CONSERVATION FOR SURVIVAL: A CONSERVATION STRATEGY FOR RESOURCE SELF-SUFFICIENCY IN THE KHUMBU REGION OF NEPAL.

by

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(PALDORJE)

A Practicum Submitted in
Partial Fulfillment of the
Requirements for the Degree
Master of Natural Resources Management

Natural Resources Institute
The University of Manitoba
Winnipeg, Manitoba, Canada

1985

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ABSTRACT

The purpose of this practicum is to develop a strategy for resource self-sufficiency and nature conservation in the Khumbu region of Nepal. The strategy seeks to ensure the prudent management and conservation of the Park so that not only the flora and fauna but also the indigenous human population may continue to live in harmony with their environment.

This study examines the historical perspectives of land use, current management strategies of the Park, a theoretical supply and demand assessment of land and labour resources, and prospective problems and opportunities. The methods used in the study include a literature review, examination of published and unpublished research articles, international journals, internal reports, personal communications with persons knowledgeable in the study area and the author's own observations and experience.

This study indicates that the Sherpa's spiritual commitment under a system of social and community control of resource management for sustainable use has been disrupted by internal and external political, social and economic factors. Traditional practices of land resource management are no longer in operation in the villages most affected by

tourism. Despite the changes that tourism has brought about, Sherpas maintain a strong identification with their culture and religion.

National and international aid agencies are offering strong support and technical solutions for the reduction of the fuelwood crisis and environmental degradation. However, a broader perspective is required to solve fuelwood and food shortages; for example, the existing socio-economic realities should be incorporated into project planning. The main problem in achieving sustainable development in the Khumbu region seems to have stemmed from gaps in government legislation and lack of co-ordination between government, aid agencies, and local people.

It is recommended that a workable strategy be developed to confront the prevailing problems by increasing productivity of land and labour resources without destroying any aspect of the environment. An informed local body should be set up to co-ordinate development and conservation projects and programmes.

ACKNOWLEDGEMENTS

First and foremost I wish to extend my gratitude to Sir Edmund Hillary and Mr. Zeke O'Connor for their moral and financial support throughout this study. This study could not have been completed without the financial assistance made available through the Sir Edmund Hillary Foundation.

I would like to acknowledge and thank the members of my Practicum Committee: Dr. W. Henson, Director of the Natural Resources Institute, University of Manitoba; who initiated my interest in the subject and provided continued guidance; and Professor H. Lapp, Department of Agricultural Engineering, University of Manitoba; and Mr. L. Tripathy, Agrologist, Manitoba Department of Agriculture for their advice and useful criticism.

I also wish to express my thanks to the staff at the Natural Resources Institute namely: Professor T. Henley, Professor R. Baydack, Mrs. E. Novotny and Ms. C. Hofer for their guidance and co-operation.

Finally, I owe a special thank you to Mrs. P. Porter for editing this report.

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GLOSSARY OF TERMS

Chorten - Sherpa term for Buddhist monument, usually built of stone and corresponds to the Indian stupa.

Chang - Homemade beer from rice, maize, millet or wheat.

Ecosystem - Self-sustaining and self-regulating community of organisms considered in relationship to each other and to their environment.

Fuelwood - Wood which is used in direct combustion to provide heat energy.

Ghee - Nepalese term for clarified butter.

Gonda - Sherpa term for monastery, most literature uses the term gompa which is a Nepalese term.

Goth - Nepalese term for temporary settlement of herdsmen.

Khumbu Region - Comprises all of the area within Sagarmatha National Park.

Khola - Nepalese term for river.

kWh - Kilowatt-hour is a unit of energy (work) equal to that expended by one kilowatt in one hour.

Lama - Sherpa term for Buddhist priest, monks and nuns are known as tawa and ani respectively.

Load - Approximately 27 Kg.

Lotok-nawa - Livestock guard.

Ngalok - Sherpa term for labour gang organized on a voluntary basis, usually comprised of persons of the same sex and similar age.

Panchayat - Village panchayat is the smallest political constituency and administrative unit in Nepal. There are approximately 4,000 such units distributed over 75 districts in the country.

Pathi - Nepalese measure used for measuring grain, salt, etc.; roughly equivalent of 3.36 kg.

Porter - Person who carries equipment and supplies.

Rakshi - Nepalese term for distilled liquor.

Rupee (Rs) - Nepalese currency, U.S. $1 = Rs 17.00 (1985). Price is quoted in the current Rs or $ terms of the year indicated.

Sagarmatha - Nepalese name for Mt. Everest.

Sherpa - The word Sherpa (n) denotes an ethnic group. However, where the word 'Sherpa' is used with job category, the term means hired man who carry loads at high altitudes during a mountaineering expeditions, or to assist in setting up tents, managing loads and doing whatever work needs to be done during a trek.

Shingi-nawa - Forest guard.

Sirdar - Group leader, organizer.

Subsistence - Sustenance, existence and/or livelihood.

Sustainable use -Consumption without reducing the capacity of the resource to continue production at an equal or greater rate in perpetuity.

Tin - A 18 litre(l) biscuit tin is used by the Sherpas for measuring potato and turnips. In the lowlands of Nepal, pathi is used for such purposes.

Transition - Movement, change from one state to another.

Trekking - Backpacking, travelling on foot, hiking.

ABBREVIATIONS

a.s.l. -	above sea level
FAO -	Food and Agricultural Organization of the United Nations.
IUCN -	International Union for Conservation of Nature and Natural Resources
Kg -	Kilograms
kWh -	kilowatt-hour
NCS -	Nature Conservation strategy
PAC -	Park Advisory Committee
Rs -	Rupees
SNP -	Sagarmatha National Park
t -	metric tonnes
UNESCO -	United Nations Educational, Scientific and Cultural Organization
UNEP -	United Nations Environment Programme
UNDP -	United Nations Development Programmes
WCS -	World Conservation Strategy

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Chapter I

INTRODUCTION

1.1 PREAMBLE

Since the opening of Nepal to outside visitors in 1950, the Khumbu region has been transformed from an isolated mountain dwelling to one of Asia's top tourist resorts. The number of foreign visitors per year (5,276 in 1984) exceeds the number of local inhabitants (approximately 3,000 in 1984) (Sagarmatha National Park Office, 1984). In addition to the highest mountain peak in the world (Mount Sagarmatha 8,848 meters), the unique culture of the Sherpa people is found in this region, the significance of which has been recognized through the development of a National Park (in 1976) and designation of the Park as a natural world heritage site (in 1980). As a result, foreign aid has been offered for health, education, forest management and Park development. Extensive research has been carried out in the fields of mountaineering, anthropology, medicine, grazing and tourism in the area.

Because of tourist related development and the growing population, continued encroachment on the Park lands and forests is beyond sustainable levels, and livestock habitat is extensively overgrazed.

The tourism industry represents an integral part of the present economy to many of the Sherpa people and to the nation, but degradation of the natural and social environment has occured. The extent of this degradation is, however, difficult to quantify. The societal values for traditional land use and cultural life and dependency upon the local resource base, must be studied to implement a sound management strategy. Because tourism depends on world economic and political factors, management must seek alternatives to address the problems of over-population and scarce resources in order to develop a self-sustainable society. This requires information about the number of people dependent on the land resource, and how this demand can be met in the future.

This study examines the ultimate demands on the resource of the local people and the visitors. The supply situation of the resource, including revenue generated by tourism, is also examined. Based on the secondary data from various literature sources and on the author's field experience gained from growing up in the study area and having worked for the last three years as a manager of Sagarmatha (Mount Everest) National Park, a conservation strategy for resource self-sufficiency is prepared for the Department of National Parks and Wildlife Conservation, Kathmandu, Nepal. The information collected in the study is intended to serve as a guideline for the Park managers and outside funding

organizations. It will help to ensure regional self-sufficiency of food and cash income to the local inhabitants and to restore the resource supply base.

1.2 PROBLEM STATEMENT

Deforestation is a serious problem in Nepal, and the Khumbu region is no exception. Since the advent of tourism in the early 60's, the demand for firewood has increased dramatically. The Sherpa's continued use of timber for house construction and fuel wood for cooking also contributed to the gradual depletion of once widespread forests. During the lifetime of some of the older villagers, the slopes around the villages provided abundant firewood. These slopes at present are either bare or covered by scrub vegetation. Only a trace of the original forest still stands near the monasteries in the main villages and in less accessible areas.

The forests close to heavily travelled trails continue to be used as a source of fuelwood. There are signs of erosion resulting from excessive wood cutting, overgrazing and trampling. Regeneration of forests is slow due to the high altitude, the cold climate and livestock grazing on the new growth. The traditional methods of cooking and heating are extremely wasteful. An effective way to address the energy problem is required.

Growing potatoes and buckwheat and grazing animals have been a traditional pattern of land use by the Sherpa people. However Khumbu is a food deficient area, partially dependent on the importation of food grains from the midhills of Nepal. The economic dependency on the outside world is also increasing.

The resources of Khumbu have traditionally been managed by the Sherpa people for the last 450 years. Now they are managed by the Sagarmatha Park, the local panchayat authorities, and the tourism ministry whose bases are centrally located in Kathmandu, so that the important resource management policies are made and executed from outside of the Khumbu region. However, efforts are being made to create an advisory committee of prominent Park residents. There is need to investigate the traditional land use practices and to encourage local participation in the decision making. The planners and administrators would do well to understand the social, political, and ecological complexity of the situation in Khumbu.

The growing recognition of energy conservation measures to replace fuelwood problems needs, however, to be understood in a broader perspective. The Khumbu region is fortunate to have vast natural and cultural resources which could continue to attract tourists and provide supplementary income for the local people and foreign exchange to the nation. However, this depends on proper management of tourism.

A workable strategy to satisfy basic needs must be developed and suitable alternative ways of increasing food, fodder, and labour productivity introduced. Prior to this study, no systematic attempt has been made to develop an overall strategy for confronting the prevailing problems with a sensitivity to social, cultural and organizational differences.

1.3 STUDY AREA

Sagarmatha National Park lies in the northeastern region of Nepal in the Solu Khumbu district of Sagarmatha Zone (Figure 1). The Park area (Figure 2), covering 1141 km^2 is also known as 'Khumbu'. It is mountainous, rising to the peak of Mount Sagarmatha (Mt. Everest 8,848 m), with many peaks in excess of 6,000 meters. The Park includes the catchment areas of three major rivers; Dudh Kosi, Bhote Kosi and Imja Khola. To the north, the Park is bounded by the border between Nepal and China (Tibet) and to the south the Park extends to Monjo (2810 m) the confluence of the two ridges of Tamserku peak and Kwangde peak. In the upper valleys above 4,000 m, glaciation has created U-shaped valley profiles while the valleys of lower reaches are essentially very steep sided, V-shaped in profile.

The main vegetation in the Park varies from hemlock and pine at lower altitudes through fir, juniper, birch and rhododendron woods to scrub and alpine plant communities.

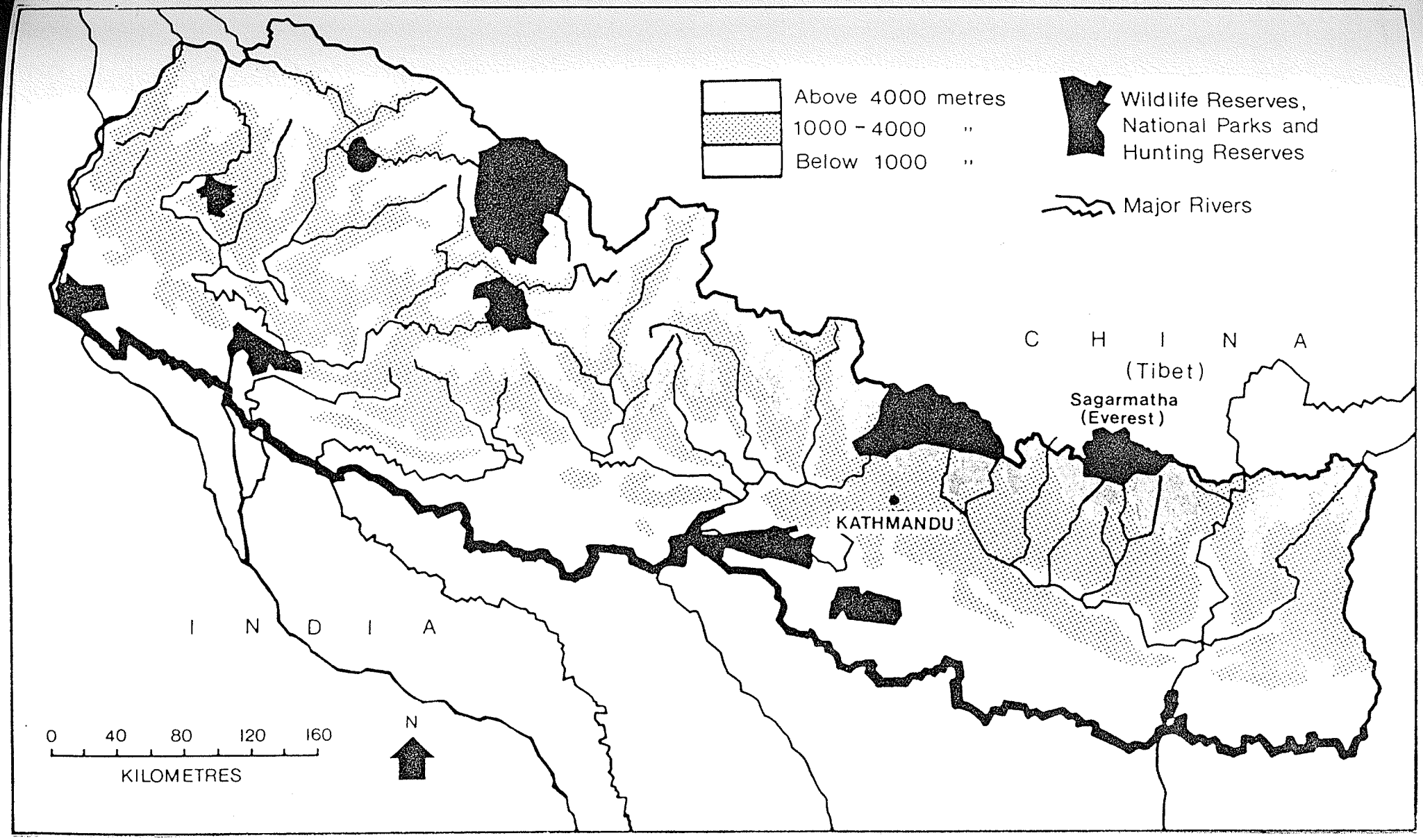


Figure 1: Locational map of Nepal showing major river systems, National Parks and Reserves.
Source: IUCN, 1983.

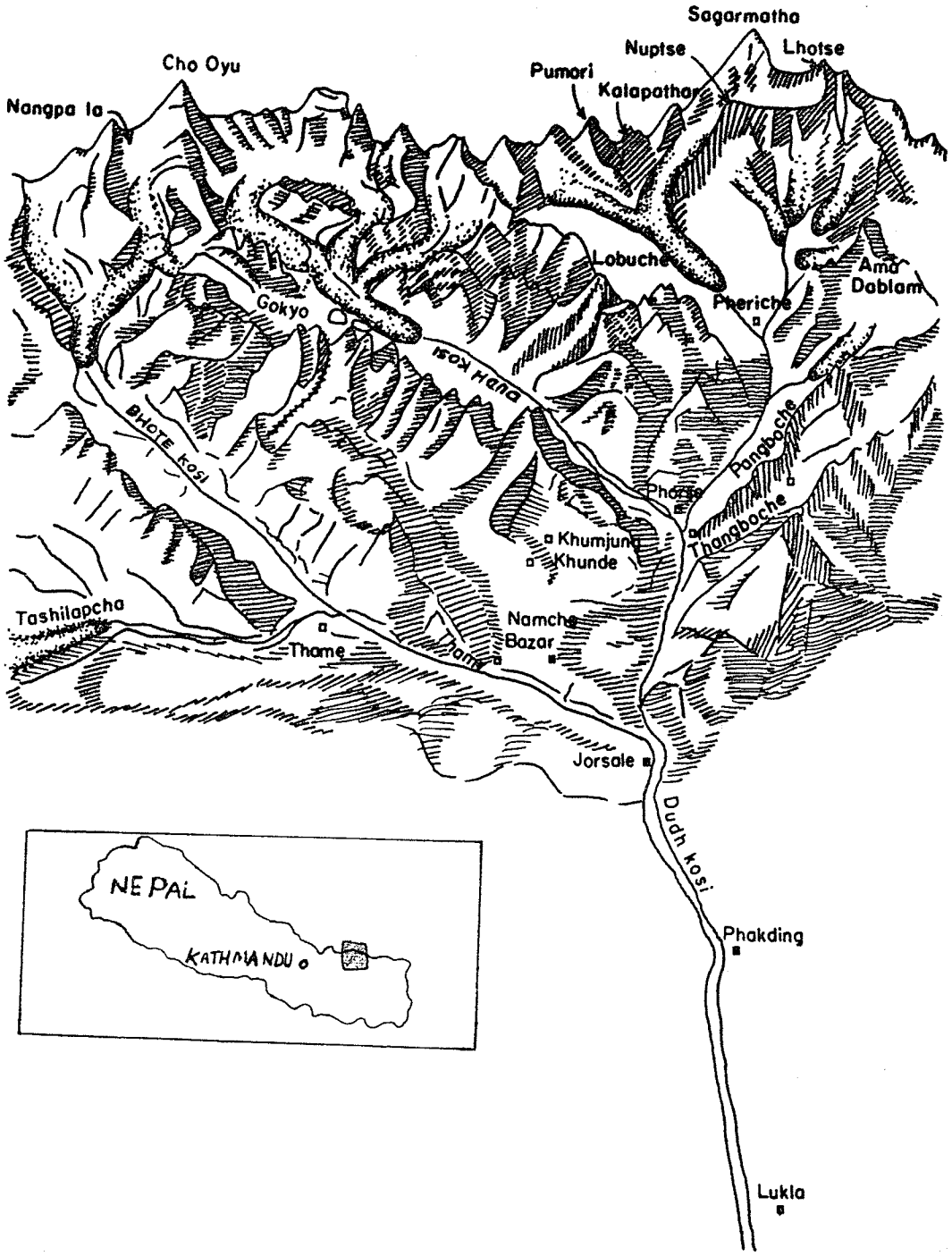


Figure 2: The Location Map of Sagarmatha National Park (Khumbu).

The climate is one of cool, wet summers and cold dry winters. Almost all the annual precipitation, (averaging less than 1,000 mm), falls during the summer monsoon, which lasts from June to September.

This semi-arid region was settled by Sherpa people around 450 years ago. They left their original homeland, Tibet, to escape political and military pressures. They crossed over Nangpa-la (5,716 m pass) and came to their present homeland. They adapted to this harsh environment and developed a unique culture of their own (Haimendorf, 1964). Today, there are approximately 3,000 of these people in the region. The economy of these people traditionally has been based heavily on growing tubers, potatoes, and buckwheat, trading with Tibet and grazing animals. With the recent growth of tourism, this economy is becoming increasingly dependent on the new income.

There is a walking access route from the south, a seasonal trade route between Tibet and Nepal via Nangpa-la pass, and snow-bound pass to the west of Thame village called Tashi-labtsa, leading to Rolwaling valley. This pass and other mountain cols in the east are accessible only to experienced mountaineers. There is an airstrip at Luckla (2,800 m) within two walking days from the Park headquarters at Namche Bazar. The nearest road is approximately 260 kms from the Park. Although the main villages and settlements are technically excluded from the Park boundary, a large

proportion of the Park area is traditionally used by the Sherpas for grazing and gathering forest products. The dependency of the people on the region's limited resource base has been dramatically changed over the last 30 years.

The main changes occurred in the late 1950's with the compounding factors of the Tibetan refugee influx,the nationalization of local control of the forest and the emergence of tourism in Nepal. Chinese occupation of Tibet (in 1959) forced many Tibetans to take refuge in the Khumbu region, and many of the refugees brought large herds of cattle with them. These increases in human and animal population have resulted in deforestation and over-grazing with soil erosion problems.

The traditional barter-trade was interrupted with the closing of the border between Nepal and Tibet. In the meantime, the tourist industry has enabled Sherpa people to earn cash income by working as guides and porters on mountaineering expeditions and on trekking trips. The government of Nepal introduced (in 1956) a Forest Nationalization Act to bring the forest resources under the authority of the state. Thus, local control over the forests had been taken away and put in the hands of the authorities who reside outside of Khumbu.

1.4 RESEARCH OBJECTIVES

The purpose of this study is to develop a conservation strategy to assist Park managers in restoring the resource supply base and self-sufficiency on the region for local inhabitants. Specific objectives are:

-to provide an overview of the historic and current land use patterns in the Khumbu region.

-to examine and discuss present nature conservation strategies and evaluate future trends and viewpoints for the enhancement of the natural and cultural heritage.

-to examine the ratio of supply and demand of the present resource base, including revenue generated from tourism.

-to determine the adequacy in the resource base and suggest alternative means to achieve a self-supporting system for resource management.

1.5 ASSUMPTIONS

For the purpose of this study, it will be assumed that:

- Firewood fuel will continue to play an important role as a renewable energy source for the people in Sagarmatha National Park.

- Sagarmatha National Park will continue to attract tourism.

- Conservation strategy can contribute to the formulation of guidelines in planning and management of reforestation programmes, alternative energy sources, small scale handicraft industries, cultural restoration and tourism in the Khumbu region. And that this study will be applicable to other mountain Parks of Nepal such as Langtang and Dolpo.

1.6 DELIMITATIONS

The study will be deliminated in the following manner:

- This study will not include wildlife, geology, minerals and water resources or the activities of the Sherpa people who reside outside of the Khumbu region.

- Acknowledging the constraints of time, distance and financial costs involved, the study will rely on the author's experience of the region and secondary data from various literature on the study area.

1.7 METHODOLOGY

The study consists of three specific methods to develop a strategy for resource self-sufficiency and nature conservation in Sagarmatha National Park. Information from anthropological studies, mountaineering books and related publications formed the basis for studying the cultural-historical perspectives of land use before and after the 1960's.

A review of related literature has been compiled to determine the present management strategies of the Park and conservation efforts of the government. Review of the literature has been approached from a number of directions; computer search of literature, personal correspondence, international conventions relating to National Parks, Sagarmatha National Park bibliography, international journals and periodicals.

Computerized literature search at the University of Manitoba provided a broad range of references on Nepal and literature produced by IUCN, UNESCO, FAO and World Bank. Correspondence with associates of the author who had researched a diverse range of topics in Nepal provided invaluable input into the study. After initial development of the proposal, letters and copies of the proposal were distributed to selected authors requesting reference materials and suggestions. Papers from World National Parks Congress, Bali (1982), the author's participation in the 18th International Seminar on National Parks and Equivalent Reserves (August 6 - September 5, 1984), and publications relating to national Parks have contributed to the author's knowledge and understanding of National Parks' philosophies, issues, trends and management problems.

The calculations for supply and demand of land resources for forestry and grazing land are based on a number of studies: Industrial Services Centre (1977), Sherpa (1979), Bjonness (1980 a) and Bajracharya (1981). The total land area under forest cover, grazing land, cultivated land and barren land have been calculated from a 1:100,000 topographic map of the area by using a planimeter. An approximation is used to estimate consumption and supply of land and labour. Much guess-work, based on personal field experience, was needed to estimate resource consumption and resource base. Landsat satellite photographs from Landsat -

3 image no. 830330704063 XB and 822660402500 supplied by EROS Data Center, National Oceanic and Aviation Administration, Sioux Falls, South Dakota, were obtained, but because of their large scale, were inadequate to determine resource base.

However, the Canadian-aided land resource mapping project with the Topographical Survey Branch of Nepal are producing a series of maps of Nepal at 1:50,000 scale. Similarly, Bradford Washburn of the Boston Museum of Science is doing detailed aerial photography, both vertical and oblique, of SNP area. Unfortunately, both these projects were not completed in time to be used in this research.

Chapter II

SUBSISTENCE FARMING ECONOMY

2.1 INTRODUCTION

Nepal is a landlocked mountain kingdom, bordered on the north by China and on the east, west and south by India. In approximately 160 air kilometres, the elevation ranges from the sub-tropical Terai in the south (elevation varying from 30-60m above sea level) to the great peaks of the Himalayas in the north (8,848m). Such an altitudinal range has influenced the distribution and diversity of the flora and fauna. The vegetation varies from sub-tropical mixed evergreen forests through temperate evergreen forests, to sub-alpine and alpine plants (Stainton, 1972). There are also treeless steppes of the trans-Himalayan region in the northwestern part of Nepal. These varied landscapes with different vegetational zones provide habitat for many species of wildlife, making it a spectacular natural area in southern Asia (Shah, 1978).

Temperature and rainfall vary widely in different parts of the country. Generally, Nepal experiences monsoonal rain from July to September and cold dry weather from December to February. As in most other developing countries,

cultivation and animal husbandry are the main occupations of the people. According to the government five year plan (1975), 95% of the 13 million people in Nepal live in rural areas and engage in agricultural occupations (Bjonness, 1980). Shah (1978) points out that hilly areas comprise 83% of the total area of land.

The most productive region lies in the fertile lands of the alluvial plains. However, two-thirds of the population is concentrated in the hill region, exerting pressure on the resources of the hill-side terraces, scarce fuel supplies, and pasture. Thus the hill land is used most intensively in an effort to produce more than the resource base can tolerate.

The primitive method of agriculture and the pastoral practices of the Nepalese people had a minimal effect on the natural environment. These people were a part of the ecosystem, living on plants and animals and playing their role in the food chain as a herbivore and a predator (Dubos, 1980). This balance has been upset in the last two decades by "improved" agricultural methods and an increase in the growth rate of the human population. The clearing of forests for agriculture continues. The cumulative factors of the opening up of Nepal to foreign visitors, western industrialization, and development schemes, such as malaria eradication, have made available the previously inaccessible forested areas to agricultural settlements.

2.2 CROP PRODUCTION

Khumbu people, prior to the 1960's, maintained a reasonable balance between preservation and use, and respected the communal use of their land system. In the Khumbu region, people grew potatoes, buckwheat, turnips, vegetables and a limited amount of barley on the south-facing slopes during the months of April to October. The climate and the altitude of the region limited the growing season, allowing only one cultivation period per year. For six months of the year the soil is frozen and all agricultural operation comes to a standstill. These people were generally mobile in character. To escape the cold winter months, they migrated out of Khumbu temporarily to the lowlands, to search for grains, and for pilgrimage purposes. They also travelled to Tibet for barter trade. These movement patterns were also associated with their land holdings, since people own land on a scattered altitudinal basis for grazing pastures and during the summer months, they moved with their livestock to their higher summer settlements (Haimendorf, 1964).

At higher altitudes there were scattered and smaller size plots of cultivated land in association with animal husbandry. The mainstay of Sherpa diet consisted of potatoes, buckwheat, barley (grown locally at one location, Dingboche alt. 4,243m a.s.l.) and imported grains such as rice, maize and millet. It is estimated that an average

household of 5 persons consumed 55 loads of potatoes and produced 80 loads per annum. The excess of potatoes was fed to livestock and made into dry potato chips for exporting purposes. An average family could produce more potato and buckwheat than its members required for their yearly consumption. The excess food was donated for religious purposes and used for accumulating material wealth by selling it to Tibet and to the lowlands.

Depending on the local conditions and altitudes, preparation of fields for planting potatoes and sowing of buckwheat started about mid-April. These crops were harvested in September and mid-October. The fields were usually dug with hoes; occasionally buckwheat was sown by ploughs dragged by a team of men. The division of labour was distinct between the sexes. Carrying manure to the fields, fencing, carrying potatoes, thrashing barley and buckwheat and hay making were performed by men. Women normally carried on with the work of sowing, planting potatoes, and weeding. The majority of the agricultural work was performed by a system of Ngalok (labour gangs) with the co-operation of members of different households. Hired labourers were paid by a measure of potatoes and dairy products such as butter.

2.3 ANIMAL HUSBANDRY

Due to the scarcity of tillable land and the limited agricultural season in Khumbu, the raising of cattle, which involved grazing on different slopes of the region, was a significant occupation (Fantin, 1978). Haimendorf's observation in 1967 showed that one-half of the households were involved in raising animals. The yak and nak (bos grunniens) provided hair for making blankets, and their ownership, prestige in the society. The male Yak was used mainly for transport in trading with Tibet and during seasonal migrations. The female nak and zom (female crossbred) provided milk, curd, butter and meat. Figure 3 provides the Sherpa nomenclature for the various crossbred animals. Crossbreeds and some of the animal products, such as blankets, hides, and butter, were used for trading purposes. In addition to the various economic values of yak (male) and nak (female), the male and female crossbreeds of nak and lang (bosaunus typicus) were important for trading to Tibet and Pharak region. The male crossbred Zopkio were taken to Tibet to be exchanged for 3-year-old yak and nak calves and female zom were sold to Pharak region to be raised for dairy purposes. The mature zom were sometimes resold back to the Khumbu region.

The grazing land around the villages and any accessible mountainsides were used for pastures and hay collecting. Almost all herd owners had meadow fields and houses at

CROSSING				OFFSPRING	
Male		Female		Male	Female
yak	X	nak	=	yak	nak
lang	X	nak	=	zopkio-dimji (infertile)	zom-dimji
yak	X	zom	=	koyak (infertile)	tolmu
lang	X	zom	=	tolu (infertile)	phakim
yak	X	phakim	=	zopkio-urang (infertile)	zom-urang

Figure 3: Sherpa Nomenclature of Crossbred Animals

different subsidiary settlements. There was however, a distinct grazing pattern in the valleys where only a known family or members of the clan could graze their cattle. Namche and Thame pastures were located mainly along the Bhote Kosi valley, whereas the villages of Khumjung and Phortse used the Dudh kosi valley for grazing purposes. Similarly Khunde and Pangboche people with few exceptions grazed their cattle in the Imja Khola valley.

Herdsmen also practised rotational grazing in which they drove their cattle to lower valleys (the main villages) in the fall to feed on the lush green pasture. During the winter months, yak and Nak must be hand fed with hay collected during August and September. At the end of May or early June, the cattle were driven to the higher summer pastures to graze.

The dairy products were mostly for domestic consumption, but any excess was used as medium of payment for agricultural labour and for religious rites. Animal husbandry was a full-time occupation and at least one member of the family devoted his/her time to caring for the animals, which were utilized to the fullest possible extent for meat, wool for clothing, hide for shoes, dairy products, and fertilizing the fields.

2.4 TRADE AND CRAFTS

The economy was dependent partly upon barter between Tibet and lower-lying regions of Nepal where grains were produced. The Sherpa people, with their trans-Himalayan location, played middleman in the trade. Some of them developed trading as their primary occupation and used pack animals, while many people maintained their farming economy with occasional barter trading. The barter trade was mainly to obtain necessary goods for their own consumption. Sherpas imported salt, tea, wool, fats, ornaments and barley flours. In exchange, dyes, grains, butter, dried potato chips, unrefined sugar, paper, buffalo hides, and crossbreeds were traded. During this period, jewellery, woolen clothing and many religious books, and ritual objects were also imported. The grains such as rice and sugar, and dyes were brought from lowland areas in exchange for blankets, herbs produced in Khumbu and for salt from Tibet (Haimendorf, 1975).

The rich traders employed many men to carry rice and hides across Nangpa-la pass (alt. 5,716 m a.s.l.) to Tibet. In return, these men got half of the market exchange rates for their transport labour. The difficulty of crossing the snowbound pass in winter and the opening of wide crevasses in the ice during the monsoon period confined trade with Tibet to four months of the year (May, June, October and November). The duration of a trading trip might last from 12 days to a month.

During the months when there was not much agricultural work and trade was not possible, spinning and weaving were done by both men and women who made their own clothes from sheep and yak and nak wool. Yak hair blankets were sold for a good price in the lowlands. A 1.2m x 2.4m yak hair blanket (Chara) weighing approximately 5 kg was often sold for 60 pathis of maize or millet during 1950's (Nima Tashi, pers. comm., 1982).

A wide range of small-scale handicrafts was produced in Khumbu. Most of the products such as wooden vessels, wooden-saddles, decorative carpentry were produced for their own use. Stone carvings, primarily prayers on rock slates and boulders, and carving on wood, were done by specialists. Another kind of specialization, derived from Tibetan culture, was scroll (T'anka) and wall or fresco painting. The artist is given the Sherpa title of respect, Kappa, and his work traditionally depicts Buddhist history and scripture, and is found in monasteries, temples and private houses of the region. Recently Khumbu artists have begun paintings for the tourists, their subject being stylized landscapes showing the Sherpa villages set among the mountains of the region.

Professional bootmakers, tailors and dressmakers come from ethnic groups other than Sherpa, and metal-workers (blacksmiths) belong to one of the untouchable castes of Hindu society. These crafts and carpentry are considered

worthy skills but not highly esteemed by Sherpa people in the Khumbu region. It is becoming increasingly common and cheaper to purchase synthetic materials and fabrics from Kathmandu. However, spinning and weaving yak hair blankets, aprons and woolen fabric are still occupations that are carried on today for personal use and for the tourist market.

2.5 FOREST USE PATTERN AND CONTROL

Traditionally, the forests of Khumbu served as a source of fuel wood, building materials, furniture, leaf-litter for compost and cattle grazing. The patches of original forest remnants found near monasteries and inaccessible areas show that there was dense forests near all the villages. The size of the timber seen in old houses and the memories of some of the residents showed that the slopes of the Khumbu region once provided abundant firewood (Pawson et al. 1984). The land between Namche and Khumjung (present Syangboche airfield) was covered with dense juniper forests. Present-day Namche Bazar was once called "Nauche", which means "dense forest" in Sherpa dialect (Nima Tashi, pers. comm., 1982).

The forests of Khumbu were common property and were looked after by the community which appointed a "forest guard" (shingi nawa) on a rotational basis. The forest guard was responsible for the preservation of protected

forest land and the husbandry of the communities' wood and timber resources. His main job was to prevent the irresponsible cutting of live trees. However, limited felling was permitted for special purposes such as house-building, and wood could be cut for ceremonial purposes or for funeral pyres. The forest guard would also inspect the stock of wood in people's houses and demand an explanation for unusual quantities. Fining of offenders took place in a public gathering. Fines were collected and most of them were spent on village monasteries or on public works such as maintenance of tracks and bridges (Sherpa, 1979).

The forest guard system survived effectively by perpetuating through stringent village enforced laws the attitude that the common forest land belonged to all of the Sherpas.

Similarly, with regard to livestock, in every village two men were elected on a rotational basis to control the use of the village agricultural land and cattle breeding. The main duties of these men, (Lotok-nawa) were to coordinate agricultural activities and to prevent damage to crops. Livestock were removed from the main villages from July to the end of September. During this time, potatoes and buckwheat were harvested and cattle owners were fined if their cattle strayed into meadows or a field of potatoes or buckwheat (Haimendorf, 1964).

2.6 CONCLUSION

From the literature up to 1950, it is apparent that the people lived in an undisturbed, isolated region. There were no political, social or cultural interferences from outside the Khumbu region. Animal husbandry and agriculture were the main traditional means of livelihood for more than 450 years. The more wealthy Sherpas participated in the activities of trade with Tibet and the lowlands of Nepal. Haimendorf (1964) points out that an average family of farmers could produce more food than its members' daily needs. The surplus of animal and agricultural produce traditionally went to maintain the monasteries and religious ceremonies. Local control over natural resources was effective and resource exploitation did not exceed the resource base (Haimendorf, 1975).

Chapter III

TRANSITIONAL FARMING ECONOMY

3.1 INTRODUCTION

Before 1960 trade outside Khumbu accounted for one-third of the required total income. Since then a number of factors have changed the economy and lifestyle of the Sherpas. First, due to the Tibetan uprising against the Chinese communists' presence in their country and affairs, the trade route between Nepal and Tibet was closed. This limitation of import and export imposed by both the Chinese and Nepalese governments forced the Sherpas to choose or look for new sources of income.

> Fortunately for the Sherpas the checks on their trading activities imposed by political events in a neighboring county coincided with the opening of mountaineering and tourism which soon became major sources of income (Haimendorf, 1975).

The Sherpas now work as high altitude guides, climbers and porters for mountaineering expeditions. This new trend of employment to earn cash has enabled the Sherpa people to enjoy a better standard of living. Most trade now takes place in Namche Bazar, with the people from the lowlands of

Nepal bringing their grains to sell at a weekly market (Fantin, 1978). Barter trade has now become less common and cash transactions are used for buying grains (Pawson et al. 1984).

Chinese occupation of Tibet changed many aspects of Khumbu Sherpa life in terms of economy, lifestyle, culture, community spirit and the environment. Along with the changes in economic pattern, the traditional contacts for cultural exchanges have come to a standstill, since the Chinese destroyed some of the monasteries, such as Rongbuk in Tibet.

A large influx of Tibetan refugees entered into Khumbu via Nangpa-la in the late 1950's. Some of the refugees moved to the lower valleys and finally to India, but many of them with large herds of cattle have settled permanently in Khumbu and increased the local population. As a result of over-population and not enough grazing land or fodder to sustain the increased number of livestock, thousands of cattle died. These increases in population have resulted in serious deforestation and over-grazing leading to soil erosion problems. The limited land for settlement, cultivation and fire-wood collection in the Khumbu made any increase in population difficult to accommodate.

In the meantime, the government of Nepal (in 1956) introduced a forest nationalization Act to bring the forest

resources under the authority of the state. By this, the local control over the forest as discussed was taken away and put in the hands of the central government.

This generated the idea that "what belongs to everyone, belong to no one" and the "tragedy of the common"occurred. Garrett Hardin (1968) in his essay "The Tragedy of the Commons", discusses the rational decision of an individual which leads to a collectively irrational outcome. This is what happened in the Khumbu where selling firewood to mountaineering expeditions and tourists who used large quantities of the slow-growing resource for cooking and heating, gave the individual wood-seller a positive benefit while the negative impact on the forest was shared by all other Khumbu people. Thus the Khumbu ecosystem was disturbed by the compounding factors of the Tibetan refugee influx, nationalization of local control of the forests, and the emergence of tourism.

The alternate source of income from the tourism industry helped the Sherpas to deal with their limited crop production and other problems of population increase. With their earnings from tourism, Sherpas have been able to purchase their needed food grain from the lower valleys. The local people, as a result of tourist-related income enjoy higher standards of living than the country's many other remote ethnic minorities (Pawson et al. 1984). That this alteration to life style has not been without cost is

indicated by the present fuel wood crisis, erosion, the problem of waste and other social and physical impacts.

3.2 CHANGES IN AGRICULTURAL PROCESSES INCLUDING ANIMAL HUSBANDRY

Tourist trekking activities have created problems for agriculture. The involvement of so many persons in tourist trekking and mountaineering expeditions, often in regions outside Khumbu, has led to a labour shortage, particularly at planting and harvesting times. Today, many labourers hired from Pharak and Solu areas compensate for local manpower consumed in the trekking business. Production has diminished, however, partly because of the lessened motivation of such workers, and partly because there is less leaf-litter from the forests to mix with manure for fertilizing purposes.

The increased demand for potatoes and the corresponding inflation of all food prices have forced the Sherpas to try to keep up the production level. Agricultural activity in the Khumbu has not declined despite the labour shortage. There have been more fresh potato fields cleared and a new variety of potato introduced in the late 70's has flourished. A person from Khumjung brought seed potatoes from Helambu, another Sherpa township north-east of Kathmandu, and cultivated them (Pemba Tenzing, pers. comm., 1983). This new variety is not as tasty as the local variety but it produces three-fold in quantity.

As a by-product of the development of tourism, other new kinds of vegetables have been introduced to the region. The people of Khumbu now grow carrots, cabbage and other green vegetables in limited quantities. It is apparent that the agricultural work of Khumbu has not declined with the changes. This is partly due to the plain-like terrain, created by glaciers, which does not cause erosion of agricultural land as is common to the hill regions of Nepal where excessive runoff of water causes general flooding and erosion.

Other anticipated tourist related impacts have been changes in the pattern of animal husbandry. Haimendorf (1975) noted that the capital accumulated from tourism was invested for tourist related facilities, rather than for land and cattle which the traditional traders and early mountaineers had done.

Animal husbandry has always been important in the Sherpa economy. In the past, Yak and Nak were raised not only for meat, wool and dairy products but for the sale of calves. Crossbreeds were sold to Tibet and Pharak-Solu regions for a profit. The import of female Nak from Tibet and export of male crossbreeds to Tibet has stopped due to restrictions imposed by the Chinese officials. From the census Table 1 and 2, livestock survey comparison of two decades, it is evident that the animal numbers have not changed much.

TABLE 1

Livestock in the Main Villages in Khumbu 1978

	Yak farm	Namche Bazar	Khum-jung	Khunde	Phortse	Thame	Pang boche	TOTAL
Yak	12	51	62	40	95	134	75	469
Nak	54	31	121	109	260	496	175	1246
Male crossbr.	4	80	60	61	7	134	25	369
Female Cr.br.	2	49	98	56	12	103	24	344
Cow		82	80	37	31	126	39	395
Lang		8	8	5	3	31	7	62
Horse		1	1			2		4
Male sheep		11	11	4	1	46	4	77
Female sheep		57	51	44	17	189	4	362
Male goat		6	6		4	16	17	49
Female goat		16	67		13	32	25	153
	72	392	565	356	443	1309	393	3530
	2%	11%	16%	10%	13%	37%	11%	100%

Source: Bjonness, 1980.

TABLE 2

Census of Owners and Livestock in the Main Villages in Khumbu 1957

Village	cattle owners	male yak	female nak	male crossbreeds	female crossbreeds	lang	cow	TOTAL cattle	
Khumjung	(35)	14	333	24	15	13	56	455	16%
Khunde	(28)	2	316	35	2	17	16	388	13%
Thyangb.	(1)		23	4	2	1		30	1%
Milingbo	(5)	2	20		3		8	33	1%
Pangboche	(33)	2	228	7	2	3	12	254	9%
Phortse	(36)	16	454			8	17	495	17%
Namche Bazar	(28)		40	238	50	1	48	377	13%
Jaro	(3)	1	25				4	30	1%
Thame area	(91)	2	647	79	27	27	72	854	29%
	(258)	39	2086	387	101	70	233	2916	
		1%	72%	13%	4%	2%	8%		100%

Source: Haimendorf, 1975.

However, changes in the distribution and composition of herds have occurred.

There are fewer Yak and Nak, but more crossbreeds are found. They are grazed close to the main villages, unlike the hardier Yak and Nak which are taken to higher pastures. There is a greater number of small herd owners (Bjonness,1980), which indicates that livestock ownership at present is a less exclusive occupation.

The main reason for herding more male Yak and crossbreed (Zopkio) is tourism's demand for them for portering purposes. The shortage of manpower to herd large numbers of nak and yak and relatively easier means of herding milk producing crossbreeds have created more smaller herd owners. Animal husbandry has become less profitable as a full time occupation with the rise of tourism in the Khumbu. This has resulted in a pattern of change in composition from a majority of nak (2086) in 1957 to a majority of crossbreeds and yak in 1978 (see table 1 and 2). Grazing of crossbreeds, sheep, and goat close to the villages makes their dairy products and carrying abilities (for portering) more accessible to the villages and tourist market.

According to Haimendorf, there were very few people who kept sheep and goats in 1957 and their importance for the economy was negligible. However, by 1982, 500 goats and 800 sheep were raised in Khumbu. The main reasons for breeding

these animals were for meat and wool. There is a great demand for goat meat by many Hindu Nepalese officials and army employees who do not eat beef for religious reasons. Since the owners were generally of lower income bracket and had no summer pastures (goths) higher up in the valley, sheep and goats were grazed close to the main villages, further overgrazing the nearby pastures. Goats tend to chew down to the roots of the grass, preventing it from growing back which creates more barren land. Goats generally are able to climb fences and create problems for forest seedlings in the nurseries and private vegetable gardens. As a result, National Park office in consultation with the village panchayats of Namche and Khumjung in May 1983, removed all goats from the Park. The goat owners were compensated for their losses with the financial help of the Sir Edmund Hillary Foundation.

Due to the labour shortage created by tourism, Khumbu people have less time to take their herds to higher summer pastures. The traditional grazing pattern (transhumance)in which the herds are moved from one pasture to another according to the grass conditions is becoming less common. This pattern of animal husbandry has caused severe overgrazing in pastures adjacent to the villages. Forest depletion due to firewood collection, and browsing and overgrazing have led to depletion of vegetation cover in many areas. There is increased pressure on overgrazed land

in the region due to deforestation and increased demand for fodder.

The livestock census of 1957, 1971 and 1978 (Table 3) confirmed that the ownership structure changed from relatively few owners (258) with average herds of 11-12 animals to many owners (384) with fewer animals (6-7) in a herd. In the same period the proportion of animals in the households changed from many Yak and Nak, 73% of all big animals in 1957, to 57% in 1978 with more emphasis on crossbreeds. Thus animal husbandry is slowly changing from transhumance to a subsidiary settlement (Bjonness,1980). The Khumbu region tourism study (1977) concluded that the livestock farming is slowly diminishing, partly because of changes in Sherpas' values and expectations with more emphasis on tourism and trade, and partly because of less pasture land (Industrial Services Centre, 1977). This interpretation is not shared by the Sherpa community, who feel that the tendency to herd more male Yak and female crossbreeds (zom) is for economic reasons. The male yak, being a hardy animal,is in great demand for tourist trekking within the Khumbu and earns Rs 50 per animal per day (1983). The zom which produces twice as much milk as Nak are highly valued for their dairy products and tame disposition. Inflation and the demand for dairy products have increased the number of Zom in Khumbu as well as owners as illustrated in Table 4.

TABLE 3

Animal Ownership and Structure in Khumjung 1957, 1971 and 1978

	Total number		Households with	
	yak/nak	crossbr./cows	yak/nak	crossbr./cows
1957 (Haimendorf)	347	30-37	17	16
1971 (Haimendorf)	226	177	7	-
1978* (Livestock Survey)	188	247	5	31

Source: Haimendorf, 1975. * Bjonness, 1980 a.

TABLE 4

Distribution of Owners by Size of Herds

Animal number: (size of herd)	1-2	3-5	6-9	10-14	15-24	more 25	Total owners	%
Yak/nak	6	13	10	23	6	2	60	16%
Crossbreeds	23	21	18				62	16%
Cow	66	26					92	24%
Mix yak/nak/cows		55	45	33	27	10	170	44%
Number of owners	95	115	73	56	33	12	384	
	25%	30%	19%	15%	8%	3%		100%

Source: Bjonness, 1980 a.

3.3 MOUNTAINEERING AND TREKKING

Tourism began with the first mountaineering expeditions of the 1950's and has grown ever since; more than 175,000 non-Indian visitors came to Nepal in 1982. For 200 years Nepal had remained in isolation and only opened its gates to foreigners in 1951. After the overthrow of the Rana Regime in 1950, the Nepalese realized the importance of the tourist industry for viewing the arts and architecture of the cities and the rugged scenery of the mountain ranges. The flow of tourists was not recorded until 1962, and early figures for tourist numbers are not known. In the year 1962, the total number of non-Indian visitors to Nepal was 6179 (Industrial Services Centre, 1977) and tourism earnings amounted to Rs. 65,000 (U.S. $6500). In 1971, Nepal's total foreign exchange earnings increased to U.S. $2.2 million and by 1981 it reached U.S. $52 million (Jefferies, 1982). At present tourism brings the largest percentage share of the country's foreign exchange. Table 5 shows the annual non-Indian visitor numbers in Nepal.

The mountaineering and trekking tourist constitutes in general only 30% of total non-Indian visitors. However, the mountaineering and trekking tourist spends more time in Nepal, accounting for more than 37% of the nights spent in Nepal (Burger, 1978). Trekking routes consist of the Khumbu region north-east of Kathmandu; Langtang, Helambu, and Gosaikunda, north of Kathmandu; and Jomsom, and Annapurna

TABLE 5

Nepal Tourist Arrivals 1962-1982

Year	Total Number of Tourists	No. of Tourists (Non-Indian)	Percentile Change (Non-Indian)
1962	6,179	-	-
1966	12,567	-	-
1970	45,970	-	-
1974	89,838	72,601	-
1975	92,440	74,559	-3.5
1976	105,108	85,769	-15.0
1977	129,329	106,277	-24.0
1978	156,123	125,636	-18.2
1979	162,276	124,753	-0.7
1980	162,897	122,285	-2.0
1981	161,669	-	-
1982	175,448	-	-

Source: Annual Statistical Report, 1981. Dept. of Tourism, Nepal.

north east of Pokhara. These three main areas receive 90% of the trekkers. The Khumbu region's share of the trekkers has been an average of 29%.

As the most remote region in the world and the highest point on the earth's surface, Mt. Everest has been a focal point of international attention for over 60 years. Many nations sent expeditions to find routes and climb the peak even before the country was known to the East and West.

The history dates back to the middle of 19th century when British cartographers based in India conducted a survey of the mountain ranges in Nepal and Tibet. Detailed surveying was then restricted because of the political outlook in Tibet and Nepal. From the plains of India, they measured one mountain to 29,002 feet above sea level which was higher than any-other mountain peak. In 1852, the Surveyor General of India named the mountain after his predecessor, George Everest who had begun the survey. The Tibetan name of the mountain 'Chamolungmo' was not known to them. The mountain's true height of 29,028 feet (8484 m) was established only after the development of modern surveying techniques.

The British government recognized that the region was of minor strategic importance to them; however, they wanted to establish an imperialist presence by scaling that highest of all mountains. The scaling of a mountain such as Mt.

Everest provided a substitute for acquiring new territory. This attitude is reflected in all the climbers who have planted their country's flag on top to proclaim the achievement.

In 1860, faced with political setbacks, the British trained some Indians in the science of surveying and sent them North to explore. These Indian spies, dressed as pilgrims (yogi), carrying cartographic tools skillfully hidden in religious artifacts, travelled in the vicinity of the mountain people. These men brought back amazing tales of adventure and a mass of data that greatly expanded the knowledge of the Everest region. Noel (1927) describes the story of these Indian spies as follows:

> "They counted their every step by the revolution of their prayer wheels, or by the beads on their rosaries. At night they would write their notes on a roll of paper inside the prayer wheel. They recorded compass bearings of mountains and rivers passed, by means of little compasses cleverly disguised as amulets worn around their necks. They carried boiling point thermometers inside hollow walking sticks for the measurement of altitudes."

From the data brought back by these explorers, rough maps were drawn and mountaineers used these maps to explore the region.

In the period, 1921-1938 seven British climbing expeditions failed to reach the summit. Then, came the interruption of World War II and climbing resumed only in

1951 when the Swiss provided fierce competition to be the first to climb Mt. Everest. The successful ascent of Mt. Everest by the British in 1953 marked the beginning of a new era which continues to the present day. It seems that Sherpas' association with westerners goes back to the early exploration. They have worked as porters and guides in the mountains with the westerners in the regions of Tibet and Sikkim (Dawa Tenzing, pers. comm.,1982). According to Haimendorf (1953)

> "Sherpas had already earned a reputation as high altitude porters and sturdy mountaineers, though operating mainly outside their own homelands."

Thus as Nepal opened its frontiers to foreign visitors and mountaineers, it was not new for the Sherpas to work with westerners. They earned fame for themselves working hard on the mountains with their western sahibs. This relationship has become an important factor in their subsequent economic and social development.

TABLE 6

Number of Visitors in Sagarmatha National Park

1971/72	72/73	73/74	74/75	75/76	76/77	77/78
1406	2254	3503	3660	3550	3650	3850

1979	1980	1981	1982	1983	1984
4317	5310	5092	5069	4980	5276

Source: Sagarmatha National Park Office, Namche Bazar.

In 1971, 642 trekkers and mountaineers travelled to the Khumbu region and the Sherpa people seemed ready to make a significant commitment to take advantage of the rapidly growing tourist industry (Haimendorf, 1975). By 1984, the number of visitors had increased to 5,300 (Table 6). This rapid growth of tourism is largely due to the building of Luckla airstrip (1964), Syangboche airstrip, and the generally improved tourist facilities in Kathmandu and in the Khumbu region. The Luckla airstrip (30-45 minutes flying time from Kathmandu) is one day's walk from Jorsalle, the main entrance to the S.N.P. Twin engine planes with capacity of 19 passengers fly regularly to Luckla from Kathmandu during tourist trekking seasons.

The Park keeps records of all visitors and visitors in turn have to register and pay an entrance fee of Rs 60. The majority of visitors come to the region in two peak seasons, from October to December, and from the end of February to May. During the monsoon season from June to September, there is no plane service to Luckla and access to the Park on foot is dangerous due to the effects of monsoon rain. The short trekking period and the difficult access limit the number of visitors to the Park. The seasonal variation of tourist flow due to weather conditions, sometimes has been the cause of insufficient facilities, crowded trails, and temporary food and firewood shortages in the region.

3.3.1 Economic Impact

The majority of tourists (70%) come in organized groups bringing their own food and equipment. A survey of tourist trekking by Bjonness (1978) showed that the major proportion of the economic benefit goes to the trekking and travel agencies in Kathmandu. The main economic input to the local people derives mainly from manpower assistance. The organized groups employ two local people for every trekker on a trek. This figure does not include the animals used for transport. The local inhabitants work for tourists as Sirdar (group leader, organizer), Sherpa (guide, high altitude porter), porter, cook or climbing partner on an expedition. Large numbers of pack animals are used for transporting food and equipment. The 30% who come as individual trekkers, however, spend money locally on both lodging and food. An individual trekker spends less money on guides and porters. The local people now have constructed hotels, lodges and teashops along the main trekking routes. Fisher (1978) breaks down the tourist dollar as follows:

1. Management-Trekking co. Kathmandu 40%
2. Trail Expenses 5%
3. Food 20%
4. Guides & Porters 35%

In the allocation for food, 50% of the food is purchased in Kathmandu for most of the organized groups.

Mountaineering and trekking is the main source of cash income (90%) for the region. According to Fisher (1978) the majority of the people are involved in tourist business in one way or another. Thus the economy of the Khumbu people has been extensively reoriented towards tourism. The large sums of money being earned by the region are much more significant in comparison with the income per capita of an average Nepali in the country ($140 p.a.). However, the higher income among the Sherpas coupled with the increase in demand for food and fuel by the tourists have escalated the market price, and monetary gain of the Sherpa is consumed by inflation. Most of the goods, except some staple foods, potato, buckwheat, and some dairy products, and the firewood, must be brought in from outside of Khumbu.

3.3.2 Inflation

Tourism in the area also has directly affected local food prices at the market. The Sherpa people are dependent for their food grain supply on lower valleys. On top of this, much of the trekkers' and mountaineers' bulk food is purchased locally, escalating the market price. The higher incomes of the Sherpas also drive prices up. The economic situation of the Sherpas has improved to some extent but their savings are low.

The high income most Sherpas now receive from tourism is absorbed by the high cost of living. Since they can afford

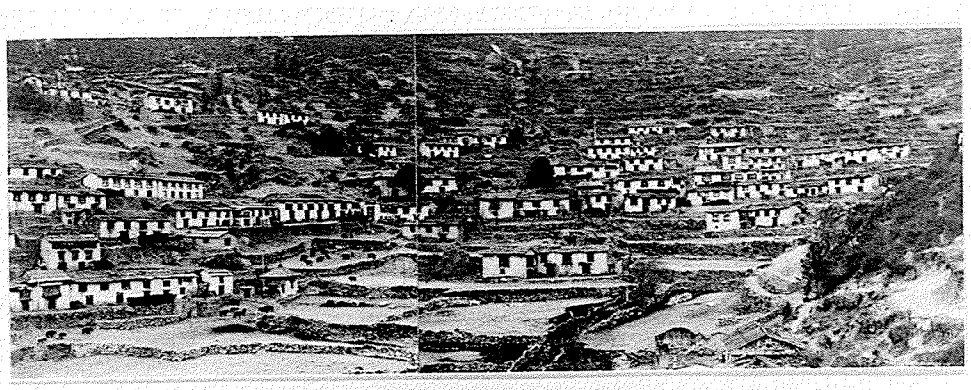
to, Sherpas are now eating more and better. Items such as rice, sugar, and eggs, which were luxury items before the 1960's, are now quite commonly used. The most seriously affected by this trend of inflation are those who still practice agriculture, and monasteries, and those whose incomes do not come from tourism. Inflation has not only affected the local people but also the tourists. In 1967, a trekking agency provided trekkers with meals, sirdar, porter, tents, and sleeping bag for $17 a day (Paige, pers. comm., 1984). By 1984, the same trekking company charged $65 per day without sleeping bags. The group sizes varied from 3-8 members in 1967 to 10-20 members in 1984.

3.3.3 Environmental Impact

Originally, scarce resource, the 'forest' was used by Sherpas only for construction and fuel consumption. With the large influx of tourists, the use of slow-growing trees in the region became a booming business for many people. Before the adoption of fuel use regulations by the National Park, it was estimated that the additional fuel consumption attributable to a yearly influx of 4,200 tourists during the four-month trekking season was approximately 10% above the normal requirements of the 3,500 local inhabitants (Industrial Services Centre,1977). According to Sherpa (1979) 5,000 kg of firewood are consumed per household per year. This figure does not include timber used for house

repair and new house construction, or wood used for ceremonial and cremation purposes.

In addition to local requirements, trekkers spend an average of 14 days in the Park, necessitating that their own and their porters' food be cooked on open fires. The larger mountaineering expeditions are particularly heavy consumers of firewood. On average 5 mountaineering expeditions visit Khumbu each year and spend more than two months in the region for climbing. The use of firewood by mountaineering expeditions and organized trekking groups has been sharply curtailed since 1981, as a result of the Park's regulation requiring all visitors to bring their own cooking fuel. Local hotels and lodges still use firewood as the main source of cooking fuel. Extensive tourist-related construction has taken place along the main trekking routes i.e. Namche to Everest Base camp-Kalopather trail. There are now at least 20 lodges and teashops constructed in Namche. In contrast to these places most visited by tourists, other villages such as Phortse and Thame are not so much affected by modernization. Thus, the impact of tourism in human settlements has varied from village to village (Figure 4 and 5). Another tourist related impact in Khumbu at present is waste. Despite the National Park regulation that visitors remove or bury trash, trails, campsites and mountain slopes are becoming increasingly



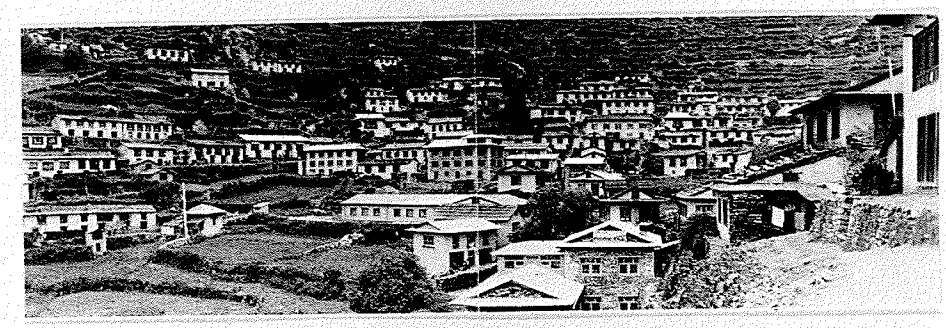


Figure 4: Views of the central area of Namche Bazar, taken in 1970 (upper) and in 1982 (lower). Extensive construction has taken place, all of it related to tourism. New buildings include a bank, grocery stores, tea and chang (beer) shops, and tourist lodges.

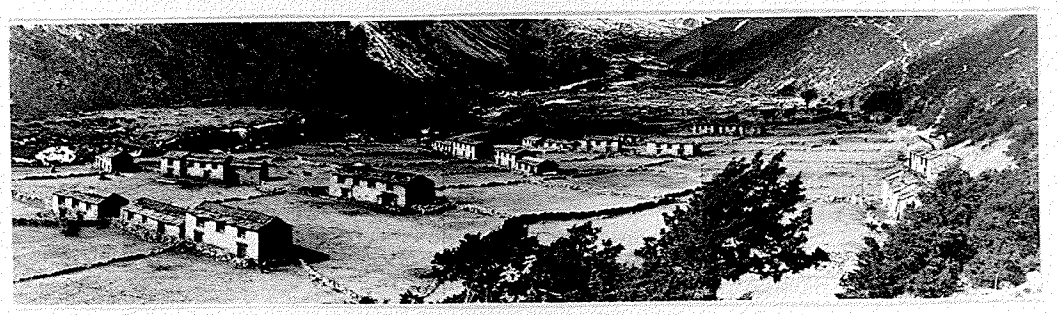


Figure 5: View of Thame village in 1970. Rarely visited by trekkers, the Thame valley has undergone little change in the past 12 years, and a photograph taken in 1982 (not reproduced here) shows no visible development.

Photographs courtesy of I.G. Pawson, Univ. of California. U.S.A.

littered. Waste from the loads of canned and packaged goods brought year after year in large quantities by trekkers and climbers pose a visual problem on the trails in Khumbu. Also lack of toilet facilities on the trail and the presence on the landscape of multicolored toilet papers of tourist origin are an eyesore.

3.4 CONCLUSION

Tourism has had both positive and negative economic effects. The economic changes brought about by tourists in the Khumbu region are positive. On average one member of every household is engaged in tourist business and has a good income. The Sherpa people are now managing 30% of the trekking companies in Kathmandu and have secured the tourist trekking jobs. On the other hand, the demands of trekkers has had negative effects on local society, inflation and environmental damage such as fuelwood shortage, litter and soil erosion being among the worst effects.

Since it makes up such a large part of Khumbu economy, the stability of tourism is an important issue. The high degree of national as well as local dependency on tourism may lead to serious economic problems if the balance of a complex set of factors - political, economic, environmental, energy related, aesthetic is disturbed. The political stability - or lack of it - of Nepal and her neighbors strongly affects the pattern of international tourism to

Nepal as does the state of the energy crises, economic depression or the current government in the western industrialized nations and Japan. Equally, unemployment and monetary fluctuations or restrictions can disrupt the flow of tourism, as in 1983 when France imposed currency restrictions in the amount of U.S. $400 on her travelling citizens. As a result, some of the trekking and tour agencies in Nepal dealing specifically with French tourists nearly went out of business.

At present the elasticity of demand for Khumbu as a tourist resort is relatively high due in part to the appeal of seeing or climbing the highest mountain in the world, and in part to the popularity of the local people and their fame outside Nepal as mountain people. However, as former Himalayan Trust doctor John Mckinnon (1974) put it

> "who will visit 'Khumbu' if this landscape becomes a desert and littered with rubbish."

The demand will surely decrease if the environment deteriorates further with more litter, deforestation and soil erosion. This will be discussed more in detail in Chapter lV. The question remains to be asked "What will the Sherpa people do if tourism stops tomorrow?" "Tourists are something like the floods that plague Bihar and Utter Pradesh" (Nawang Tenzing Zangpo,the High Lama of Tengboche) as quoted by Fisher (1978). Tourists come every year in an uncontrolled flow. Too much rain in the monsoon causes severe floods and destruction. And too little rain causes

food shortages and hunger. In other words, as floods are unpredictable, similarly tourists can boom or stop at any time. The fact that 90% of the population in Khumbu still own land in Khumbu and even the affluent Sherpas now living in Kathmandu still hold on to their land and houses in the Khumbu indicates that they are prepared to make the changes that would come with the "drying up of the flow." Similarly, many tourist guides have lucrative side lines in trade with Tibet, Hong Kong and India.

If a disruption of tourism occurs, two major trends may develop. First, it is probable that the standard of living will drop considerably. Secondly, the younger generation will seek jobs in government and business in Kathmandu. This is made possible by the increasing number of Sherpa children being educated in the schools. Future economic options remain open for Khumbu since only a small percentage of the people have specialized solely in tourism. The main option would be to return to traditional means of livelihood, farming and trading. Trading has been revived in the last decade and it is expanding, however it has not resumed the place it once held in the Sherpa economy.

3.5 SOCIAL AND POLITICAL CHANGES

As in many countries around the world, the development of tourism brought changes in social and cultural values in Nepal and specifically in Khumbu. The new sources of cash income and western influence have affected the Sherpas' way of living and thinking processes. Today, there is high mobility among the young people in the society. Increasing knowledge and exposure to the outside world through their job contacts have broadened their ideas and increased their expectations for a better life. Before, the sense of self-identity in the society was very important, and the power and image of a person depended upon how much he cared for the community (Nima Tashi, pers. comm., 1982). Today an educated person, or an experienced guide, or a farmer for that matter, does not care or, more significant, has no time to participate in local politics and the welfare of the community. This point illustrates the strong influence of the "individualistic behaviour" of their counterparts. Since almost every household at present in Khumbu has at least one member involved in the tourism business, (Fisher, 1978), the people have experienced the rapid development of a monetary economy.

Massive employment in tourism causes some of the men to spend almost ten months a year away from their homes and families. Generally those involved in tourism spend more time out of Khumbu than at home, which puts more stress on

family life. The number of men and the months of their absence from Khumbu at the present time far exceeds the numbers for the traditional trade to Tibet or India.

One of the most disturbing effects on the social life of the Sherpa's is change in the population structure. A study by Pawson et al. (1984) showed that the population growth of Khumbu Sherpas for a decade has been at a virtual standstill, births barely outnumbering deaths. Two factors account for this: the married heads of households engaged in tourist business are away from home for many months of the year, and deaths on various expeditions have taken a heavy toll. There were 58 Sherpas recorded as being killed on expeditions between 1950 until mid-1974 (Fisher, 1978). Thus, there is not only 'brain drain' from Khumbu but economic loss because the most able men are being killed on the mountain. Finally, emigration of trained and educated men has diminished social and political activity in the region.

3.5.1 Westernization

With more than half a century's (60 odd years) association with westerners, and opportunities to travel abroad, Sherpas have learned many western and oriental languages, and acquired new tastes. It is common for a Sherpa guide to speak 6 to 8 languages and to be able to prepare a variety of dishes uncommon to Khumbu thanks, to

the diversity of nationalities visiting the Khumbu region. Table 7 illustrates the origin of visitors to the Park over a two year period.

TABLE 7

National Origins of Visitors in Sagarmatha (Mount Everest) National Park, 1979 - 1980

Country of origin	Number of visitors	Percent
U.S.A.	1,778	18.4
Japan	1,602	16.6
Germany	1,086	11.2
France	994	9.8
Australia	877	9.1
United Kingdom	877	9.1
Other	2,494	25.8
Total visitors surveyed	9,658	100.00

Source: Sagarmatha National Park Office, Namche Bazar.

Most Sherpa men have switched from their traditional clothing to western clothing such as pants, down Parkas, jackets, boots, shirts and even sun glasses. This may be due in part to the practicality of western clothes on the mountain. Women's dress, on the other hand, has not changed from the traditional style; it seems to be more comfortable, practical and more suitable in the Khumbu environment. It is common to see all Sherpa men and women, whether educated, wealthy tourist managers or living outside of Khumbu, wear the traditional Tibetan style Chuwe dress on ceremonial occasions.

It is significant that the Sherpas have maintained a strong cultural identity despite the fact that they have mingled with a mass of more wealthy people from all over the

world for a long time. They have established a strong affinity to their own society and they are recognized as a member of the community. Their religious beliefs and clan bonds have made them a distinct group. The achievements of the Sherpa people as entrepreneurs in trekking and mountaineering have been due to their reputation for loyalty, trustworthiness, adaptability and good naturedness; all qualities gained in their harsh environment. Sherpas who have travelled overseas come back with strong views to reinforce their own culture. The segregation of old people in much of western society is an example that has taught the educated and well travelled Sherpas to value their own tradition even more. In fact, their beliefs and participation in their own religion have become stronger. In the summer of 1981, the Head Lama of Tengboche raised $20,000 in two days from Sherpa people for the construction of a monastery in Kathmandu, a feat that would have been impossible in the early 1960's. In the summer of 1980 youths involved in tourism volunteered to restore Mani Thunkyur (series of prayer wheels) in Namche and to construct a chorten in Khumjung (1984). However, the important religious practices of carving or having carved prayers on rock slates or boulders, and of building chortens, are less frequently observed, possibly because of inflation and lack of free time.

3.5.2 Political Changes

Prior to the introduction of panchayat democracy in Nepal, Rana Regimes appointed a Pembu (Mayor) in each major village to collect taxes on agricultural land and fines for breaking social laws. Two men were elected yearly in every village to prevent damage to crops. These men, Lotok Nawa, controlled cattle breeding and the use of agricultural land. A forest guard Shingi-nawa was appointed to keep watch on the village's forests and the community's wood and timber resources. Also appointed were the two officials Chorumba and Chorpen who were caretakers of the village Gonda (temple) and were responsible for its upkeep and administration and who maintained law and order during the yearly festivals. Among these traditional wardens, Shingi-nawas had ceased to function except in the village of Phortse, because the large sums of money paid for firewood soon undermined the authority of Shingi-nawa. This responsibility is now taken over by the National Park staff. However, efforts are being made to reorganize the traditional system of forest protection.

The present form of government, the panchayat democracy, was introduced in 1961 by the late King Mahendra Bir Bikram Shah Dev. Its purpose was to work towards unifying the country into a common political system with a national consciousness. The system interconnects all levels of government from village to national and the king, with its

four tier system: the village, district, zonal and national panchayat. The integration of Khumbu local government into Nepal's national system of panchayat democracy has been accomplished and there is generally a high voter turnout at election time in Khumbu.

It is true that tourism has paved the national government's way into the remote and inaccessible Khumbu region, for the region was visited by very few government officials prior to 1960. The development of tourism has increased the presence of non-Sherpa Nepalese in the region. The number of government officials in Namche has increased from 11.7% - 1970 to 20.4% in 1982 (Pawson et al. 1984). Fisher (1978) records the changes as follows:

> "In 1964, Government presence in Khumbu was represented by a Post Office and Police checkpost in Namche. By 1978 there were two airstrips, a meteorological station, village panchayat secretaries from outside Khumbu, a medical station, a Government Yak Farm, a bank providing such services as savings accounts and encashment of travellers' cheques, and a National Park which includes all of upper Khumbu (excluding, in theory, the villages themselves), plus the original post office and checkpost in Namche and an auxiliary checkpost in Thame."

The increased Nepali official presence in SNP is attributed to the importance of the region and its tourist industry. The presence of non-Sherpa Nepalese in the region (mostly in Namche) has had little impact and is viewed as harmless by the Sherpa community. However, the establishment of S.N.P. has been a cause for fear in the Sherpas, a matter which will be discussed in the next chapter.

3.6 CONCLUSION

The traditional subsistence agriculture has changed toward a transitional agricultural system. The traditional practices of land resource management are disrupted by internal and external political, social and economic factors. There is uncontrolled expansion of tourism exerting increased demand on the local manpower, food and forest resources. The Sherpa people are becoming increasingly dependent on cash income from tourism. The cash earned from tourism is used to purchase more grains, e.g. rice, corn, millet and barley, than was previously consumed. The modernization caused by tourism is becoming more heavily dependent on the external cash income and imported food supply.

Chapter IV

NATURE CONSERVATION STRATEGY

4.1 WORLD CONSERVATION STRATEGY (WCS) AND NEPAL

Nepal is an agricultural country in which 90% of the population is employed in agriculture. Eighty percent of Nepal's exports is based on agricultural products, and 87% of the nation's energy is supplied by wood forests (World Bank, 1979). Nepal depends heavily on its renewable natural resources. The problem of forest depletion is discussed by many authors in much of the literature on Nepal. The conservation of the forest resource is seen to be vital not only to the people of Nepal but also to the neighboring countries (Emmel, 1977). The major rivers run generally in a north-south direction. During the monsoon season, the bare slopes of Nepal resulting from erosion, send flood waters to India and Bangladesh. Precious top soil is washed down year by year, forming alluvial soil deposits in India. Extensive use of the axe and hoe in the Himalayas has reduced the rich wildlife to a mere fraction of its former abundance (Mishra, 1982).

The government of Nepal initiated a wildlife conservation programme in the early 1970's. A number of efforts were

made to protect the diminishing wildlife resources and their habitat. In 1973, with the assistance of FAO and UNDP, Nepal established a National Park and Wildlife Conservation office. Five National Parks and four reserves (wildlife) were created throughout the country (Shah, 1978 and Mishra, 1982). These protected areas are representative of various ecosystems in the country.

There is, however, a considerable problem relating to Park management. All of the National Parks: langtang, Sagarmatha, Dolpo, Rara, and Chitawan -- have been created where people were already living. The government has been able to relocate the people from Rara and Chitawan National Parks to outside the Park boundaries, but the people encompassed by the other parks have their traditional rights to make use of the Parks' resources and have been part of the ecosystem in these Parks for a long time. Therefore, relocating the inhabitants from the other Parks hasn't been feasible economically or ecologically. The government, on the one hand, is establishing Parks and on the other hand encouraging the use of the area for tourism to earn foreign currency (Bjonness, 1980 b).

Despite the various problems Nepal faces, it has created within a decade six National Parks, five wildlife reserves and a hunting (recreational) reserve totalling 5 % of the land surface in the country.

The most recent achievement in the field of conservation in Nepal is its willingness to implement 'Nature conservation strategy (NCS). Nepal is one of the first developing counties to take initiative in NCS, a model developed from the WCS.

The World Conservation Strategy (WCS) was commissioned by the United Nations Environment Programme (UNEP) in 1980, funded by UNEP and the World Wildlife Fund (WWF) and prepared by the International Union for the Conservation of Nature and Natural Resources (IUCN). The strategy calls for integration of 'living resource conservation and sustainable development.' There can be little development on a sustainable basis without conservation of the resources that provide the input for development. It further points out that 'living resources are renewable if conserved; and they are destructible if not.'

The WCS proposes that "developers and conservationists work together to utilize resources so that they can yield the greatest sustainable benefit to present generations while maintaining their potential to meet the needs and aspirations of future generations" (IUCN, 1980). It outlines conservation requirements and priorities such as preservation, maintenance, sustainable utilization, restoration, and enhancement of the natural environment. It also suggests guidelines for action to break down the polarization of interest between conservationists and developers.

The basic aim of the WCS is the conservation of living resources and its continued use for the "survival and well being of all mankind."

Seeing the strategic importance of the WCS, the government of Nepal with the assistance of IUCN initiated a NCS in 1983. The aim of the strategy is to bring mutual co-operation between different government departments, organizations and private sectors to achieve conservation of natural resources. The strategy gives most attention to its potential as an educational tool to bring co-operation among the decision makers in conservation schemes. The other priorities of NCS according to IUCN (1983) are pollution control, further afforestation, conservation of farms and forestry genetic resources, and conservation courses for teachers. The success of NCS can well be dependent upon the 'National Planning Commission,' as the commission is responsible for planning and screening development projects in the country. It will be the responsibility of the commission to aid conservation by setting priorities of conservation projects and by stopping environmentally unsound development projects. At present, there is little co-ordination between the government departments, private sectors and donor agencies, which results in duplication of works, unsound projects, and environmentally, economically and socially harmful development projects. A classic example is the establishment of cement industries in

Kathmandu valley: the coal burning cement plants in Kathmandu are producing so much uncontrolled smoke, ash and dust that environmentalists compare its pollution problem with Tokyo and Los Angeles (The Globe and Mail, 10, 3, 1984).

NCS can play a major role for Nepal in aiding development with a better planning structure. As A.W. Clewsen, president of World Bank has said "it is less expensive to incorporate the environmental dimensions into project planning than to ignore them and pay the penalties at some future time" (Wyman, 1983). Nepal can not afford to make these mistakes. NCS is thus a right step taken by the Nepalese government to solve its environmental problems and to achieve sustainable development.

Nature conservation strategy can play an important role in SNP, specially to bring mutual understanding between different foreign aid agencies, government offices and the local people. It is hoped that the planning commission with its NCS will provide priorities in the conservation of forests, restoration of architectural buildings and monuments, and development in SNP.

4.2 ESTABLISHMENT OF SAGARMATHA NATIONAL PARK

The country's strategic position buffering India and China (two power blocks) has made it interesting to the western world, and its need, as one of the developing countries, has provided broad scope for foreign aid. A portion of this assistance has been directed at the conservation and management of the country's valuable wildlife resources and their habitats. Through bilateral developments and multinational organizations such as FAO/UNDP, assistance was sought to tackle the environmental problems Nepal faces as an agricultural country which is predominantly mountainous with a rapidly growing population (nearly 3% per annum). The threat posed by the intensified land use and tourism on the resource base provided part of the incentives for the establishment of Sagarmatha National Park, gazetted in 1976. The natural qualities of the region, particularly the Sagarmatha, the highest point on earth's surface and its surroundings have been the main driving force behind the government objective in making this region into a National Park.

Sagarmatha National Park was established with the technical and financial assistance of the New Zealand government (period 1976-1980). Management planning and development of the infrastructure was carried out largely by New Zealanders whose involvement with the Khumbu region followed Sir Edmund Hillary's successful ascent of Everest.

The 1974 New Zealand mission formed the basis of the present management plan and the development of lodges, the visitor centre, and the programme to train local people in Park management. In the beginning there was a great deal of local resentment of the Park and its regulations concerning firewood collection.

Sagarmatha National Park was established with the prime objective of conserving a high mountain ecosystem in a natural condition. It is an "area set aside for conservation, management, and utilization of animals, birds, vegetation or landscape together with natural environment" (National Park and Wildlife Conservation Act 2029, Nepal (1972/73) (Garrett,1981). Although this Act did not include the cultural components, the importance of and uniqueness of the culture of these high altitude dwellers have been recognized internationally. The internationally accepted criteria for National Park status were approved at the 11th general assembly of the IUCN (International Union for Conservation of Nature and Natural Resources) Twelfth Technical Meeting 1972. In these criteria recognition of human occupation, traditional land use practices, and unique cultural activities were given consideration (Bjonness, 1980 b). In the legal definition of the Park, the main villages and settlements were excluded from the Park boundary.

The management of the Park in the field has been difficult, due to the conflicting objectives of the

government. The local people are wholly dependent on the resources in the Park. The government wishes to develop the area for tourism to earn foreign currency (Bjonness, 1980 b); at the same time, it wants to practice conservation and manage the Park. On the local level, the traditional uses of the forest and the benefit from tourism are in conflict with the Park regulations. There is a lack of understanding between the national and local level about an approach to management of the Khumbu region.

4.2.1 Present Management Strategies of Sagarmatha National Park

Prior to the introduction of tourism and mountaineering, the Sherpas were managing a partly modified landscape under a system of social and community controls which ensured wisest use of forest resources and minimized long-term forest degradation. Recently, the system has broken down in the villages most affected by tourism. The negative attitude towards the Park and the cutting of green wood for firewood by local people continues. Forest use is no longer conducted under the principles of wise use and the best of the community interest.

National Park management, realizing the problem, has initiated several steps to minimize deforestation. It has introduced regulations that ensure prohibition of the sale of firewood to visitors, as well as the cutting of green

wood by the local inhabitants or visitors, which calls for self-sufficiency in fuel before entering the Park (Ridgeway, 1982). These regulations are being enforced in the field by the staff. The Park has a reforestation programme, planting seedlings raised from the locally collected seeds every year. The reforestation scheme is a long-term project, as the area's fastest growing timber species such as blue pine (Pinus wallichiana) will take 60 years to mature (Sherpa, 1983). The immediate need to minimize firewood demand is best done by enforcing the regulations strictly and conducting practical research in minimum impacts, low technology energy alternatives.

The World Heritage Committee provided funds for construction of a 27 kilowatt microhydro electricity facility in Namche and other site activities such as restoration of religious monuments, and reforestation. Several small scale technologies such as solar water heaters, backboiler water heaters and photovoltaic cells to charge batteries for electricity and communication were included. After completion of the project (October 1983) the Namche spring dried up to some extent and the water flow decreased so only 15 kilowatts of electricity were produced (The Rising Nepal 1, 11, 1983). The power was used to provide light to most houses (120) and cooking for 2 houses and 2 kitchens in the Park's office for day-time use.

Minimum impact alternate energy sources must continue to be researched. Involvement of local people in decision making to achieve the common goal is seen as important (Jefferies, 1982).

An advisory body of local representatives has been formed in the Park, to discuss and advise the Park authorities on matters of park management. The Park concept is new to the region and until the local people are fully aware of the Park objectives, law enforcement alone cannot succeed in achieving protection. An effort has been made to reinstitute the traditional system of forest protection by the local forests guards. Since 1982, one honorary guard from each ward (panchayat) in the village has been appointed by the panchayat assemblies to be forest guard, to help protect the village forests and notify the Park's office or the panchayat of any illegal cutting.

Local monitoring of tourism in the area is being done by Sagarmatha National Park whose headquarters is in Namche Bazar. The Park headquarters contain an administrative office, museum and library. The Park employees maintain tracks, bridges, and campsites and enforce regulations. The management has put no restrictions on visitor numbers so far. Restrictions have been supplied by nature, in that monsoonal and cold weather months and their effect on air travel limit the visitor coming into this region. However, Park imposed limitations on visitor numbers may come in the

future once the physical and social carrying capacity is well understood. The demands on the resource by the visitors during the spring and fall season have a marked effect on the environment and local market. Like North American Parks, Sagarmatha Park faces the problem of law enforcement, and of severe vegetational damage due to the intensive camping and other uses during the trekking season (Beyers, 1970). Thus proper management technique is required in the Park to best manage tourism. The balance between preservation and use must be achieved to provide a livelihood for the local inhabitants and to protect the national and international prestige of the highest Park in the world.

4.2.2 Public Participation

> "Without the support or at least worst acceptance by local people the future of any protected area cannot be considered secure since their search for the means for their own survival the temptation to take wildland resources from the area, or to encroach upon its boundaries, will tend to be irresistible." (Raymond F. Dasmann, 1982).

Nepalese Park officials and the experts involved in park planning appear to have overlooked the historical perspectives of Sherpa land use. There is no mention of local participation in either the management plan document or the Himalayan National Park Regulations. The creation of the National Park has been done without the consent or advice of the local people--those most directly affected,

positively and negatively--who have lived in and protected a land that has been given National Park status.

The establishment of SNP certainly became a real threat to the inhabitants and resulted in more cutting of firewood and timber despite the Park regulations (Ang Phurba, pers. comm., 1983). Many people feared that they might be removed from Khumbu and settled somewhere in the lowlands like the people from Rara National Park. During his visit in 1977, his Royal Highness Prince Gyanendra made a close observation from his helicopter and noticed many timber stacks lying in the forests. These were duly removed by the Park and since then all the timber required for house repair and construction has been cut outside the Park boundary only with permission obtained from the forest officer in Salleri, the district head office which is 5 days walking distance. In 1979, the Park used 65 army personnel (armed guards) to act as guards to apprehend illegal firewood collectors. Previously social and religious institutions had regulated resource use and exploitation in the area; for example two elected men controlled the whole of village forests. Although Sherpas are seen as an integral part of the Park concept, their land use practices have been regarded as ecologically inappropriate and environmentally unsound.

The Park personnel, despite the limitations cited, have made considerable efforts to involve local people in Park management. Three Park Wardens from the region were trained

in New Zealand under the N.Z. bilateral aid programme, and a Park Advisory Committee was set up.

4.2.3 Park Advisory Committee

The New Zealanders introduced some of their own systems of Park management, one of them the establishment of a 'Park Advisory Committee' (PAC), for which meetings were called twice a year. In a system similar to N.Z 'Parks Board' (which is slowly losing its popularity in N.Z.) the Park Advisory Committee consisted of the head lamas of Tengboche and Thame monasteries, pradhan panches (mayors) of Khumjung and Namche panchayats, ward chairmen of village panchayats,a representative of the district administration office, village elders, young people, and a blacksmith representing the minority group of the lower caste. Its main role was to discuss and advise the Park authorities on matters of park management, but PAC soon became inactive largely because the Nepalese counterpart officials did not take an interest in the matter.

Because of its potential as a source of local knowledge and its influence to prevent conflict between conservation rules and local demands, the PAC was reestablished in 1981. Since then, it has played a major role in conservation by information dissemination and achieving more co-operation and support for SNP. For example, PAC was instrumental in banning all the goats from the Park in 1983.

4.2.4 Reintroduction of Forest Guards

Until 1960, village law in Khumbu was made by influential people in an assembly called yul-thim meaning 'village law' in Sherpa. The appointment of their Shingi-nawa (forest guard) and Lotok-nawa (agricultural guard) took place during the yulthim. The Shingi-nawa took the responsibility of protecting the village-protected forests and similarly lotok-nawa enforced laws concerning livestock grazing and crop production. The lotok-nawa still practise despite all the changes in the Sherpa economy. On the other hand, the shingi-nawa system has failed because of several factors, such as people's willingness to pay high prices for firewood, the nationalization of forests, and the Tibetan refugee influx described earlier.

SNP administrators saw that law enforcement alone could not solve the problem of forest depletion without public support. There was a strong feeling as early as 1976, among the Park personnel and people involved in establishing the SNP, that the traditional system of honorary forest guards be reestablished. This did not happen until the monsoon of 1981, when 4 nawas were appointed in the home village of the warden, Khunde, by the village assembly with the support of the warden. The system proved successful and a year later in July 1982, one shingi nawa from each panchayat ward - totalling 18 nawas were appointed in the yearly village assemblies held at Khumjung and Namche panchayats. The

proposal put forward by the warden to reinstitute the nawa system received the unanimous vote of both village panchayat assemblies. The nawas are directly responsible to the warden and pradhan panch and their duty is to report any illegal cutting of greenwood in their respective areas. They are appointed in rotation by the decision of the village assembly. They will receive the support of the Park staff and panchayat and a modest cash prize for their work. This plan is well received by the Sherpa community and its activation certainly has counteracted the temptation to cut down more convenient sources of firewood such as live trees.

4.2.5 Conservation Education

Other forest conservation efforts include education programmes in Khumbu school and for Park visitors. A conservation education programme has been developed for Khumjung High School to teach the young people about the forests, birds, wildlife and Park activities. Field trips to plant nurseries, Park lodges and visitor centres have been conducted as part of the educational programme.

The development of a visitor centre at the Park headquarters in Namche has been completed and it has displays of the natural and cultural history of the region. A limited number of brochures has been distributed to the visitors. The local apathy towards the National Park, brought about by ignorance, can only be overcome by

conservation education. It is clearly realized that the Park managers must encourage the local people who cared for the natural resources of the area in the past to continue to do so and the younger generation must be taught to take an interest in nature conservation. It is necessary to make them realize that their future and livelihood is tied in with the future of the natural environment they live in.

4.3 REFORESTATION PROJECT

Sagarmatha National Park management has formulated and enforced regulations to stop the felling of live trees, and it requires that all trekkers and mountaineering expeditions be self sufficient in fuel while in the Park. Similarly, it has initiated reafforestation and intermediate technology energy programmes to overcome the area's single most serious problem, 'deforestation'.

Two plant nurseries were established between 1978 and 1979 by the N.Z. foresters who were sent from N.Z. under the volunteer Service Abroad programme. Their experience with raising locally collected seeds in the nursery has been proved successful. As a result, an area totalling 55 hectares have been planted with locally raised trees between 1980 and 1983 (Sherpa, 1983). It is expected that 60,000-100,000 seedlings will be planted every year between 1984 and 1988. Since N.Z. aid was withdrawn from SNP in June, 1981, the Sir Edmund Hillary Himalayan Trust has

provided the funds for the operation, development and plantation of the reforestation project. A portion of the fencing cost was provided by the World Heritage Fund. The Sir Edmund Hillary Foundation of Canada has now agreed to fund the project for a term of 5 years starting in 1984.

The main species of native plants raised in the nurseries so far are Abies spectabilis (fir), Pinus wallichiana (blue pine), Betula utilis (silver birch) and Salix sikkimiensis (willow). The scope for reforestation is vast, although the actual growth rate is very slow due to the high altitude and cold climate. There is good local support for the project and potential financial support from the Himalayan Trust and other donor agencies.

Once the woodlots around the main villages are well established, it is expected that villagers will give full support to the reforestation project. Then the expensive method of fencing may not be required. At present, most of the plantation sites have been fenced with dry rockwall (a local style) 1.5 m high by 0.5 m width to keep the livestock out. As the project expands, fencing becomes not only expensive but technically impossible due to the steepness of the bare slopes. The alternative is to increase the villagers' awareness of the plantation, so that accompanying shepherds will keep domestic stock away from young trees, or watchmen be stationed on or near the plantation sites. Since land is scarce, large amounts of it cannot be fenced

off at the expense of grazing land for the slow-growing fuelwood plantations. Therefore, grazing must be allowed on the woodlots where trees such as pine are planted, as those evergreen trees are not browsed as much by the livestock as are silver fir and willow. Also hay-making in the plantation enclosure must be allowed for the benefit of the local people. It is necessary to improve the forestry techniques so that the supply of wood can be improved. The use of fast-growing tree species is important in energy plantations. In the strictest sense, the Khumbu plantation programme is not a cost effective alternative in the short run. However its value as a soil stabilizer, wildlife habitat and benefit to the environment justifies its slow growth.

Forests are a renewable resource, but they require husbandry for maximum regeneration since they are 'not automatically self-renewing.' Forest resources in the Khumbu have been mined as a stock resource rather than managed as a renewable resource. The benefits of reforestation are the increased protection of the forests and the benefits to be derived from the future use of the resource. In addition to economic benefits, it provides environmental, recreational and aesthetic ones.

Because of the slow growth-rates, and the difficulty of planting trees on bare slopes, reforestation alone is no longer seen as a solution to the current problem of the fuel

wood crisis in Khumbu. The main purpose of the project so far has been to promote conservation of forest resources by involving local people in tree planting programmes. Thus an alternative to wood use in the form of minimum impact low technology energy sources should be introduced and supported.

4.4 ENERGY ALTERNATIVES IN SAGARMATHA NATIONAL PARK

Potential energy alternatives have been studied in the past and some examples of alternative energy technology are being tested in SNP. Firewood studies by Sherpa (1979), Stern (1983) and Hillary (1982) have indicated clearly that Khumbu region's energy demand must be supplemented by either more fuelwood, and more efficient use of the fuelwood, or by utilizing alternative sources of energy. The renewable energy technologies (solar, wind or hydroelectric) are seen to be most feasible in the countryside and particularly in Khumbu. Kerosene and butane gas have been used to some extent but due to increased costs and difficulty of transport to Khumbu, renewable energy sources are being introduced. Some examples of alternative sources of technology already in operation or under construction in Khumbu are described briefly as follows:

1. kerosene and butane gas
2. solar
    a. Photo-voltaic cells
    b. Solar water heaters
3. wetback water heater

4. improved stoves
5. charcoal
6. hydroelectricity

1. Kerosene and Butane Gas

A limited amount of kerosene is being used for lighting purposes. It was mainly used by the trekking and climbing groups for their pressurized telly-lamps. Traditionally Sherpas have used pine resins, dried pine wood and dry bamboo for lighting purposes, especially when spinning and weaving and during festivities. Since the introduction of kerosene in Khumbu it has been used in small quantities for wick lamps, and it has helped to alleviate some of the problems of live pine trees being slashed for resins and torches. The use of kerosene became more popular once the road between Kathmandu - Lamasangu was constructed. Because of its high price and local concept that of firewood as a 'free good', kerosene is not used for cooking purposes in Sherpa homes. However, the National Park legislation requiring all visitors to be self-sufficient in fuel, required that the organized trekking groups and expeditions cook their meals on kerosene stoves.

In 1981, SNP established a kerosene depot in Jorsalle (the Park entrance) with financial assistance from the German Alpine Club and Nepal Oil Corporation. It was intended that this depot help fulfill visitors' fuel

sufficiency regulations by having fuel for sale to meet trekkers' needs. Unfortunately, the depot operated only one year and because of supply difficulties and pricing policy the contractor gave up and no further attempt has been made to operate the depot again. There is, however, a steady market of kerosene in Namche Bazar brought from the Katahari-Okhaldunga direction of India. The price of this kerosene ranges from $0.75 to $1.20 a litre (1983). Since airline policy does not permit kerosene to be carried in aircraft, overland transportation adds greatly to the cost and kerosene in Khumbu costs four times more than in Kathmandu. Obviously this commercial energy source is not a cost effective alternative for the local people at present.

Butane gas, although mainly used by some mountaineering expeditions for both lighting and cooking purposes is relatively expensive, hard to get and difficult to transport in Khumbu. Thus its potential as an alternative fuel to firewood is limited also.

2. Solar

2(a) Photovoltaic Cells

Photovoltaic cells were initially introduced in SNP to charge car batteries to operate a radio system linking SNP with Kathmandu. This prototype has helped to charge batteries but main charging had to be done by a generator.

Since 1982, the World Heritage Committee approved funds for investigating alternatives to firewood and as a result 37 watt capacity solar cells were installed at the trekkers' lodges at Lobuche and Tengboche. The solar cells charged batteries to power two 21 watt D.C. light bulbs. Another panel was used at the Park H.Q. in Namche to charge the batteries for radio communication. Although this technology demonstrated in a small way its performance as an alternative to kerosene, its use is not feasible. Because of the high cost of the initial investment and their sophisticated nature, solar cells are not a cost effective alternative to kerosene, unless there is subsidization from the Park or foreign aid.

2(b) Solar Water Heaters

Solar water heaters were used in the Khunde hospital for heating water for the staff and the patients. They have proven successful and certainly reduced the use of firewood to heat water. With the assistance from World Heritage Fund, the Park has provided about a dozen of these flat tank solar water heaters, which were capable of holding 60 litres of water. These were made in Kathmandu and were installed in Namche, Khunde, Khumjung, Tengboche and Thame. The total cost of a solar water heater in Khumbu including installation was approximately Rs 2,000 but they were subsidized 50% by World Heritage Fund.

The people who have really taken advantage of this facility are Namche hotelliers who sell hot showers to trekkers at Rs 10 per shower. A solar water heater normally heats two showers a day except during the monsoon season when there is lot of cloud cover. The other people who purchased this type of water heater did so for the sake of having one as a status symbol. The main objective of this technology--to cut down use of firewood for heating water failed since only the hotelliers use it to earn extra income by providing more showers to trekkers. Obviously, this approach does not provide incentives for saving firewood in general.

3. Wetback water heater

The best received, efficient and simple technology so far developed has been the introduction of an auxilliary backboiler or wetback water heater. This is made in Kathmandu, with a welded flat tank of heavy milled steel sheet. It is connected by two pipes to a hot water storage tank (locally available wooden barrels also work) and water thermosyphons through the system. It is installed in the back or side of a traditional fire pit. The system heats water while meals are being prepared on the fireplace and does not require a stove hole solely for heating water. It is true that 1/4 of the firewood in a Sherpa house is consumed for heating water only.

The wetback water heater units are installed in Namche and other settlements and each installed system costs approximately Rs 800 . This wood conserving technology is thus efficient in private cost terms. The units are durable and the demand for them in Khumbu is high. This simple technology works well with all traditional stoves and serves a wider community, thus it is seen as one of the better firewood-saving alternatives in Khumbu. It may also be useful to many other hill or mountain settlements of Nepal, so it is a project well worth pursuing in the future.

4. Improved Stoves

Traditionally, 3 stones were used as the cooking place; this later was modified to an iron cooking tripod fire place. With the influence of Tibetans in late 1950's, a boxed fire hearth made up of stones and clay with several cooking holes was developed. The later model used less firewood than the traditional open fire and was found to be more fuel efficient. Smith (1981) found open fires to be only 6-8% efficient while popular airtight stoves were found to be 30-80% efficient. The introduction of western style stoves would not be economically feasible in the Khumbu region. These stoves cost on average US $1500 (Smith, 1981). The older people generally preferred the open fire place for maximum warmth. In an experiment, two airtight draft controlled stoves were installed in the lodges at Lobuche and Pheriche. These stoves were designed in

Kathmandu and transported to Khumbu. Because of its higher fuelbox temperatures and greater combustion efficiency the stove even burns green wood, which is illegal in SNP. In the end it was found that cooking takes more time on this "improved" stove than cooking directly on a fireplace.

Other improved stove designs have not been tested in SNP. It was generally felt that traditional fireplaces waste so much heat that improvements for fireplaces must be sought. To select one, the following criteria must be followed:

a. simple to understand, install and maintain
b. socially acceptable
c. relatively inexpensive

The introduction of fuel efficient stoves tested in the field could be one of the better means to save firewood in less time and at less cost. Stern (1983) found that an average family in Namche with six members used a minimum of 20 kilograms of firewood in a single day. The traditional Chulo (stoves) were found to be only 12-15% fuel efficient, with a tremendous amount of heat loss. A sample survey of new stoves in Budhanilkantha showed that new stoves used an average of 33% less firewood than the traditional chulo. If this is likely to be true in the Khumbu region also then it means a reduction of firewood from 20 kg/day to 14 kg/day i.e. a saving of 6 kg of firewood in an average home in

Namche per day. The feasibility of using more efficient stoves in the households depends on factors other than savings in fuelwood such as cost of new stove, social acceptance and subsidies. However, it is worthwhile to pursue a project of this kind by involving the local people in its dissemination.

5. Charcoal

A limited amount of charcoal is being used for heating purposes in SNP mainly by government offices, Khunde hospital and blacksmiths. Charcoal , is fired (made) outside of the Park boundary and brought in. The potential for charcoal is limited due to the forest depletion problem and forest regulations restricting charcoal production. Charcoal, when produced by primary means, involves the loss of all the heat value of the expelled volatiles. Thus 100 kg of charcoal has heating value only a little higher than the same weight of drywood but it represents at least 200 kg of wood.

6. Hydroelectricity

The World Heritage Committee funded a 27 kilowatt micro-hydroelectric facility in Namche Bazar as a first step to alleviate SNP's wood problem. The aim of the project was to save a tree a day. The project was started early in 1982 and completed in October 1983. The Namche spring was used as a source of water intake and the project has taken

advantage of the steep drop of the site below Namche to draw water down in a 80 meter penstock pipe. A small forebay tank was constructed to collect the spring water (Coburn, 1984).

Most of the houses (120) were provided with a 25-60 W electric bulb per room (410 rooms) and two hotels and 2 kitchens at the Park Headquarters were provided each with one kilowatt power for electric hot plates for daytime cooking only. Due to a shortage of Namche spring water, only 15 kilowatts of electricity have been produced which did not meet the requirements for lighting and cooking.

The salient features of this project are that its site location, including the power house, is away from the tourist trail, it has an underground transmission line, and the facility is managed by the local people. The micro hydro has great potential in the region. There were six hydro sites located by the Industrial Services Centre (1977) study. Namche project proved successful and it seemed that development of small and micro-hydro sites would be better than larger projects in Khumbu because of capital costs, environmental safety, and less impact on the people who use them (Coburn, 1984).

Yet to be determined are the long term social and economic impacts of the facility on Namche people. Observations made during the first year of operation

indicated that firewood consumption has not decreased although thorough research is needed to verify this.

The pricing of electricity to the consumers at rates of Rs 2 per kWh for lighting was higher than the price in Kathmandu. Since the majority of Namche households are profitably involved in tourist business this price has not affected them. If a similar project is constructed in other settlements, government subsidy or foreign aid may be needed.

From this experience with the close liaison with this and other energy alternative projects (1981 - June 1983) and from follow up done by correspondence it is urged that development of small and micro-hydroelectric projects be considered and the system be designed to provide for cooking and heating purposes in order to save firewood. The Namche hydro project was able to provide only lights due to shortage of water. The high cost of transport and scattered nature of the villages makes transmission line costs high and bigger plants would also require a dam, making it environmentally unsafe. The provision of electric lights only increases the use of firewood because people stay up late at night.

There are two other attempts to produce hydroelectricity in Khumbu. A 2 kW hydroelectricity project at Tengboche is currently being funded by the Department of National Parks

intended to provide power for both lighting and cooking. The second project, an Austrian-Nepal joint project located in Thame valley, is to provide 700-800 kW hydroelectricity. It was started in 1975 but, due to its geologically unstable position and transportation difficulties, the construction is still in a preliminary stage. This project could provide enough power to light and cook for Khumjung, Khunde and Namche (1500 people). However due to its unstable location and distance from transport, the project will probably have little effect in Khumbu.

4.5 CONCLUSION

Because of the large influx of tourists, and the fact that the local population and the hotels, lodges and tea houses depend solely on firewood as the sole source of fuel, an alternative source of energy is badly needed for SNP.

Most of the energy-conserving technologies described so far have been undertaken in close co-operation with and under the guidance of the author, then Warden of SNP. During the implementation of these technologies, valuable experience was gained indicating that all of these proved to be "technological show pieces" in the highest and most remote part of the world. These facilities were provided or installed in obvious places so that 5,000 visitors from every corner of the world could see the technological achievements. The tourists now can enjoy the electric

lights in their hotels and lodges and take hot showers while local inhabitants go their own way fetching water from a distance and collecting firewood sometimes 5 km away, using their own backs for carrying. It is clear that, because of its location, any project in Khumbu "...receives more media attention than other areas of Nepal" (Price, 1983). The question remains, what did these projects achieve? In a nutshell, valuable technical experience was gained, but many of the energy conserving technologies tested do not appear to be economically, technically, environmentally or socially applicable in SNP. Among the alternative energy sources so far tried in SNP, backboiler water heater has the greatest potential for saving firewood. It is simple, easy to install, inexpensive and easy to transport to Khumbu.

Micro-hydroelectric power is seen as a very good potential source of energy and there is the biggest resource for it in the region. Local consumption could be augmented by the use of power in small industries (e.g., handicrafts), and pumping water for drinking purposes. By putting the power to various uses, the price of electricity will be lower. It would be possible to operate small projects locally with some government loans. On the whole, local people must seek the assistance of the government or foreign aid for initial capital investment. Under its sixth development plan, the Nepal government is encouraging the establishment of many small or micro hydro projects on an

individual or communal basis in the country (Manandhar, 1982). The distribution of subsidized back boiler water heaters at minimal costs and electrification in the region hold the greatest promise of saving firewood. Also, conservation must play a major role in reducing the pressures on the Khumbu forest, for example introduction of improved stoves.

Three other alternative energy sources, which have their drawbacks in SNP, are briefly summarized:

Wind energy: Although power generation from wind is possible in the region, especially above 4000 m above sea level, it is not recommended because of the relatively high level of technical skill needed to operate and maintain it. It does not produce enough power to justify its establishment, and locating it on the ridges makes it aesthetically undesirable. It also needs constant, steady wind which is not available in the Khumbu valley.

Biogas: The optimum temperature for the operation of a biogas plant is 15-40°C and effective plants are located in the county at lower elevations where the warmer climatic conditions (temp. ranges from 20°C to 50°C) favour bacterial fermentation. Biogas is produced by bacterial decomposition in the absence of oxygen of animal waste and some crop residues to produce methane (CH_4) gas which is burned for cooking. The remaining sludge containing nitrogen (N2) can

be used as fertilizer. It takes the waste of about five animals to run a biogas plant which produces enough gas for a family of 5 or 6.

The main drawback of this technology in Khumbu is the agricultural regulation that bans cattle grazing in the villages from the middle of June until the middle of September at just the time that the temperature rises above 12°C. Thus biogas technology is not physically viable in Khumbu proper, but investigation should be made in the Park Corridor (Luckla to Jorsalle) where the temperature is suitable and the animal waste resources are available.

Solar cookers: The inconvenience of cooking outside, time limitation and socially unacceptable design made this alternative energy source unsuitable to pursue in the Khumbu.

Chapter V

THE RESOURCE BASE

5.1 LAND BASED RESOURCES

5.1.1 Introduction

Since a complete inventory of the natural resources of Khumbu would require a tremendous amount of field work and expertise, an attempt has been made to compile inventories of the resources and their supply base largely derived from secondary information and field observations. There has been no adequate inventories of forests, mineral resources, wildlife, landownership and income of people undertaken so far. Some guesswork was necessary in examining the actual and potential resource base in order to assess prospective problems and opportunities.

The Khumbu region forms a roughly triangular geographical unit encompassing upper catchments of the Dudh Kosi, Bhote Kosi, and Imja Khola bounded in the north by the summits of the high Himalayan mountains and terminating in the south near Jorsalle on Dudh Kosi (Figure 6). The Park consists mostly of steep and rugged terrain ranging from deep valley bottoms at Jorsalle (2,845 m a.s.l.) to the Mt Sagarmatha (8,848 m a.s.l.) a range of over 6000 m. There are deep

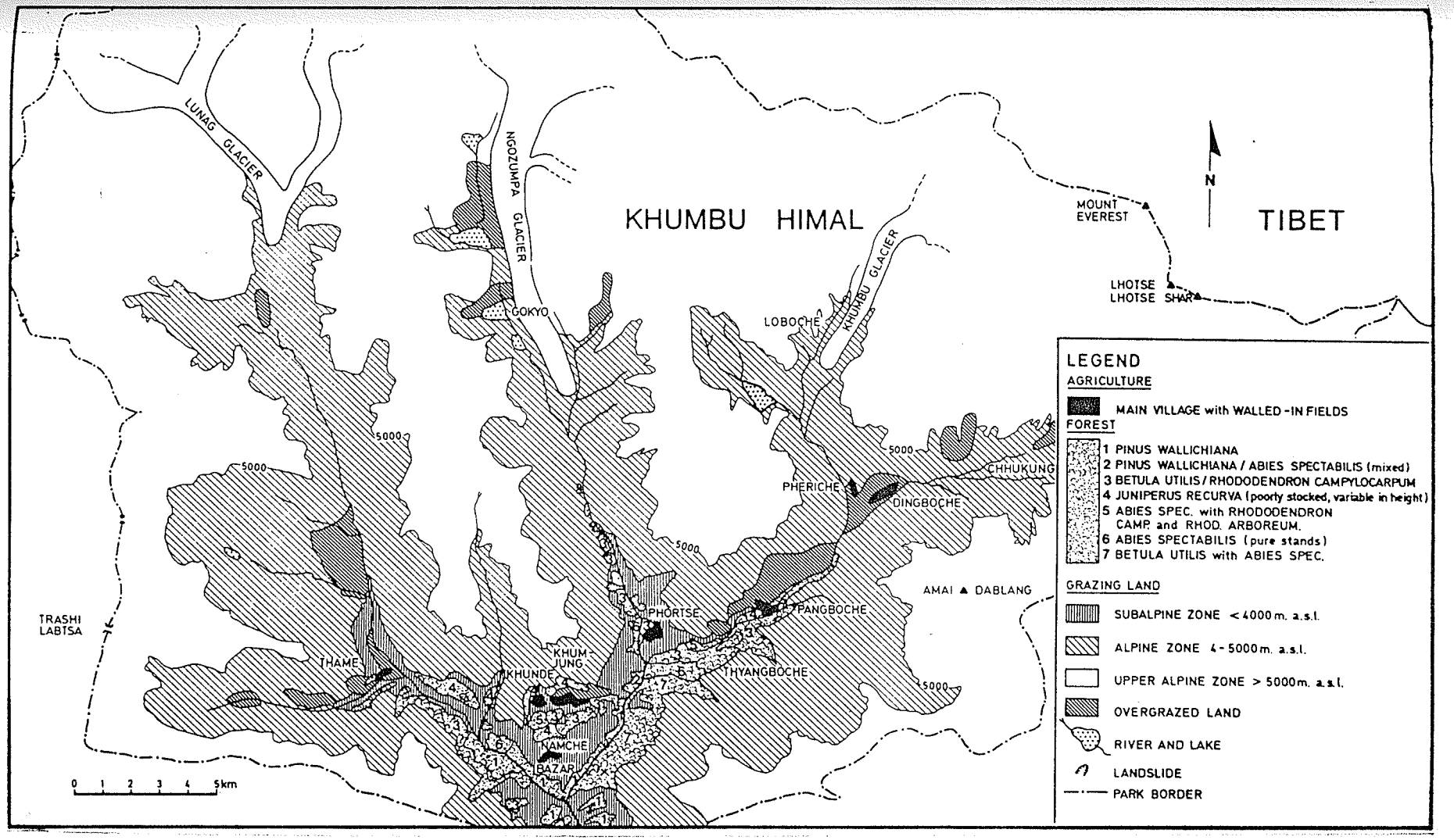


Figure 6: Land use and vegetation map.
Source: Bjonness, 1980.

ravines and glacial valleys divided by ridges rising to high snow and rock peaks. The valleys leading to Nangpa-la, Gokyo, Lobuche and Chukung contains some relatively level areas which are used by the local people for settlements and agriculture. The total area of the Park is approximately 1141 km^2 (114100 Hectares). The Park land can be categorized according to use as shown in Table 8.

TABLE 8

Area of Land According to Use Type in Sagarmatha National Park.

	PARK LAND			
Land Type	Forests	Grazing land	Arable land (cultivated)	Barren land rock,snow, ice, glaciers & lakes)
Unit/Area (Hectares)	2934	32250	212	78711
Percent	2.57%	28.26%	0.19	68.98

Most of the Parkland (79%) consists of mountains, glaciers, icefields, lakes, rocky mountains and steep barren slopes above 5000 m. Although this category of the land resource generates a substantial amount of income for the local people and to the nation through tourism, it is not included in this study.

The mountains are geologically of recent origin and the evidence suggests that uplift is still occurring at a slow rate (Hagen et al., 1963). The main uplift of the Himalayas occurred during human history in the period 500,000 to 80,000 years ago. For management purposes it is important to recognize natural evolutionary processes such as erosion, and flooding due to the young, steep, dynamic landscape of the Park. For the local people the value of this resource category is derived from their strong religious belief that God and deities are placed on the mountains and boulder tops. The other indirect benefit comes from the mountaineering expeditions these mountains draw to the area, which will be discussed under tourism. For the nation, these formidable peaks provide a borderline and dignity. All the rivers flowing out of Park territory, for example Dudh Kosi, join the Ganges and eventually run to the Bay of Bengal. Thus Sagarmatha, the Nepalese name for Mt. Everest meaning 'mother of ocean' justifies itself, and the catchment condition in the Park area has a potential influence beyond the park, and even beyond the boundaries of Nepal.

Since there is no evidence of economic mineral deposits in the Park, mineral resources will be disregarded in the study. There is, however, extensive quarrying of stone and flat stone which is used for house building. Many of the traditional houses in the Khumbu are roofed with flat stone.

However, with the scarcity of rock slates and the difficulty of quarrying, people have switched to wooden shingles and some have recently imported, in small numbers corrugated iron sheets for roofing.

In order to project the situation of the Khumbu resources, an estimate of existing land based resources supply is made. This information will enable us to examine the demand elasticity of the local people and changing patterns of land use in the Park. Land based resources are inter-related for their different uses and cannot be dealt with in isolation.

5.1.2 Forest Supply Situation

The original area under forest cover is estimated to have been approximately 5,500 hectares. The decline in forest cover occurred originally during the colonization of the region by the Sherpa people, and more recently it has accelerated because of fires, grazing, mountaineering and trekking, and the Tibetan refugee influx. Forests have been removed primarily from near the villages and the south-facing slopes of the mountains. The south-facing slopes are usually warmer and the growth of juniper trees is thus more abundant. Also wood collecting was done mostly by shepherds who grazed their cattle on the warmer slopes (Nima Tashi, pers. comm., 1982). The adverse effect of heavy grazing and clearing the canopy has decreased natural regeneration.

Shrubs and herbaceous plants flourish on these slopes which in turn make the slopes susceptible to wildfires. There have been many regular wild fires and man-set fires, at higher altitudes particularly, in order to clear land for grazing purposes. Thus these combined factors have reduced the forests of south-facing slopes much more than those of the colder north-facing slopes.

The total existing forest cover calculated from topographic maps was 2934 hectares (ha). Interpretation of landsatellite photographs of the area and personal field observation confirms this result. The productive forest which could meet the firewood supply needs is, however, much less than the above figure. The total accessible forest area may add up to only 800 ha as indicated by Naylor (1970) and Sherpa (1979). Naylor (1970) however did not mention the forest areas close to the summer pastures such as Dole, Thame valley and areas below Kyangjum.

The forests of Khumbu have been described by many authors including Naylor (1970), Stainton (1972), Schilling (1977) and Sherpa (1979). The description of forests species and their distribution according to micro climate and altitudes are briefly mentioned here for future management purposes.

Forests are composed mainly of rhododendron, silver birch, blue pine, juniper, hemlock, silver fir, and willow below 4000 m and above this elevation dwarf rhododendron,

dwarf junipers and cushions of primula, potentilla, gentiana and other species. Isolated vegetation occurs up to 5330 m but beyond this there is no vegetation.

Due to topographic variability and climate, Khumbu region has large differences over small distances in microsite characteristics. This has a marked effect on the distribution of tree species. Aspects and altitude are probably the major factors affecting the species and association present on a particular site. Blue pine (*pinus wallichiana*) occupies southerly aspects, and with increasing altitude is replaced by silver fir (*Abies spectabilis*) and tree juniper (*Juniperus recurva*). The north facing slopes are often dominated by birch (*Betula utilis*) with silver fir in mixture on slightly warmer microsites. Rhododendron species form an understory at higher altitudes. The rhododendron forests are gradually infiltrated with birch and tree juniper, and finally at the upper limits of altitude, scrub juniper (*Juniperus wallichiana*) becomes the dominant cover. Changes in aspect and altitude often have an abrupt effect on species distribution, thus forming a complex arrangement of species (Schilling, 1977). Understanding these ecological niches becomes important in forest and wildlife management. The growth rates of four main species of trees found in SNP are illustrated in Table 9. Site index is defined as the tree height when it has 50 annual rings at breast height i.e. 1.4 m above ground.

TABLE 9

Growth Rates of 4 Main Species of Trees at Different Altitudes in Sagarmatha National Park.

BOTANICAL NAME	COMMON	LOCAL NAME	SITE NAME	ALTITUDE m	SITE INDEX 50 yrs. h Meters
Abies spectabilis	Fir	Thasing	Phunki Tenka	3250	14.2
			Khunde	3833	
			Khumjung	3833	9.0
			Tengboche	3867	
Pinus wallichiana	Pine	Metang	Solu	2,200	28.9
			Khumbu	3,200	22.0
Juniperus recurva	Juniper	Sukpa	Khunde	3833	4.1
			Phunki Tenka	3250	7.9
Betula utilis	Birch	Takpa	Khumbu		7.9

Source: Sherpa, 1979.

Blue pine and fir trees are the fastest growing trees in the Park. These are used mainly for sawn timber and construction purposes. The slower growing trees, silver birch and juniper, are best liked by locals for firewood because of their hardness and density.

The sustainable supply of fuelwood in Khumbu is assumed to be the sum of the annual increment of wood from the growth of trees including stem, branches and also the production of dead wood. Based on the fuelwood supply calculation of Bajracharya (1981), annual growth of trees is estimated at 3 m^3/ha considering all parts of the tree. The percentage of deadwood is estimated at 2.5 percent of the total growing stock of wood. Assuming an average of 50 percent moisture content, density is assessed at 0.50g/ml, thus total amount of sustainable supply of fuelwood is estimated at 1210000 kg/year or 1210 metric tonnes per annum. This calculation is based on the assumption that only 800 ha of total forest (3934) ha is accessible for fuelwood collection.

5.1.3 Consumption of Firewood

Three different groups constitute the consumers of firewood:

- local people
- mountaineering and trekking groups

- participants in festivals and religious activities

Local people:

A Sherpa household with an average family of five members uses between 10 to 20 kg of firewood in a single day. Sherpa households situated along the trekking routes that use their homes as hotels for trekkers, Namche households for example, use more than 50 kg of firewood per day. Stern (1983) calculated that people of Namche (540 pop.) and their trekker guests alone burn 800,000 kg of firewood per year. This figure may be a little overestimated since in monsoon period (3 months) there are no tourists and the climate is warmer. The figure however gives an indication that Sherpa people use an enormous amount of firewood for heating and cooking.

Most families have children and/or servants who collect wood. The majority of the Sherpas employ servants on either a temporary or permanent basis. The temporary servants (almost all from outside the Park) collect firewood for a few months and they get room and board plus a minimal wage of Rs 8 per day. Servants hired on a permanent basis are sent to collect firewood during off-trekking season and are then sent during the trekking season on portering and expedition work. If firewood has to be bought, as in the case of some families in Namche, the cost per basket of dry wood is Rs 30. A basket load weights approximately 27 kg.

On average it takes 6 hours to travel and collect a basketful of dry wood from forests.

Assuming that an average family consumes 15 kg of firewood per day, each household would need 5,475 kg of dry wood per annum. According to Sherpa (1979), there are 638 households in the Park. Thus the total annual consumption of firewood in the Park becomes 3493050 kg.

Mountaineering and trekking:

The majority of trekkers come with an organized group and their average stay in the Park is 14 days. Each group is estimated to burn 40 kg of wood per day. During trekking seasons on average two large trekking groups go through the Park entrance gate daily (Parks office). During the two trekking seasons (6 months), trekking groups alone consume (80x180) 14,400 kg of firewood. This does not include individual trekkers (30 percent of total) and porters who stay and have their meals cooked in Sherpa houses.

On average five mountaineering expeditions visit the Park in a year. Each expedition uses about 120 kg of firewood per day (Sherpa, 1979). A mountaineering expedition usually lasts two months, and it uses about 7,200 kg of wood. Thus total wood used by the expeditions amounts to 36,000 kg. The assumption is made that expeditions depend solely on woodfuel and wood is burnt at base camp by the members of the expedition who stay behind during a mountain climb. Firewood is not used above base camp.

Since 1982, however, the use of firewood by trekkers and mountaineering expeditions has been curtailed substantially because of a National Park regulation requiring them to bring their own fuels into the Park.

Festivals and ceremonies:

An enormous quantity of firewood is consumed during the important Sherpa festivals such as Dumji, and Losar, and ceremonies such as Ngingne, weddings and funerals. A huge amount of rice is cooked for distributing and making chang (beer) during these occasions. Based on personal observation, it is estimated that an average family uses one eighth of its subsistence fuel needs for festivals and ceremonies i.e. 436631 kg. For example, during Dumji festival in Khumjung (1981) approximately 800 pathi of rice were cooked in 4 days which used 600 loads of firewood totalling 16,200 kg.

Disregarding the variation of wood consumption from village to village and the seasonal nature fo firewood use, the total requirements of firewood in the Khumbu region totals 3980081 kg per annum or 3980.08 metric tonnes (Table 10).

This analysis of consumption versus supply indicates that a severe case of deforestation is underway (Table 10).The supply is less than one third of the consumption even if the

TABLE 10

Firewood Consumption and Supply

Consumption	vs	Sustainable Supply
Local need		
Subsistence	3493050 kg.	
Festivals	436631 kg.	1210,000 kg.
Trekking groups	14,400 kg.	
Mountaineering Exp.	36,000 kg.	
Total	3980081 kg.	1210,000 kg.

trekking and mountaineering groups use alternative fuel to wood. This would indicate that selective cutting of forests is taking place and deforestation is occurring at a very rapid rate.

5.1.4 Grazing Land

A large proportion of the Park land is used for grazing and winter hay collection. Grazing land, including steep inaccessible terrain, comprises 28 percent of the total surface area of the Park i.e. 32250 ha. The present grazing area is much larger than it was 30 years ago, due to the clearing of forests by man and natural fire. Grazing lands are public open spaces and are thus common property resources. There are no private grazing lands in the region, apart from some walled-in private hay fields. Grazing land allocation between different settlements has

been determined by geographical location. For instance, Khumjung and Phortse people share the grazing areas in the Gokyo valley, both sides of Dudh Kosi river; Thame and Namche people share the grazing areas in the Thame valley, both sides of Bhote Kosi river; and Pangboche and Khunde graze their livestock in the Khumbu valley i.e. along the Imja Khola (Figure 6).

The grazing land extends from the surrounding areas of villages to areas in the high valleys and mountain slopes up to 5000 m, depending on the steepness of slope and grass conditions. Grazing is based on the principle of transhumance and livestock are moved to higher pastures in the spring and summer season and to lower altitudes during fall and winter.

The traditional movement of herds from place to place has resulted in many scattered subsidairy settlements (goth) in all of the valleys. Subsidiary settlements can be a simple shelter or storage for hay during the winter feeding months, and the houses and hay fields are privately owned. Hay is cut from both walled-in fields and open areas. The number of summer settlements in the Park is illustrated in Table 11. For the majority of the Sherpa people, livestock play an important role. As seen in Table 11, Thame valley people

TABLE 11

The Number of Summer Settlements Owned by each Village in Sagarmatha National Park.

	Number of Summer Settlements						
Village	1	2	3	4	5	over 6	Total
Jorsalle	4	-	-	-	-	-	4
Namche Bazar	17	-	-	-	-	-	17
Zarok	4	-	-	-	-	-	4
Thame valley	70	24	7	2	-	-	103
Khumjung	39	8	5	1	4	3	60
Khunde	18	5	4	3	2	1	33
Phortse	16	11	9	6	4	2	48
Pangboche	29	1	2	1	-	1	34
Debuche	2	-	-	-	-	-	2
Milingo	3	1	-	-	-	-	1
Pheriche	3	1	-	-	-	-	4
Dingboche	3	1	-	-	-	-	4
Others	4	-	-	-	-	-	4
Total	210	51	27	13	10	7	318

Source: Sherpa, 1979.

Note: In Khumjung village, 39 households have 1 summer settlement each and similarly 3 households owns more than 6 summer settlements.

have the largest number of summer settlements followed by Phortse and Khumjung. The people of Thame and Phortse are still very dependent on agriculture as their primary occupation.

The total livestock in the Park according to 1978 census (Bjonness, 1980 a) was 3,530 animals. Assuming the total number of animals remain the same, the total hay required for livestock in the Khumbu is estimated at 1270800 kg. Every large animal requires at least 2 kg of hay per day and feeding is required at least six months on average. The private hay fields produce approximately 65 percent of the total requirement and the rest is collected from the communal grazing areas. It is extremely difficult to estimate how much hay is produced per hectare of grazing land without proper field research. The grazing area is often snow covered for 3-4 months during winter. Some animals are handfed during these months with minimal quantities of corn, potatoes, turnips, and barley and buckwheat straw along with the collected hay.

Since productivity of the grazing area cannot be calculated without determining the productivity rate in the field, relative intensity of grazing in various traditional areas is used. Bjonness (1980 a) established a grazing intensity value for each traditional grazing site based on the formula: number of animals x grazing weeks. Assumptions were made that the animal's range of grazing was

1.5 km from each subsidiary settlement. The animals in each village were multiplied by time and adjusted where necessary for natural barriers such as steep slopes, rivers and glaciers. The grazing intensity map (Figure 7) shows where the impact was heavy, moderate and light. The intensively grazed areas correlate to the heavily deforested, or barren lighter colour, on colour imagery due to lack of vegetation cover. From field observation and from landsatellite photographs, there is clear evidence of overgrazing in the Khumbu region.

The trend toward keeping cows and crossbreeds for dairy purposes near the main settlements all year round is causing detrimental impact on the lower lying regions. Areas near the tree line and close to the main villages are heavily grazed and evidence of erosion is seen.

On the other hand, the traditional Yak and Nak grazing pastures are lightly grazed. The winter fodder situation limits the number of animals one can own in Khumbu. Less time is spent in some of the subsidiary settlements and less manure is available for the hay fields, which reduces the level of hay production. On average hay cost Rs 2.50 per kg. and this make it very expensive to purchase hay. There

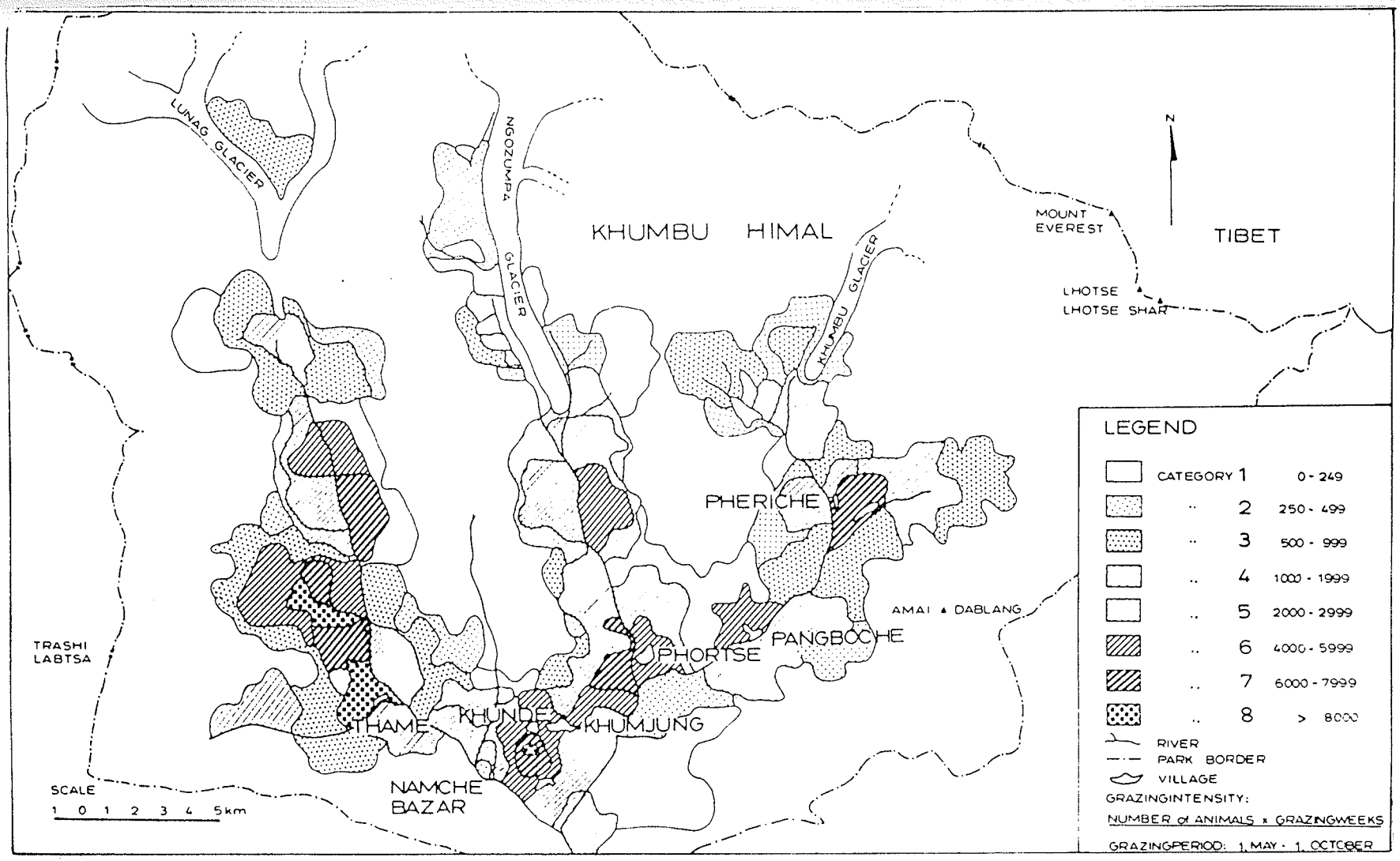


Figure 7: Grazing intensity map for all animals in Sagarmatha National Park, throughout the vegetation season.
Source: Bjonness, 1980.

is fierce competition between wildlife and domestic stock for food, since almost all of the land is also grazed by wildlife, particularly the Himalayan Tahr.

5.1.5 Arable Land

Agriculture is the foundation of the Nepalese economy and requires 90 percent of the labour force in Nepal. The mountains and hill regions account for only one-third of the arable land but nearly two-thirds of the population is found to live within the limited land. Khumbu region is no exception, being located in an extremely mountainous area, where there is very little arable land. Most of the fields are found around the main villages, and there are smaller scattered potato fields along the three main valleys. The distribution and ownership of land on a scattered basis was due to herdsmen requiring dwelling and stone houses for fodder storage within easy reach of grazing land (Haimendorf, 1975). The movement of herdsmen from one settlement to another at different altitudes resulted in the distribution of fields at altitudes ranging from 2,800 m to 4,500 m. The farmer thus has been able to extend the agricultural work in the fields over a long period of time depending on altitude and local conditions.

In Khumbu, only one crop is produced since the soil is frozen for almost six months of the year. The main crops produced are potatoes (90%), buckwheat (5%), barley (1%), turnips, radishes and other green vegetables (4%).

In this area, the total cultivated land calculated from topographic maps is only 212 ha. There are 638 houses in the Khumbu and thus on average there would be 0.4 ha of cultivated land per individual family. This figure is similar to that of World Bank report (1979) in which calculations show that the hills and mountains have proportions of 1500 persons per square kilometer of arable land and individual family land holdings have fallen to an average of less than 0.4 ha.

It is impossible to get an accurate area of landholdings since there are no aerial photographs available and no land reform survey data available to this day. Land taxes are collected on the bases of how much seed a family sow in the field. This measure of collecting taxes is practiced in many hill areas where land zonation mapping and or survey is not completed. Land reform Act was passed in 1962 and under this programme correct identification and accurate enumeration of tenants and owners of land by survey was one of several reform measures (Pant and Jain, 1969). This however is not yet achieved in the Khumbu region.

On average a moderate field (0.5 ha) of potatoes requires 10 loads[1] of seeds and yields 90 loads of potatoes in the Khumbu. A family of five on average consumes 50 loads of potatoes and uses 20 loads for feeding livestock, and giving away to monks and the local monastery. Table 12 provides a typical consumption pattern of a family of five in 1983

compared with the consumption pattern of a family of seven in 1956.

TABLE 12

A Comparative Food Consumption Pattern in Khumbu 1983 - 1956

Items	Family of 5	Family of 7
	1983	1956[2]
potatoes (loads)	50	75
Rice pathi)	80	20
Maize, millet and Wheat (pathi)	80	80
Buckwheat (pathi)	20	80
Sugar (pathi)	20	-

[1] load = 27 kg.
[2] Source: Haimendorf, 1975.

It is clear that more potatoes and buckwheat were consumed during 1950's. The income from tourism has caused people to switch the diet more from potatoes and buckwheat to rice and sugar.

From personal observation of potato production it is estimated that more potatoes are harvested than can be consumed by local people alone. It is true that 90 percent

of the households have at least one field. The only village where demand for potatoes exceed supply is Namche (105 households). This demand is presently being met from the surplus of Thame valley. The grains except buckwheat, are bought from lower valleys outside the region.

Distribution of landholdings is interesting, for ownership of a field in a main village is mainly by inheritance or as a dowry from the parents of a man or his wife. Although Sherpas are free to acquire holdings of land, ownership of fields or houses in a village by non-residents is unusual. There is a strong tendency among the people to sell land only to their nearest relative or other clan members.

5.2 HUMAN LABOUR RESOURCES

5.2.1 Labour Supply

It is difficult to assess the relative productivity of labour since it depends on so many factors in the Khumbu society. The problem of comparing work between a man who works 6 hours a day on a trekking job and a woman who does domestic work for 12 hours is compounded by the traditional ideas of division of labour between ages and sexes and type of work performed. Nor do the wages provide an index for productivity. The government has set porter rates in Khumbu region at Rs 24 for men and Rs 22 for women but by trekking agencies and for local activities, adult men and women are

paid at the same rate for their daily work. Unless the job requires special skill, there is very little division of work among the Sherpa people; most of the daily work is performed by both sexes, and children from the age of 12 are involved in such activities as carrying water, herding cattle, and collecting wood. There is no retirement and people of both sexes work till they die. The elderly people do their share of work such as looking after grand children, herding cattle and whatever other work they can physically perform. This of course depends on the wealth and labour requirements of a family. The seasonality of activities such as tourism, cropping, dairying and hay making make it extremely difficult to calculate the quantity of labour, i.e. production units required. Therefore a general estimate is made on the basis of personal observation in the field. The annual activities and festivals that are performed at different months and seasons of the year are shown in Figure 8. This annual cycle of activities determines the requirement for labour at specific times of the year.

Population census data collected from Pawson et al. (1984) showed that there were 1538 people between the age of 15 and 69 in 1982. On the assumption that these age groups are working people, who work 26 days a month and take 4 days rest, the total units of labour (man days) available in Khumbu is 479865 man days per annum.

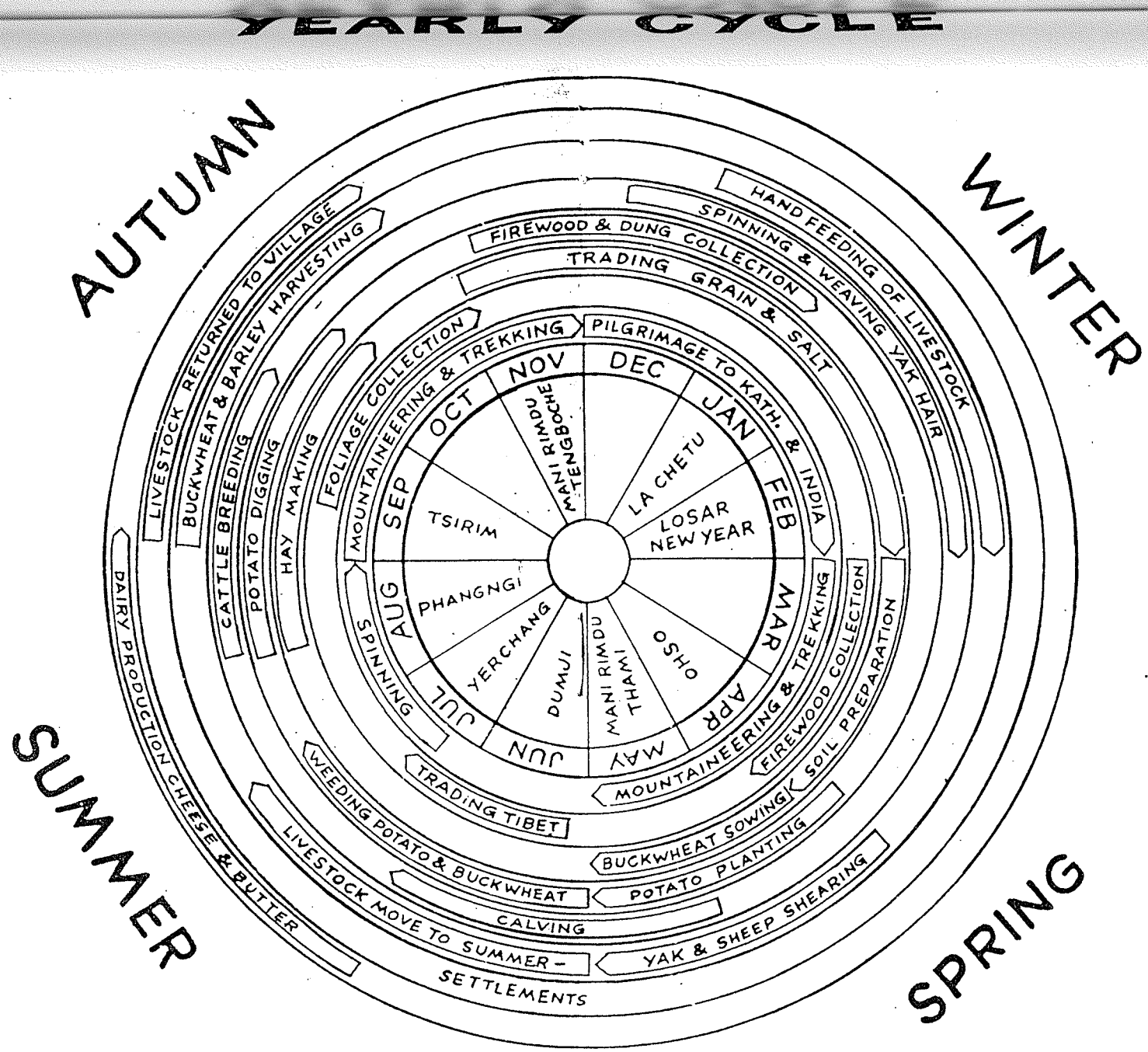


Figure 8: Performance of various activities and festivities at different times of the year in the Khumbu.
Source: Sherpa, 1982.

5.2.2 Labour Demand

5.2.2.1 Tourism

Most of the people over the age of 15 engage in different occupations at different times of the year. Haimendorf (1975) noted that one person from nearly every household was involved in trekking business. The use of man power assistance in tourism ranges from 0.5 person per an individual trekker to 700 persons per a large 20 men mountaineering expedition. There are also many people involved in the tourist industry as in hotels, lodges, tea houses and shops. On average two people are employed for every one visitor in the Park. The average stay of the tourist was determined to be 14 days. Therefore total men days required for tourist services alone 14x5,000x2=140,000 men days. This figure does not include men working in other parts of the country for tourism and tourist induced jobs. Expeditions and trekkers place a major demand on labour for guides and porters. The level of employment and income from tourism is depicted in Table 13.

5.2.2.2 Animal Husbandry

Livestock are mainly herded by young children and servants in a family. Due to their long range feeding habits, Yak and Nak are normally herded by an adult. On average a family owns 6-7 animals (Bjonness, 1980 a). One

TABLE 13

Level of Participation and Tourism Earnings of Four Villages in Sagarmatha National Park

	Namche	Khunde	Khumjung	Phortse
% households in tourism	84%	85%	76%	47%
No. of individuals (total pop. in parentheses)	150(540)	68(227)	113(585)	35(277)
Rs/year earned in tourism	895,000	304,000	479,280	184,850
Mean earnings/ person	5,967	4,472	4,241	5,281

Source: Fisher, 1978.

person on average spends half a day herding, feeding and taking care of cattle. During dairy production more than one person in the family is involved in herding cattle. There is considerable time spent on collecting hay for the cattle. More than half of the households in Khumbu own livestock (Sherpa, 1979), thus the total man power needed to tend livestock in Khumbu is estimated at (182x315+12x315) 61,110 man days per annum. Assumption is made here that animals do not require tending the whole day (182), that there are 315 households with livestock, and that 12 days are spent collecting hay for the cattle.

5.2.2.3 Firewood Collection

Firewood is traditionally collected during four months (November, December, March and April) in a year. People of both sexes and all ages collect firewood and store it for the rest of the year. During these months, up to two members of a family take part in collecting firewood. Members of most of the villages, except Tengboche, Debuche and Phurte have to travel at least half a day to fetch a load (27 kg) of firewood. The total man power spent on collecting firewood in Khumbu is estimated at 182 days x 638 households i.e. 116,116 man days per annum. This figure does not include firewood collection time for festivals and for tourist sale.

5.2.2.4 Crop Production

The amount of labour input required to produce a given quantity of potatoes and buckwheat is a given area of land has been difficult to calculate. There are many factors to account for, such as the size of the field, quality of the soil, the distance from the house, the level of productivity of the labourer and soil compaction. Despite these variations, an estimate of labour input for an average field (0.45 ha) is made on the basis of the work performed by the family (Table 14).

TABLE 14

Labour Input in an Average size Field in Khumjung

Activities	Man days
Softening field[1]	10
Fencing repair	3
Manure transport	6
Planting	12
Weeding twice	16
Digging up	20
Storage (pitting)	5
Total man days	72

[1] Many people now use two Zopkio drawn ploughs which is equivalent of 10 man days.

The assumptions are the 70% of the households in Khumbu possess a field of 0.45 ha which is 0.5 Km from the house,

and requires 8 loads of potato seeds and produces 72 loads of potatoes. The total man days per household is approximately 72 and thus the total man days spent on crops is (72x478.5) = 34,452 man days.

5.2.2.5 Domestic Work

People spend considerable time getting water. Except in Namche village, where a hydraulic ramp pumps water to several central locations, all other villages spend on average half an hour to fetch a 30 litre container of water. An average family normally requires 100 litres of water per day and this quantity must be doubled if water is also used for feeding the cattle at home. Since water is abundant during summer months from nearby springs, streams and from central pipes, the total time required per household per day is averaged at 1 hour. Thus total man days spent collecting water in the Khumbu household is estimated to be (36 x 542) 19,512, assuming 15 percent of the households have water taps in the house or a water source located close by.

It is difficult to calculate without a motion study the amount of time spent on cleaning, tidying up the house, cooking, minding children, entertaining guests, making fires and washing clothes. However, from observation, food preparation takes between 1-2 hours in the morning and the same in the evening. Food preparation is often shared between an unmarried daughter and the mother. Child care is

also shared between the mother, and the baby's siblings or grandparents as the case may be. Household work can be estimated at 3 hours a day, thus a total of 109 days per household is required i.e. 69,542 man days per annum. Domestic work thus consumes (19512 + 69542) 89,054 man days per annum.

5.2.2.6 Miscellaneous

The other type of work requiring good deal of labour is social work. This involves giving free labour to neighbors, relatives and friends during house construction and attending funerals or religious ceremonies. From observations, a household spends about 3 days per year for such activities. Some members of the family spend 3-4 weeks on a trading trip to Tibet; similarly people travel to India and other parts of Nepal for a considerable time. The weekly market is held at the central village of Namche. On average one member of the family goes to the market twice a month which from most villages involves a day to travel and shop.

A tremendous number of man days are required to repair communal monasteries, paths and bridges. The panchayat office sometimes decides to call for 1-3 days of shramdan (free labour) from each household for such communal activities.

Similarly, spinning and weaving and craft work are performed during the off trekking and agricultural season. Another important seasonal activity is the collection of leaflitter. Every household spends on average a week to collect enough litter for animal bedding and to apply on the field. The total labour needed for communal work and other works is (3+24+7) 446 = 15,164 man days per annum. It is assumed that 70 percent of the households fit in to the above category in their work performance. The above analysis of the labour supply and demand in Khumbu (Table 15) show that there is theoretically labour surplus of 23,960 man days per year.

TABLE 15

Labour Supply and Demand

Activities	Labour required No. of days p.a.	Total Labour available per annum
Domestic work	89054	
Tourism	140000	
Firewood collection	116116	
		479856
Animal husbandry	61110	
Crop production	34452	
Miscellaneous	15164	
Total	455896	479856

However, a rough degree of employment per month on various activities excluding daily chores such as getting water and other domestic work is outlined in Figure 9. The diagram shows that during six months of the year, labour requirement is high and even exceeds the labour supply.

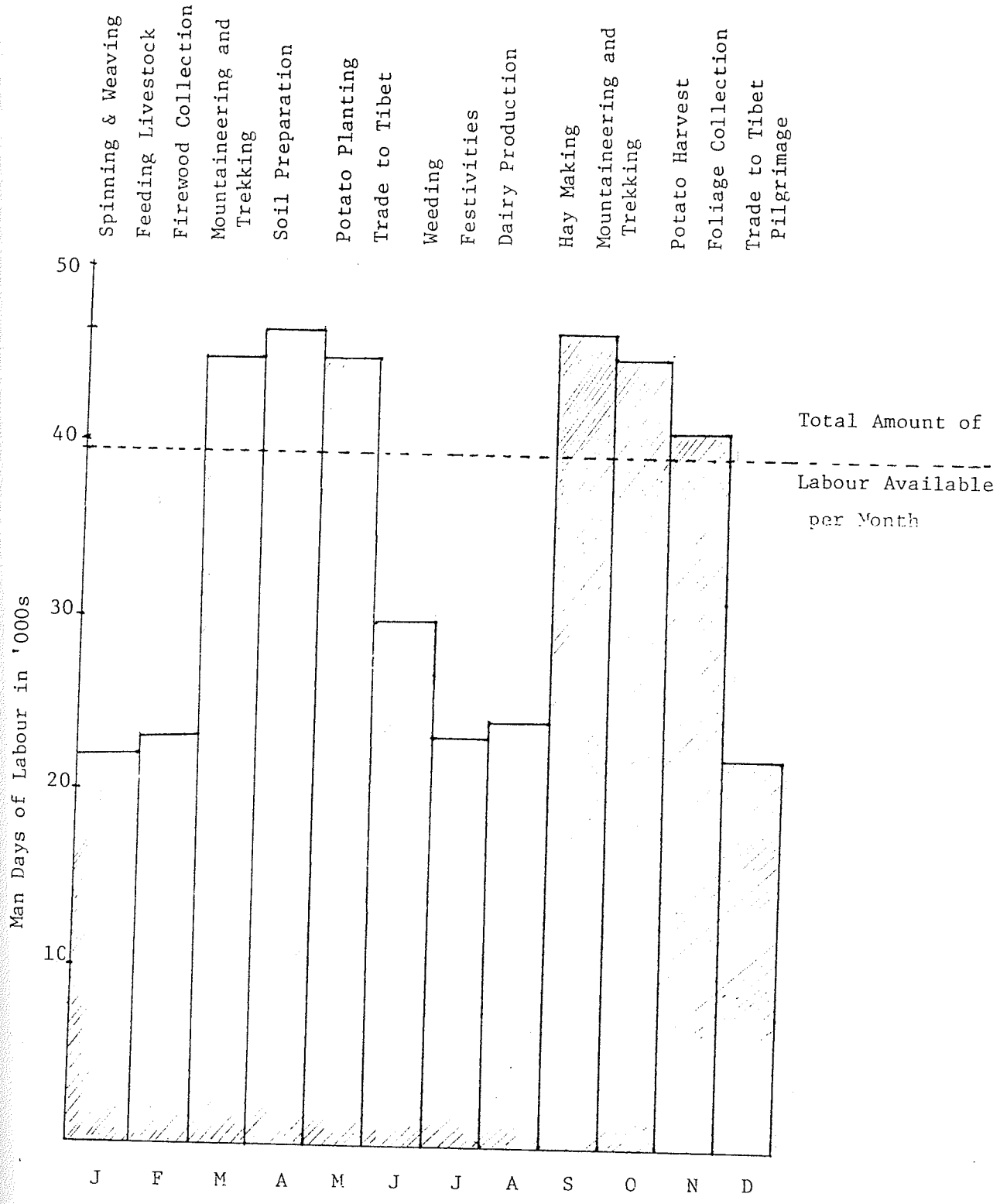


Figure 9: Number of Man Days Spent on Various Tasks and Labour Supply by Month

This is largely due to agricultural and tourism activities occuring at the same time.* The other six months of the year, people are not busy and are considerably under-employed.

5.3 INCOME, CONSUMPTION AND EXPENDITURE

5.3.1 Sources of Income

Until recently, the value of commodities was hard to calculate since subsistence agriculture and barter trade made up most of the Khumbu economy. Now, however, most of the commodities are traded in cash. The main staple diet potato is produced locally and this diet is supplemented with protein meat, milk and ghee (butter) from local livestock.

Cash income is earned mainly from tourism and trade. The occupational changes among the people of Khumbu (Table 16) shows there is increasing dependence on tourism for cash income. The data presented in Table 16 does not include activities relating to domestic work or other occupations, but represents only the general occupational status of the individuals who indicated that they spent most of the time in the specified occupations. People are devoting more time and money to earning tourism money than traditional agriculture. The proportion of income from various sources

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* The yearly cycle (Figure 8) presents conflict between the tourist seasons and the agricultural seasons.

for an average household is shown in the Figure 10. Income from arable land and livestock accounts for only half, the rest coming from tourist activities and trade. Tourist activities involve providing services as guides and porters, and hotel, teashop and souvenir facilities.

TABLE 16

Selected Primary Occupations of Khumbu People Over 15 Years of Age

Occupation	1970	Percent*	1982	Percent*
Expedition guide	178	9.7	256	14.9
Farmer	392	21.5	150	8.8
Servant	20	1.1	69	4.0
Lama, Nun	212	11.6	114	6.7
Trader, Shopkeeper	59	2.2	68	4.0

Source: Pawson et al., 1984.
* Percentage of population over 15 years.

5.3.2 Consumption and Expenditure

A large proportion of the wealth is invested in livestock and more than 50 percent of the households in Khumbu have livestock. The value of the major big animals in Khumbu is estimated as follows:

	Amount of Rs
Yak and Nak	2,000
Zom (female crossbreed)	2,200
Cow	800
Sheep	400
Zopkio (male crossbreed)	1,500

In order to get an idea of the fixed or capital assets involved costs of house construction and land are examined. Houses are normally constructed with two storeys are

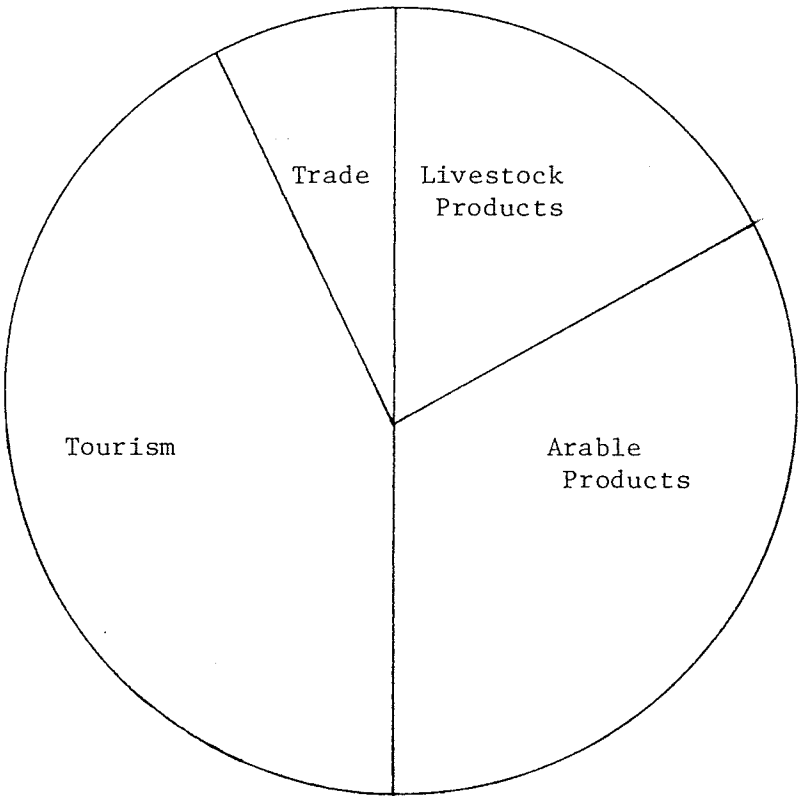

Figure 10: Relative Income From Various Sources in a Khumbu Family

made of rocks and timber. Depending on the location and demand, a normal size family house costs between Rs 40,000 - 75,000 to build. Similarly the price of land is estimated between Rs 8,000 to 12,000 per ropani (.05 ha).

Most of the earnings from tourism and trade are spent on purchasing food grains from outside Khumbu for subsistence living. As described in Table 12, daily needs of a family, a considerable amount of grain (rice, maize and millet) has to be imported. Much of the earnings from tourism is spent on luxury items such as house improvement, jewellery and clothes. A small portion of the earnings is reinvested in tourist oriented activities such as teashops. Livestock sale outside of Khumbu is also common; for instance a 4 month old female Nak calf (Zopruk) is sold to people of Solu, as is a male (Zopkio) to Tibet.

The cash economy brought about by tourism has brought inflation to Khumbu. Table 17 shows comparative price changes over time. The prices of food commodities are rising faster than the wage rates. This trend indicates that a large proportion of the income earned from tourism is spent to fight inflation. At present relatively high wages are earned compared to the 1960's, but purchasing power is much the same since the cost of living is also very high.

TABLE 17

Comparison of Food Costs and Wage Levels Over a Number of Years

Year	Rice Rs/pathi	Potatoes Rs/tin	Corn/millet Rs/pathi	Firewood Rs/load	Porter Rs/day	Sherpa Rs/day	Sirdar Rs/day
1964	8-10	2	6	5	6	10	16
1974	26	12-15	8-10	10	10	15	25
1978	30-40	20	15	20	18	25	35
1984*	50-60	20-25	26-30	30	25	30	40-50

Source: Fisher, J. 1978. * Sagarmatha National Park, 1984.

5.3.3 Extra-Ordinary Expenditure

The most important traditional festival is Dumji which is held in the month of June in every major village in the Khumbu. It is customary for the burden of responsibility to fall on all households in rotation. In the village of Khunde and Khumjung, the festivities are held jointly in the Khumjung monastery. The festival involves five days of chanting and reading religious texts by monks. During this time, members of ten households will feed all of the village people. This responsibility falls every 17 odd years in Khumjung and Khunde, since the frequency depends on the number of households in a village. In quantities proportional to their economic standard, the households feed cooked rice and chang (beer). An actual expenditure of ten households during a dumji festival is given in the Table 18. The individual household expenditure ranges from Rs 5,000 to 20,000 for such purposes.

The cooked rice and chang are offered to every individual in a village, and a minimal wage is given to the monks for their time during the festival. Potato and maize shown in the table are used for making chang and rakshi (distillation of spirit). On average, Khumjung Dumji expenditure was Rs 100,000. Similarly, Namche spends approximately Rs 64,000, Pangboche and Phortse about 60,000 and Thame and Kyarok Rs 108,000.

TABLE 18

Expenditures of Households During a Dumji Festival in the Twin Villages of Khumjung and Khunde (June 1982)

	EXPENDITURE			
HOUSE	RICE[1] (Pathi)	MAIZE/MILLET (Pathi)	POTATO (Tin)	CASH (Rupees)
1	220	15	5	500
2	200	20	5	500
3	160	20	8	500
4	100	35	10	500
5	160	25	10	500
6	180	20	5	500
7	120	40	10	500
8	160	30	12	500
9	120	30	12	500
10	180	20	5	500
Total	1600	255	82	Rs 5000

[1] 10% of the total rice along with the maize/millet and potatoes are used for making chang (beer) and rakshi (distilled liquor).

A marriage ceremony requires considerable expenditure of cash, gold and other goods according to the wealth of the parents. It is customary for the bride to be given gold, clothes and household goods by her parents and relatives. The household goods include cooking utensils, blankets, carpets, often livestock and a piece of land. There is considerable expenditure involved for both bride's and bride groom's parents and their relatives for feasting and dowry presents.

The other major expenditure is the funeral rituals. It is customary (Lamaist faith) to call for the local priests to perform a ritual after a person is dead so that the wandering soul of the dead person can find its way to heaven. Much of the deceased's personal belongings and some cash is given to the Lamas during the cremation.

An offering (gyawa) is made within 49 days after the death of a person. This involves reading religious books by monks and nuns and distribution of cooked rice to all the people in the village and sometimes people from other villages also. Depending on the wealth of the deceased family, ghee, salt, and cash are also distributed along with the rice (normally cooked and made into a ball). An average wealthy family spends up to Rs 50,000 for such rituals. However, the kinsmen of the deceased person also contribute to the offering. The other major family expenses are during the celebration of new year and yarchang (summer beer).

Chapter VI

AGRICULTURAL SUPPLY AND CONSUMPTION SITUATION

6.1 FOOD GRAIN

Local requirements of cereal grain, rice, wheat, maize and millet is estimated to be 420,000 kg or 420 metric tonnes per annum. According to agricultural statistics of Nepal (1972) local requirements of cereal grain is 140 kg per head in Solu Khumbu districts. This figure, although it seems high for Khumbu, is used as a basis for calculation. The total amount of grains Khumbu has to import is thus 420 metric tonnes. Tourist requirements, on a per day basis, are estimated to be 170 grams of wheat products, and 100 grams of rice per head per day (Industrial Services Centre, 1977). This means that the tourism requirement of rice and wheat products is about 18.8 metric tonnes. Since all grains have to be imported the total annual grain deficit is 438.9 metric tonnes (Table 19). This means approximately 439 metric tonnes of grains are imported annually from outside of Khumbu. The main assumptions are that the tourists spends on average 14 days in the Park and annual visitor number is 5,000. The local population of Khumbu region is estimated at 3,000.

TABLE 19

Food Grain Supply and Demand in the Khumbu Region 1984

Crop	Production t	Local requirement t	Tourist requirement t	Total requirement t	Surplus deficit +/-
Rice	None	149	7	156.0	-156.0
Wheat	-	118	11.9	129.9	-129.9
Maize and Millet	-	153	-	153.0	-153.0
Total		420	18.9	438.9	-438.9

TABLE 20

Fruits and Vegetable Situation in the Khumbu Region 1984

Item	Production t	Local requirement t	Tourist requirement t	Total requirement t	Surplus deficit +/-
Fruits	None	51.0	7.0	58.0	-58.0
Vegetables	25.0	105.0	10.5	115.5	-90.5
Potato	310.0	210.0	14.0	224.0	+86.0

6.2 VEGETABLES AND FRUITS

Local demands for vegetables and fruits according to Department of Agriculture, government of Nepal is 70 kg of potato, 35 kg of other vegetables and 17 kg of fruits per capita per year (Industrial Services Centre, 1977). This figure when checked with the consumption pattern of a family in Khumbu showed a very small difference of ±8 kg. Tourist consumption based on the information from trekking guides has been estimated at 200 grams of potato, 150 grams of other vegetables and 100 grams of fruits per day. The figures on potato and vegetable production have been estimated from the average production per household per year. Vegetable and potato production respectively will not exceed 25 and 310 metric tonnes per year. There is no fruit production in Khumbu and all the required fruit has to be imported from Kathmandu and low lands. Similarly there will be a net deficit of 91 metric tonnes of vegetables and this demand also has to be met by importing from Kathmandu and Solu areas. There will be a potato surplus of 86 metric tonnes per year (Table 20).

6.3 DAIRY PRODUCTS

Local per capita demand according to the Department of Agriculture is 125 ml of milk and 9 grams of ghee per day (Industrial Services Centre, 1977). Tourist demand in season is estimated at 250 ml of milk, 50 grams of butter

and 100 grams of cheese. Figures on milk and cheese production are estimated on the basis of livestock survey of 1978 by Bjonness (1980 a). Annual production of dairy products in the Khumbu will be as shown in Table 21. Again the deficits of butter and cheese are being met by importing from Kathmandu and lower valleys. As given in the Table 21, there will thus be a deficit of 6600 kg of cheese, 3250 kg of butter and 1500 kg of ghee in the Khumbu region.

TABLE 21

Dairy Production and Consumption in the Khumbu Region, 1984

Item	Production t	Local requirement t	Tourist requirement t	Total requirement t	Surplus deficit +/-
Milk (l)	15,4000	137468	16250	153718	-282
Cheese (kg)	100	200	6500	6700	-6600
Butter (kg)	-	-	3250	3250	-3250
Ghee (kg)	9000	10500	-	10500	-1500

Adapted from Industrial Services Centre, 1977.

Chapter VII

POPULATION TREND

Nepal's demographic situation according to World Bank (1979) is among the worst in the world and is deteriorating steadily. The rate of population increase is 2.67% per annum and population density with respect to arable land far exceeds that of India and Bangladesh. The rapidly growing population is beginning to exceed the carrying capacity of the land. This is manifest in the serious deforestation and soil erosion problems of Nepal. The total population of Nepal has reached 15 million (1981 census). The changes recorded in the overall population structure of Khumbu region are quite different from those of the national population trend.

A population census was carried out in 1970 by the resident doctors of Khunde hospital, Dr. A. and Dr.S. Lang. A similar survey was conducted in 1982 by Pawson et al. (1984). The most noticeable changes between 1970 and 1982 as illustrated in Table 22 are the increase of Nepali inhabitants and the virtual standstill of the population growth of the local Sherpas. Almost all of the Nepalese are government employees and mostly stationed in Namche Bazar. The decline in Tibetan population is due to their continued movement to India and Kathmandu.

TABLE 22

Ethnic Structure of Khumbu Population, 1970 - 1982

Ethnicity	1970	Population percent	1982	Population percent	1970-1982 Growth percent
Sherpa	2388	86.5	2524	81.2	+57
Tibetan	274	9.9	187	6.0	-31.8
Nepali	84	3.0	339	10.9	+303.6
European	2	0.1	8	0.3	-
Not Known	13	0.5	50	1.6	-
TOTAL	2761	100.0	3108	100.0	+12.6

Source: Pawson et al., 1984.

The present trend of Sherpa population is supposedly due to several factors. The child mortality rate has fallen due to better care and increased acceptance of modern medicine by the local people. The decline in fertility according to a 1982 study was due to the decline in economic importance of children, employment of women on tourists' portering jobs, and the involvement of many men away from home for several months in tourists' jobs. The decline of fertility due to men spending several months away from home however can be argued. Traditionally farmers spent 4-5 months of the year trading in Tibet, gathering grains in the lowlands or tending livestock in the subsidiary settlements. It may well be due to the social change in attitude towards materialism and the work habits that discourages sexual activity outside of marriage. There is continued mortality from climbing expeditions and migration out of Khumbu by more affluent and educated residents. The 1982 study shows that the birth rate is outnumbered by death and out-migration. The most able (physically) persons being killed in the mountains and 'brain drain' of able and skilled people leaving the village is a disturbing factor and a big loss in the Khumbu economy.

This trend, however, has favourable implications for conservation and management of the region. The declining pattern of population may have decreasing impact on the Park environment.

Chapter VIII

PROSPECTIVE PROBLEMS AND OPPORTUNITIES

The analysis of the fuelwood consumption and supply situation presented in this research has shown that a serious fuelwood crisis exists. The problem of deforestation has been widely identified and some measures have already been taken to increase the fuelwood supply by afforestation and to decrease consumption by introducing alternative energy technologies. However as long as they can afford the time to collect it, the majority of the local people do not perceive fuelwood scarcity as a problem. Thus it appears, and by discussions with local people confirm, that they are not too worried about the future. It can be hypothesized that people view forests as property of the National Park and not as belonging to them. There seems to be a real need to educate people and introduce community-oriented forest management techniques.

The present study demonstrates the weakness of the fuelwood supply system in that consumption far exceeds supply. The supply of forests for fuelwood, leaf litter and timber will be further curtailed by possible deterioration of the forest ecosystem caused by factors other than fuelwood demand, such as natural landslides, fires and

overgrazing. Despite the problems described here, potential opportunities exist to improve the situation, given the willingness of the people to adopt fuel-saving devices and practise conservation measures.

The Khumbu region historically was a grain deficit area, and with the emergence of tourism more grain had to be imported. The people have become more dependent on food grains as their cash earning ability has increased and the standard of living has risen. Although sufficient quantities of potatoes are being produced, there is limited availability or organic matter since more and more dung is being burnt for fuel. Because of physical isolation, cost and inadequate knowledge, people have no access to chemical fertilizers and better seeds, and government agricultural extension services are not available as they are in other parts of Nepal. Since the Himalayan National Park regulation restricts any further expansion of agricultural land, the arable land for crop production is limited.

An alternative is to increase the productivity of the land, but since double cropping is not feasible because of altitude and climatic conditions, alternative vegetables may be grown. There are varieties of short growing season vegetables which can flourish along with the potato. Small vegetable gardens could supplement local needs and the requirements of tourism with varieties of carrots, cabbage, cauliflower, peas and beans that have been developed to grow

in a short season. For this opportunity to be explored the improved seeds and fertilizers would have to be introduced to the region.

In general the Khumbu region is suitable for livestock farming which is one of the traditional occupations of the people and which provides an essential income supplement. To bring about a balance between grazing and vegetation biomass, traditional utilization of resources, such as existing settlements, and the grazing patterns should be examined and a grazing management plan drawn up in consultation with the local people and enforced locally. There is every evidence that livestock will play a major role in the Khumbu economy and the only prospective problem is that fewer and fewer people are experienced with and willing to undertake livestock farming. The government yak farm could be instrumental in changing that trend even though the present yak farm has so far shown little positive impact. Yak and nak have been the backbone of the traditional economy of the Sherpa people since these animals are well suited to the constraints and opportunities of the harsh environment of Khumbu. Livestock yields could be improved by simple breeding programmes and fodder production increased by rotational grazing management and reseeding with improved seeds.

It is evident from this study that there is an abundance of labour in Khumbu, yet there is a shortage in the spring

and fall because both agricultural work and tourist requirements compete for the available manpower. At present this shortage is filled with seasonal workers from the lower valleys. In general, housewives and children spend much of their time in collecting firewood and water, the basic requirements for subsistence.

Tremendous opportunities exist for small scale projects such as "drinking water supply projects" which could save domestic time for other productive uses. The majority of the villages are within easy distance of fresh water springs and streams. The water source could be collected and channelled through high density polyethelene pipes into a storage tank, the capacity of the tank varying according to the supply and the requirements of the village. By installing the polythene pipes about one metre underground, the hazards of vandalism and freezing would be minimized. Earlier attempts at such water supply projects have had a high failure rate and provide water only during the summer months, except at Khunde village where the hospital staff regularly check the system.

The activity of the Sherpas has been shaped by such factors as the intense high rainfall, great diurnal seasonal temperature variation, high altitude and thinner air. Traditionally, Sherpas spend a great proportion of their leisure time making their own clothes (spinning, weaving, sewing, boot making and blanket making) during the off-

agricultural season. Currently this spare time is spent either idly or in stocking firewood, since 80% of the clothing is imported.

Small-scale handicrafts and cottage industries tailored to the special needs and opportunities of the region could boost the economy and would reduce seasonal unemployment. Those industries should be based on subsistence strategies utilizing traditional knowledge, skills and resources. A good example is demonstrated in the successful Swiss-aided projects for Tibetan refugees in the Tibetan carpet industry in Nepal.

Khumbu region is blessed with the spectacular high mountain landscape, with glaciers, deep gully streams and alpine vegetation, in combination with the unique culture of the Sherpa people. The number of international tourists has tremendously increased and visitors are overwhelmed by the majestic views of the mountains, the monasteries and the special qualities of the population. Tourism is a favourable foreign exchange generating industry for Nepal and it is a major source of income for a majority of the people in Khumbu. The main exports of this industry are human pleasure, inexhaustible natural gifts, artistic legacy of the past, traditional customs and festivals (Mathieson, and Wall, 1982). The health of the tourism industry depends on many factors and cannot be predicted easily. In the long run, it is expected that international tourists visiting

Nepal will increase in number because of the country's ruggedness, and the richness and variety of its landscapes. The creation of jobs and income, however, is not without price; as indicated earlier in this study some of the earnings must be spent to fight the inflation created, and there are both positive and negative impacts on the socio-economic and physical environments.

Observations in the field and discussions with both local guides and tourist groups indicated that mountaineering and trekking at the present level have reached the carrying capacity of S.N.P. Since unmanaged tourism will destroy the industry, there is need for further research to determine optimum management and carrying capacity. Already there is congestion on the trails and in campgrounds, a shortage of food and labour, and inflation during peak seasons. The present number of tourists has already posed serious management problems in the Park, and thus, it is necessary to handle the flow in such a way to ensure maximum benefit to the local people and maintain the quality of the environment. Some possible means of achieving that goal are listed below.

- Limiting the number of visitors to S.N.P. in a particular season/month on a first-come-first-serve basis; a limited number of trekking permits/climbing expedition permits to be issued in Kathmandu once the carrying capacity has been determined.

- Designating S.N.P. for trekking and mountaineering tourists only, which would reduce the need for infrastructure such as hotels, lodges, and houses, and would create labour intensive industry. This would benefit the country as a whole by sending non-trekking tourists to other rural areas of Nepal and it would reduce the chance of government monopoly and leakage by multinational companies.

- Increasing visitor numbers by lengthening the season and by promoting off season tourists. Almost all of the literature on tourism specifies only two seasons, October - December and April - May. There is scope for both winter and late spring travel provided access and promotion are carried out. For example, the extension of the Phaplu airport or the road to Salleri from either Dhankuta or Jiri could bring tourists during the winter and even late spring.

Creating this diversity by increasing seasonality would help the national economy, for Nepal is limited by its provision of infrastructure such as utilities and communication systems. As an example, there were only 6,782 hotel beds to accommodate 175,448 total tourists arrivals in 1982 (Far East Asia and Australia, 1984). To effect better management, the Department of Tourism, Department of National Parks, and tourist agencies could pool their resources.

Although some of the pollution problems have been recognized by Park officials, those of trekking agencies and visitors have been overlooked so far. Visual pollution, such as tourists' trash, has received enough attention nationally and internationally and some measures have been taken to enforce by-laws and to provide rubbish pits where possible. However, the state of sewerage systems and sanitation is very poor or nonexistent and requires serious consideration. Traditionally, human waste is mixed with leaf litter and used as manure in the fields. What few toilet facilities there are along trekking routes are in a poor state of repair and are unhygienic. The disposal of solid waste anywhere and everywhere has created an unhealthy atmosphere along the trekking routes since dried fecal matter is blown about and even contaminates surrounding rivers and streams. Provision of practical and hygienic toilet facilities and education regarding sanitation should be considered in management strategies so that a healthier environment can be created for both tourists and local people.

It is imperative that the Government make more effort to improve the quality of their outstanding World Heritage Site by establishing strict and enforceable policies to regulate visitor numbers and to defend against outside pressures for further tourism development. The benefits of conservation should be shared with the local people. In this regard,

World Conservation Strategy suggests that individuals directly affected by conservation measures should be the first to benefit from them. Local Communities in S.N.P. have benefitted directly be being able to work in tourism; however, very little of the money received by the national treasury has been re-invested in the area. Unlike other tourist areas of the world, a minimal amount is spend on services such as tracks, bridges, water supply and health facilities. Approximately U.S. $40,000 is collected annually from S.N.P. for visitor entrance fees and mountaineering peak fees alone, and this amount goes directly into the government coffers. Unless local people are provided with increased opportunities for employment and education in sustainable development and management projects, local commitment to conservation will be difficult to accomplish. It will also be difficult to achieve the objectives of Nepal's National Conservation Strategy (NCS) which is

- "To ensure the sustainable use of Nepal's natural resources.
- To preserve the genetic diversity of Nepal.
- To maintain essential ecological processes and life support systems.
- To help satisfy the basic material, spiritual and cultural needs of all the people of Nepal both present and future generations."

It will be necessary to satisfy the basic needs of these people before successfully appealing them to contribute their resources (land, labour and capital) to conservation. It is thus necessary to invest a good proportion of public funds in conservation measures and at the same time to encourage local initiative and responsibility. After all, a healthy system of protected areas in the country depends on the abilities of the nation to feed, clothe and house its own people.

In the view of the NCS, economic development and conservation are compatible; indeed, conservation is seen as a prerequisite at all levels of economic development. This approach of living resource conservation is to ensure maximum sustainable productivity of resource use. Conservation is thus for people. A realistic approach to achieving conservation is to work closely with the existing socio-economic systems. An appropriate strategy for influencing conservation efforts should involve programmes which will ensure future benefits from the conservation. The government should reward local leaders and decision makers for their conservation efforts by bringing in socio-economic reforms. This could be achieved by environmental education programmes, training tourist guides and providing basic needs for the people in general. It might also involve measures to ensure that local resource users receive a stream of benefits from tourism or foreign aid for their conservation efforts.

Many of the earlier efforts toward conservation, and government programmes such as "back to the village national campaign, land reform, agricultural and forest extension services" in the hill and mountains have been viewed by local people as either ineffective or harmful. There is a deep-seated mistrust and cynicism about government officials in general. The officials do not work with village laymen on a one-to-one basis and their expectations are too high when they do go out on village tours. The main point here is that the officials have provided faulty services, which inhibits local acceptance of and incentive for innovation. In order for new technology and conservation to be introduced into the country, the attitudes of both government employees and local villagers must be changed.

As an outstanding example, Sagarmatha National Park was initially resented by local people and its establishment was received with fear. Since the Park enforced strict laws against cutting green wood for fuel, but provided no alternatives, the concerns of the Sherpas are understandable. Much of the resentment was based on rumors about even worse regulations still to come, among them that in future Sherpas would not be allowed to live in the Park. This is an illustration of the lack of communication between the local people and the Park management officials, in that the livelihood of the people depended on the success or failure of the conservation effort, yet the very people whom the Park was intended to serve were not informed.

Although the Park has paramount political and jurisdictional authority over the strong traditional institutions (the nawa system) it is at the same time in the ambiguous position of having no authority to control or advise on development projects sponsored by other agencies. The situation of the Khumbu region is unique in that it can attract many different projects, yet there is no single institution or organization to co-ordinate the projects. During 1981-1982, the following Projects were undertaken in SNP by various agencies, organizations or individuals with little or no consultation or co-ordination with the Department of National Parks which is responsible for running SNP.

- FAO and World Bank assisted trail construction projects between Luckla and Namche. Parts of the trail below Namche were constructed through a section which had been planted with tree seedlings a year before.
- The Ministry of Local Development funded two projects. Two suspension bridges were built with the help of two Peace Corps volunteers. A drinking water supply system was completed under the supervision of another Peace Corp volunteer.
- The Himalayan Trust built a high school in Khumjung village.
- The Remote Area Development Committee funded a drinking water supply project at Tengboche monastery.

- Nepal Industrial Development Corporation (NIDC) supported the construction of a hotel in Namche.
- An Austrian aided small hydroelectricity development project was under construction at Thamo. This project is administered by the Small Hydel Development Board in Kathmandu.
- World Heritage Convention funded an alternative energy programme in SNP through the United Nations Development Program (UNDP) which included a micro hydro project at Namche and investigation of other energy technologies. Funds were also made available to SNP for cultural restoration and fencing plantation sites.

Similarly, Department of National Parks funded several projects including bridge repairs, trail maintenance, and building projects for staff accommodation. From the above it is evident that there is no co-ordination among funding organizations and that each agency has its limited field of interest within the broad needs of the region. Every agency is, however, willing to help, although many of them predetermine the project needs. One of the most important aid projects is the Himalayan Trust run by Sir Edmund Hillary since the 1960's. He has been responsible for building and staffing hospitals, schools and health clinics and providing improved transportation facilities. He has helped establish SNP and is now involved in funding the Park's reforestation project. His approach to funding is a

valid one, predicated on local initiative; he will only help a project that has the community's support and in most cases only after the villagers have requested help (Sir Edmund Hillary, pers. comm., 1984).

The gaps in government legislation make it difficult for an office to enforce laws outside its jurisdiction. The various governing bodies in Khumbu include two panchayat offices, which are responsible to the district panchayat; the Northern Boundary Administration and police office, which are responsible to the chief district officer in Salleri; and the SNP office which is responsible to the Department of National Parks and Wildlife Conservation in Kathmandu. Each of these offices has its own by-laws which cannot easily be enforced outside its particular jurisdiction. For example, in SNP trekkers are, by National Park by-laws, forbidden to use firewood for cooking, yet this by-law cannot be imposed on trekkers who prepare their meals in a Sherpa house in a village because the main villages are legally excluded from the Park and fall under the jurisdiction of the local panchayat.

Similarly there is no control over building codes and architectural and historical sites and buildings are deteriorating with so-called "development". Many of the houses are now being roofed with imported corrugated iron sheets, and different colours of roof paints make for an unslightly landscape. Obviously some controls with

provision of alternate means to achieve architectural uniformity need to be investigated. A final example of the problem is manifest in the Austrian-aided small hydro development project, which has signed contracts for constructing overhead transmission lines in the Park without any consultation whatsoever with Park authorities about environmental impact assessment.

These kinds of gaps in legislation of government agencies suggest that special attention must be paid to reducing the gaps and providing legislation that does not conflict with other laws. The roles and responsibilities of each government agency and each level of government should be clarified in order to achieve common goals and avoid wasting time and resources. Therefore, it is essential to set up a co-ordinating and reviewing committee at the local level. This committee should represent local farmers, guides, head lamas of the monasteries, panchayat officials, class organizations and government officials representing the Park and Chief District Office and/or the local development office. This committee would review the project proposals of government and aid agencies and individuals before the proposals go for approval to the concerned departments or the National Planning Commission. Its main function would be to co-ordinate and maintain links between government agencies, donor agencies and local needs, and it could submit development proposals directly to the concerned agencies as well as receiving proposals.

The need for a sound policy pertaining to different aspects of resource management is great. The National Park's conservation aim of promoting wise use of the natural resources in perpetuity and preventing degradation of the environment should be the basis for carrying out management planning, and the present management plan should be revised and up-dated. The above-named committee should be the body that ensures that management practices are within the framework of the policy. Where possible the policies should be in line with nationally and internationally accepted standards and criteria such as NCS and WCS.

As an example, determining different types of land use within the Park should follow IUCN land use categories. Theoretical zoning will be valueless and become more problematic unless the community has been actively involved and informed. From the outset the planning process in the Park should involve citizen participation and should be co-ordinated with local authorities and government agencies.

Chapter IX

SUMMARY, CONCLUSIONS AND RECOMMENDATIONS

9.1 SUMMARY

The natural qualities of the Khumbu region, particularly the highest mountain in the world, Mt. Sagarmatha, and the cultural and religious significance of the unique way of life of the Sherpa community make the area an obvious choice as a World Heritage Site. This area was chosen to develop a strategy for resource self-sufficiency and nature conservation. This study examined the historical perspectives of land use, current management strategies of the Park and physical supply and demand of resources.

Khumbu people, prior to the 1960's, maintained a reasonable balance between preservation and use, and respected the communal use of their land resource. This was partly due to their strong religious and cultural beliefs which were committed to sustainable ways of life that were essentially sound in ecological terms. Growing limited crops such as potato, animal husbandry and trade with Tibet were the main traditional means of livelihood. The surplus of animal and agricultural produce traditionally were contributed to maintain the monasteries and for religious

ceremonies. There was strong local control over natural resource management.

The opening of Nepal to foreign visitors in the 1950's has changed this traditional subsistence agriculture to a transitional agricultural system. Dasmann(1982) points out

> ''...that the ecosystem people are the most likely to be adversely affected by contact with representatives of the more dominant culture including those who come with the intention of establishing nature reserves."

The development of the area for tourism, nationalization of local control of forests (1956) and the Tibetan refugee influx (1959) have cumulative effects on the traditional practices of land resource management. Two main results of these changes are most notable. First of all, a "common property resource attitude" developed among the people in their use of natural resources (forests and grazing land). Resources that belong to everyone belong to no one.

Second, people became more dependent on cash income from tourism. Tourism provided opportunities for modernization and higher living standards for those who were directly involved in the tourist business, which in turn resulted in high inflation rates and more dependence on the imported food supply.

Tourism is not controlled as yet and it is exerting increased pressure on the local food, fuel and labour resources. Large quantities of wood from the slow growing

forests of Khumbu were burned as fuel for mountaineering expeditions and trekkers, and wood soon became a cash crop for the local people. Fuel wood is the sole source of energy for cooking and heating for the inhabitants, and it is not surprising that the degradation of forests and the fuelwood crisis has received much attention from Park planners and researchers from outside the region.

The establishment of Sagarmatha National Park was based mainly on perceived environmental problems such as the fuelwood crisis and on the potential of the region for the tourist industry. A focus of SNP has been to minimize deforestation, and the aid agencies so far have sought technical solutions to the fuelwood problem, which include reforestation, solar energy and hydroelectricity. The success of these programmes is yet to be determined in SNP. In the meantime, the local inhabitants and trekkers (despite Park by-laws) continue to use the scarce resource for preparing their meals in Sherpa houses. Locally, firewood is not perceived as a "real problem" as long as people can afford the time to collect it.

It is imperative to make people conscious of the problem and to strengthen community support for conservation. Without public support, no programme will succeed. Utilizing the potential of the Park Advisory Committee and reviving the traditional nawa system in land management is seen as not only the logical but a practical solution to effective control of deforestation and overgrazing.

The analysis of the resource supply and demand situation indicated that there is a high dependence on the import of food grains as well as the fuelwood shortage. Labour productivity is very low; the study indicates that housewives and children spend a great proportion of their time collecting firewood and water, the basic requirements for subsistence. In addition, the level of agricultural production is low due to limited land and skills. The food and fuel problems are exacerbated by the increasing population, mainly tourists (5000) and government officials (339). Although the national and international funding organizations have given high priorities to the energy issues, other aspects of basic needs have been neglected. As an example, potential alternative way of increasing food and fodder production and labour productivity have not been explored.

Despite strong support for conservation work in this region, solving the fuel and food problems requires a broader perspective. One approach is through the implementation of Nepal's nature conservation strategy, which calls for living resource conservation to ensure maximum sustainable productivity of resource use. A realistic approach to achieving conservation is to work closely with existing socio-economic realities. The gaps in government legislation and the lack of co-ordination between government agencies, aid agencies and local needs seems to

be the main hindrance to achieving sustainable development. Citizen participation throughout the planning process and co-ordinated development and conservation programmes are prerequisites to success. An integrated approach to resource use such as tourism development in conjuction with improved agriculture and livestock production and forest management holds the greatest promise for the Khumbu region.

9.2 CONCLUSIONS

Conservation of watershed, soil, forests, and the traditions and cultural identity of the Sherpa people is not only a worthy principle, but vital to the life support system of the Khumbu region. There are sound economic and social reasons to protect these resources for future benefit, the benefit in this context being the fulfillment of basic human needs, rather than--as in the Parks of developed countries--providing a luxury for the rich. The government should recognize that successful protection of this unique Park depends on the well-being of its people.

The study indicates that the Sherpa's spiritual commitment under a system of social and community control of resource management for sustainable use is disrupted by internal and external political, social and economic factors. The traditional practices of land resource management have broken down in the villages most affected by tourism. Despite all the changes brought about by the

industry, Sherpas have maintained a strong identification with their culture and religion. Only a small percentage of the people have specialized in tourism, thus future economic options are open for Khumbu people if a disruption should occur in the influx of visitors. However, this will depend also on the patterns of national and international assistance that flows into the region.

There is growing concern about the recognition of the fuelwood problem, but a broader perspective is needed to achieve resource self-sufficiency in the region. A committee should be formed at the local level to co-ordinate all development projects in the context of total resource use patterns and to make the funding organizations aware of the problems and prospects.

There is strong local support for reforestation programmes; however, the present technologies to replace fuelwood should be examined in the context of local needs. Local people must be made aware of the fuelwood crisis through conservation education; it is important that they feel the need for these technologies and that they have the skill and financial resources to absorb them in the long run.

Any alternative means of achieving patterns of sustainable land-use in Khumbu depend on the development of a strategy for confronting the prevailing problems by

increasing the productivity of land and labour resources with minimal degradation of the environment. Specific conclusions of this study have been incorporated into the strategies presented in the Recommendations section.

9.3 RECOMMENDATIONS

Evidence from this study and personal experience of the study area have provided a foundation for the development of the following recommendations for resource self-sufficiency and nature conservation which are presented under a general statement concerning resource management, planning and development needs in the region. These recommendations should be implemented prior to the year 2000 by incorporating in the governments' seventh five-year plan (1985-1990). According to the author's perception of their importance, the recommendations are sequentially presented, beginning with the most important.

MANAGEMENT

Management: Energy Demands

> Recommendation 1: Conservation must play a major role in reducing the pressure on the Khumbu forests by improving existing stoves, introducing backboiler heating systems, encouraging insulation in new buildings and reducing fuelwood uses in activities such as festivities.

High priority must be given to improving the efficiency of energy use in the Park, and there has to be co-operation between local people and project officials in the formulation and implementation of alternate energy technology projects.

> Recommendation 2: A workable strategy to deal with the problem of long term energy needs of Khumbu region should be formulated with the close co-operation of the existing Park Advisory Committee (PAC) and the funding agencies.

This may involve implementation of cost effective, reliable, simple, environmentally sound and self-sustaining technological projects that can save substantial amounts of firewood over an extended period of time.

> Recommendation 3: Park authorities should not consider any alternate energy projects without assessing environmental and social benefits/costs.

Based on the experience of the Namche micro hydro project described in this practicum, it is strongly recommended that such projects not be pursued in future. Electric power for lighting alone does not reduce firewood consumption, which should be the goal of any such project. The implementation of projects of this nature should be compatible with local socio-economic and environmental conditions.

Management: Fuelwood Supplies

Recommendation 4: National Park authorities should designate maximum responsibility for forest management to the local inhabitants.

Both the protected areas and newly reforested areas should be managed by the appointed members of the community with technical and financial assistance from the Park. The success of reforestation depends on the willing participation of the local people. The sixth five-year plan (1980-1985) of the government has also designated and implemented many integrated projects in the various districts of Nepal (Manandhar, 1982). Under this concept, people's participation in reforestation and management of the existing forests is encouraged. Local people should be motivated to protect the forests and agree to their rational exploitation.

Recommendation 5: Sagarmatha National Park, while maintaining the present reforestation programme, should seriously consider replanting the Park corridor area between Luckla and Namche.

At present, 80% of the building timber requirements of Khumbu are being met from this area. Due to its lower altitude and favourable climate, the growth rate of trees is almost three times faster than it is in Khumbu. A community forestry programme should be undertaken either by the Park or by the community forestry development (Department of

Forests). This Park corridor has the potential for future timber supply and firewood, and the region is also a wildlife migration area for the Park.

Management: Information

> Recommendation 6: An active environmental education programme should be launched. The strategy for resource self-sufficiency and nature conservation can only be achieved by making people aware of the problems.

The local population must be educated in such a way that increases their perception and understanding of the environment. Through understanding, their willingness and knowledge to apply ecologically sound land-use practices in resource management can be obtained. This programme should include school children, farmers and trekking and mountaineering guides.

Management: Public Participation

> Recommendation 7: The potential of the local Park advisory committee and honorary forest guards should be recognized and strengthened.

Continuity of communication between Park authorities and Park public would contribute to mutual understanding, to the ultimate benefit of the Park. The committee should be involved in providing advice to Park authorities about policy making, planning and management decisions. It should also act as an agent for information dissemination.

Management: Grazing

> Recommendation 8: A grazing management plan should be formulated and implemented. Since livestock products play a vital role in the diet of the people and provide some income for the farmers, action must be taken to improve animal feed (pastureland) and animal productivity (yield). It is strongly recommended that pastureland be managed by a rotational grazing method.

The Park Advisory Committee or the proposed Khumbu region coordination committee should be the medium for enforcing the farmers' observation of this grazing management restriction. The purpose would be to revive the traditional methods of grazing and livestock management. Nak and Yak breeding should be encouraged more than other cattle, such as cows.

Management: Tourism

> Recommendation 9: The Department of Tourism and other sectors involved in tourism should promote off peak season tourism in Nepal.

The extention opportunities of Nepal's cultural heritage and the scenic beauty of the mountain ranges other than Kathmandu valley and the popular Parks should be recognized and advertised for tourism. This would reduce seasonality.

> Recommendation 10: Sagarmatha National Park should be designated as a "unique tourist area" for trekking and mountaineering visitors only.

The Park should provide a semi-wilderness experience with an environment different from the increasingly urbanized world. Limited user facilities should be provided and more group trekking should be encouraged. This would encourage user self-sufficiency in food and fuel and would contribute significantly to generating employment.

> Recommendation 11: The Park authorities should promote alternate viewpoints and tourist routes such as Gokyo-ri to the popular Kalopather in order to reduce seasonal overcrowding.

A comprehensive visitor management programme should be developed to protect the quality of the Park environment and the quality of the visitor experience.

> Recommendation 12: Larger scale tourism development should only be undertaken in combination with rational management of renewable natural resources in the region.

Tourism should be developed with integrated rural development. Tourism development must be accompanied by the improvement of agriculture, livestock production, forest management, communication and transportation (UNESCO, 1977).

Management: Research

> Recommendation 13: In view of this study, the author believes that integrated interdisciplinary research should be carried out in all of the National Parks in Nepal.

A problem oriented integrated interdisciplinary research approach is needed for rational management and planning for a Park and its surroundings. This would involve research into ecosystem survey, socio-economic analysis, legal analysis, historical surveys, and the potential and limitations of resources. An inventory of resources by scientists of different backgrounds would provide information vital to the understanding of the resources of the Park and would aid in making management decisions.

> Recommendation 14: Research should contribute to the management of specific Park problems. Therefore, research topics should originate from the Park's management and planning perspectives, with problems in need of investigation being given priority.

Management: Administration

Recommendation 15: National Park designation should reconsider the inclusion of both permanent and seasonally occupied villages in the Park.

This strategy seeks to broaden the base with regard to the scope of features already found in a National Park by officially including elements of man's cultural heritage in zones within a National Park. The exclusion of main villages from the Park boundary does not have any practical advantages for the Park management or the Sherpa people. The inhabitants are very dependent on the Park for its natural resources and for employment opportunities. The anthropological , historic sites and cultivated landscape and architectural buildings are an

integral part of the Park experience for the visitors and are a cultural heritage of the Park.

> Recommendation 16: High priority should be given to research directed toward establishing the physical and social carrying capacity with regard to tourism development.

The carrying capacity study should give high priority to assessing the impacts of external factors on the local inhabitants. This information should be used as a basis for the establishment and enforcement of visitor quotas to prevent trekking and mountaineering groups from exceeding the social and environmental carrying capacities of the Park. It is further recommended here that in the absence of physical and social criteria for carrying capacity, judgements of National Park authorities and the expertise of professionals in the field should be applied to limit visitors.

PLANNING

Planning: Development

> Recommendation 17: A Khumbu region co-ordinating committee for development should be established. The make-up of the committee would be as described in section 8 (p. 150).

The main functions of this group would be to supervise the overall development and the implementation of development projects in the region. Maintaining links of co-operation and co-ordination between the government agencies, local authorities

and aid agencies would be its most important function. It would also review and make recommendations for future projects. The long term objective of this committee would be to contribute to the general effort of achieving a sustainable development meant to improve the standard of living of people in the regions and its surrounding areas, and to minimize environmental degradation.

Planning: Co-ordination

> Recommendation 18: Park authorities should seek to co-ordinate Park management planning with other departmental agencies, district and local authorities (panchayats) so that Park management plans can be integrated with other plans for it and the surrounding areas.

A total systems approach in planning would lead to better management of specific resources. This would diffuse bureaucratic competitions and hostilities (Prosser, 1977). The Department of National Parks and the National Planning Commission could assist in achieving this process of planning and implementation in the field, which would reduce unsympathetic development in a special Park environment.

SUSTAINABLE DEVELOPMENT

Development: Subsistence Agriculture

> Recommendation 19: It is important to promote a subsistence strategy grounded in a general basic need approach, which would generate income among poor farmers to enable them to buy essential goods and services.

The potential for growing vegetables along with potatoes to increase farmers' productivity should be encouraged. Projects such as producing vegetables (cabbage, cauliflower, rayo, radish, cress, spinach, turnip, onion, garlic, carrots, peas and beans) on a small scale would supplement the local diet and stimulate economic development in the area.

In addition to training the local farmers, an extension service should be provided. New techniques of vegetable cultivation should be investigated and the introduction of green houses to ensure a supply of green vegetables during all seasons might also be feasible. This kind of project would also help meet tourists' requirements for vegetables. A few efforts to raise some of the above mentioned vegetables have already been undertaken by some farmers, but they lack expertise for this new trade.

Development: Crafts

> Recommendation 20: The government should provide assistance in the development of small scale cottage industries based on traditional crafts and skills.

The development of small scale cottage industries in the region would assist in increasing the income of the people and reduce unemployment. There is a potential market for traditional crafts and agricultural products both locally and for sale to visitors. Incentives should be offered to produce handicrafts, make traditional clothes on looms, and weave carpets, for export

purposes as well as local consumption. Existing sources of funding and expertise, and outside funding, should be sought for initial capital investment, technical assistance and training.

Development: Water and Sanitation

> recommendation 21: Drinking water supply and toilet facilities for local people as well as for tourists should be provided by construction of suitable water systems and toilets. Financial support for demonstrations of construction and training should be provided insofar as is possible.

CONSERVATION

Conservation: Cultural Resources

> Recommendation 22: Park authorities should respect the religious customs and beliefs of the local inhabitants by giving adequate protection of religious structures and appropriate control of staff and visitor activities.

The unique cultural identity of the Sherpa people should be allowed to prosper as long as the people are willing to practise. Visitors should be informed about the Sherpa culture through Parks' interpretive service and other media, so that the cultural heritage can be protected.

A good start has already been made, in that the Park has built a "cultural centre" at Tengboche Monastery and has carried out restoration of monasteries with the financial help of the World Heritage Fund. A general management programme incorporating long-term plans for cultural preservation should be prepared for Khumbu on the basis of information already available in the Park.

Conservation: Environmental Quality

> Recommendation 23: Park authorities should control and maintain the aesthetic qualities of the Park environment as an integral part of the National Park experience.

It is vital to encourage, and where possible provide assistance in, retaining traditional architectural styles and minimizing incongruous visual impacts. Forms of roofing, other than iron sheets or paints that are intrusive to the surroundings, should be sought and utilized for aesthetic and architectural reasons.

In the literature search done for this practicum, the author came across many papers which had been undertaken over a period of many years. It is strongly recommended that this body of literature be collected for the Park. Many of the research papers were not available in the Park or in Nepal.

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