the resources i.e., crops, non timber forest products and livestock indicate their concurrent relevance to livelihoods (Dovie et al, 2002 and Agate, 2000). Traditionally the local people of Uttarakhand had occupied and maintained a rich diversity of wild edibles and agricultural food crops, however, due to changing socioeconomic conditions all the known species of wild edibles are not in use. Shrinking hill agricultural systems and scarcity of traditional food crops have made the local people to eat exotic foods. This way they are getting less diversity in their seasonal and daily meals round the year.

The study conducted by Ryes - Garcia et al (2005) and Ladio et al (2003) have reported the observations on the declining trends in consuming wild edible. These studies have also found that local people know more edibles as they consume. Since the multiple uses of these species are one of the major causes of local people’s concern and that’s why they still give high preference to these species inspite of their low production

The present study revealed that Mandal- Chopta region of the Kedarnath wild life Sanctuary inherit a rich traditional knowledge and documentation of this knowledge and status of wild edible plants in the wild has provided novel information from the area. Still
several households in the region depend on the wild plants for livelihood. The number of wild edible plants recorded in the present study area indicates its high diversity.

About 64 species of wild edible plants are commonly used by the local people in study area. Among the wild edibles *Myrica esculenta*, *Berberis asiatica* and *Rubus ellipticus* were the most preferred fruit species. All three species were also used in curing various ailments. However, they were mostly consumed as seasonal fruits and these fruits change the taste and provide additional nutritional supply in order to maintain the good health. Nutritive value of many wild edibles are much higher than cultivated/domesticated plants as they are the cheap sources of protein, carbohydrate, fats, vitamins and minerals (Anonymous, 1970-1988).

According to several informants wild green leafy vegetables increase the amount of blood in the body which is likely to refer to the high iron content of many wild greens. However, chemical analyses were beyond the scope of this study, and therefore, the information on the nutrient contents is entirely based on literature. The majority of wild edible herbs eaten typically contain high levels of important nutrients especially for diets usually high in starch (Sundriyal and Sundriyal, 2003; Ogoye, 2003). The informants who reported these uses know perfectly well that these plants can be noxious, but they only ate some very particular parts of the plant or they use them in very small quantities. Such knowledge is common in other areas too (Orech, 2007; Narayanan, 2007 and Singh, 2006).

Wild edible plants which are used as vegetables prepared as curry are eaten with bread made of ground wheat/barley/finger millet. Wild edible plants provide important leafy vegetables for many rural households (Maikhuri et al., 2004). Households with limited access to cultivated vegetables such as the present region had to store dried herbs for use during the lean periods. Households that consumed wild edible daily were by far the majority. This emphasizes the role of wild edible in the diets of people, similarly reported in other studies (Bonet, 2002 and Kala, 2007).

The majority of wild edible plants do play an opportunistic or overlapping role as medicinals (Maikhuri et al., 2000) and hence adding extra value, and thereby making them very attractive and important to the users. During the surveys, it was observed that 31 species of wild edible have medicinal values which are used in curing various diseases.
(Table 5.23). Many wild edible species are also used in traditional medicine. Still, several households in the region depend on the plants for medicinal purposes. Many wild edible species are commonly used by the people to cure simple to the more complex problems facing in the routine life.

During the surveys, it was observed that a large number of plants are used for curing female disorders compared to males. This can be attributed to the fact that unlike men, women are shyer and therefore find treatment in the community itself. The work load on them is also comparatively higher and hence they hardly find time to visit market places for treatment (Badola and Hussain, 2003). In study area it was found that many traditional stoves (chullhas) with smoldering fuelwood were used for cooking. Because of smoke produced by fuelwood and lack of proper ventilation in the houses, women generally face problems of suffocation and suffer from swollen eyes, loss of vision, bronchitis and tuberculosis.

There were no differences between the numbers of households that harvested wild edible species from microenvironments within and around the village, indicating the importance of the full range of environments. However, whilst wild plants are collected from a range of environments, the amounts collected from village commons tended to be higher than that collected from distant alpine rangelands. Therefore, households do recognize all these units of land as important sources of the species they harvest and may contribute cultural significance to any management options designed for these lands.

The information collected in the present study did not show any association between the income or social status and use of wild edible plants. Although the literacy rate was very high, most people were unemployed because of a lack of employment opportunities. The villagers therefore still relied for their sustenance on rainfed agricultural land and forests. This increases people’s dependency on agriculture and forest resources for income from which they can earn substantial money, although agricultural work does not necessarily require educated people.

Households with financial means to purchase cultivated alternatives also reported that they consumed the wild edible. This demonstrates the strong cultural underpinnings of the use of wild edible plants (Cocks, 2003) although the remoteness of the village from
markets that supply cultivated species must have a role to play (Rao, 1996). We did not notice any differences in preferences for wild edible between households in a village. Though our data collection methods do not permit us to do any analysis, our observations during data collection clearly indicated that the knowledge about the plants is more common with older people (>35 years) as compared to young adults (13–25 years). Some of the respondents even commented that the young adults are not participating in collection and processing of these wild edibles and thus the knowledge about some of the species may disappear. This was also reported by other workers (Bonet, 2002) from elsewhere. We recognize the need for collecting, preserving and documenting this knowledge as an urgent and fundamental necessity not only for maintaining the local cultural traditions but also to facilitate the research on new food sources elsewhere as well.

About two-thirds of households that consumed wild edible plants indicated that there were sufficient wild edible available for harvesting in the year of the study. However, when residents were asked to compare the current availability with the past decade, the majority was in agreement that the amount of wild edible has decreased. This is not surprising because several households cultivated some of the wild edible plants now (Maikhuri, 2000). The marginal lands and traditional agroecosystems are important sources of wild edible plants as observed in this study and can make important contributions to biodiversity conservation and food security.

The fuelwood being the major source of fuel in the study area was extracted throughout the year whereas lopping for leaf fodder mostly occurred during months of December to April in winter season when cattle were kept in the sheds. Fuelwood consumption at permanent villages did not vary across different seasons this may be ascribed due to easy availability of fuelwood and not much long summer season in the region. It is estimated that in the Mandal valley, villager’s requirement of fuelwood is 3.6-4.0 tonnes per family per year (Singh et al. 2008). This is quite similar to the fuelwood consumption in Garhwal Himalayas (3.6 tonnes/family/year) reported by Negi (1996).

In the sub-alpine and alpine region fuelwood consumption is restricted only for 6-8 months, but due to high tourist activities each dhaba owner consumed around 1.2 Q/day. Overall fuelwood consumption by 14 dhaba owners at Chopta (sub-alpine zone) is higher
than the fuelwood consumption by a village having more than 60 families (Singh et al 2010). At present, fuelwood consumption in the sub-alpine and alpine region is higher than its production and if the present rate continues, some of the preferred species such as Rhododendron campanulatum, R. arboreum, and Quercus semecarpifolia are bound to face the danger of local extinction by Singh, 2008.

In the present study area, it was observed that dependency of villagers for their basic needs in the nearby forests may be sustainable but the use of sub-alpine and alpine forests for livestock grazing and tourism are the major causes of forest degradation. Reserved Forests near villages that possessed small village forests were often badly degraded, while those located at some distance away from villages could be in better condition with lower level of disturbance. Maithani (1994) reported a village forest in Gopeshwar (Chamoli) district which has been managed for decades and is “the best protected forest in the area”. Such village forests which are closely monitored by the Village Panchayats might have a better regeneration status than the village forests that were observed during our study. Oak regeneration appears to be benefited by moderate levels of disturbance which resulted in the partial opening of the canopy. This is also supported by some other studies as well. For example, Rao and Singh (1989), Thadani and Ashton (1995) in the Central Himalayan oak species (Quercus leucotrichophora) and Quintana-Ascencio et al. (1996) in Mexican highlands (Quercus crispipilis) concluded that these species are unable to regenerate under deep shade, and require open patches relatively free from browsing and trampling by ungulates.

A relationship between fuelwood consumption and income has been recorded in these villages, which shows that poor people are more dependent on forests for fuelwood as a source of energy. A study by Nautiyal and Kaechele (2008) also showed a dramatic change in per capita fuelwood consumption in the villages where people are using LPG. In the study area it was observed that people with high income have greater purchasing capacity will reduce pressure on forests from fuelwood extraction and help people to adopt alternative sources of energy, such as LPG, kerosene, and solar energy.

There is also great economic potential of some species upon analyses of their nutritional and chemical composition based on species popularity and importance (Dhyani et al 2007). The high degree of coincidence of food and medicinal uses of most of these
plants is particularly remarkable. Many wild plants adds to soil fertility and is used by the inhabitants for their day to day requirements of fodder, fuel, timber, agricultural tools and miscellaneous items for example *Myrica esculenta* and *Rhododendron arboreum* can be used as medicinal, fodder and fuel.

Edible plants of the wild habitats contribute economic value by virtue of their use in indigenous and immigrant cultures, and by their taxonomic proximity to cultivated species. Most of the wild edible species provide a good root stock for the commercial cultivars of the fruit crops because of their wider adaptability, vigorous growth and resistance to major diseases and pests. Hence, the native fruit species can be utilised as a good breeding material for the improvement of horticultural crops (Arora and Nayar, 1984). It must be added that while each of the wild edible species exhibits desirable qualities, they would nonetheless require significant improvement through breeding and selection. To assess their existing and potential economic value, ethnobotanical observations, quantitative data on the diversity and abundance of the species need to be intensified.

Declining population of wild edible plants in the wild due to habitat loss has raised concern among various scientist, ecologists and conservationists of the Himalayan region (Kala, 1998; Uniyal et al., 2002). Their distribution is dimishing day by day due to excessive collection, grazing, fodder and fuelwood collection, forest fire, indiscriminate felling of trees, illegal collection of wild plants and rapid increases of notorious weeds viz., *Eupatorium adenophorum* and *Parthenium hysterophorus* (Gajar Ghas) in several places (Mishra and Rawat, 1998). Among the many factors involved in the depletion of a species from the wild, the most important is the small population size on the restriction of the species to a small area. The excessive grazing by heavy body animals eg: buffalos, cows and mules in the subalpine and alpine regions, causing excessive soil erosion, devoid of natural vegetation and converting into artificial grasslands, locally known as ‘Kharak’. There is a need of to watch these factors and their control.

During the course of study, it was observed that the old local inhabitant and shepherds have good knowledge about wild plants. Their knowledge should be utilised in conservation and cultivation activities, providing some financial benefits. Some important
wild edible plants like *Taxus baccata*, *Fagopyrum debotrys* and *Rosa sericea* are found rare. Hence these species needs urgent conservation efforts on its natural habitat.

6.1 Loss of Local Ecological Knowledge

Local ecological knowledge is required for the identification, collection and preparation of wild foods (Pilgrim *et al.* 2008). The distribution of local ecological knowledge between individuals in a community is usually differentiated by gender, age or social role. Several studies show women score higher on food-related knowledge (Price 1997; Somnasang *et al.* 1998; Styger *et al.* 1999). In Garhwal Himalayas, women above 35 years of age were able to describe the uses of 65 per cent of all edible species, while young men could only describe 23 per cent (Shrestha and Dhillon 2006). Men and women might also hold specialized local ecological knowledge.

Research has pointed to declines in local ecological knowledge (Pilgrim *et al.* 2008) as communities rely increasingly on store-bought foods and move away from land-based livelihoods. Somnasang *et al.* (1998) found that young people working outside the village did not have the chance to acquire this traditional knowledge. It is thus possible that as young adults leave land-based livelihoods, knowledge transmission to younger generations will be diminished. In other cases, individuals' preferences change as they grow and thus, their stock of local ecological knowledge changes, even if they remain within their community. In Ethiopia, Fentahun and Hager (2009) found that ‘grown-ups succumb to the culture of the society which regards the consumption of wild fruits (commonly consumed by children) as a source of shame’. As climate change alters habitats, so knock-on effects are expected on local ecological knowledge (Strauch *et al.* 2009).

Pressure on Forest

The Mandal forest is very dense and diverse forest. Villagers in study area use wild and agroforestry tree species to fulfill their various needs. In the Mandal area, the villagers preferred wild plant species for a variety of purposes. As these species were easily accessible, pressure on them was enormous. *Quercus leucotrichophora*, *Q. floribunda*, *Q. semecarpifolia*, *Abies pindrow*, *Alnus nepalensis*, *Pinus roxburghii*, *Rhododendrum*
Diversity, Endemism and Economic Potential of Wild Edible Plants in Chopta-Mandal Forest and Vicinity of Garhwal Himalayas in Uttarakhand

arboreum, Betula alnoides, and Lyonia ovalifolia are the fuelwood species the villagers prefer because they have high calorific values and are easily available and accessible. Present study reveal pressure on forests growing in the vicinity of the villages (within a 5-km range and between 1500 m and 2300 m) is high. Trees were indiscriminately lopped for fodder and cut down for fuelwood extraction.

The climax communities of the Western Himalaya are characterized by the dominance of one or the other species of Quercus (Awasthi et al 2003). These forests are not only intricately associated with the hydrological balance but also form the life support system for the local inhabitants (Singh and Singh 1992). The sustainability of these forests depends greatly on their productivity, resilience and human activities (Awasthi et al 2003). Scientific studies suggest that the plant community structure is greatly influenced by disturbances in the forests (Yadav and Gupta 2006). Disturbances ultimately cause canopy gaps and reduce leaf fall; hence, they negatively affect the return of nitrogen to the soil and increase dryness in the forest (Singh et al 1984) and consequently lead to poor regeneration of the forest trees.