

## People And Their Natural Resources For Off-farm Employment

### The People

The stretch of midlands and mountains lying in the Kosi Basin of eastern Nepal is generally known as the "Kirat" area, and its indigenous inhabitants as "Kiratis". References to Kiratis may be traced back to sacred Hindu writings, such as Vedas, Ramayana, and Mahabharata. The Kirat region is generally divided into two sections on either side of the Arun river, i.e., "Khumbuan", lying to the west, and the 'Limbuan', lying to the east. The Khumbuan is dominated by 'Rai' people and the Limbuan by 'Limbu' people. In addition, there are other groups of people who have Tibetan characteristics in their language and culture. They exhibit certain endemic features which have emerged from geographical isolation. The lower Arun, however, has gone through a rapid change after the unification of Nepal in the late 18th century. Brahmins, Chhetriyas, and occupational castes of the Hindu society have integrated themselves with the indigenous society. In the same way, the Newars of Kathmandu Valley settled in the principal towns as shopkeepers, businessmen, and craftsmen. The religious indifference among those people was noticed as early as 1799 by Guiseppe and was reconfirmed by Levi in 1905. After over 70 years, Gurung (1980) records his impression of Arun people in the following way, "What I witnessed on that night of May 8th at Phedi in the form of Dhami and Phedangna rituals and secular songs, was a meeting of Hinduistic Khasa and tribal Kirat cultures in the context of hill ecology....."



A Navagaon lady in a "Haat Bazar" at Seduwa



Rai Ladies sell "Chhyang" in the "Haat Bazar"  
(Courtesy of Dr. D. Kansakar)

Environmental perceptions of the people and their ecological needs are expressed not only in farming systems but also in traditional rituals and rites. Besides, the evidence from mountaineering and trekking expeditions suggests that a strong component of complementarity exists among the people of various ecological zones. Thus the Rai or Limbus, porters/guides do not go beyond the last village called Tashigaon (2,130 m) along the caravan route to Makalu base camp. They are replaced by Bhotetas for higher-altitude portage.

The distribution pattern of the various people in the Arun Basin has been largely determined by environmental conditions as well as socioeconomic compulsions. Thus the upper Arun valley is inhabited by Bhotetas, and the middle mountainous region is dominated by Rais and by Limbus. Another small group of Kirati people, of similar culture and race, are the Yakhas, who live in the southern hills of the Arun Basin. People typical of Hindu culture, such as Brahmin, Chhetriya and associated occupational castes live near the valley bottom and on low-lying terraces. A small group of traditional potters called Kumale are to be found in the Kumal gaon area near Tumlingtar.



People of northern Sankhuwasabha are seen with bear skulls. The huge animals, that come to rob the corn in the fields, are trapped to death

The Bhotcha people of the upper Arun are considered to be different from those in Khumbu, Pharak, and Solu region, and have not been studied intensively (Furer Haimendorf 1975). A group of those people, locally known as Lhomi (Tibetan generic term for lowlanders) or Kar Bhotchas, have villages 'clinging' to the hill slopes high above the Arun gorge. Their fields are generally located on gentle sunny slopes above 2,000m. Steep slopes and ravines are left for shrubs and trees. They use alpine and sub-alpine pastures for their ruminant animals, while they keep pigs and fowls in their villages. Another prominent group of Bhotchas are found in Ritak, Thundam, Nawagaon, etc. Those Bhotchas are known as Nawa or Nava. Anthropologists believe that they are more akin to the Sherpas of Khumbu, both culturally and linguistically. However, the pig culture of Kirat sets them apart from the Sherpas and the Tibetans. Those people prefer to be called Sherpas in order to get jobs in mountaineering, for which they are most fit and energetic. The Nawas keep herds of sheep and yak. Shepherd boys use their spare time to collect medicinal herbs from alpine slopes. Even a boy, 10 years of age knew how to medicate a sheep poisoned by young leaves of monkshood (*Aconitum* spp.) and how one should collect monkshood tubers for sale.



A Gurung shepherd collects giant rhubarb for its tender shoots which are eaten raw

Another group of highland dwellers in the Arun Basin are the Gurungs and Magars. They have specialized in animal husbandry of sheep. The Gurungs use the sub-alpine and alpine pastures along the upper reaches of Milke Danda.

The highlanders of Arun Basin have a significant role to play in the watershed management of the upper Arun, in order to maintain an ecological balance that would be crucial for the management of the forthcoming Arun III hydroelectric project. The census of 1981 for the three districts of the Arun Basin (population 451,884) indicate that the population pressure in the northern district Sankhuwasabha is low ( $37.2/\text{km}^2$ ) compared to the other two districts, i.e., Bhojpur ( $127.9/\text{km}^2$ ) and Dhankuta ( $145.7/\text{km}^2$ ). It should, however, be borne in mind that low-density areas have limited land for cultivation, and natural processes such as active down-cutting of the river, steep slopes, and higher intensity of rainfall, make the area quite fragile even for a low density of population.

The distribution of population by climatic zones (Table 4) suggests that the sub-tropical zone has a greater population pressure, i.e., 133.44 people per sq km. The reduction of pressure on the temperate and the alpine zone is largely due to natural limitations for agricultural development. In the same fashion, the pressure on the tropical zone (11.53 persons per sq km) is also quite low.

### **Off-Farm Activities**

People living in the Arun Basin have a number of off-farm activities to support their own day-to-day life, as well as to bring in cash income for commodities like clothes, salt, kerosene, spices, utensils, and so on. Those activities may be classified into three broad categories - (i) forest and vegetation based, (ii) labour based, and (iii) skill based. All of these activities have a close bearing on environmental management of the region.

### **Forest-based activities**

Resources from the wild, such as medicinal herbs, wild edible fruits, tubers, rhizomes and vegetables, fibre plants, bamboos, and fruit beads (Rudrakshya), are widely used by the local people, but their indigenous knowledge of collecting,

processing, and producing various items has yet to be adequately evaluated and promoted.

### Medicinal Plants

Although over 400 plants with medicinal virtues occur in the flora of eastern Nepal (Malla and Shakya 1984-85), only about 20 of them have been exploited for commercial purposes. A number of them have been used by local people as traditional home remedies.

Overseas export figures of medicinal herbs from eastern Nepal during the years 1971/72 to 1981/82 do not exhibit any definite pattern of increase or decrease. The export items and their quantities are controlled by foreign marketing centres like Singapore, Hamburg and Tokyo. The bulk of medicinal herbs are exported to India. However, no reliable record is available to attempt any analysis. The development potential of medicinal plants remains quite high. Special items of exports from the basin are the chiraita (*Swertia* spp.), *Lycopodium* powder, cinnamon bark, and Rudrakshya beads (*Elaeocarpus ganitrus*).

There is no organized group of people for the collection of medicinal herbs. Most of the collectors are shepherds who spend their summer in the sub-alpine and alpine zones. There is no organized mechanism for the sale of medicinal herbs, nor is there any processing centre.

Medicinal herbs are regarded as a free commodity to be collected from nature. Demand for any particular item instigates mountain dwellers to collect as much as possible. Conservation measures have not yet been thought of. Thus some of the high-altitude herbs, like *Picrorrhiza* (Kutki), *Nardostachys* (Jatamansi), non-poisonous species of *Aconitum* (Nirmasi) have declined drastically. Sub-tropical and tropical herbs like *Rauwolfia*, and *Alstonia* (Chhatiwan) have already gone near to extinction in the area.

Rotational cropping of medicinal herbs from the alpine and the sub-alpine zones and the cultivation of various medicinal plants in the temperate and the sub-tropical zones should provide greater scope for cash income for the people of the Arun Basin and its vicinity.

## Fibre Plants

A number of wild plants provide raw materials for making cords, clothes and paper. Paper making is a well-known cottage industry all along the Nepal Himalaya. However, the refined textile fibre from Allo plants (*Girardinia diversifolia*) is widely produced in the Arun Basin.

## Hand-made paper

Bast fibres, locally known as Lokta, are obtained from three shrubs of the family Thymeliaceae (*Daphne bholua*, *D. papyracea* and *Edgeworthia gardneri*) which are collected extensively from oak-laurel and oak-rhododendron forests at 2,100-2,700 m altitude. The shrubs grow to about one to three m and occur as an undergrowth in shady places. The bark of mature plants are peeled from top to bottom, and thus the whole plant is destroyed. Thus rotational cropping (10-15 years) must be practiced in order to maintain a steady supply. Collection should not be done before seeding, and the roots should not be disturbed. Regeneration takes place both from seed (approx. 25 per cent) and root suckers (75 per cent) as per Jeanrenaud in Jackson (1987). Trees in the Lokta habitat should not be subjected to fuel collection. It has generally been observed that wood requirements for fuel to cook and digest, and to provide wood ash, contribute greater environmental damage than the collection of 'Lokta' itself. The ratio of one kg of paper to three kg of firewood is said to be a standard in preparing hand-made paper (Jeanrenaud 1987). The employment and income derived from hand-made paper is quite promising. However, there is a need for technological input to reduce or replace fuel material and to substitute wood ash by appropriate chemicals (Mahat 1987).

Nepali paper of Bhojpur is highly regarded in the Kathmandu market. It is not unusual to find loads of hand-made paper in the airport godown at Tumlingtar for shipment to Kathmandu. There is a growing demand for Nepali paper in the tourist industry, to produce greeting cards, calendars, letter pads, and prints, of various images depicting Nepalese art and culture. The industry is being promoted by His Majesty's Government of Nepal in co-operation with other agencies, including the UNICEF (United Nations Children's Fund). However, the risk of over-exploitation and extinction of the fibre plants and the depletion of supportive forest cover should

not be overlooked. Therefore, this industry needs to be examined carefully in the context of the overall ecosystem in a watershed.

### Allo as textile fibre

Fibres obtained from the inner bark of a gigantic nettle, called Allo, are widely used for making ropes, head-bands, cloth-bags, fishing nets, rough clothes, etc., by the people in the upper Arun valley. This nettle *Girardinia diversifolia* (Link) Friis occurs as an undergrowth in mixed deciduous forests of oaks, maples, and cherries at altitudes lying between 1,500-3,000 m. This plant grows profusely forming an impenetrable cover of stinging nettle with slender 1 to 3 m tall stems. The stems are cut near the base and the barks are peeled off to yield the fibre. The Allo needs lots of water for cleaning the fibres, which are considered as among the longest fibres found in plants (Canning and Green 1986). The plant seeds profusely and the root suckers also produce a lot of new stems following the harvesting. However, the forest ecosystem should not be disturbed in order to sustain a regular supply of Allo fibres. Cultivation of Allo could well be encouraged along forest edges and on rocky slopes.



The "Allo" plant (*Girardinia heterophylla*) grows on wastelands also



The Kosi Hill Area Rural Development Programme (KHARDEP) has made special efforts to develop Allo as a highly prized commodity of eastern Nepal. Studies conducted by the KHARDEP have shown that a successful cottage industry for the production of a new textile material best suited for making jackets, waistcoats, caps, and so on is entirely possible.

The Rai women of Sankhuwasabha district are skilled weavers, and their products have received wider appreciation by the urban public and overseas buyers. Technical assistance with the introduction of new types of looms, winders, warping machine, drying rollers, and subsequent training of local women have proved quite promising and a start has been made on finding marketing outlets for Allo products (Dunsmore 1987).

## Bamboo

Bamboo is the most versatile plant material available to the rural people. Although it is widely cultivated, extensively collected, and intensively used by local people, its botanical identity and ecological roles are not known sufficiently. The contributions of Stapleton in Jackson (1987) provide an excellent ground for a good beginning in research and development on bamboos of Nepal.

Twenty species of bamboo have been recognized, and seven of them are still indeterminate. Based on the perception developed by local people, Nepalese bamboo may be classified into two groups - (1) large-statured bamboo and (2) small statured bamboo.

### Large-Statured Bamboo ("Bans") :

There are 11 different species of large statured bamboo, which are collectively known as "Bans" (Table 16). Most of them are over ten m tall and have a diameter of over five cm in cross-section. They are used for a variety of purposes: as poles for construction of huts, sheds, houses, and small bridges, as weaving material for making mats, partition walls, and roofing materials; as pots for carrying milk and milk-products, as vegetable from young shoots; and also as fodder from leaves. Botanically bamboos of Nepal are recognized under two genera, i.e., *Bambusa* and *Dendrocalamus*. *Dendrocalamus hamiltonii*, known as Tama Bans, has a wide variety

of uses and grows successfully from 2,000 m to 3,000 m altitude in the hills and valleys of Nepal. This is a "multipurpose" species preferred by most hill people.

Bamboos are principally propagated by vegetative means through rhizome cuttings, which can weigh up to 40 kg. Propagation through seeds is rather difficult, and the availability of seeds is a constraint by itself. However, judging from the wide use of bamboos in the rural economy and in maintaining the mountain ecology, it is tempting to use large-statured bamboo as the most desired plant for community forestry. Mass propagation through tissue culture techniques is entirely possible, as has been evident in the laboratories of the Royal Botanical Gardens, Godawary, Nepal. The transfer of young bamboo plants from flasks to fields involves considerable management problems, which need to be solved to attempt large-scale

Table 16 : LARGE-STATURED BAMBOO SPECIES

Scientific Name	Local Name	Altitude (m)	Uses/remarks
1. <i>Bambusa nutans</i>	Mal Bans	Terai - 1600	Construction
2. <i>Bambusa</i> sp.	Tharu Bans Sate Bans	- 1500	"
3. <i>B. balcoa</i>	Dhanu Bans Bhalu Bans		Scaffolding of large building
4. <i>B. arundinacea</i>	Kante Bans	- 1250	Thorny
5. <i>B. vulgaris</i>			planted for paper pulp, ornamental
6. <i>Dendrocalamus hamiltonii</i>	Tama Bans Ban Bans Choya Bans	300 - 2000	multipurpose; fodder leaves
7. <i>Dendrocalamus</i> sp.	Phusre Bans Khosre Bans Tama Bans	1500 - 2000	not good for weaving
8. <i>D. hookeri</i>	Kalo Bans Bhalu Bans	1500 - 2000	cold resistant; small poles
9. <i>D. Sp.</i>	Dhungre Bans	1500 - 2000	cylindrical containers, pillars for buildings, fodder, weaving
10. <i>D. patellaris</i>	Nibha Bans Lyas Bans	1950 - 2600	Good quality weaving material; flutes.
11. <i>D. strictus</i>	-	below 1000	Siwalik & Non-alluvial Terai.

Source : Stapleton (1987)

planting of bamboo in Nepal. The Arun Basin is one of the favourable areas for such an endeavour. Over ten species of bamboo are already in cultivation along hill slopes and valleys where the humid conditions are favourable to most bamboo species. Their cultivation may be visualized not only in terms of stabilizing fragile slopes and rehabilitating barren lands but also in terms of their economic returns through cottage industries.

#### Small-Statured Bamboo (Nigalo and Malingo) :

Small bamboos have a wide use as weaving material for baskets, especially "Doko", "Dalo", and as roofing mats, partition mat walls, etc. There are some nine different species under three genera -- *Drepanostachyum*, *Arundinaria*, and *Thamnocalamus*. Some species are most sought after for their edible shoots, while others have specific use for making writing pens or smoking pipes. Most of them are used for weaving. Cultivation of small bamboos is not infrequent, but it is customary for most high-altitude dwellers in the Arun Basin to go into forests and bring back bamboo for domestic consumption. Roy Lancaster (1981), in his travelogue, narrates as following:

"Half way through the morning and still in the dark forest, we heard a noise somewhere along the track ahead of us. .... The cracking and clattering of bamboos was unmistakable. Suddenly from out of the thicket ahead burst several men trotting in single file, each hauling a bundle of green bamboos. The canes measured 10-12 ft. in length and 0.75-1 inch thick and were packed 80-100 per bundle .... The men ... were taking them down to Hatia where they would be used to repair roofs and fences..."

Most valued of bamboos for basket work in eastern Nepal is the "Malingo", which is known as *Arundinaria maling* in plant science. It is widespread above 2,800 m, often spreading over 80 per cent ground cover along gullies and shaded slopes where tall trees are being destroyed. In the side valley of the Arun Basin, the "Malingo" bamboo is replaced by "Ghode Nigalo" above 2,600 m (8500 feet). The "Ghode Nigalo" is a *Thamnocalamus* sp., and its swollen nodes do not weave into a water-proof roofing material as that of "Malingo". However, young shoots of both species are much relished by bears and red pandas. These bamboo clumps provide perfect

shelter for mountain pheasants like the Monal (Horned pheasant), Danphe (Impeyan pheasant) and Chilime (Blood pheasant).

People of the upper Arun valley use bamboo mats as roofing material not only for temporary huts and sheds but also for permanent houses. They cannot afford wooden planks, as is more frequent in other parts of Nepal. Furer-Haimendorf quotes Stainton to confirm the dearth of conifers in the forests of the upper Arun valley as being the main cause for using more bamboo.

Mountain people are excellent weavers of bamboo materials, especially baskets, mats, winnowing trays, and grain containers. Dunsmore (1987) reports that the bamboo baskets produced by the people of the Kosi hills received a very promising response from the buyers during a small exhibition staged at Kathmandu. Bamboo-based cottage industry should be one of the important activities to promote in the Arun Basin. Large-scale plantation of bamboo for paper pulp is a feasible option provided seedlings are made available and a marketing mechanism is developed. Mahat (1987) emphasizes that the investment of government agencies in bamboo plantations and development is well justified and community forestry programmes have a potential to greatly promote cultivation and development of bamboo plantations on private as well as community-managed lands. A short description of small-statured bamboo, their habitats and uses is given in Table 17.

TABLE 17 : SMALL-STATURED BAMBOO SPECIES

	Scientific Name	Local Name	Altitude	Uses/remarks
1.	<i>Drepanostachyum intermedium</i>	Tite Nigalo	1200-2400 m	Baskets and Mats. Fodder. Also in cultivation.
2.	<i>D. khasianum</i>	Tite Nigalo		
3.	<i>D. hookerianum</i>	-	above 2000 m	cultivation.
4.	<i>D. sp.</i>	Malinge Nigalo	1800 m	also in cultivation.
5.	<i>D. sp.</i>	Malinge Nigalo	1800-2000 m	weaving material
6.	<i>D. sp.</i>	"	2500-3000 m	western sp. edible shoots
7.	<i>Arundinaria maling</i>	Malingo	2300-2800 m	highly valued for basket
8.	<i>A. racemosa</i>	-	above the Malingo	
9.	<i>Thamnocalamus sp.</i>	Ghode		Brushes, fodder

Source : Stapleton (1987)

## Labour-based activities

Several activities, such as construction of roads, bridges, dams, etc, mountaineering expedition and trekking, quarrying semi-precious stones, employment in military service at home or abroad, and a number of other activities make use of the manpower from the Arun Basin. Of them, mountain tourism and the mining of semi-precious stones are considered here for discussion.

Table 18 : OCCURRENCE OF SEMI-PRECIOUS AND PRECIOUS MINERALS IN THE ARUN BASIN. (COURTESY : D. R. KANSAKAR)

S.No.	Name of the Locality	Altitude (m)	County rock	Type of Mineral	mineral concentration(%)	Production per day (kg)	Remarks
1.	Bhote Khola (Swachi)	1250 m	Chlorite Schist	Garnet	50	150	25-30 % Gem Quality
2.	Bhude Khani	1,350 m	"	"	30	90	30% Gem Quality
3.	Hanglung	1,570 m	"	"	20	-	-
4.	Sunamla (Paipung)	1,860 m	"	"	40	-	No Gem variety
5.	Chin khuwa	1,320 m	Mica Schist	"	-	-	Not Economic
6.	Dhami Kuwa	2,100 m	"	"	?	-	"
7.	Toribari Khotak	-	"	"	40	-	-
8.	Himmuwa	1,200 m	Garnet mica Schist	"	5	-	-
9.	Jantare Bhir	2,470 m	"	"	-	-	-
10.	Pakhuwa	1,830 m	Pegmatite in mica Schist	"	-	-	-
11.	Hyakule	2,070 m	Pegmatite in calc-silicates	"	-	-	-
12.	Tinjure	-	"	"	-	-	-

Source: Thapa 1978 : Tuladhar and Sharma 1981

## Mining Activities

Chainpur area in the eastern part of the Arun Basin in Sankhuwasabha district has been well known for the occurrence of semi-precious and precious stones, like garnet, tourmaline, beryl, and aquamarine. A number of such occurrences have been reported (Table 18). As a result, six garnet mines and one tourmaline and aquamarine mine are operating under the license issued by HMG/Nepal. All of these mines are run on a small scale by private companies belonging mostly to the local people. Local people are hired by the mine owners for mining. These labourers are provided with simple excavation tools, like hammer and chisel, and in the underground shafts, they are provided with kerosene lamps or candles. No technical evaluation and documentation is done, and their excavation is guided only by visual observation of the precious mineral. As a result, mine safety, ventilation, and passageway conditions are poor, but the cost of production is low. The miners are paid according to the quantity of mineral they collect, e.g., Rs. 2.50 per kg of garnet in 1980 (Tuladhar and Sharma, 1981). The total production cost at Biratnagar is about Rs. 8.00 per kg, which includes wage to labourers and transportation on human back up to Tumlingtar and air transport from there to Biratnagar. It is then processed partly in gem industries situated at Biratnagar or Kathmandu, after which it fetches up to Rs. 300 per gm in the Kathmandu market. Thus clearly, this is a very important mineral resource of the country with a bright future. But, because of the lack of skilled gem processors in the country, this resource is far from being optimally exploited.

## Mountain Tourism

Mountain tourism is a fast-growing industry in Nepal, and its role in the management of mountain ecology and economy is becoming more and more significant. The issues of protecting the environment for tourism and from tourism are often raised in the context of the eco-development of the mountains (T.V. Singh 1983).



Porterage is a source of additional income for mountain people. Even young girls take part as porters in mountaineering expeditions



Bare-footed porters on a snowy trail to Makalu base camp



Makalu (8470 m) is the fifth highest peak of the world  
(Courtesy of Dan Taylor-Ide)

Table 19 : EXPEDITIONS TO MT. MAKALU I AND II

Year	No. of expeditions	Members	Countries
1983	6	34	USA, Belgium, Japan, France, Netherlands
1984	6	36	USA, Spain, Nepal, Britain, Switzerland, Italy
1985	6	46	France, Italy, Netherlands
1986	6	59	USA, Italy, Poland, France, Japan
1987	8	63	USA, Austria, Netherlands, Poland, France, Switzerland
5 Years	32	238	11 Countries

Source : Department of Tourism, HMG/Nepal.



Mount Makalu (8,475 m), the fifth highest peak in the world, is one of the popular peaks for mountaineering. The spill-over from the over-crowded Everest region is often absorbed by the Makalu area. Every year, an average of six expeditions operate in the Makalu region (Table 19).

It was observed in August-September 1986 that five expeditions operated almost simultaneously to Mt. Makalu I and II. Each of the teams had 5-15 climbing members and an equal number of Sherpa guides. They were supported by a caravan of porters, numbering to 60-120 heads. In each of the operations, the group could be classified into three categories. (i) Professional Sherpa guides and high-altitude porters above 4,500 m. (ii) Middle-altitude porters at 3,000 m to 4,500 m in altitude, and (iii) Low-altitude porters from 1,000 m to 3,000 m altitude.

Professional Sherpas and guides take full charge of the camps, camping equipment, and other belongings. They are recruited outside the region (Arun Basin) from Kathmandu and Solu-Khumbu area. The highland dwellers of the upper Arun have already gained a lot of experience and training from them. Those Bhotia people who often associate themselves with the Sherpas are indispensable for the middle altitude, i.e., 3,000-4,500 m. They replace the Rai and the Limbu porters from Tashigaon (2130m) onwards, the last village on the trail. The mid-altitude porters have special requirements for camping sites, which are largely determined by the availability of natural rock shelters along mountain slopes. Hundreds of porters get dispersed during the evening and start collecting firewood. Rhododendron leaves for bedding material, and a number of wild edible roots, rhizomes, and bamboo shoots are collected. Continued activity of this sort exerts great pressure on the natural vegetation. Above 3,600 m, the situation gets much worse due to the absence of trees. Mountaineering parties and local shepherds have been extracting wood from shrub vegetation of Juniper and Rhododendrons, after burning the leafy part of the bushes. A basketful of wood fetched about Rs. 100, which requires a clearing of about 100m<sup>2</sup> of shrubland. This has resulted in bare slopes that can no longer hold winter snow for a gradual supply of water during dry months for low-lying slopes and terraces. Thus the mountain slopes in the alpine and sub-alpine zones should not be stripped of the vegetal cover if water balance of the watershed is to be maintained. The supply of firewood should be done by extracting old trees and dead logs from forests at lower elevation. It is often seen that a large amount of old trees and dead logs are left to rot in ravines and dense forests.

Thus it is tempting to suggest introduction of power saws to extract such wood and setting up of firewood sales depots for mountaineering and trekking parties. Extraction of old trees, and dead logs, by using efficient mechanical means, could well be viewed as an option to make better use of old, dying, or dead wood to save new and young trees.

Regeneration of mountain vegetation needs serious consideration in the management of watersheds. Natural regeneration of vegetation is rather poor or almost impossible when the slope is stripped of vegetation. Thus it is highly desirable to open up alternative routes to approach various base camps. After a certain period of time a particular route should be closed for a number of years, to allow regeneration.

Environmental problems arising from unmanaged disposal of litter, bottles, cans, plastics, etc., are becoming more severe in several areas of mountaineering activities. Professional guides and climbing members should be trained to dispose off garbage and a surveillance mechanism should be developed.

Mountaineering and trekking tourism offers quite a significant amount of employment to the local people. However, environmental costs and consequences are never considered. It is, therefore, important that promotion and practice of mountain tourism should be viewed in a broad context of nature conservation and environmental management.